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peek vision

Near Visual Acuity Measurements by Community Screeners using digital Peek near vision testing versus conventional charts, India

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Part A: Context, Methodology and Results

Introduction: Near vision correction improves productivity,[1,2] income,[3] and quality of life,[4,5] contributing to 12 Sustainable Development Goals, and therefore is a WHO priority within the SPECS 2030 Initiative. However, estimates of near visual impairment (NVI) prevalence are made less reliable by a lack of standardisation in near visual acuity (NVA) testing, contributing to wide variability in epidemiological estimates: alternative modelling produces global estimates of 510 million[6] or 826 million[7] people with uncorrected presbyopia. NVA is less commonly tested and recorded than distance visual acuity (DVA) and unlike in DVA testing, there is no universally accepted gold standard test for NVA.

Aim: A novel digital near vision acuity test has previously been developed by Peek Vision and validated, under strict trial conditions, in Lahan, Nepal.[8] In this study, we assessed the use of the Peek near vision test in a clinical setting and community programme setting, in Northern India.

Methods: The study was carried out in the catchment area of Dr Shroff's Charity Eye Hospital, Mohammadi, Uttar Pradesh, India, with a total of 768 participants. Stage 1 assessed the interobserver variability of Peek near vision test NVI screening in 168 clinic participants, with three trained community screeners. Stage 2 compared Peek near vision test to conventional chart testing (Precision Vision Tumbling "E" Near Point Vision Chart), for NVI screening and quantitative NVA measurement, in 600 participants with two screeners. NVI screening was assessed using Cohen's kappa coefficient, sensitivity, and specificity. Bland–Altman limits of agreement (LoA) were used to evaluate NVA test agreement.

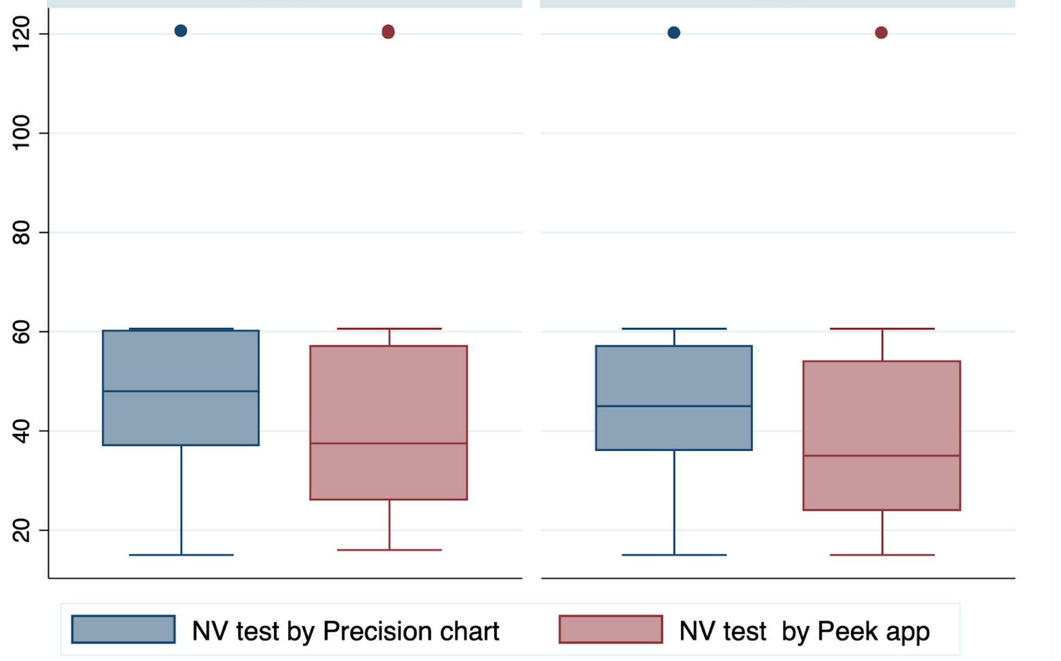

Figure 2: Box plot of time taken for NVA testing (seconds), with Peek near vision app test and conventional Precision Vision chart, by gender of participants

Results: In Stage 1, interobserver variability using Peek near vision test ranged from 96.43-98.21% (kappa = 0.92 to 0.96). In Stage 2, comparing the Peek near vision test and conventional chart NVI screening by different screeners, there was overall agreement in 95.8% of cases (kappa = 0.91) (figure 1). Peek near vision testing compared to tests with the standard chart had a sensitivity and specificity of 91.25% (87.22, 94.1) and 99.41% (97.86, 99.84) respectively. For NVA testing, the 95% LoA between Peek near vision test and chart testing were within -1.11 and +0.07 LogMAR. Mean test time was 40.3 seconds (95% CI: 38.8, 41.7) with Peek near vision test, versus 46.6 seconds (95% CI: 45.5, 47.7) with conventional chart (figure 2).

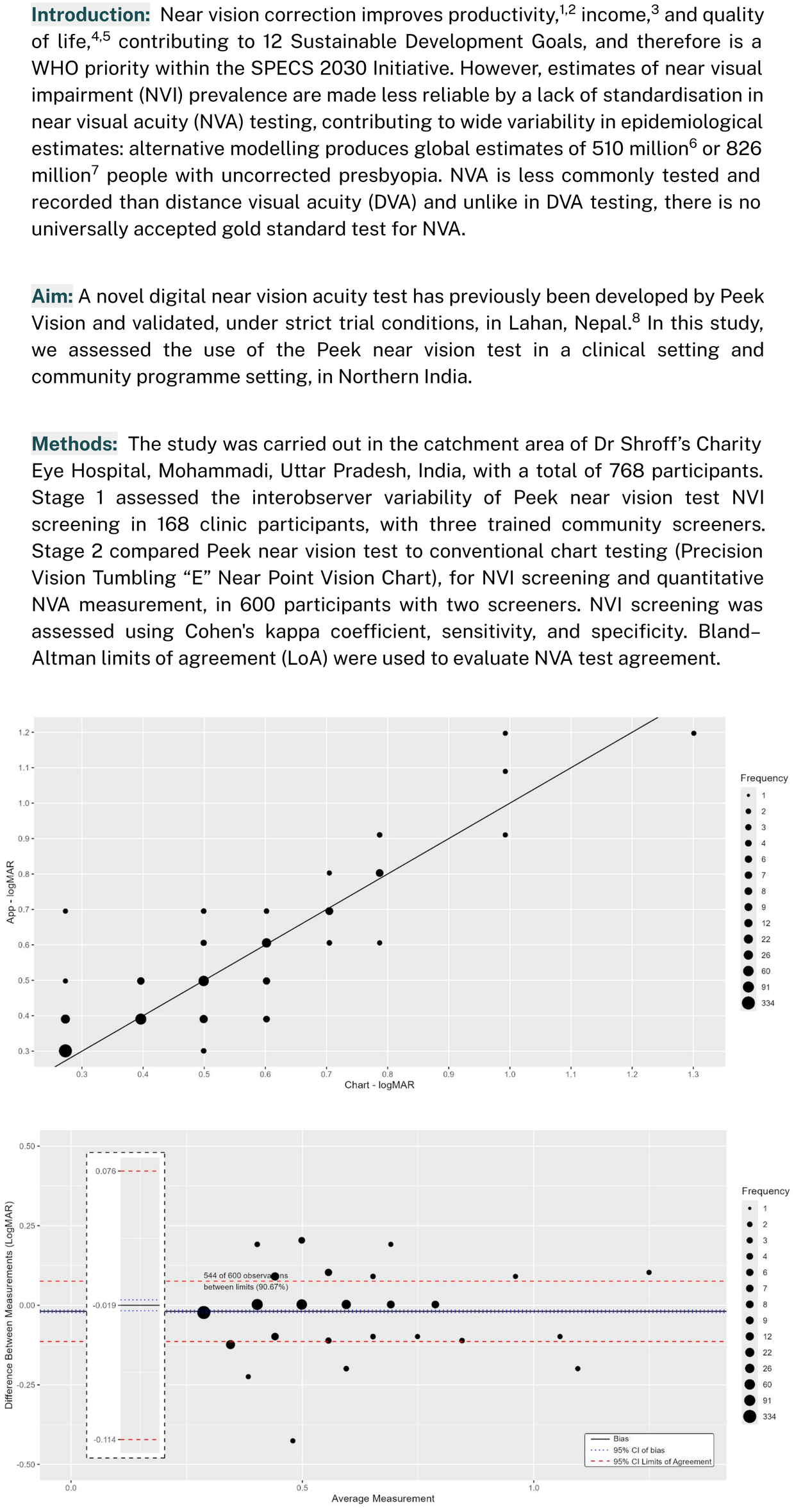

Figure 1: Agreement of quantitative NVA testing between Peek near vision test and conventional chart test by a different screener: a) Scatter plot, b) Bland-Altman Limits of Agreement

Implications: The previously demonstrated validity of Peek near vision testing was maintained when used by trained community screeners. Peek near vision test will be used in Rapid Assessment of Avoidable Blindness (RAAB) surveys, community and workplace eye health programmes and research, to allow reliable assessment of near vision and near eREC.

Part B: Lessons Learned and Challenges

In addition to there being no gold standard testing chart, the historic **lack of standardisation** of near vision testing procedure meant that a challenge was ensuring consistent use of the tests. When trying to assess whether results of testing with different methods produce reliable results, variations such as viewing angle (straight ahead or lower down reading angle) contribute to unnecessary variation and statistical noise.

This was overcome via training - for example, we recommend that Peek near vision test is used at a natural reading angle, as this better represents the condition of the eye (in terms of convergence and accommodation) when performing many near tasks such as reading or using a phone.

Another challenge (and strength) of this work, is that the team involved in the work are based in a diverse range of time zones, and come from a range of skill sets (including optometry, ophthalmology, software development and product design); ensuring that everyone was up-to-date and aligned required **careful communication**.

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