Evaluating the central visual field with a reduced density test pattern and size V stimulus

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PURPOSE

- The size V stimulus has been found to have a greater dynamic range and improved repeatability [1] and may be able to efficiently detect early glaucoma.
- We compared the diagnostic performance of a visual field test (VF) using a reduced number of test locations and the size V stimulus with the standard 10-2 test pattern.

METHODS

- VFs using the Full Threshold strategy were acquired on a HFA3 Model 840 perimeter (ZEISS, Dublin, CA) for three combinations of stimulus size and test pattern: size V, reduced (32 point) pattern; size III, reference (68 point) pattern; and size V, reference pattern (Figure 1).
- While VFs were acquired on two visits, only data from visit 1 were used for further analysis.
- Size III and V reference limits were interpolated from a previous study [2].
- Mean deviations (MD) and fraction of abnormal test locations flagged at 5% level for total deviation (TD) were computed. Comparisons between the reduced and reference patterns were carried out using Bland-Altman 95% limits of agreement.
- Receiver operating characteristic (ROC) analyses were conducted to compare the diagnostic performance of the three tests.

CONCLUSIONS

- Our preliminary findings suggest similar diagnostic performance between the size V reduced pattern and the reference patterns.
- Future work is required to compare these tests in terms of the similarity of locations for flagged defects and the ability to detect clinically relevant central scotomas.

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RESULTS

- The mean ages were 52.3 years (±14.5; 27.7 – 79.2; n=32 eyes of 31 participants) for the healthy group and 75.3 years (±6.5; 62.5 – 87.6; n=30 eyes of 25 participants) for those with glaucoma.
- Mean test duration (in minutes) was significantly shorter for the size V, reduced pattern (6.1±1.1) compared with the reference patterns using either the size III (11.1±1.7) and size V (11.1±1.9).
- MDs ranged from -28.1 to 2.65dB for the size V, reduced pattern compared with -28.6 to 2.41dB for size V reference and -29.9 to 2.43dB for the size III reference.

Visual inspection revealed good concordance between tests for the location of flagged points, with similar defects generally being present across all tests

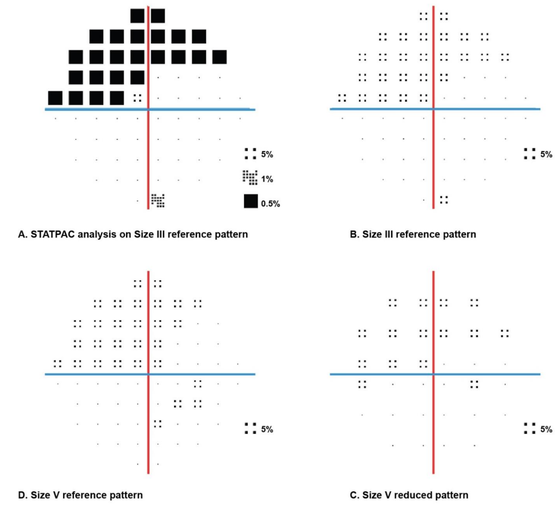

Figure 1. Total deviation probability plots from one glaucoma patient showing the similarity between the flagged defect test locations for the 3 tests: (A) size III reference pattern using HFA3 STATPAC analysis; (B-D) size III reference, size V reference and size V reduced patterns using reference limits generated from a previous study [2], which were limited to the 5% level by sample size.

REFERENCES

[1] Wall et al. *Arch Ophthalmol* 2010 128(5):570-6.
[2] Flanagan et al. *IOVS* 2016; 57(12).

MDs for the reduced pattern showed strong agreement with the reference patterns

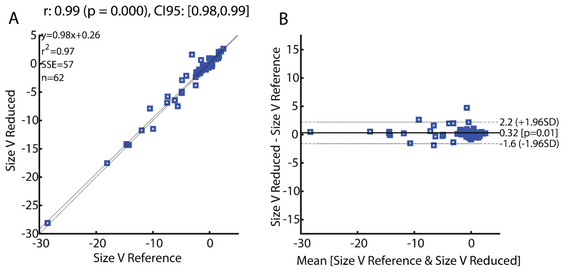

Figure 2. Regression (A) and Bland-Altman (B) plots for the comparison between the MDs for the size V reduced pattern and the size V reference patterns.

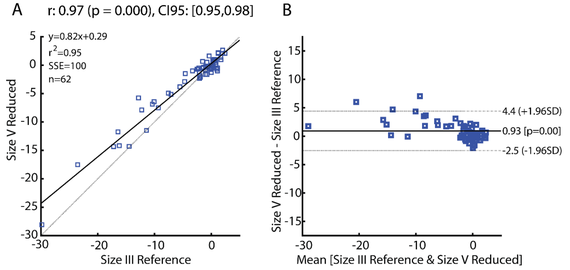

Figure 3. Regression (A) and Bland-Altman (B) plots for the comparison between the MDs for the size V reduced pattern and the size III reference patterns.

There was a strong agreement between the reduced pattern and the reference patterns for both the size III and size V in terms of the fraction of flagged points at 5% TD level

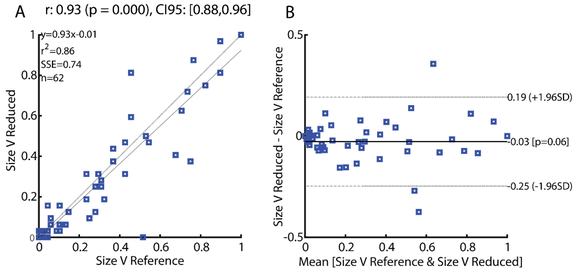

Figure 4. Regression (A) and Bland-Altman (B) plots for the comparison between the fraction of flagged test points at 5% total deviation level for the size V reduced pattern and the size V reference patterns.

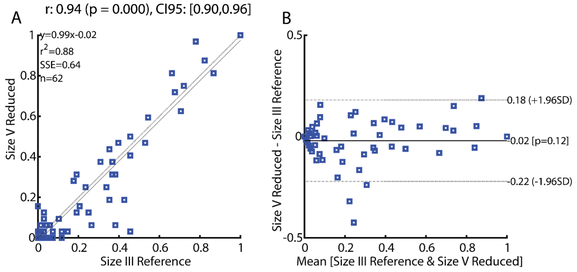

Figure 5. Regression (A) and Bland-Altman (B) plots for the comparison between the fraction of flagged test points at 5% total deviation level for the size V reduced pattern and the size III reference patterns.

Area under the curve (AUC) of ROC analyses on MD and fraction of flagged test points at 5% TD level show comparable diagnostic performance across tests

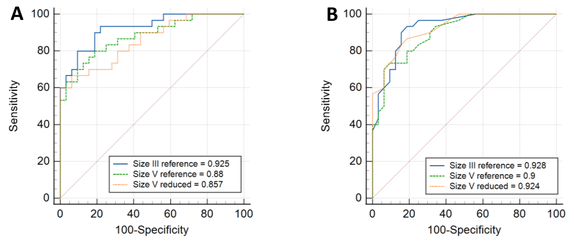

Figure 6. Receiver operating characteristic plots showing the diagnostic performance of the three tests using MD values (A) and fraction of flagged test at 5% TD level (B).

Table 1. AUC (±SEM) for the three tests using MD values and fraction of flagged test at 5% TD level

	Size V reduced	Size V reference	Size III reference
MD	0.857 ±0.047	0.88 ±0.043	0.925 ±0.032
Fraction of flagged points at 5% TD level	0.924 ±0.031	0.900 ±0.037	0.928 ±0.032

Table 2. Pairwise comparison of AUC between three tests

	Size V reduced ~ Size V reference	Size V reduced ~ Size III reference	Size V reference ~ Size III reference
MD	p=0.438	p=0.0433	p=0.160
Fraction of flagged points at 5% TD level	p=0.309	p=0.9032	p=0.373

**Bonferroni adjusted alpha for 3 comparisons: 0.0167*