

Perimetric simulations of 24-2C SITA Standard visual fields



Gary C. Lee, PhD¹; John G. Flanagan, FCOptom, PhD²; Buck Cunningham, BS¹; Thomas Callan, OD¹; Nahid Abdali, OD³; Todd Severin, MD³; Iryna Falkenstein, MD⁴; Luke X. Chong, OD, PhD⁵

¹Carl Zeiss Meditec, Inc., Dublin, CA, USA; ²Herbert Wertheim School of Optometry & Vision Science, University of California, Berkeley, Berkeley, CA, USA; ³East Bay Eye Center, San Ramon, CA, USA;

⁴Glaucoma Specialists of San Francisco, Oakland, CA, USA; ⁵School of Medicine (Optometry), Deakin University, Geelong, VIC, Australia

Poster #1255 – A0395

PURPOSE

- Perimetric simulators have traditionally been used to develop and optimize visual field (VF) tests, including the legacy SITA test strategies [1].
- In this preliminary study, we developed and evaluated a new simulator for investigating the relative performance of 24-2C SITA Standard (SS) VFs compared to 24-2C SITA Faster (SFR).

METHODS

- 24-2C SS and 24-2C SFR VFs were acquired from a previous study, including one eye per subject.
 - Data from two visits for 28 healthy and 28 glaucomatous subjects on an HFA3 Model 860 perimeter (ZEISS, Dublin, CA) were analyzed.
- HFA3 software was modified for use with a simulator [2] to provide subject responses to SITA VFs.
 - Slopes of frequency of seeing (FOS) responses were modeled as previously described [3].
 - False answer rates were set to 5%.
- Visit 1 data were used as references for true fields (REF) to produce simulated VFs (see Figure 1 and Figure 2).
- Mean absolute differences (MAD) between the REF fields and:
 - Visit 2 VFs (TEST) and
 - Simulated VFs (SIM)
 were calculated for both 24-2C SS and SFR as measures of relative performance.
- Analyses were also repeated for the 24-2 test locations and the 10 new central 24-2C test locations.

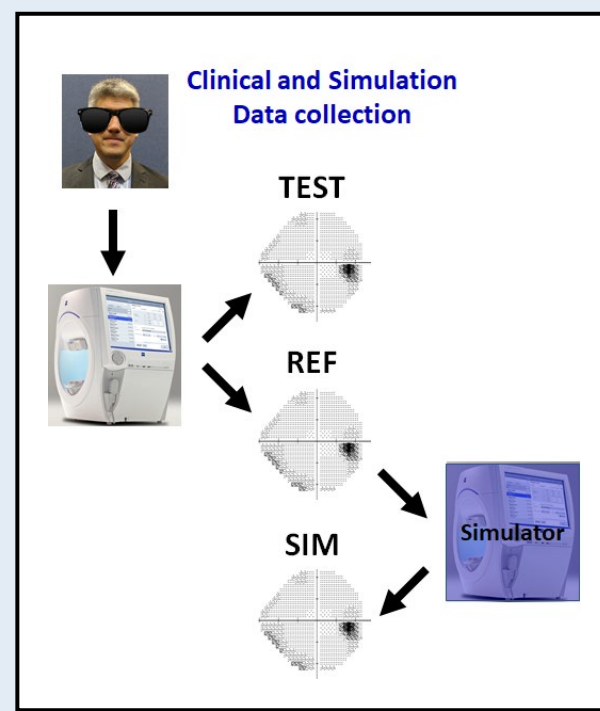


Figure 1. Workflow

Comprehensive simulations are a powerful tool in the development of future thresholding estimation strategies including SITA

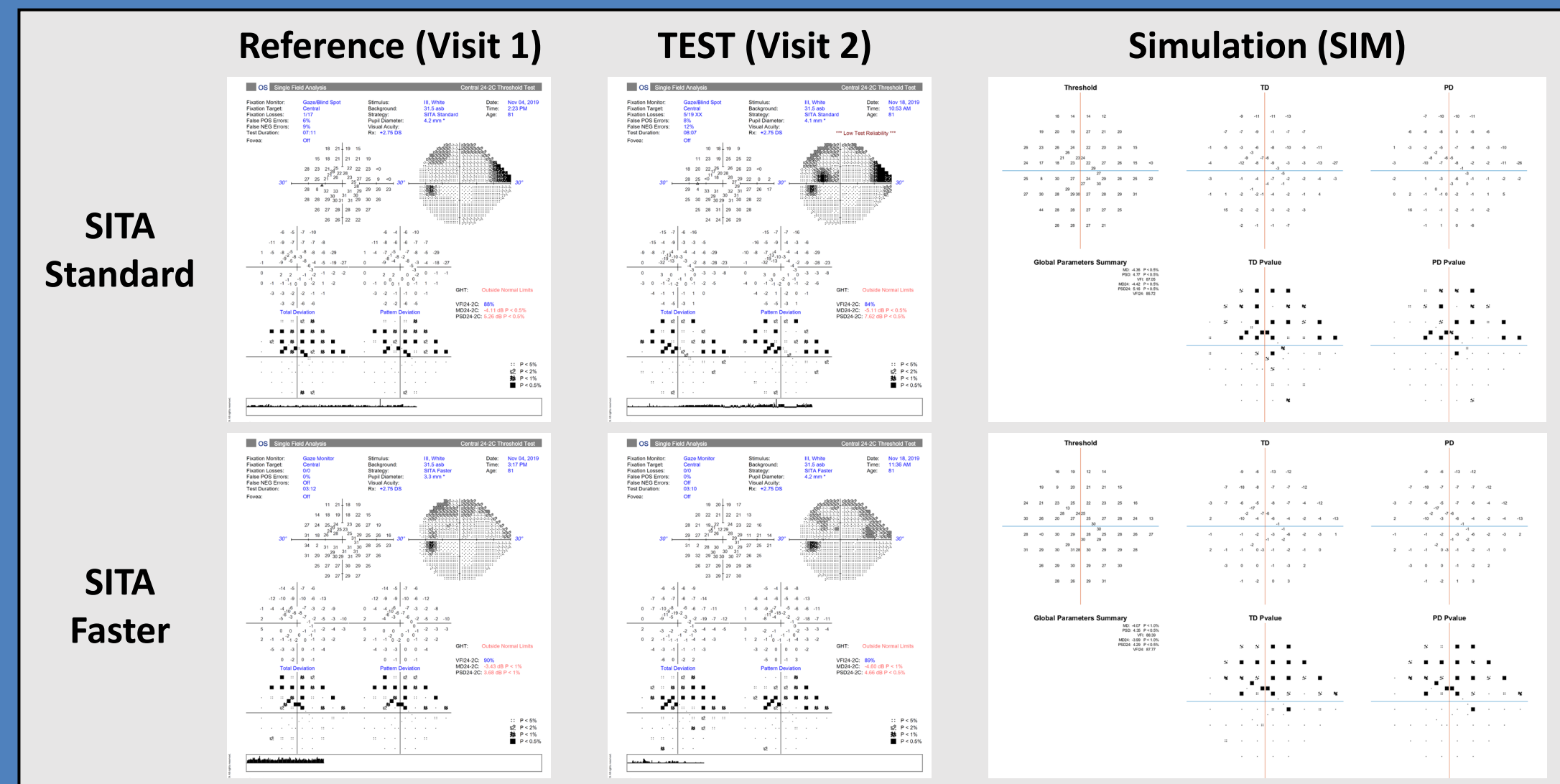


Figure 2. Examples of 24-2C SITA Standard and SITA Faster reference (Visit 1; REF), test (Visit 2; TEST), and simulated visual fields (SIM)

Region	Strategy	Cohort	Number VFs	Number Points	MAD _{TEST,REF} [dB]	MAD _{SIM,REF} [dB]
All	Standard	All	56	62	1.95 [1.75, 2.15]	1.82 [1.70, 1.93]
All	Faster	All	56	62	2.23 [1.81, 2.65]	1.84 [1.67, 2.01]
All	Standard	Healthy	28	62	1.49 [1.35, 1.62]	1.56 [1.47, 1.65]
All	Faster	Healthy	28	62	1.52 [1.10, 1.93]	1.47 [1.37, 1.56]
All	Standard	Glaucoma	28	62	2.42 [2.13, 2.71]	2.07 [1.91, 2.24]
All	Faster	Glaucoma	28	62	2.94 [2.30, 3.58]	2.21 [1.94, 2.47]
24-2	Standard	All	56	52	2.01 [1.80, 2.23]	1.85 [1.73, 1.97]
24-2	Faster	All	56	52	2.34 [1.88, 2.79]	1.86 [1.70, 2.02]
24-2	Standard	Healthy	28	52	1.53 [1.38, 1.68]	1.59 [1.49, 1.68]
24-2	Faster	Healthy	28	52	1.58 [1.17, 2.00]	1.52 [1.43, 1.62]
24-2	Standard	Glaucoma	28	52	2.50 [2.18, 2.82]	2.11 [1.93, 2.28]
24-2	Faster	Glaucoma	28	52	3.09 [2.37, 3.81]	2.20 [1.95, 2.45]
New 24-2C	Standard	All	56	10	1.64 [1.34, 1.94]	1.66 [1.46, 1.85]
New 24-2C	Faster	All	56	10	1.69 [1.36, 2.01]	1.71 [1.38, 2.04]
New 24-2C	Standard	Healthy	28	10	1.26 [0.99, 1.54]	1.41 [1.26, 1.56]
New 24-2C	Faster	Healthy	28	10	1.19 [0.74, 1.63]	1.16 [1.02, 1.30]
New 24-2C	Standard	Glaucoma	28	10	2.01 [1.50, 2.53]	1.90 [1.55, 2.25]
New 24-2C	Faster	Glaucoma	28	10	2.18 [1.77, 2.60]	2.25 [1.66, 2.85]

Table 1. Mean [95% confidence interval] of mean absolute differences between a) TEST and REF and b) SIM and REF visual fields

Email: gary.lee@zeiss.com

Disclosures: GCL (E), JGF (C,F), BC (E), TC (E), TS (C), IF (C), LXC (C,F) – Carl Zeiss Meditec, Inc.; NA – None



RESULTS

- For 28 healthy eyes, mean age was 57.3 years (standard deviation, SD: 7.6; range: 44.3 to 74.7) and mean 24-2 SS MD was 0.38 dB (SD: 1.17; range: -1.89 to 2.62).
- For 28 glaucoma eyes, mean age was 71.3 years (SD: 9.0; range 54.0 to 97.9) and mean MD was -7.92 dB (SD: 7.72; range: -23.42 to 1.63).
- Linear regression R^2 values between 24-2C MD indices were 0.99 for both SIM vs. REF and TEST vs. REF.
- MAD_{SIM,REF} was comparable but slightly lower than MAD_{TEST,REF} overall (see Table 1).
- MAD_{SIM,REF} and MAD_{TEST,REF} for both SS and SFR were similar in all and healthy eyes.
- SFR had slightly higher MAD than SS (~0.2 to 0.5 dB) in glaucoma eyes with more and deeper defects.
- MAD_{SIM,REF} and MAD_{TEST,REF} were more comparable for both SS and SFR in the ten new 24-2C test locations than in all or 24-2 only locations.

CONCLUSIONS

- Given the expected small differences in SS and SFR strategies [4], the results suggest that SS and SFR have a similar performance in healthy eyes and SS is marginally better in regions of VF defects.
- Limitations of this study include a limited sample size, the lack of ground truth fields, use of a single representative FOS model, and no fatigue effects.
- Future studies may include the use of perimetric simulations to develop novel test strategies and patterns.

References

- Bengtsson et al. *Acta Ophth Scand* 1997; 75(4).
- Lee et al. *IOVS* 2020; 61(7): PB0037.
- Henson et al. *IOVS* 2000; 41(2).
- Heijl et al. *AJO* 2019; 198(2).