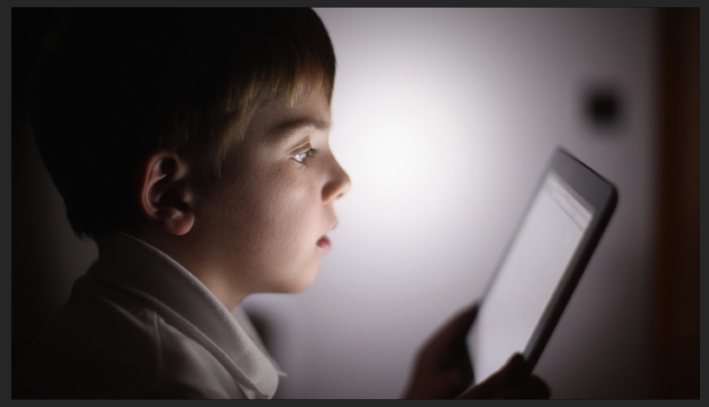

ACCOMMODATIVE BEHAVIOR AND HYPEROPIC DEFOCUS IN CHILDREN VIEWING ELECTRONIC DEVICES

Sah RP, Ramasubramanian V, Meyer D, Reed O, Bradley A, Kollbaum P.

Raman Prasad Sah

PhD Student

Indiana University
School of Optometry

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LAB RESEARCH SUPPORT FOR THIS PROJECT:

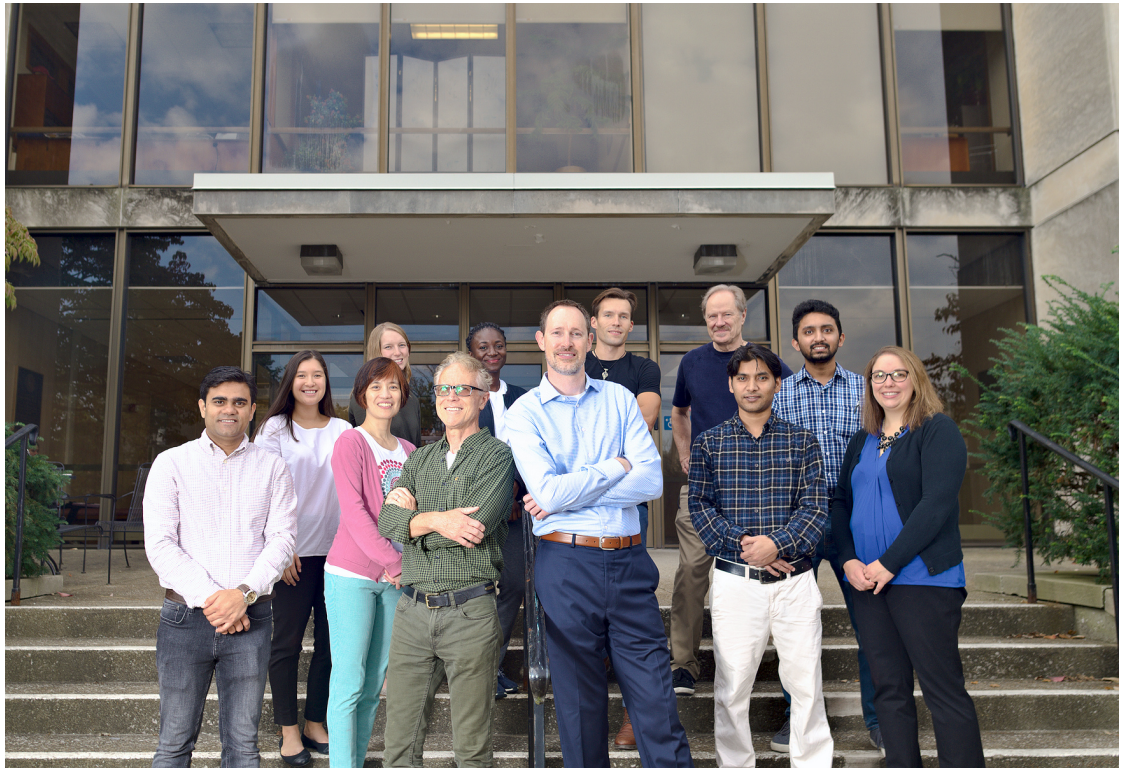
-none

OTHER LAB RESEARCH SUPPORT (in general area of CLs):

-ALCON, COOPERVISION, J&J VisionCare

PATENTS (in general area of CLs):

US/2010049133; US/2010047138; US/20110102737



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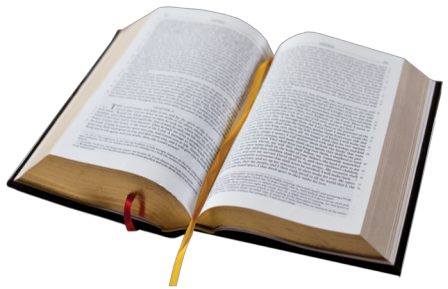
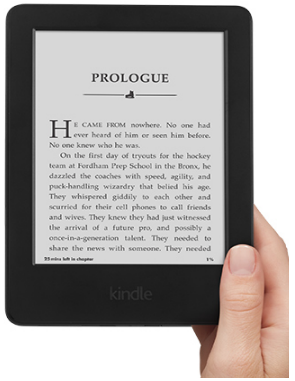
Myopia prevalence accelerated in 21st century

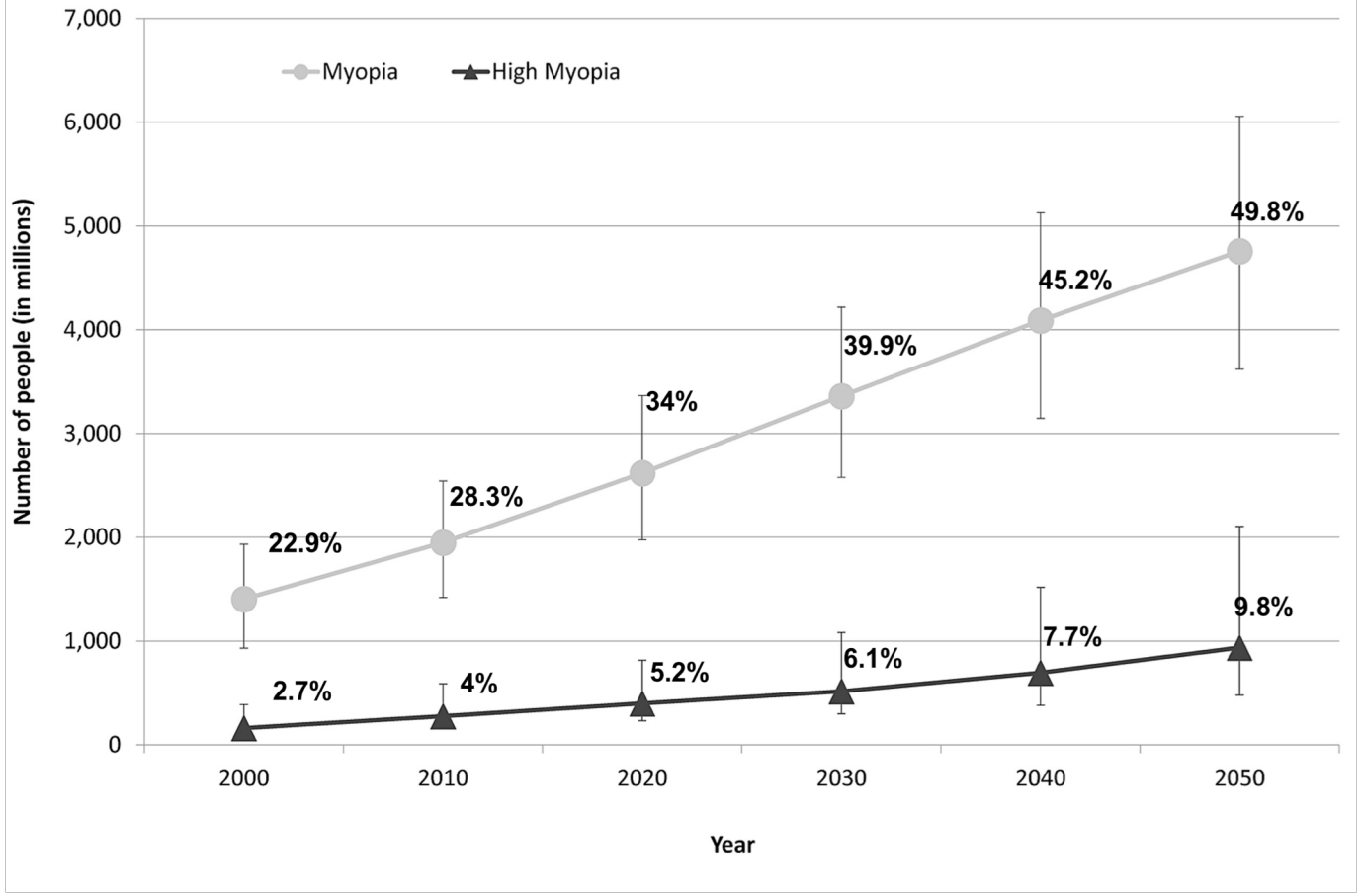
Prevalence rates in some East Asian student populations has already exceeded 90%

If we do not find a treatment, predictions suggest that 1 in 2 of the world's population will be myopic by 2050. 5 Billion people!!!

Could modern electronic displays be a contributing factor to this global pandemic?







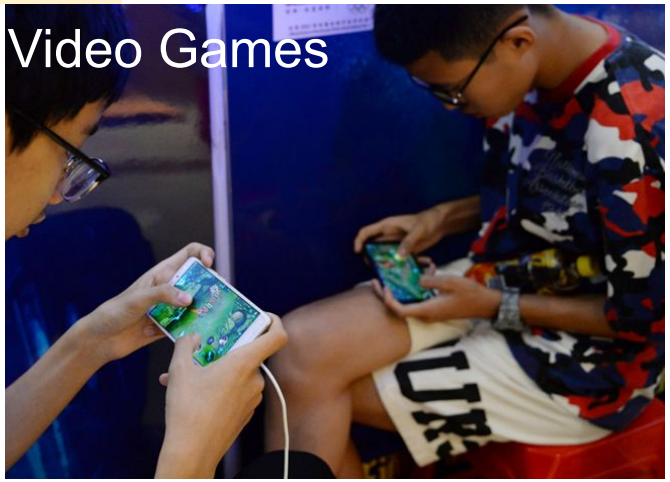
Brien Holden Vision Institute (BHVI), published in Ophthalmology in 2016
Meta Analysis, 147 studies included

Data suggest that spending more time outdoors might prevent myopia.

SINGAPORE

CHINA

Concern contributed to Chinese government to limit time spent by children on electronic devices.

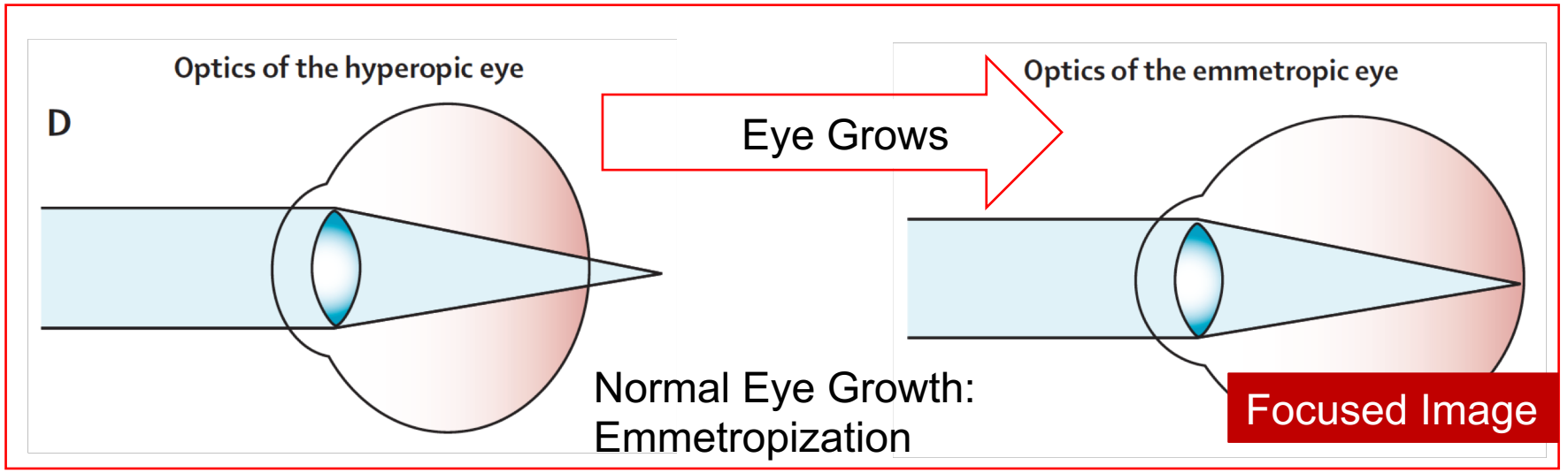


Role of electronic displays, and their ability to encourage children to stay inside, place them high on the list of concerns

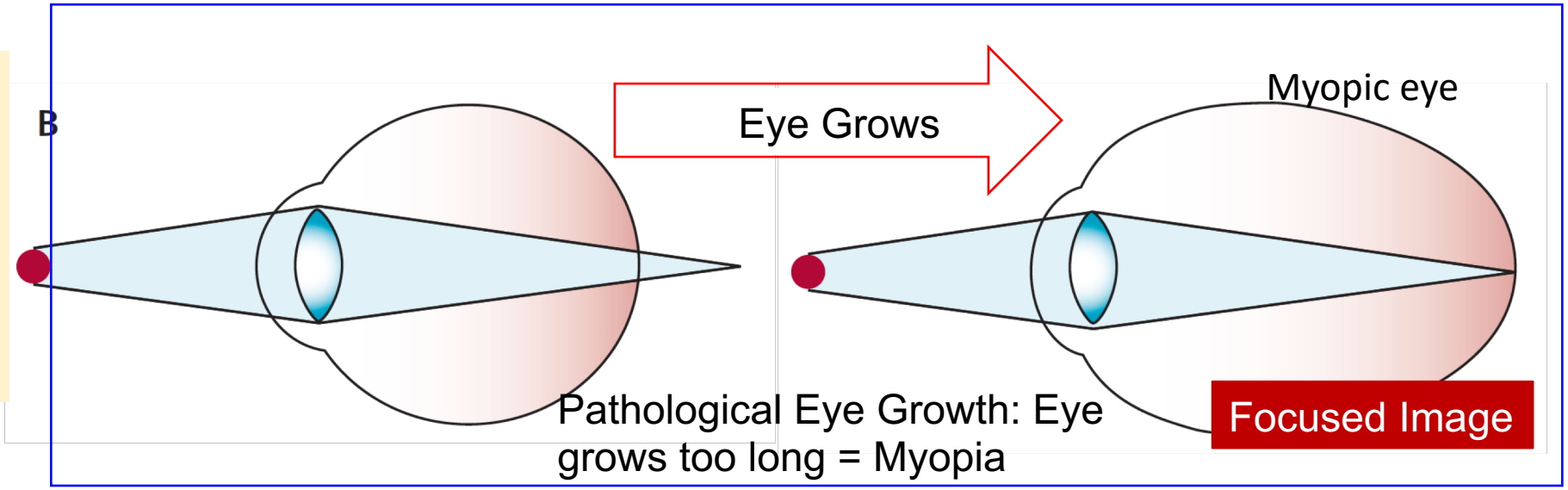
Core Hypothesis: the type of defocus present on the retina while viewing near displays contributes to or even is the cause of myopia.

Morgan I et.al, Lancet 2012

Normal Mechanism: If eyes are too short, image planes exist behind the retina, the eye grows to meet the image plane: emmetropia.



Near targets and accommodative lag create hyperopic defocus, the eye grows to meet the image plane, but now eye is too long: myopia



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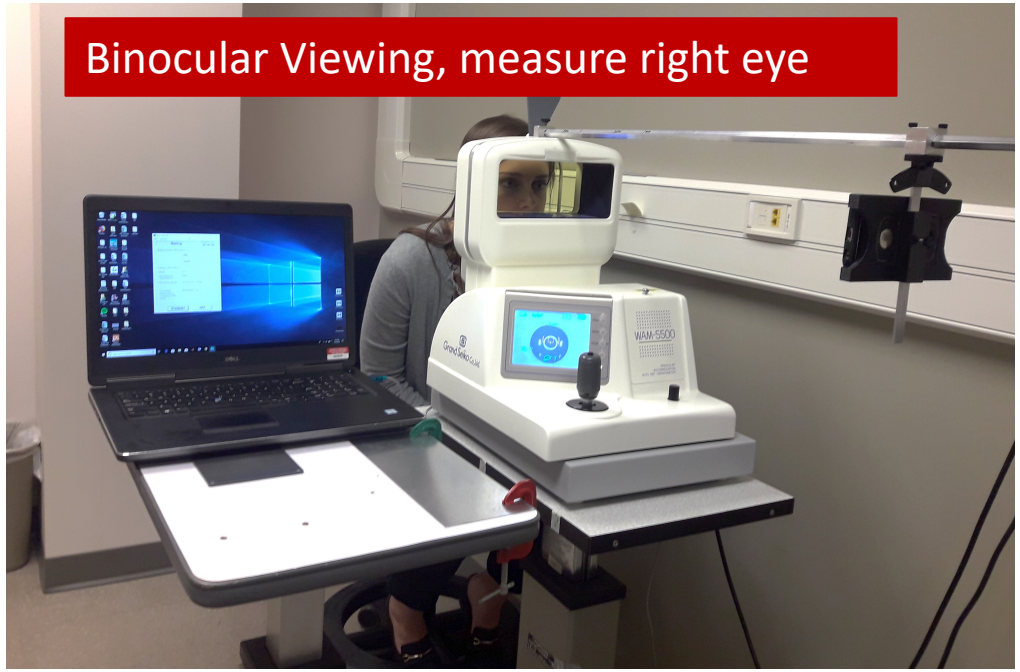
Connection: → in the 21st century…

- Increase in myopia prevalence
- Increase in hand held electronic devices
- Hyperopic defocus can make the eye grow
- Inaccurate accommodation (“lag”) creates hyperopic defocus

New Hypothesis: Children experience large accommodative lags with electronic devices, and this may contribute to the rapid increase in prevalence of myopia.

Study design:

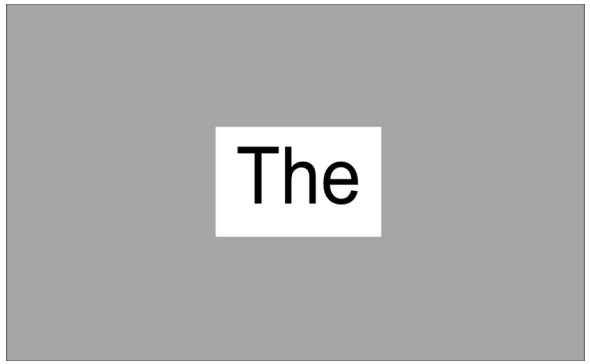
- 19 children, age 7-16 yrs.
- Emmetropes: -0.25 to +1.50 D (Uncorrected)
- Myopes: -0.50D to -6.00 D (Corrected)
- Target Distances (Vergences):
  4m, 1m, 0.33m, 0.2m (-0.25, -1.0, -3, -5 D)
- Grand Seiko (WAM-5500) Autorefractor
- iPhone and Mac computer



Instructions: “Look at the screen and not around the room. Try to look near the screen center.”

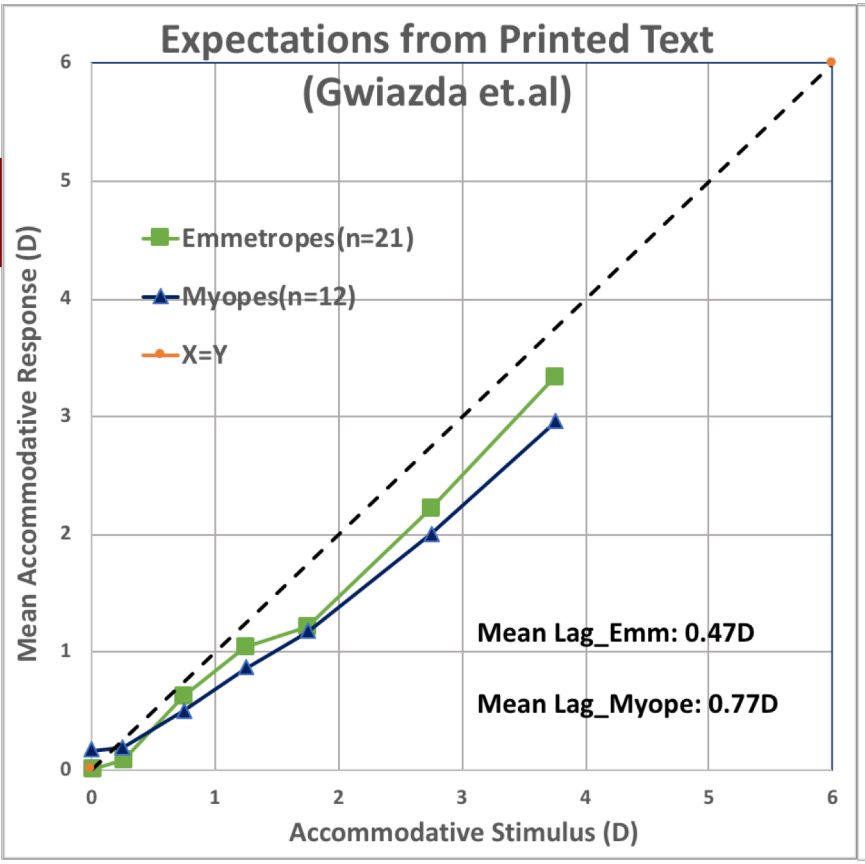
Test Stimuli

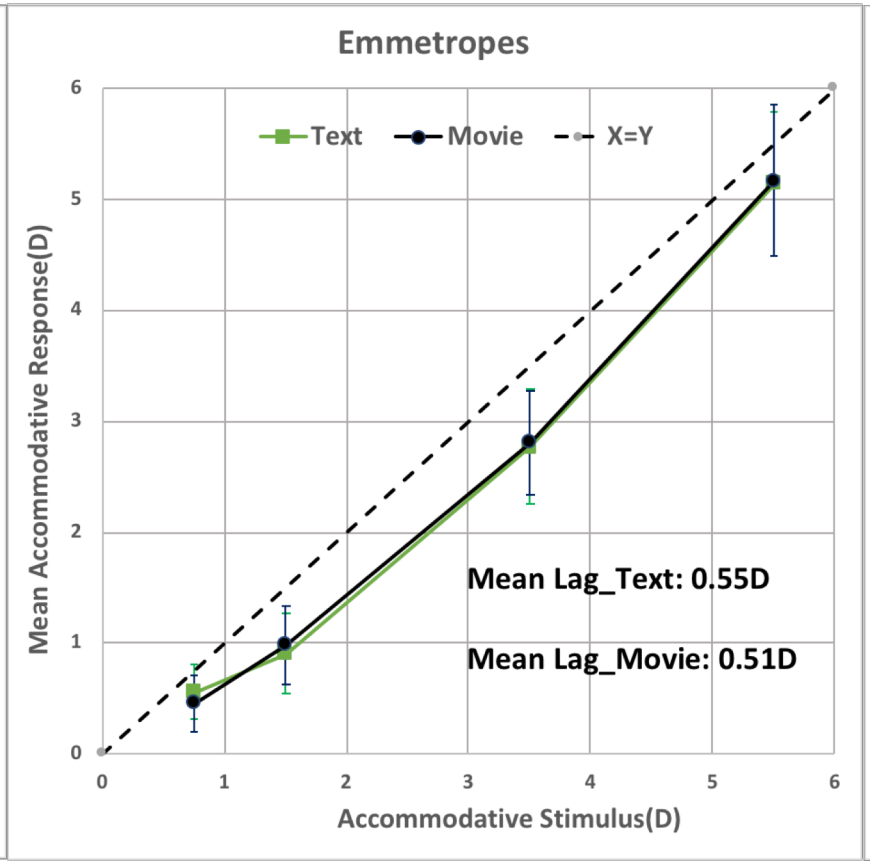
Text

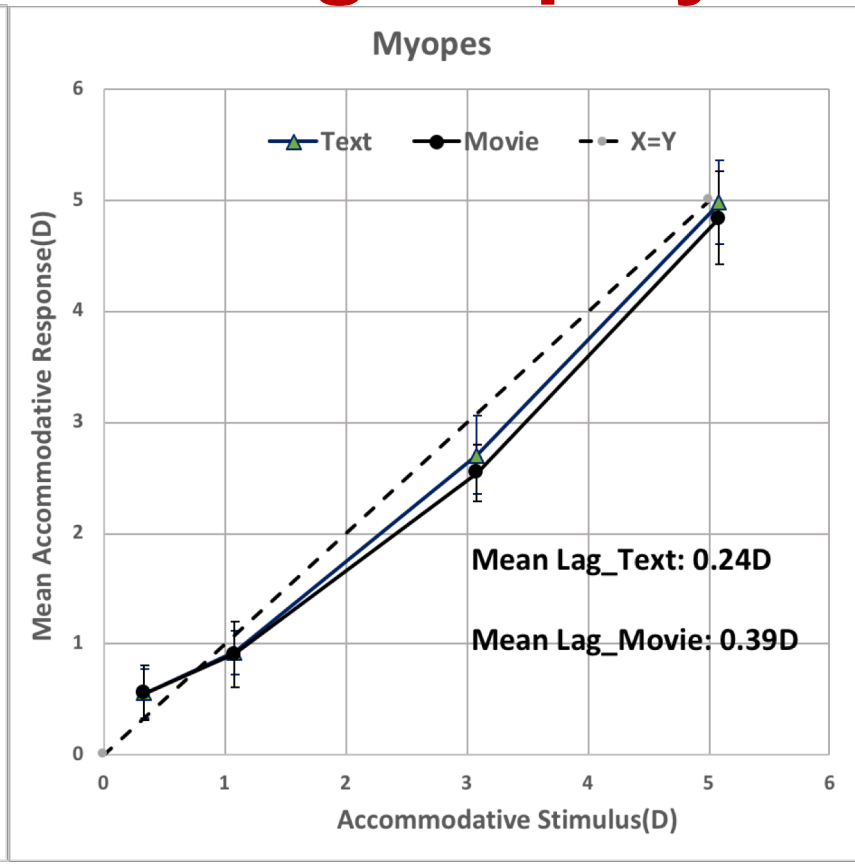


Cartoon Movie

Results: → Accom. in children viewing displays







Result: All Emmetropic and Myopic Children accommodated normally, with typical or smaller than usual accommodative lags (mean Emmetropic lag= 0.53D, mean Myopic lag = 0.32D), but, as shown previously most subjects experienced lags at near.

Conclusion: Small amounts of hyperopic defocus (accommodative lag) were present at near for most children. However, we find no evidence to support the hypothesis that electronic displays produce large accommodative lags, and thus elevate hyperopic defocus levels.

THANK YOU

Please visit our poster for further details on this study

Thursday, Nov. 8

Poster Board # 139

Exhibit Hall 3

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