Establishing normative data for horizontal and vertical random saccades using videonystagmography (VNG) and exploring correlations between age and saccade parameters.

Alysia Dyke (Glan Clwyd Hospital), Rebecca Anderson (Glan Clwyd Hospital), Debbie Cane (University of Manchester)

Introduction

The random saccade test is performed on dizzy individuals to assesses their central eye movement (oculomotor) pathway function. Normative values for saccade parameters (latency, velocity, and accuracy) vary between studies, and the impact that age has on these parameters in different saccade planes and directions is unclear. This study aimed to:

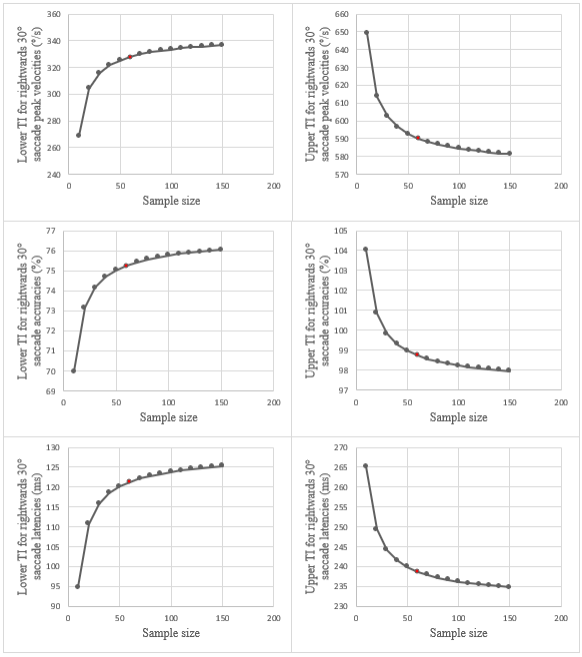
- Establish age-related normative data for this test using a video eye recording technique (Videonystagmography (VNG)), and;
- Identify any significant associations between age and saccade parameters.

It was hypothesized based on the currently available research, that age would significantly impact latency in all planes and directions, but only impact peak velocity and accuracy in some, but not all, planes and directions.

Method

Sample size calculations

Two power analyses were performed. The first used tolerance intervals which suggested that due to diminishing returns, a minimum sample size of 60 participants in each of three age categories (20≤39, 40≤59 and 60≤79 years), 180 participants in total, would be the the optimal minimum sample size to recruit, to report robust age-related normative values (see Figure below). The second used correlation analysis effect sizes reported in the wider literature, which suggested that a minimum sample size of 24 individuals would be the optimal minimum sample size to recruit to enable some sufficiently powered correlation analyses between age and saccade parameters to be performed.

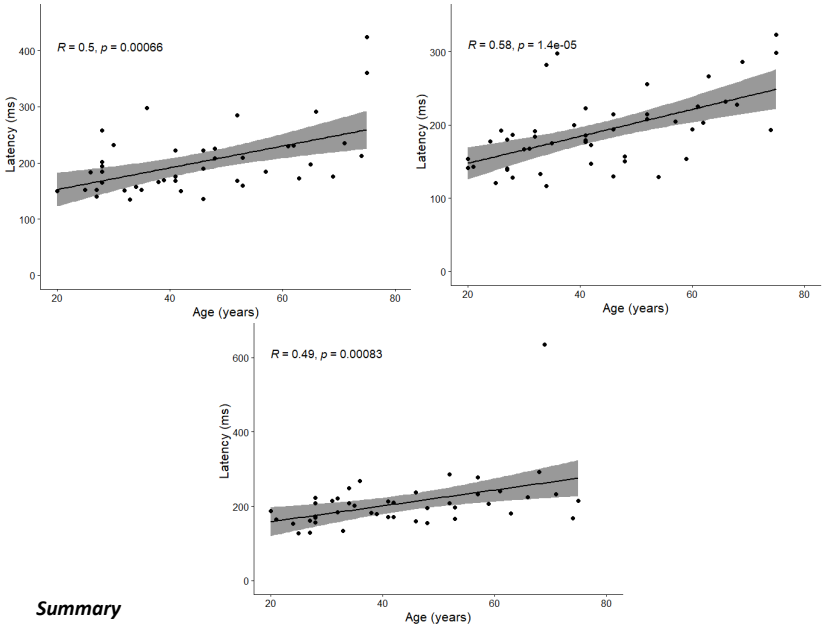


Study procedure

64 individuals aged 20-77 years old underwent screening (self-report of meeting inclusion and exclusion criteria; visual acuity examination; bedside eye movement examination). 62 individuals passed screening, and completed 1-minute horizontal and 1-minute vertical saccade tests using VNG (saccades were randomly evoked left and right at 5-30° angles, followed by a 1-minute break, then up and down at 5-15° angles). The computer software measured peak velocity, accuracy and latency values, and target angles were measured by hand and checked by a second researcher. Normative mean and standard deviation values for saccade parameters were calculated. Spearman's rank-order correlations between age and saccade parameters for saccade planes, target angles and directions with sample sizes providing sufficient power to detect significant correlations, were performed.

Results

Age-related normative data, and correlation analyses between age and peak velocity, could not be produced, due to underpowered sample sizes. Normative values for each saccade plane, direction and target angle, pooled across ages, were instead reported. These generally aligned with expected normative saccade parameter values and their variability in the wider literature. There were significant medium-large positive correlations between age and latencies of 15° leftwards (r=0.50, p=0.00066, n=43), 10° upwards (r=0.58, p=0.000014, n=48) and 15° upwards (r=0.49, p=0.00083, n=44) saccades (see Figures below). Other correlations between age and latency at different target angles, and all correlations between age and accuracy, were not significant.



Summary

The set of normative data pooled by age contributes to a limited evidence base on vertical saccade normative values. The hypothesis that age would significantly impact latency in all planes and directions, based on the wider literature's findings, was rejected. Significant positive correlations were only found for specific directions and target angles in this study, suggesting that age-related decline of higher brain centres involved in saccade programming may not be extensive. The hypothesis that age would only impact accuracy in certain saccade planes and directions was rejected, as no significant correlations were found. This adds debate to the divided literature, and suggests that the cerebellar and brainstem areas controlling saccade accuracy may be resistant to age-related decline.

As the research is still conflicting, future sufficiently powered research exploring relationships between age and saccade parameters in different directions and target angles, adjusting alpha values for multiple comparisons if performing many correlations, is warranted. This will better justify whether growing the evidence base to identify robust normative age-related random saccade parameter values, is warranted.

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Betsi Cadwaladr University Health Board
Gwasanaeth Awdioleg Gogledd Cymru
North Wales Audiology Service
MANCHESTER 1824
The University of Manchester