

An Eye to the Future: Prospective Remote Virtual Reality Glaucoma Monitoring over 2 Years

Marcus L. Turner¹, Zer Keen Chia¹, Ben Backus², Michael Deiner¹, and Yvonne Ou¹
¹Department of Ophthalmology, University of California San Francisco; ²Vivid Vision, Inc., San Francisco, CA

BACKGROUND

- Visual field testing is crucial for evaluating visual function in glaucoma, where peripheral vision is typically lost first.
- Humphrey visual field (HVF) testing through standard automated monitoring (SAP) is clinic resource intensive, requires bulky equipment, and can miss rapid glaucoma disease progression.¹
- Our virtual reality headset incorporates custom software utilizing oculokinetic perimetry, where the subject is not required to maintain steady fixation.²
- Initial analysis of a single VVP bundle of 10 tests in 2020 showed strong correlation with VVP fraction seen and HVF mean sensitivity as well as optical coherence tomography and excellent test-retest variability.³

METHODS

1. Oculus Go headsets given to initial UCSF glaucoma cohort equipped with Vivid Vision perimetry (VVP) testing software.
2. Subjects trained remotely over Zoom.
3. 3-4 independent remote testing bundles conducted quarterly consisting of 10 tests over 14 days.
4. Data collected in subjects' homes over 2 years.

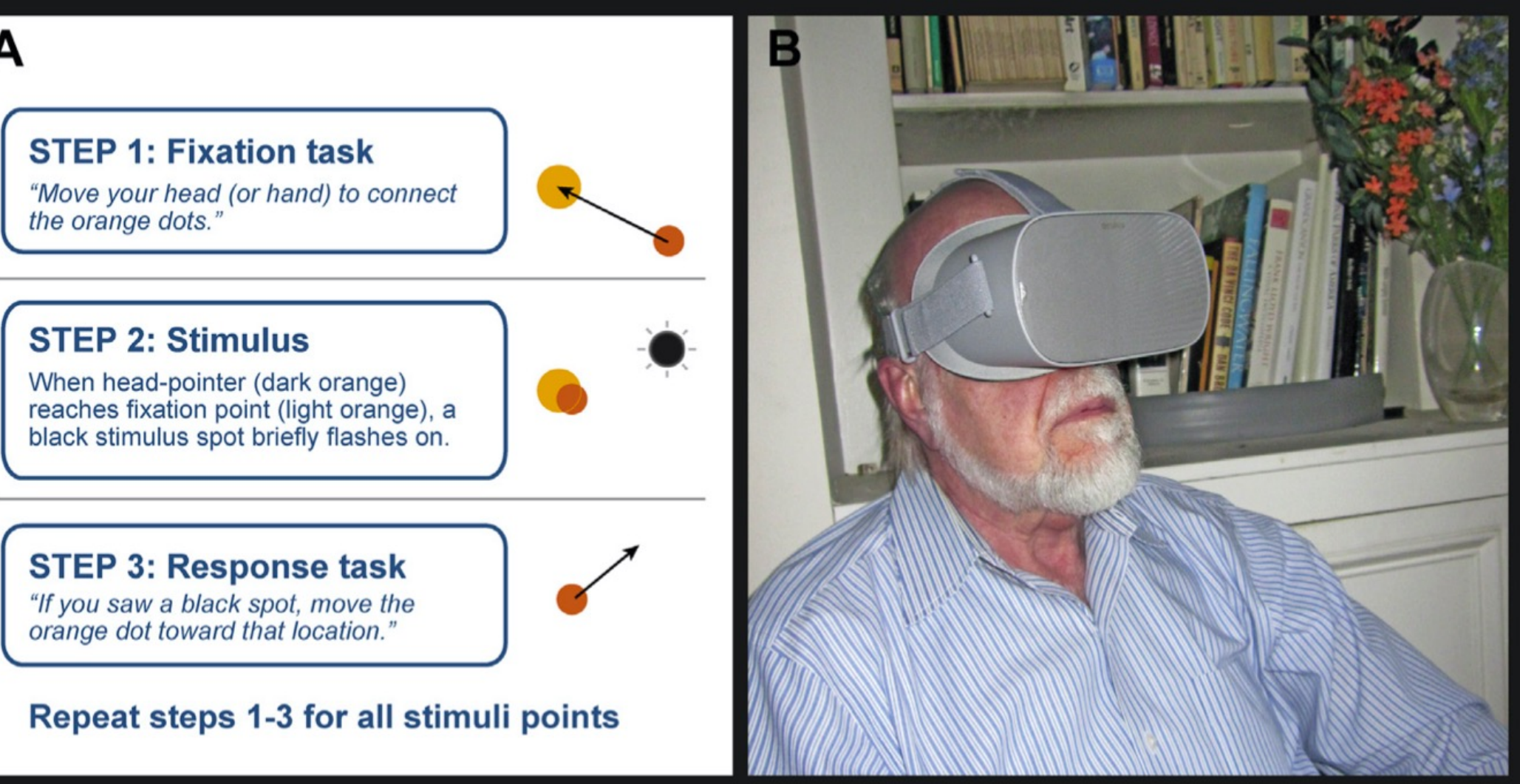
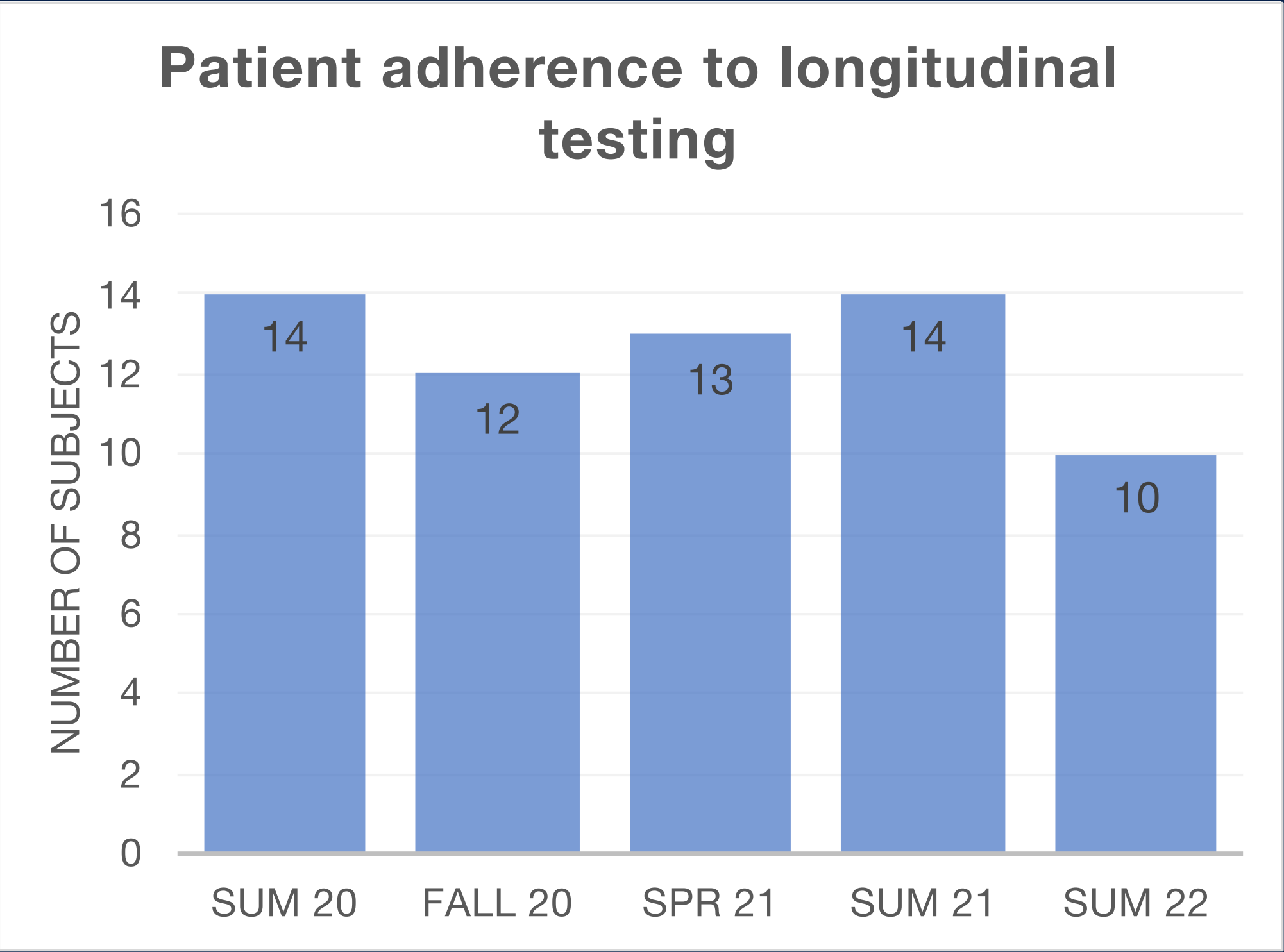


Figure 1: (A) VVP-10 test strategy. (B) Subject undergoing remote perimetry administration of VVP-10 at home.²

At-home virtual reality visual field testing is reliable, portable, and feasible over a long period of time



Number of Subjects Completing 2 Year Data	10 subjects 19 glaucomatous eyes
Average Age	63 (52-77)
Gender	4 Male; 6 Female
Ethnicity	4 Asian; 6 Caucasian
Glaucoma Diagnosis	8 POAG, 1 Mixed Mechanism, 1 Secondary OAG
Average (SD) Mean Deviation	-6.4 dB (6.2 dB)

Figure 3: (top row) Subject 7 2020 right eye HVF, with corresponding VVP10 fraction seen bundle average and 10 test bundle.

(bottom row) Subject 7 2022 right eye HVF, with corresponding VVP10 fraction seen bundle average and 10 test bundle.

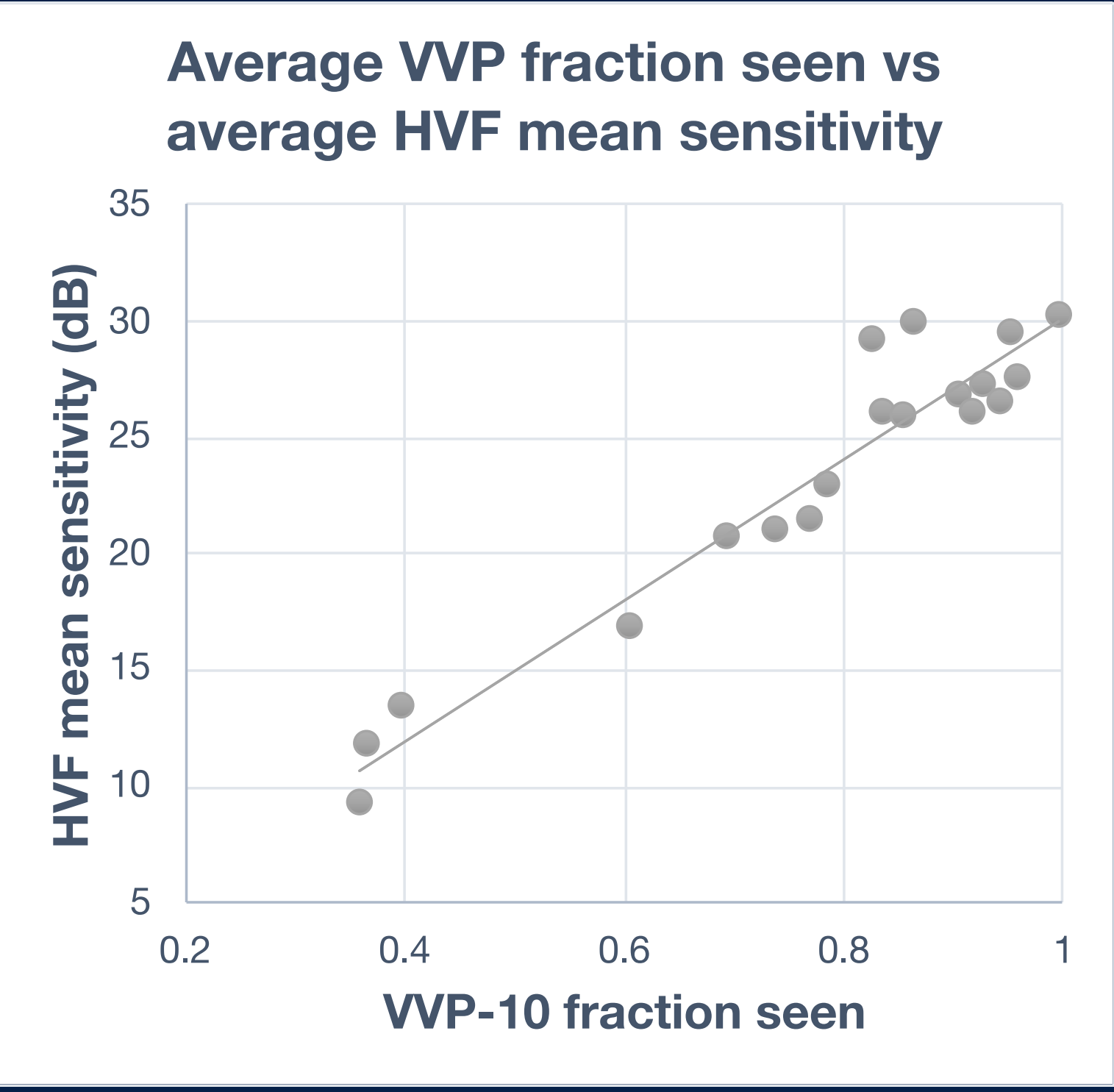


Figure 2: Scatter plot demonstrating the relationship of average VVP fraction seen and average HVF mean sensitivity per eye across all tests. VVP fraction seen is calculated in 54 test points per eye, where each point is tested 4 times. HVF mean sensitivity is calculated for 54 test points per eye. Each dot represents the average of all visual field tests per eye. R = 0.96 (p < .0001).



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RESULTS

- Final analysis cohort consisted of 19 eyes of 10 subjects over 2 years.
- Total of 487 VVP right eye tests and 457 VVP left eye tests. Total of 54 HVF right eye tests and 41 HVF left eye tests.
- Subject adherence with testing ranged between 86% - 100% in the first year, and was 71% in the second year.
- Only one subject declined year 2 testing, while three subjects were not able to continue VVP testing due to medical reasons or moving out of state.
- Pearson correlation was 0.96 (p < .0001) for VVP fraction seen and HVF mean sensitivity.

DISCUSSION

- A large proportion of our cohort was able to be remotely trained and reliably complete independent VR visual field testing at home.
- Remote VR visual field testing is feasible and demonstrates strong concordance with HVF.

REFERENCES

1. Wu et al., *Ophthalmology*. 2017
2. Deiner et al., *Ophthalmology* 2020
3. Chia et al., *Investigative Ophthalmology & Visual Science*. 2021

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