Comparison of Refractive Outcomes Between a Tele-Eye Care Comprehensive Eye Exam and a Gold Standard In-Person Eye Exam

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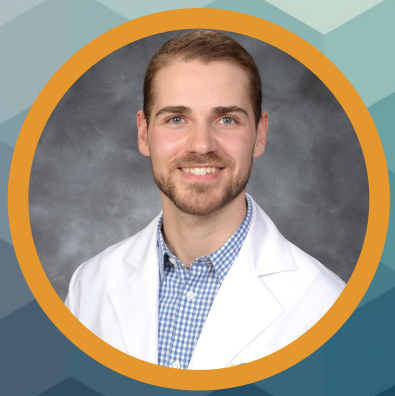

Dr. Blais has no financial interests to disclose.

Dr. Hanssens has no financial interests to disclose.

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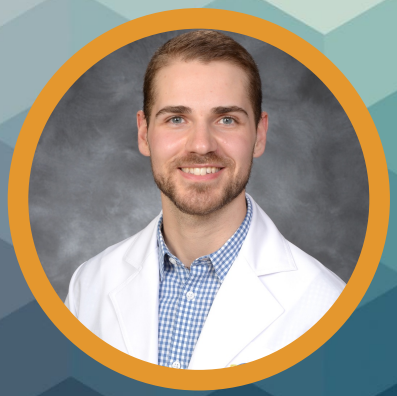


INTRODUCTION

Tele-eye care is now widespread

- Facilitated access to eye care services in remote and rural areas
- The COVID-19 pandemic left no choice to many eye care practitioners (ECP)

Tele-optometry is now used for eye exams, but :

- Very few studies exist on tele-refraction[1]
- Clinical guidelines are still limited[2]

1. Blais N, Tousignant B, Hanssens J-M. Tele-refraction in tele-eye care settings. Clinical and Experimental Optometry. 2022:1-9.
2. American Optometric Association. POSITION STATEMENT REGARDING TELEMEDICINE IN OPTOMETRY. St. Louis, MO2020.

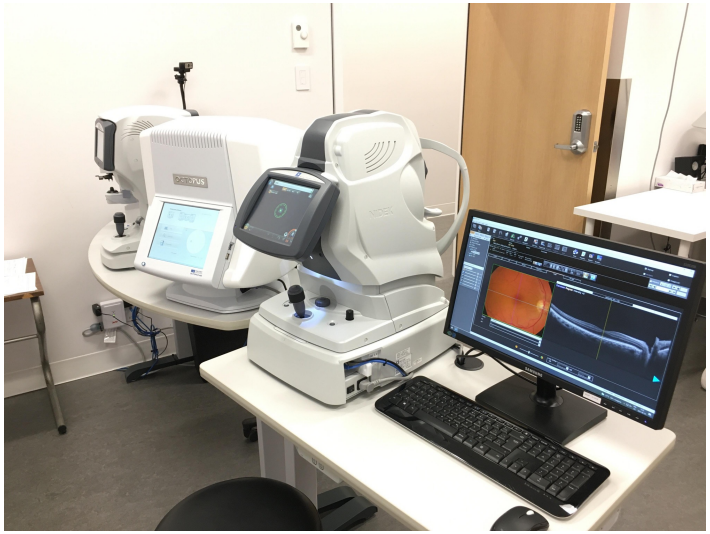
PURPOSE

This study aimed to compare, between an in-person Gold standard comprehensive eye exam and a tele-optometric comprehensive exam, the following outcomes of subjective refraction :

1. **Refractive errors (sphere, cylinder, axis)**
2. **Best corrected visual acuities (BCVA)**
3. **Visual comfort**

METHODS

- 66 participants (27M, 39F, aged 18-61 y/o) subjected to two **comprehensive** eye exams including conventional distance subjective refraction[3]
- In-person eye exam was performed by an on-site ECP
- Tele-eye care exam was performed by an on-site technician and a remote ECP
- Two optometrists were involved as ECP investigators and were randomly assigned to an exam modality



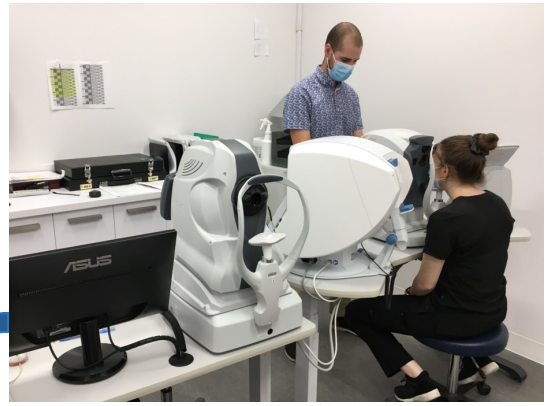
MATERIAL

- Auto-refractor (Tonoref-III)
- Electronic phoropter (RT-6100)
- Acuity screen (SC-1600)
- TV for videoconferencing
- DigitalOptometrics™ platform
- IRIS The Visual Group Electronic Medical Record (EMR)

3. Nancy C, Daniel K. Clinical Procedures for Ocular Examination, Fourth Edition: McGraw-Hill Education; 2015. 496 p.

WORKFLOW

Pre-testing room



Exam room

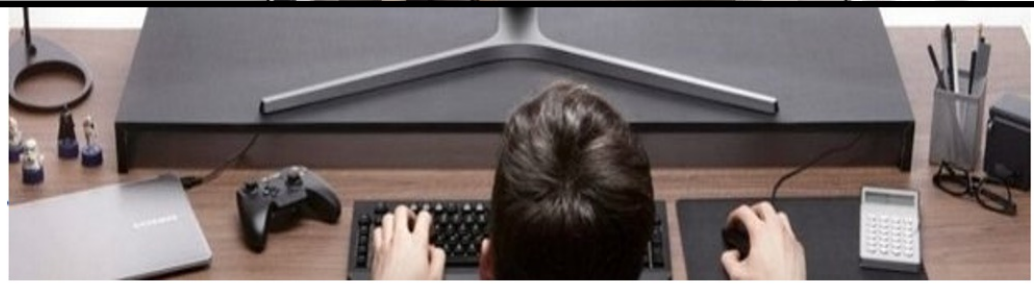
Auto-refraction

IN-PERSON refraction (sphere, cylinder, axis, BCVA)

TELE-EYE CARE refraction (sphere, cylinder, axis, BCVA)

Trial frames (double-blind)

4-Point Likert scale questionnaire



Remote ECP work set-up

STATISTICAL ANALYSIS

Only right eye refraction was used for analysis

Power vectors were used for the analysis of right eye refractive measurements[4,5]:

- **[S.E. = Sph+cyl/2]**
- **[J0 = cyl*cos(2*axis)]**
- **[J45 = cyl*sin(2*axis)]**

ICC Interpretation[6]

Values	Reliability
< 0.5	Poor
0.5 - 0.75	Moderate
0.75 - 0.9	Good
> 0.9	Excellent

4. Miller JM. Clinical applications of power vectors. *Optom Vis Sci* 2009; 86: 599-602.

5. Tousignant B, Garceau M-C, Bouffard-Saint-Pierre N et al. Comparing the Netra smartphone refractor to subjective refraction. *Clinical and Experimental Optometry* 2020; 103: 501-506.

6. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *J Chiropr Med* 2016; 15: 155-163.

Power Vectors of Refractive Errors and BCVA Between In-Person and Tele-Eye Care Modalities

	Eye Exam Modality	Mean	Standard Deviation (SD)	Intraclass Correlation Coefficient (ICC)	Lower Limit *(95% confidence interval)*	Upper Limit *(95% confidence interval)*
Spherical Equivalent ***(diopter)***	In-Person	-1.48	2.43	0.997	0.995	0.998
	Tele-Eye Care	-1.41	2.48			
J0 ***(diopter)***	In-Person	0.04	0.42	0.978	0.963	0.986
	Tele-Eye Care	0.05	0.40			
J45 ***(diopter)***	In-Person	-0.04	0.18	0.867	0.785	0.919
	Tele-Eye Care	-0.02	0.16			
Binocular BCVA ***(LogMar)***	In-Person	-0.15	0.08	0.843	0.744	0.904
	Tele-Eye Care	-0.14	0.08			

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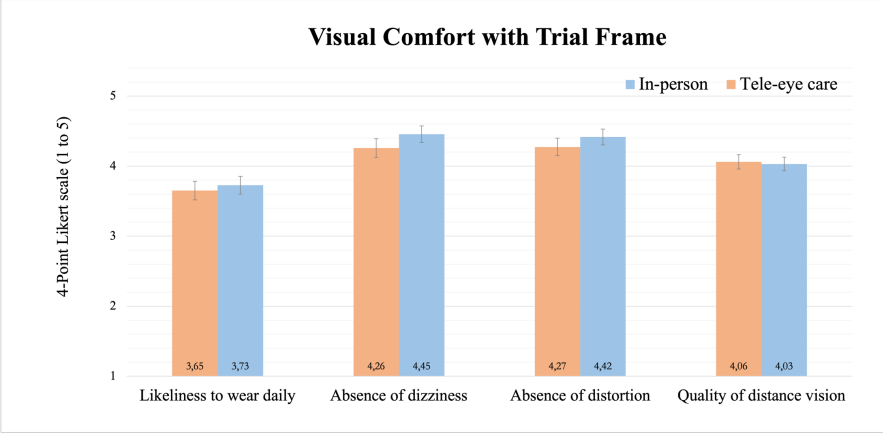
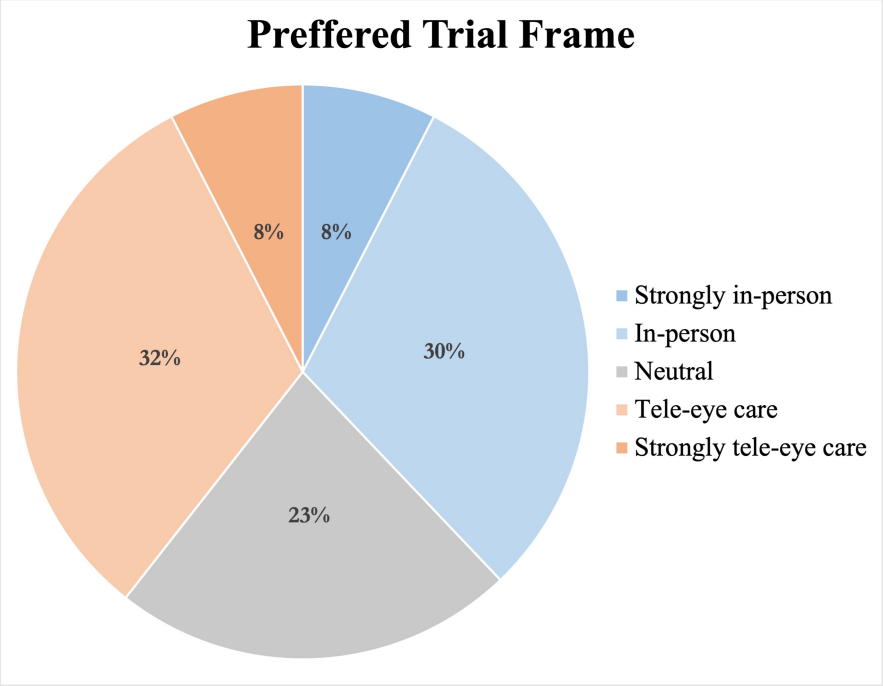
Less than one ETDRS letter (0.02LogMar) difference between means



- Moderate reliability (ICC = 0.627; 0.662; 0.729; 0.658)
- No statistically significant difference was found using

  Wilcoxon signed- rank test (p = 0.49; 0.15; 0.39; 0.75)



CONCLUSION

Manifest tele-refraction is an interesting way to **increase access to refractive errors correction** worldwide. This falls in agreement with the few available studies on manifest tele-refraction measurements.[7,8,9]

Focus for future studies:

- Cost-effectiveness of tele-refraction
- Remote assessment of **binocular vision and ocular health** through tele-optometric exams

7. Curtis R, Hazari H, Eden K et al. Validation of a portable, remotely delivered refraction approach compared to standard in-clinic refraction in a low-vision population. 2020; 0: 1357633X20960628.
8. Randhawa H, Morettin C, McLeod H et al. The validity of spectacle prescriptions via tele-optometric comprehensive eye examinations; a pilot study. *Invest Ophthalmol Vis Sci* 2020; 61: 1604-1604.
9. Blais N, Le Borgne M, Hanssens JM. Tele-refraction: Comparison of a remotely performed refraction with a Gold Standard in-person refraction. American Academy of Optometry Boston 2021; Boston2021.

FUNDING ACKNOLEDGEMENT

This work was supported by Mitacs and IRIS The Visual Group through the Mitacs Accelerate program.

This work was also supported by Innova, DigitalOptometrics and the FDERC of the Université de Montréal.

Thank you for your time!

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