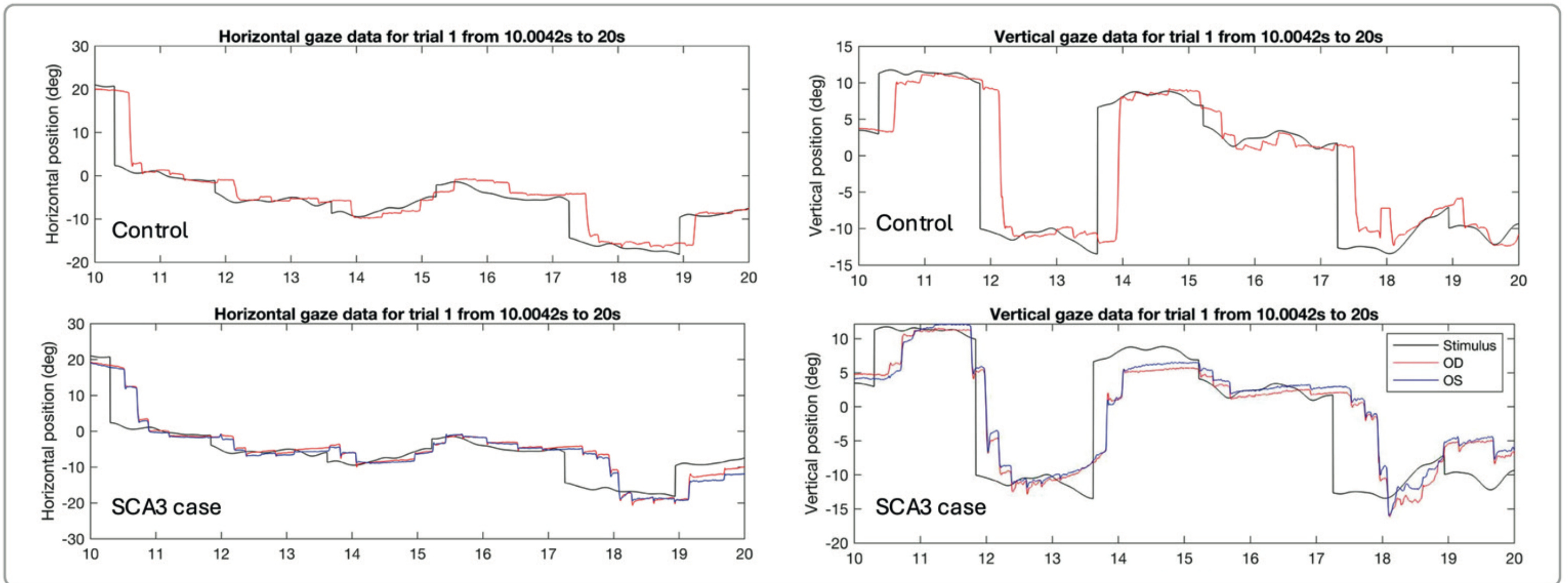


SPINOCEREBELLAR ATAXIA

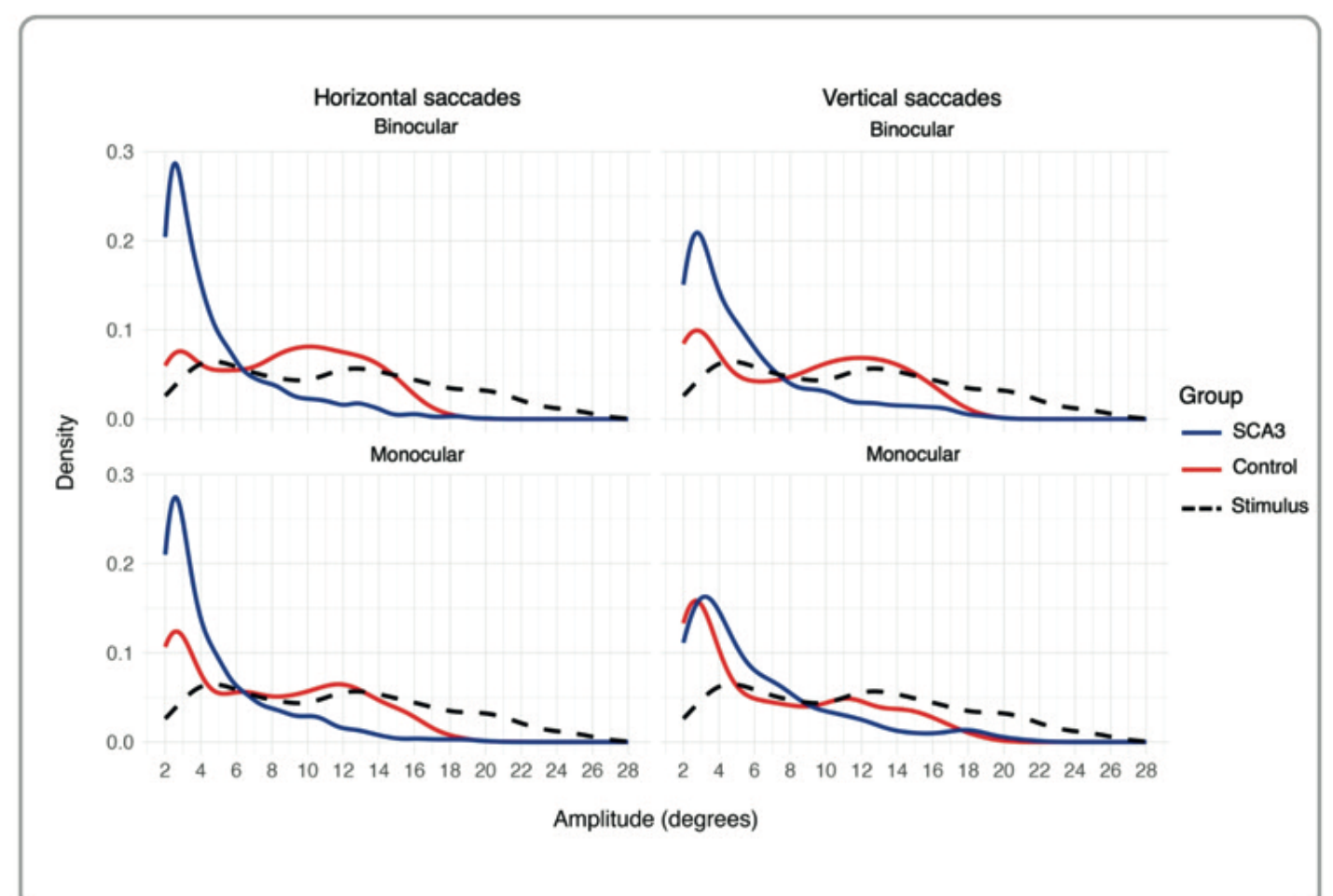
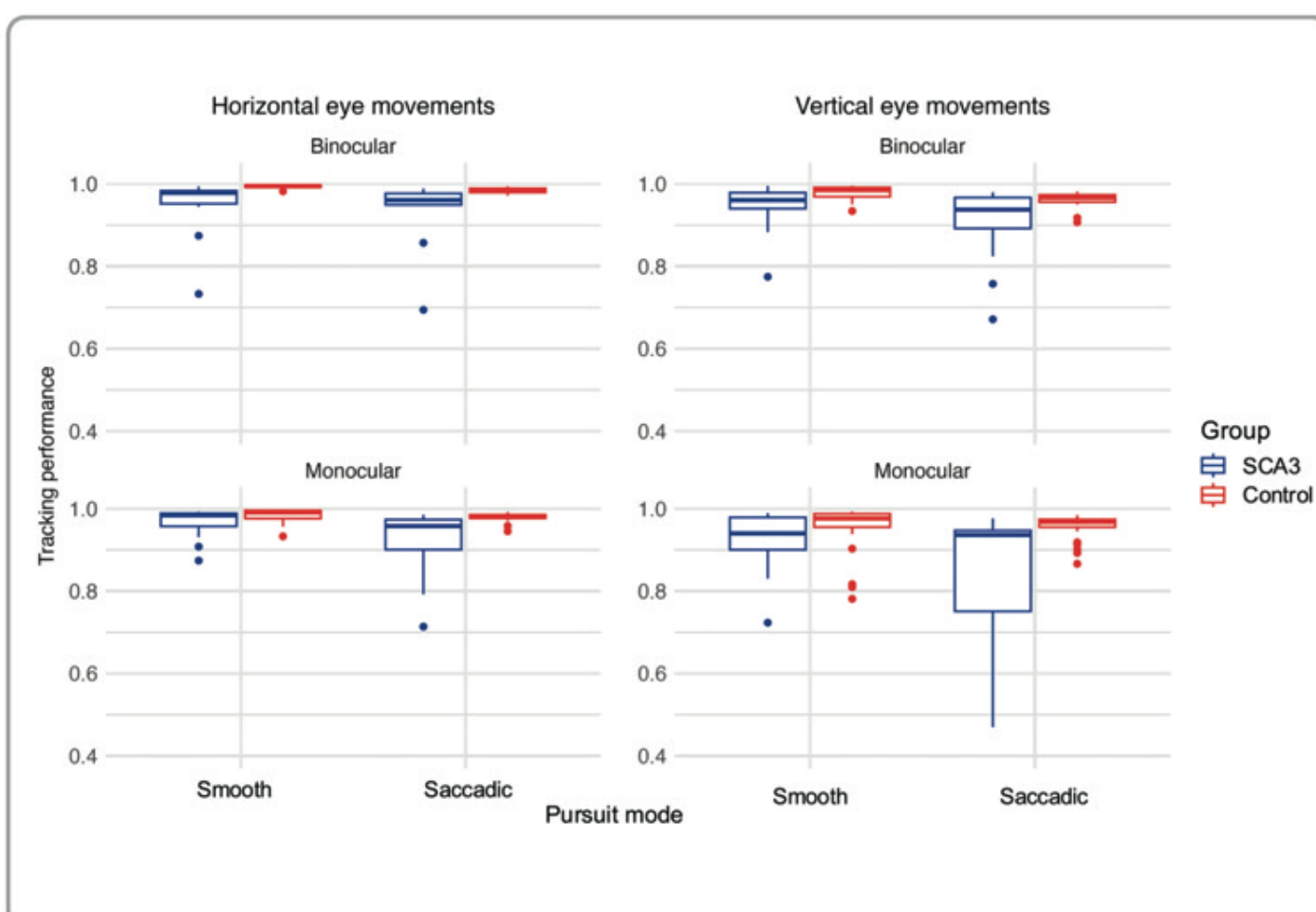
de Boer, M.J., Wasmann, R.A., Pott, J.W.R., Cornelissen, F.W., and Jansonius, N.M. (2025).

Continuous visual stimulus tracking to quantify eye motility in spinocerebellar ataxia type 3. *Frontiers in Neurology* 16:1650269.



Altered Saccadic Dynamics in SCA3

Patients with Spinocerebellar Ataxia type 3 (SCA3) demonstrate distinct oculomotor strategies during SONDA's continuous visual tracking tasks. The raw horizontal and vertical gaze traces reveal that while healthy controls typically capture a sudden stimulus jump with a single large saccade, SCA3 cases respond with a series of multiple, small saccadic movements. Despite relying on these fragmented, hypometric saccades to cover the required distance, patients remain generally capable of following the overall path of the stimulus.



Preserved Yet Reduced Tracking Performance

Despite the presence of oculomotor abnormalities, SCA3 patients demonstrate a remarkably high ability to track continuous visual stimuli. However, their overall tracking performance is (slightly) reduced compared to healthy controls. This reduction is most prominent and statistically significant during the saccadic pursuit mode under monocular viewing conditions, highlighting subtle deficits in dynamic gaze control.

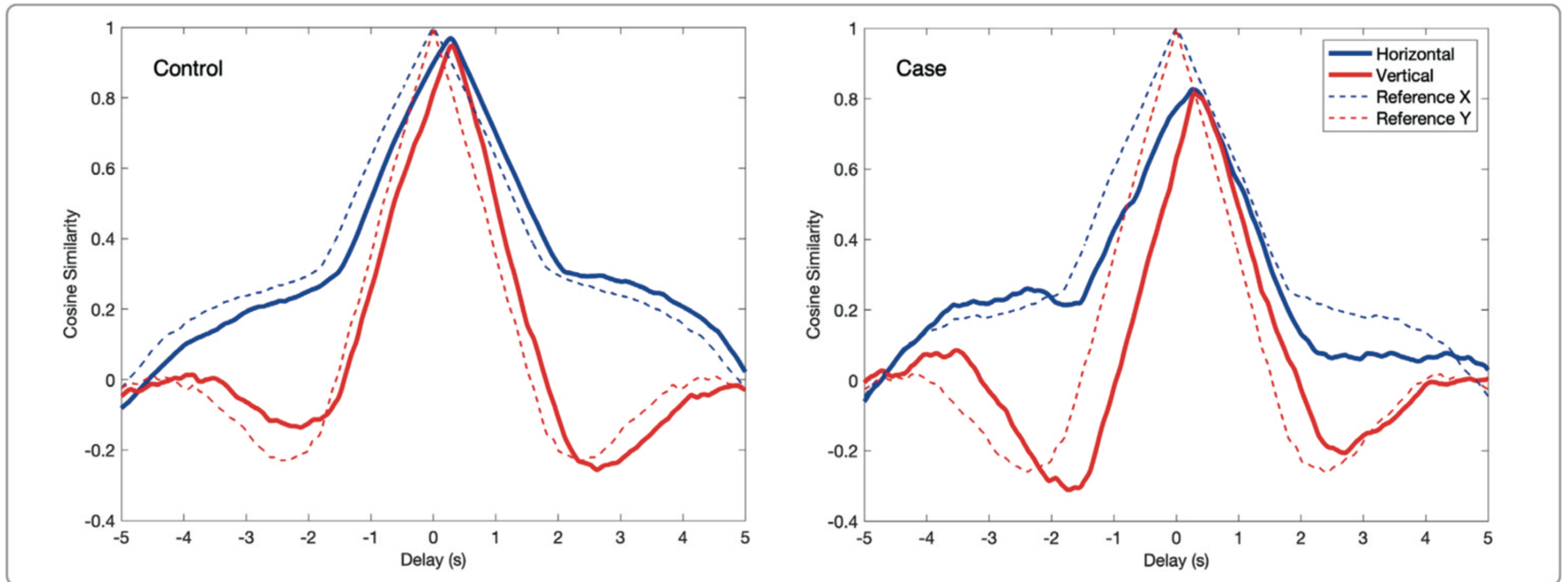
Hypometric Saccades as a Biomarker

Unlike healthy controls, SCA3 patients produce small, hypometric saccades rather than matching stimulus jump amplitudes. This horizontal-specific abnormality is strongly associated with the severity of clinical oculomotor symptoms, such as diplopia.

Consequently, saccadic amplitude distribution shows great potential as an objective biomarker for monitoring SCA3 progression.

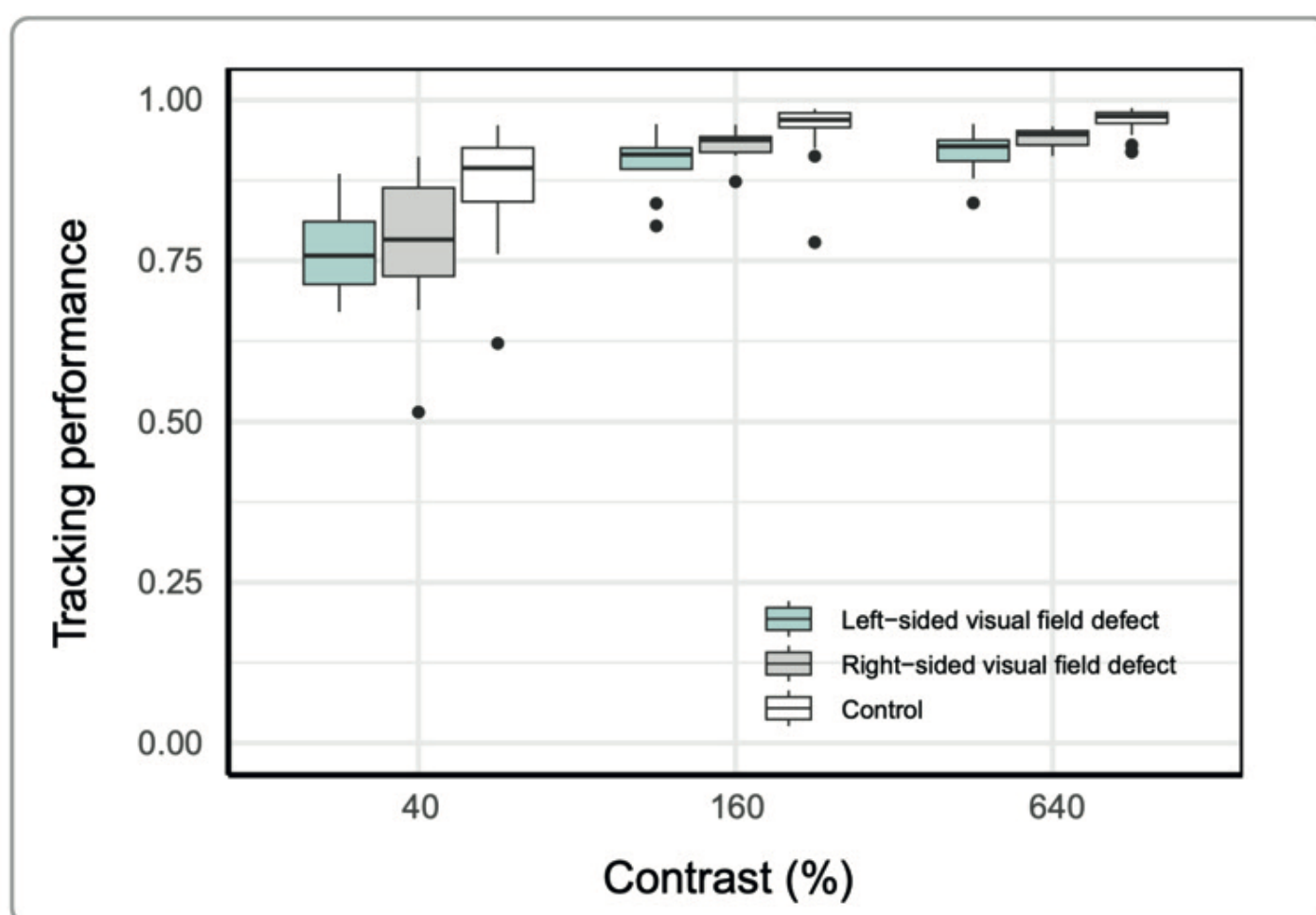
ACQUIRED BRAIN INJURY

Vrijling, A.C.L., de Boer, M.J., Renken, R.J., Marsman, J.B.C., Heutink, J., Cornelissen, F.W. and Jansonius, N.M. (2025) Using continuous visual stimulus tracking for detecting visual function loss due to acquired brain injury. Acta Ophthalmologica, 00, 1–12.



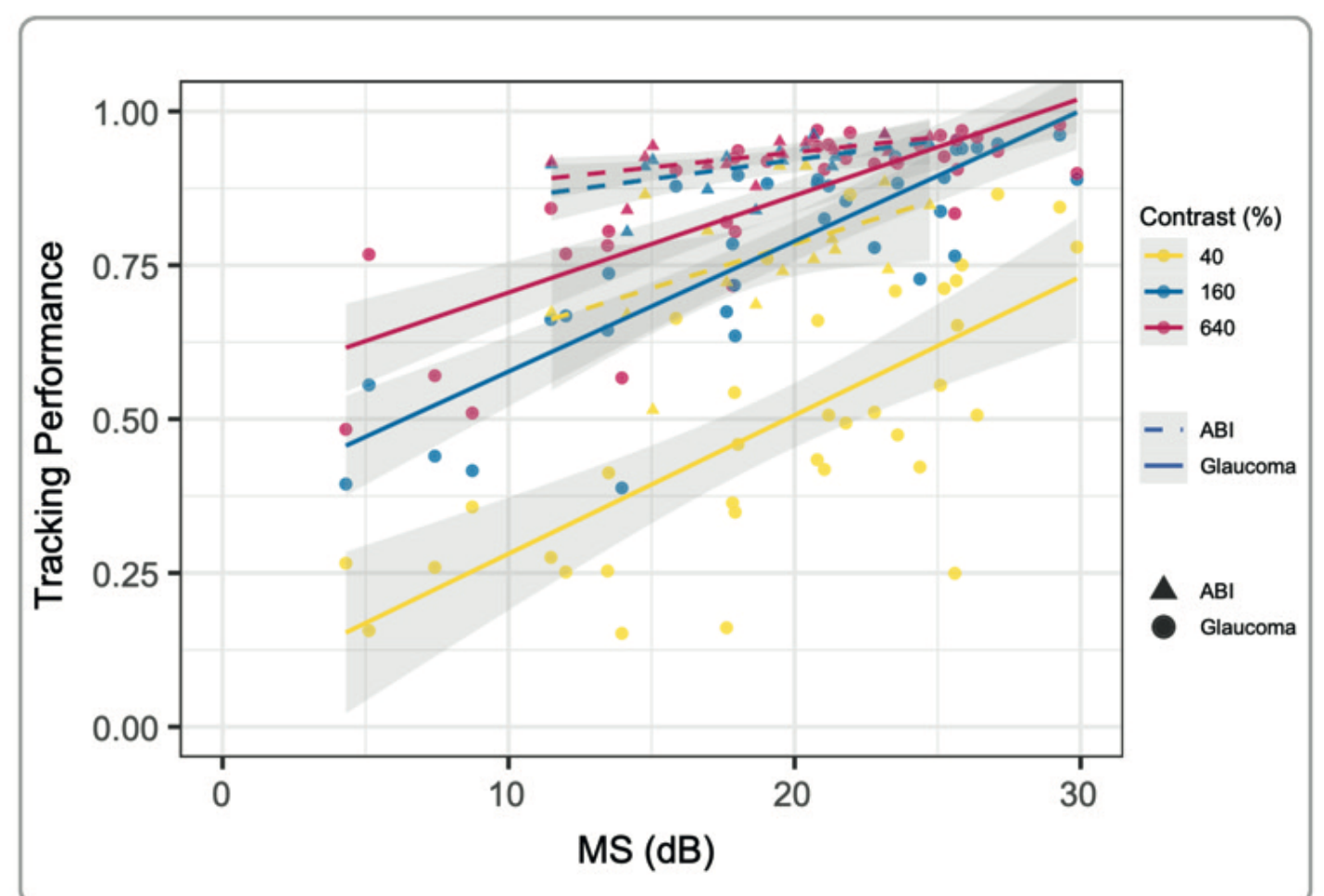
Detecting Visual Function Loss in ABI

SONDA's continuous visual stimulus tracking effectively captures visual function loss following acquired brain injury (ABI). The time-lagged cosine similarity curves demonstrate this: while healthy controls exhibit near-perfect tracking with a sharp peak and minimal delay, ABI patients typically show a markedly reduced peak tracking performance. When the moving stimulus enters a scotomatous region (blind area), the resulting tracking errors and delays naturally lower the cosine similarity score, allowing for the objective detection of visual field defects regardless of cognitive capability and without a learning effect.



Robust Detection Independent of Defect Side

Tracking performance in ABI cases is significantly lower than in controls across all contrast levels. Notably, this reduction is completely independent of whether the homonymous visual field defect is left-sided or right-sided. While tracking improves from 40% to 160% contrast, it plateaus thereafter. This demonstrates that SONDA's continuous tracking task is a robust tool for detecting ABI-related visual function loss, unaffected by the lesion's hemisphere.

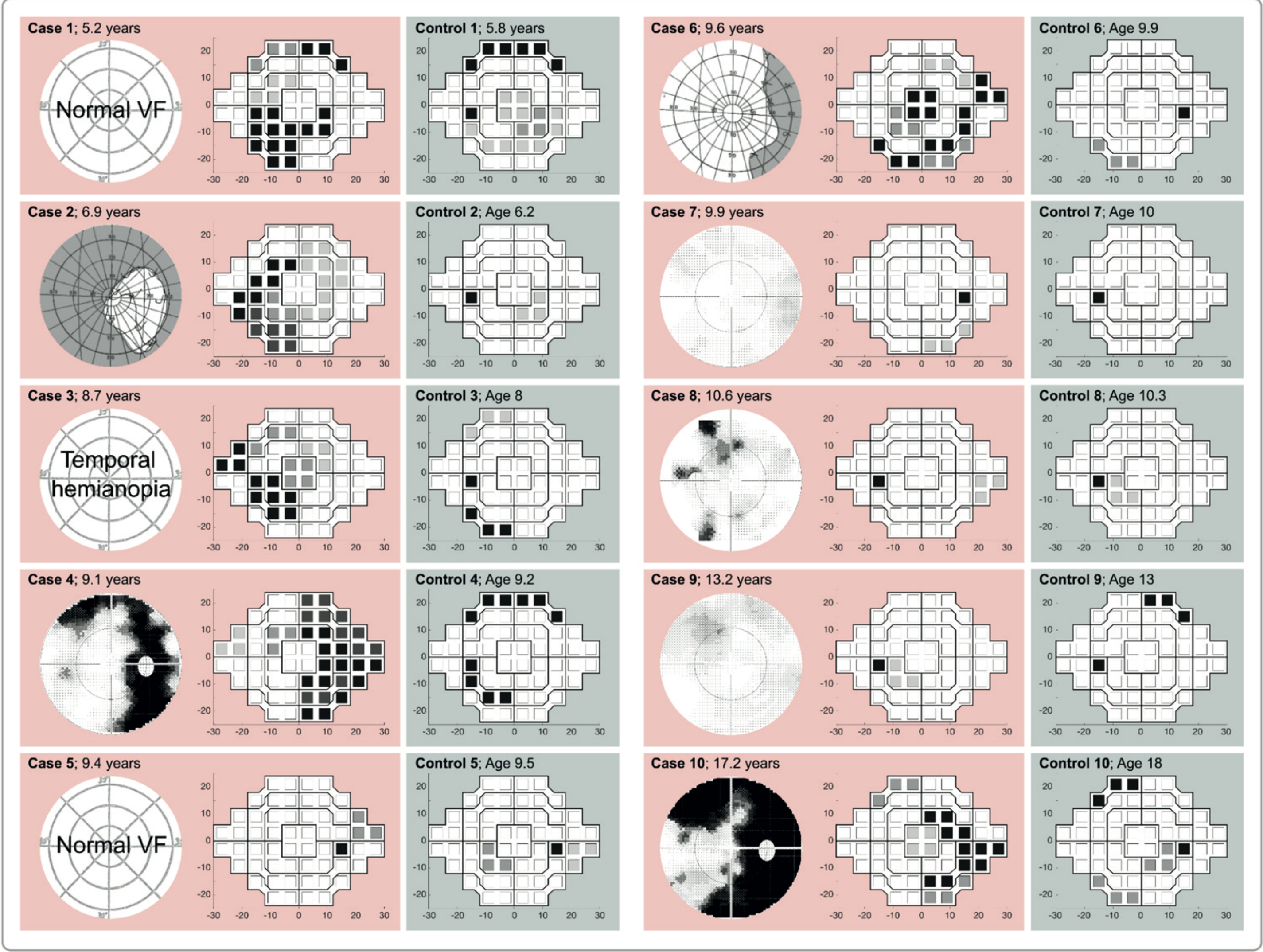


Quantifying Visual Loss and Adaptation

Tracking performance correlates strongly with the severity of visual field loss (SAP Mean Sensitivity) in ABI patients. ABI cases generally demonstrate better tracking performance than glaucoma patients with comparable visual impairment. This could be due to compensatory scanning strategies developed by patients with ABI, or to the overlapping nature of homonymous defects relative to typical glaucomatous damage.

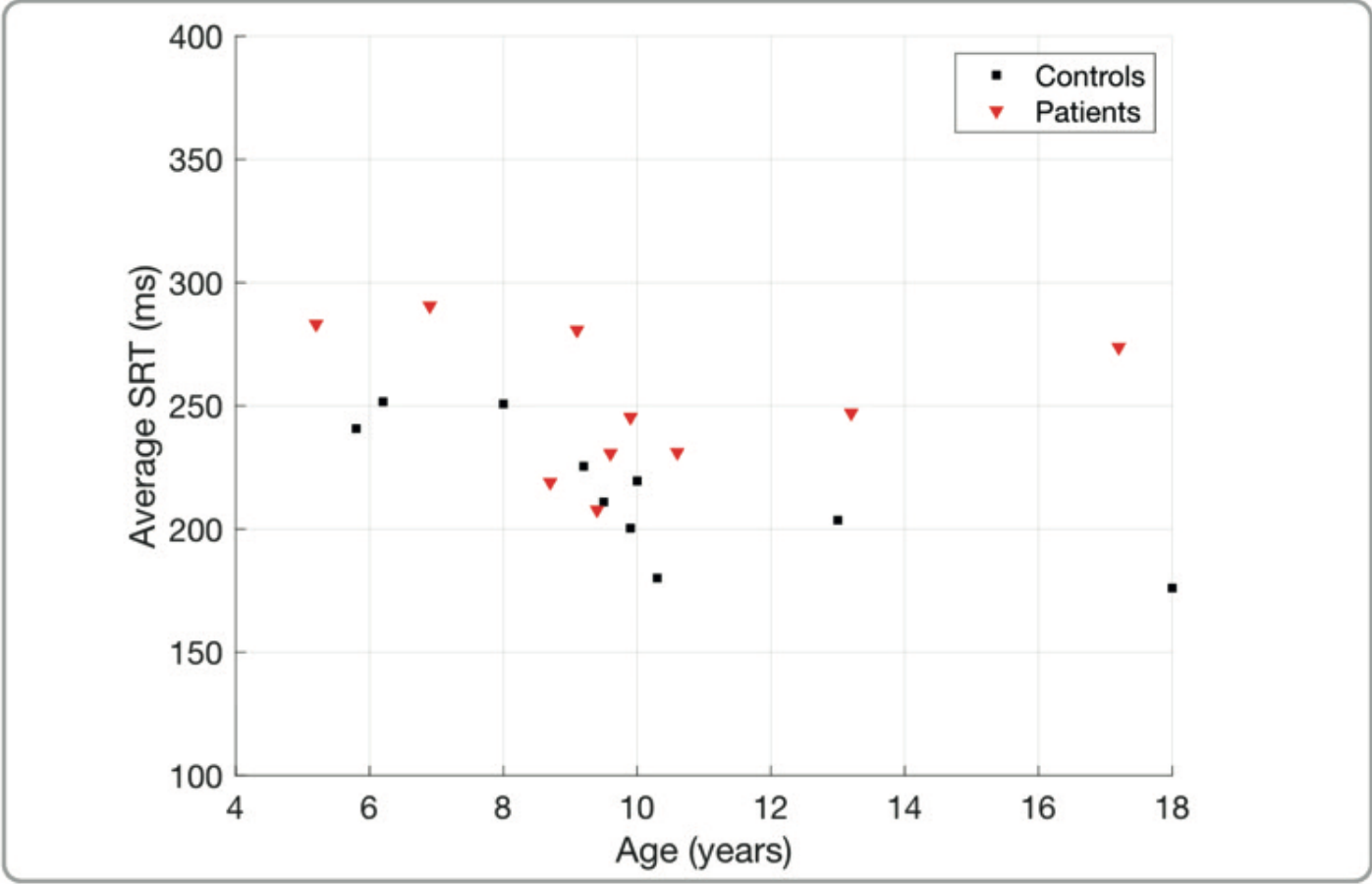
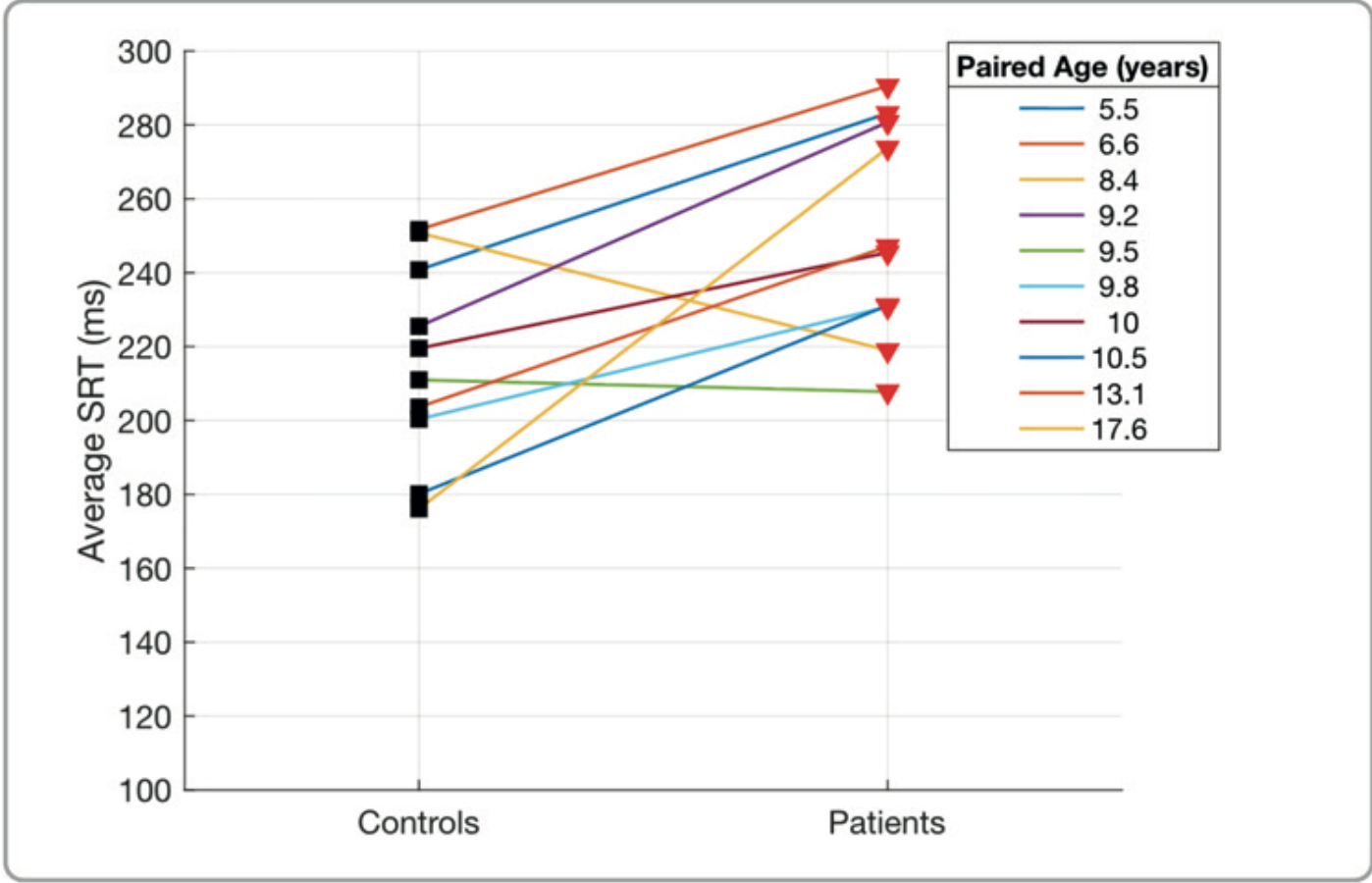
PAEDIATRIC NEURO-OPHTHALMOLOGY

Boethun, A., Nordhjem, B.J.T., Kolko, M., Mathiasen, R., Grillini, A., von Holstein, S.L. (in review). Paediatric Eye Movement-Based Perimetry Using the Standardized Oculomotor Neuro-ophthalmic Disorders Assessment (SONDA)



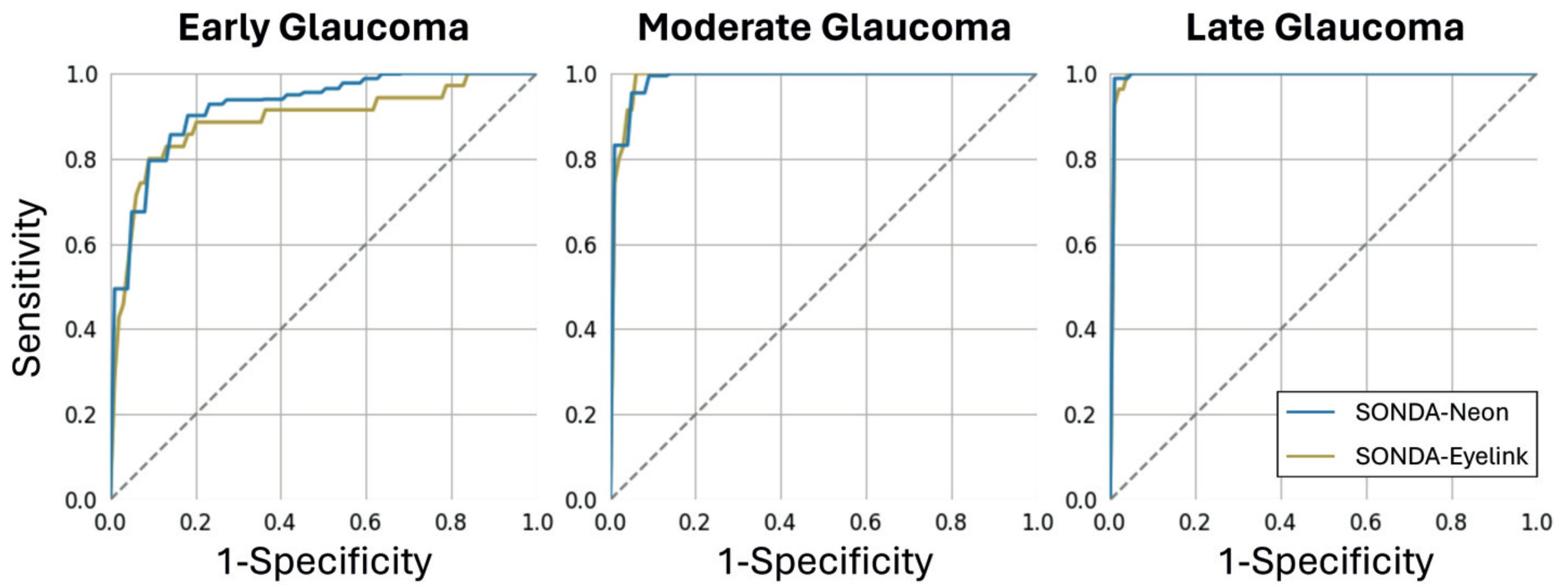
Mapping Visual Field Defects and Delayed Reactions in Children with Brain Tumor

SONDA provides a viable, patient-friendly alternative for visual field mapping in pediatric brain tumor patients, generating maps that reveal spatial patterns comparable to conventional clinical assessments. The technique captures localized visual field defects through prolonged saccadic reaction times (SRTs) or entirely unseen locations. These patients generally exhibit significantly longer SRTs than healthy, age-matched controls. Additionally, while healthy children naturally develop faster reaction times as they age, this normal developmental trend appears disrupted or highly variable in the patient group.



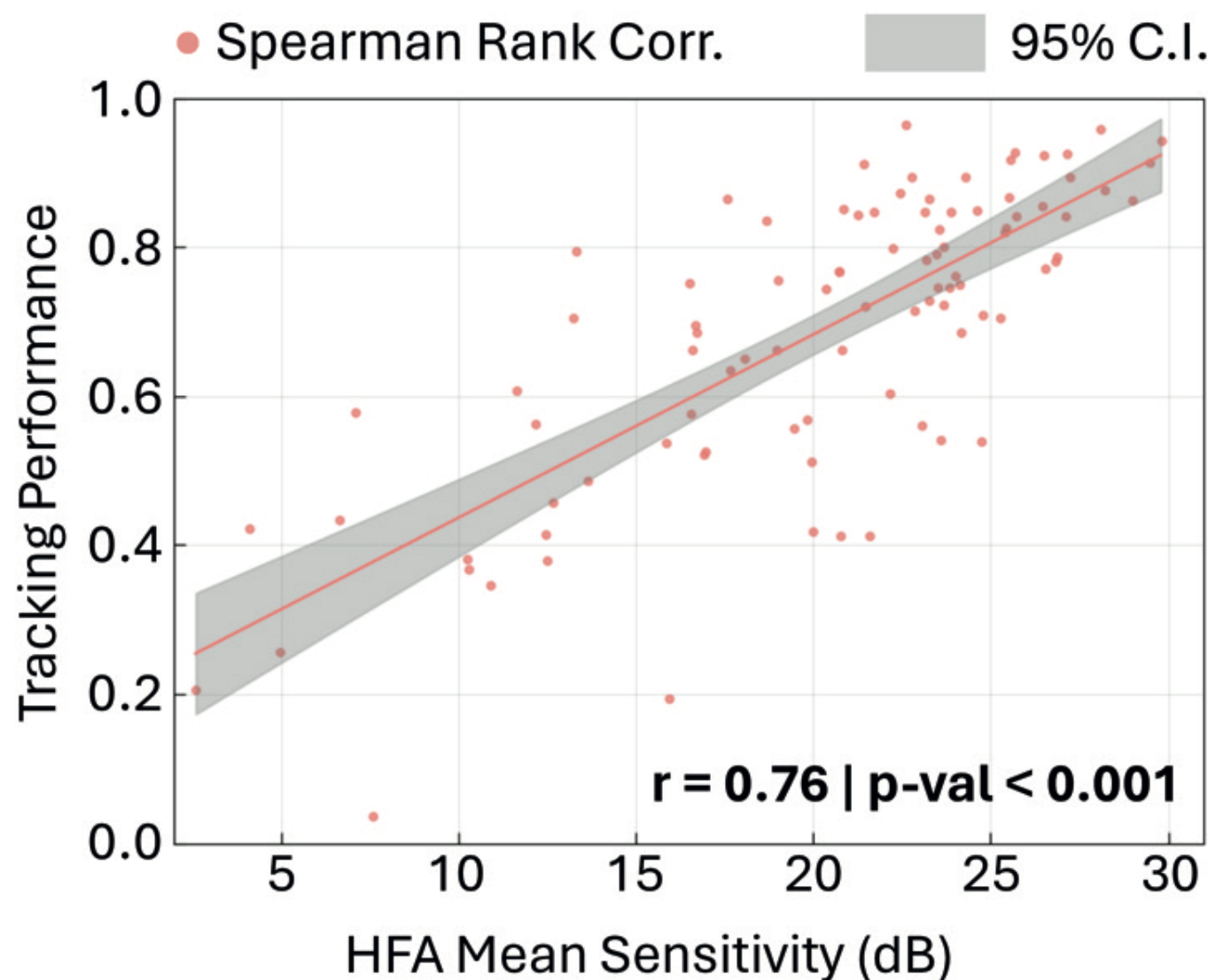
GLAUCOMA

Vrijling, A.C.L., de Boer, M.J., Renken, R.J., Marsman, J.B.C., Heutink, J., Cornelissen, F.W., Jansonius, N.M. (2025). Detecting and quantifying Glaucomatous visual function loss with continuous visual stimulus tracking: A case-control study. Transl. Vis. Sci. Technol.14(2):3 & Screening for glaucoma with a novel eye movement perimetry technique based on continuous visual stimulus tracking (in review)

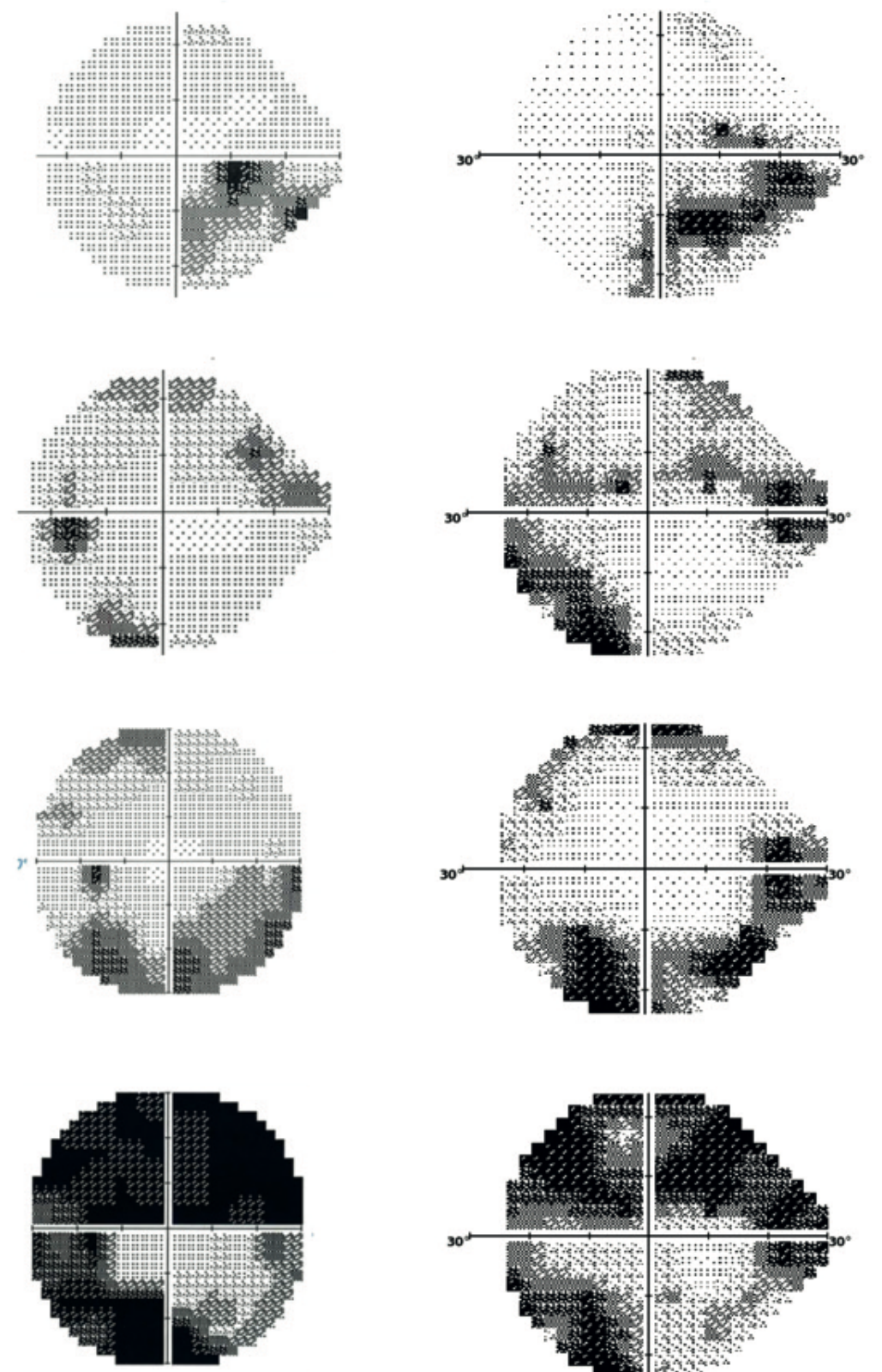


High Diagnostic Accuracy, Reproducibility, and Reliability

SONDA demonstrates excellent clinical performance for detecting glaucomatous visual function loss. Receiver Operating Characteristic (ROC) analysis reveals high diagnostic accuracy with the clinic-ready SONDA setup, with results reproduced on an independent experimental setup. At a fixed specificity of 95%, SONDA achieves a sensitivity of 68%, 95%, and 100% for Early, Moderate, and Late Glaucoma, respectively, without being affected by a learning effect. This confirms SONDA's accuracy, reliability, and reproducibility, establishing it as a highly effective tool for population screening.



HFA



Quantifying Visual Function Loss

Beyond initial detection, SONDA provides an objective quantification of visual field defects. Tracking performance (calculated using Spearman rank correlation) demonstrates a strong, linear agreement with the clinical gold standard, Standard Automated Perimetry (SAP) Mean Sensitivity. SONDA's spatial mapping is derived from a combination of Saccadic Reaction Times and advanced signal-processing algorithms, closely aligns with traditional Zeiss-HFA results. This allows clinicians to accurately stage and monitor disease progression without relying on subjective, fatigue-inducing manual button presses typical of SAP.