Comparison of a Virtual Reality Visual Field Program to the Zeiss Humphrey 24-2 Sita Standard in a Comprehensive Ophthalmology Practice

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Financial Disclosures

Dr. Rubin owns private shares of Virtual Field. No funding support was received for this work

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Background

Humphrey automated perimetry is considered the gold standard of visual field testing in patients with glaucoma. Recently, a new form of virtual visual field testing was introduced. This study describes the new method of automated perimetry and compares results to the Humphrey-Zeiss 24-2 Sita Standard in a comprehensive practice

Methods

This study aims to compare automated perimeter results in established glaucoma patients with known scotomas, who are returning for their regularly scheduled visual fields. The patient completed their scheduled visual field testing using the Humphrey-Zeiss 24-2 Sita Standard format, followed by the virtual visual field within 5 minutes of completing the Humphrey-Zeiss test.

The results were then analyzed by the author for similarities or differences between the two tests by comparing the following parameters: fixation losses, false positives, false negatives, visual field index (VFI), mean deviation (MD), and pattern deviation (PD). Statistical significance was calculated using the Mann-Whitney U test. Correlations were calculated using the Pearson correlation coefficient and the interclass correlation coefficient (ICC).

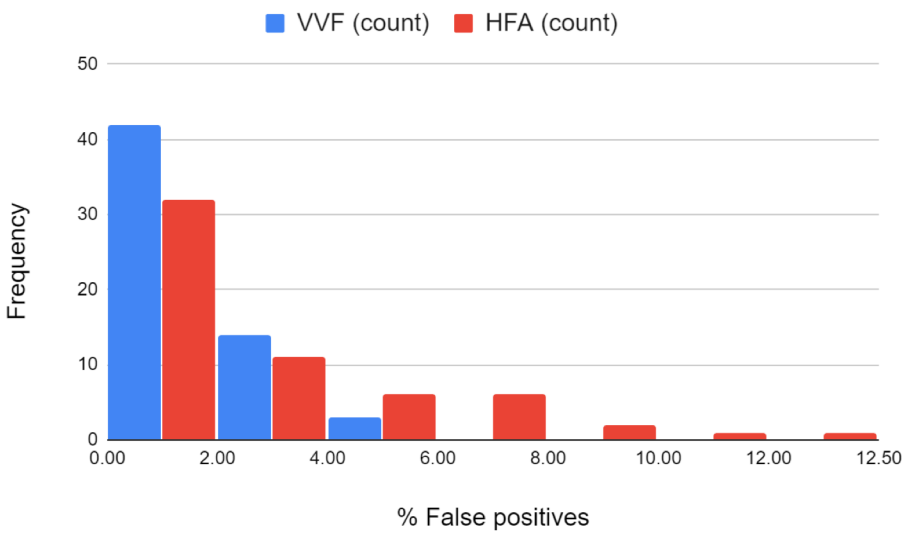
Results

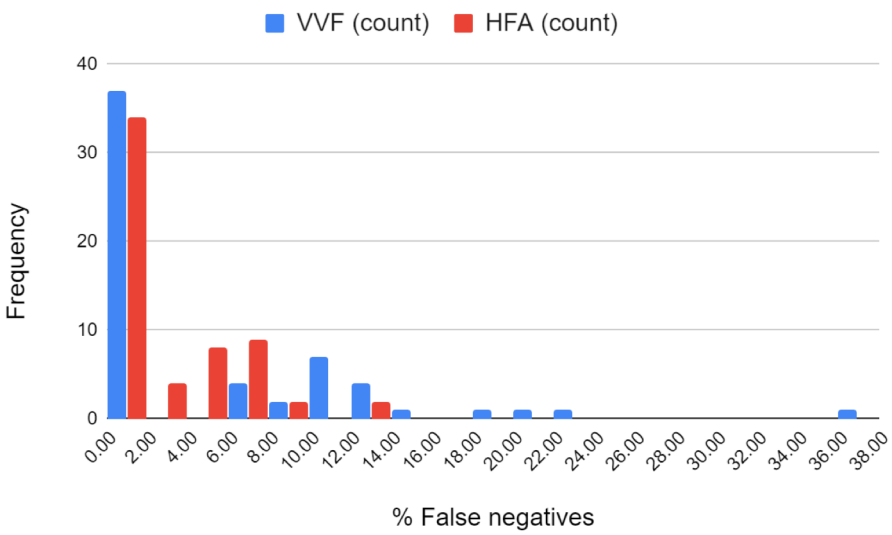
61 eyes from 31 patients were tested. 50 eyes were included in the final analysis.

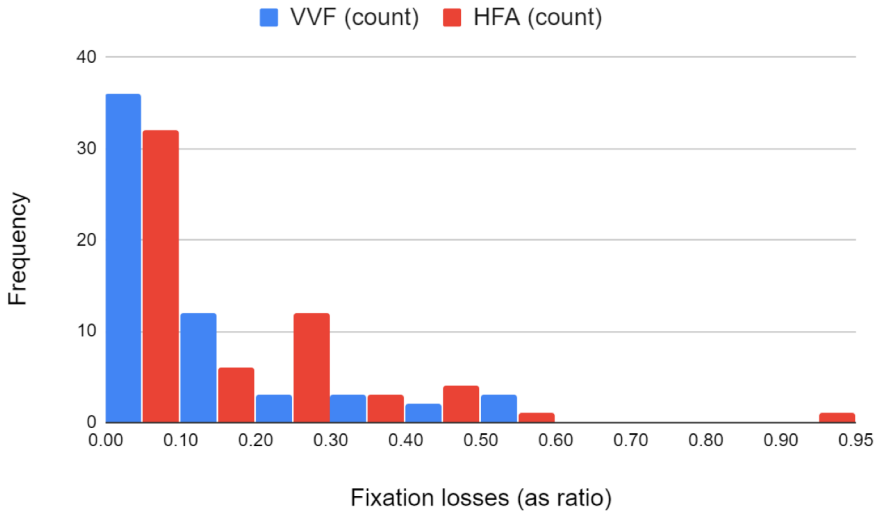
Virtual field (VVF) demonstrated no difference in ratio of fixation losses (mean difference -0.02, p=0.45) or number of false negatives (mean difference 2.13%, p=0.051), but had significantly fewer false positives (mean difference -1.29%, p=0.00086) compared to Humphreys (HFA)

Virtual field demonstrated significantly lower visual field index and mean deviation (mean difference -2.66, p=0.0033; mean difference -3.03, p<0.00001) respectively. Mean difference in patter deviation was -0.11 which was not statistically significant (p=0.47).

Pearson's correlation coefficient for virtual field index, mean deviation, and pattern deviation were 0.93 (p<0.00001), 0.85 (p<0.00001) and 0.79 (p<0.00001), respectively. Interclass correlation coefficient for virtual field index, mean deviation, and pattern deviation were 0.99, 0.74, and 0.81, respectively.







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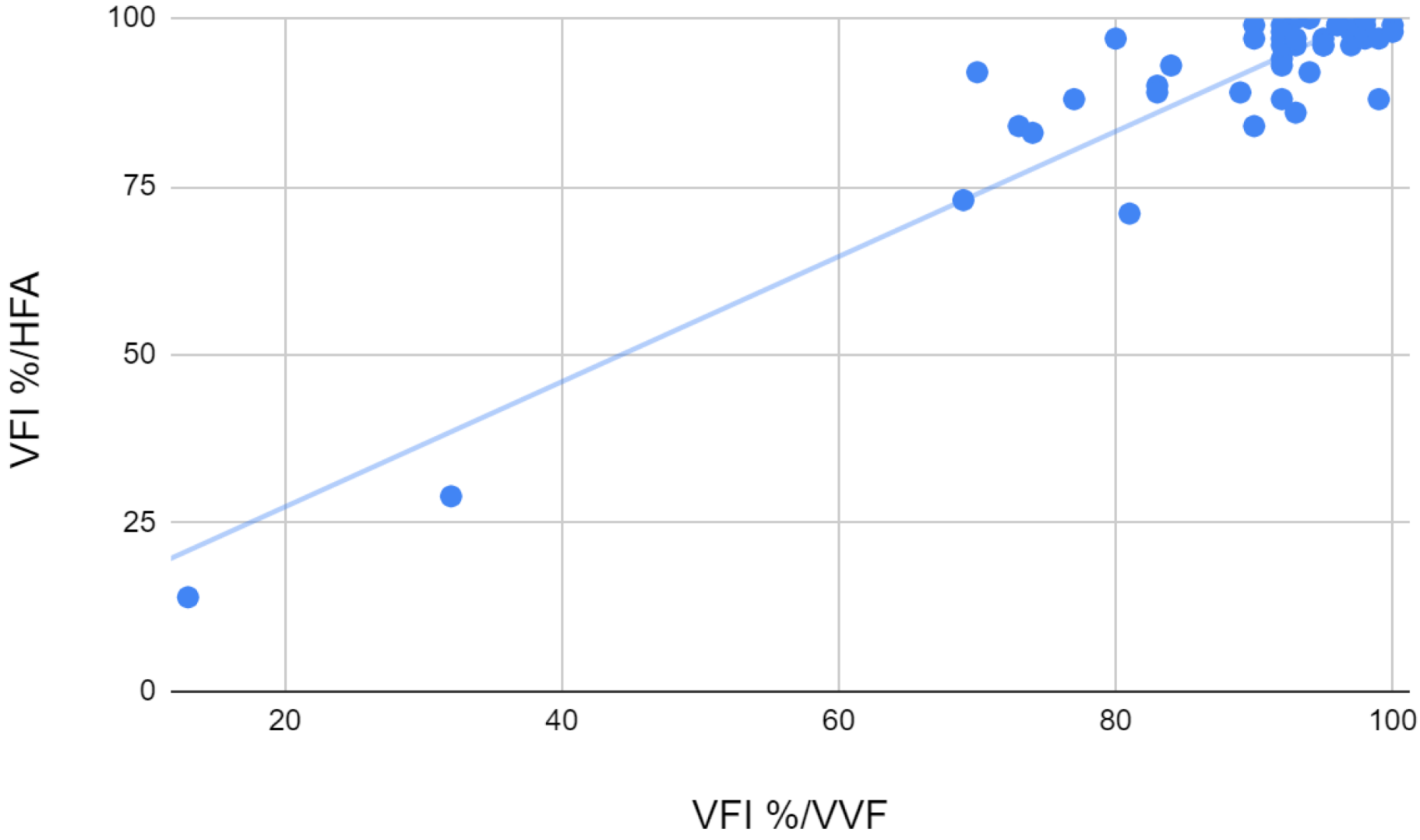

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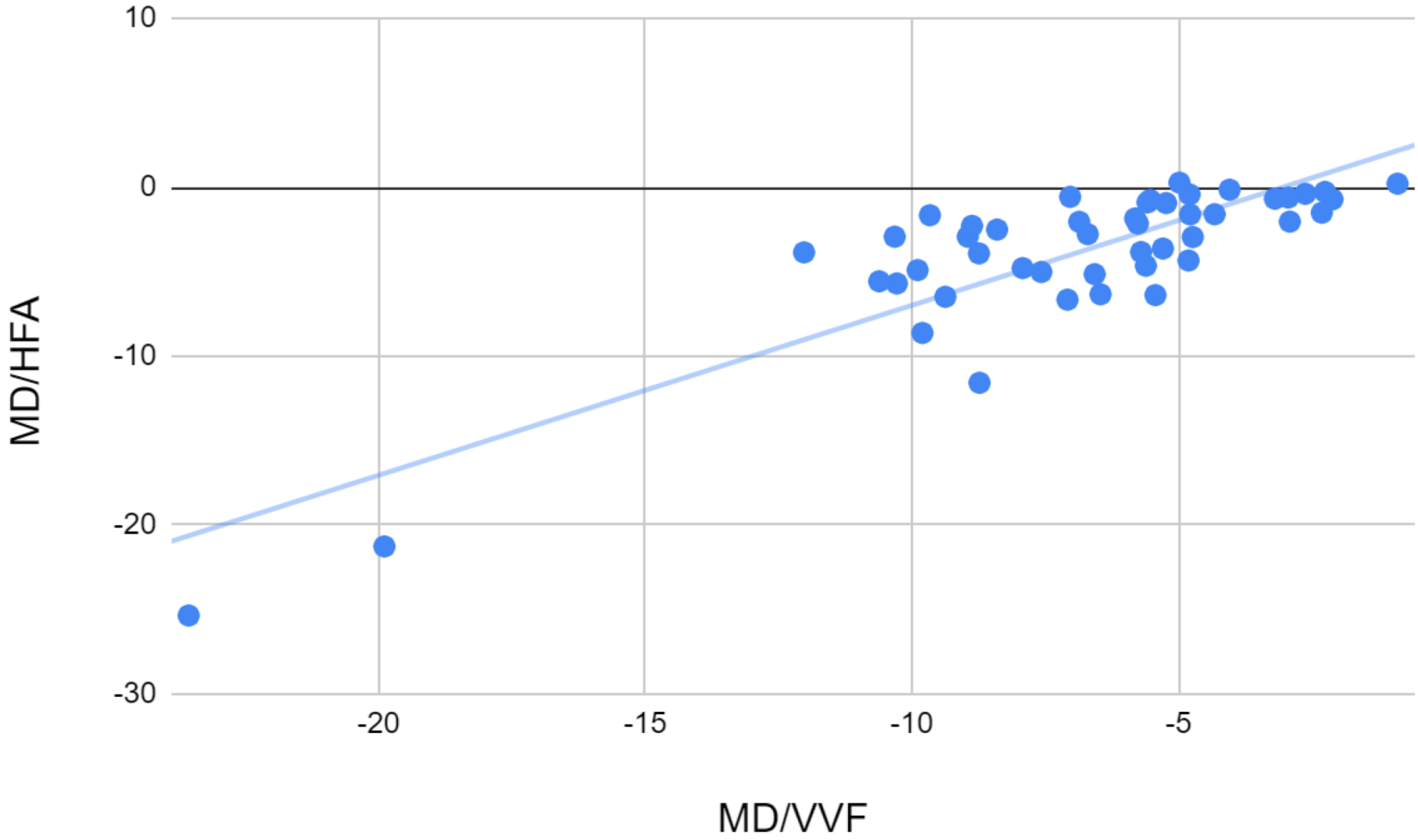

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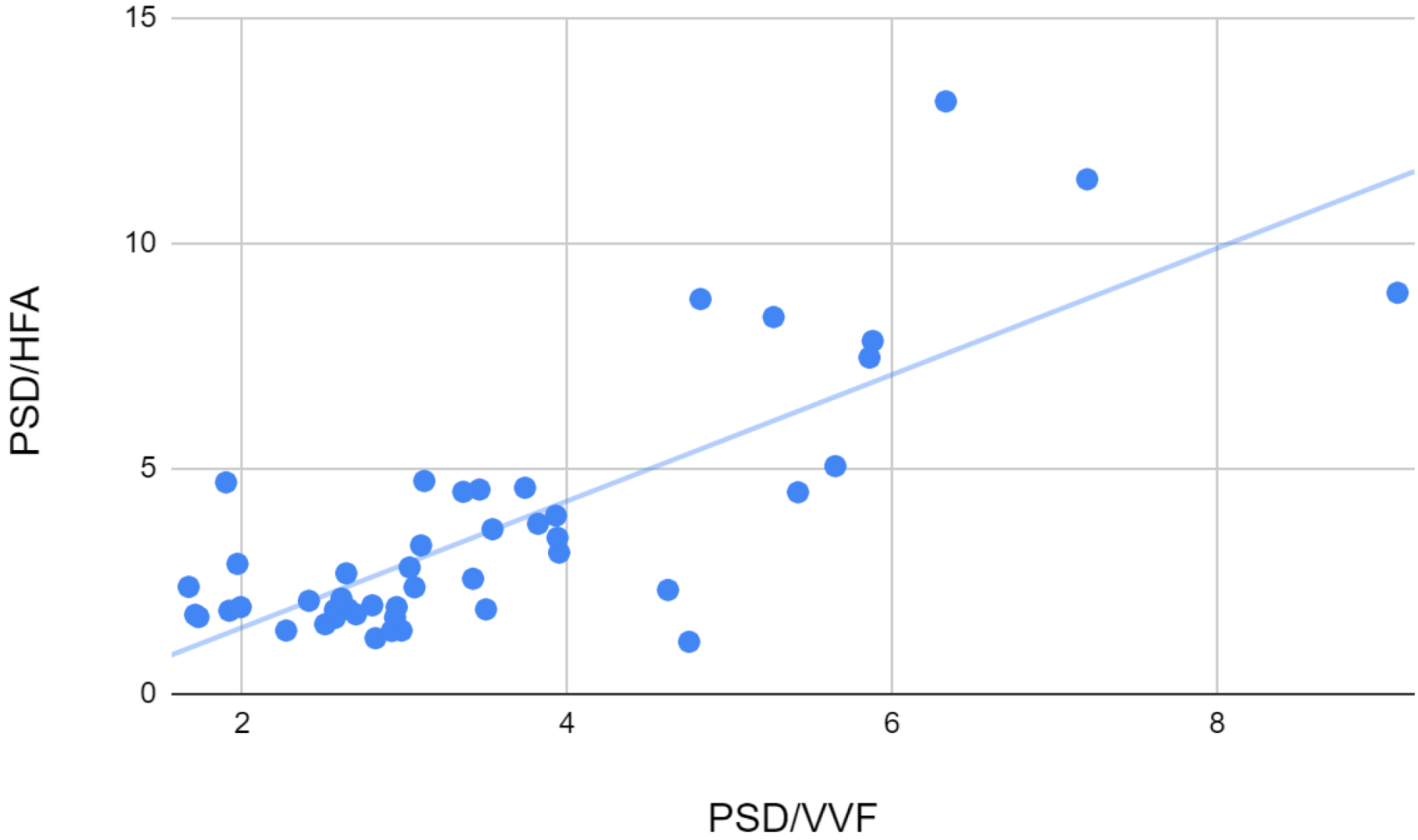

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Conclusions

Virtual field demonstrated good to excellent correlation with Humphreys with regard to visual field index, mean deviation, and pattern deviation in paired analysis. Virtual field shows promise in increasing mobility, efficiency and cost reduction in many practice settings while maintaining testing accuracy compared to the Humphreys standard.

Discussion

Overall patient performance had lower VFI and MD on the virtual field compared to Humphreys while trending toward greater false negatives. This may be due to fatigue as patients were tested 5 minutes after completing the Humphreys SITA Standard protocol using the full threshold exam on the virtual field, unfamiliarity with the virtual field testing, or differences in machine strategies. However, compared to Humphreys, Virtual field had significantly fewer false positives and trended toward fewer fixation losses.

Virtual field testing offers potential advantages over Humphrey, including smaller footprint, portability, and the possibility of increasing clinic throughput if multiple units are used simultaneously. Potential pitfalls include lack of real-time "coaching" from clinic staff and distortions due to the multifocal virtual headset lenses if patients were to move the headset during examination.

Critically, future studies would evaluate inter-test reproducibility of visual field defects and the virtual field's ability to monitor progression. Fatigue may be mitigated by using the virtual field's BOLT exam, which has similar testing time to SITA standard. Further, patients with visual field deficits secondary to other ocular pathologies should be tested.