

AGE-RELATED CHANGES IN SPATIO-CHROMATIC CONTRAST SENSITIVITY AT MESOPIC AND PHOTOPIC LIGHT LEVELS

MALIHA ASHRAF*, SOPHIE WUERGER, RAFAŁ MANTIUK, MINJUNG KIM, JASNA MARTINOVIĆ



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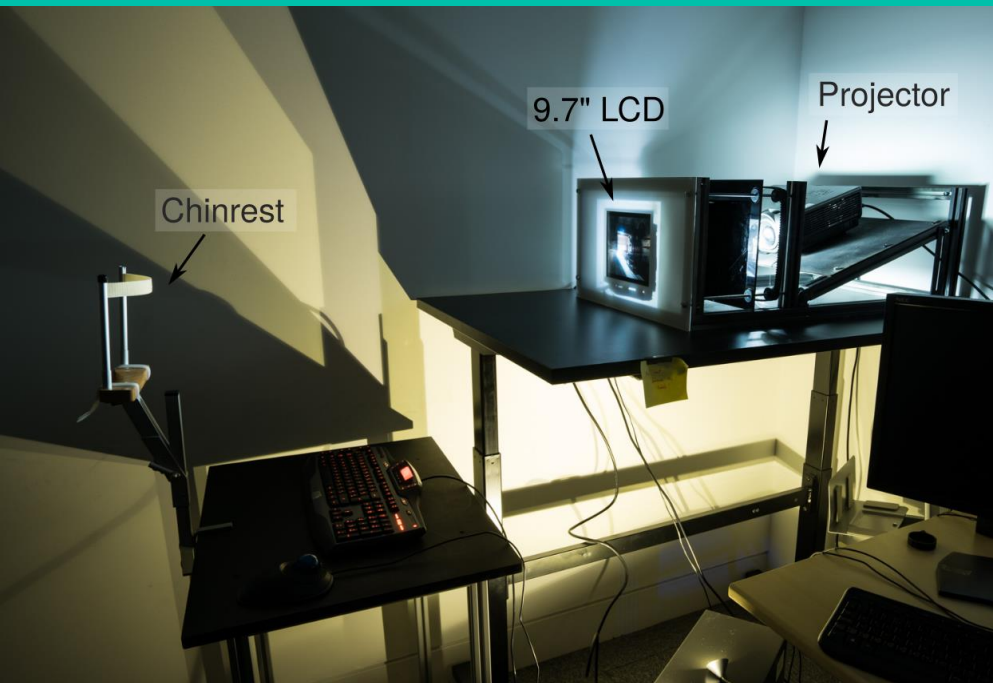
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- Senescence of spatio-chromatic contrast sensitivity at high light levels^[3] has not been investigated before
- We are investigating the joint effects of luminance and age on spatio-chromatic contrast sensitivity

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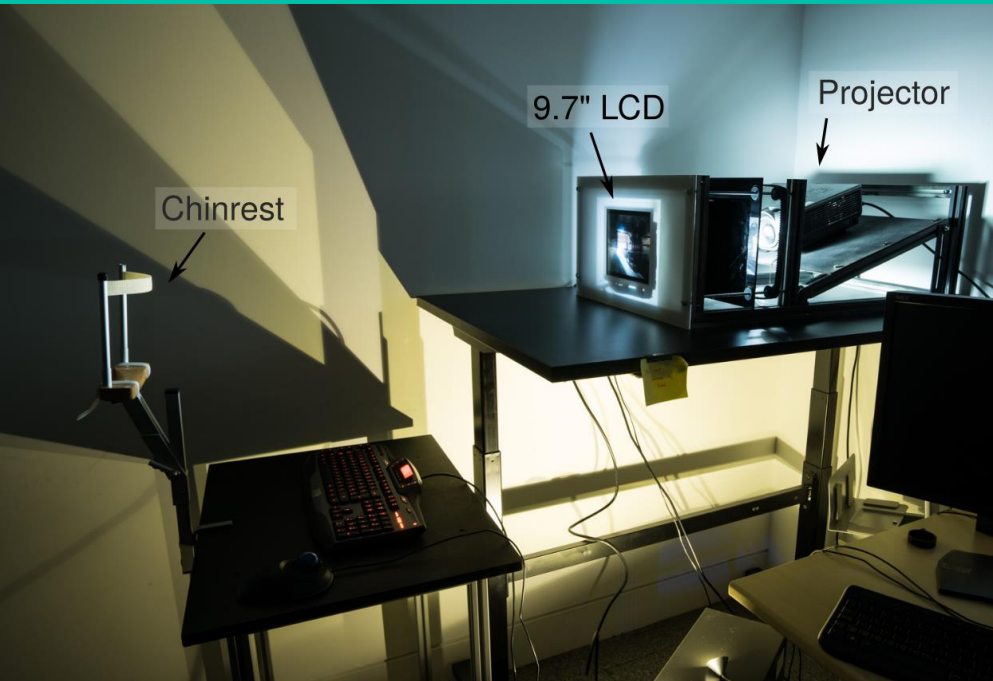
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METHODOLOGY



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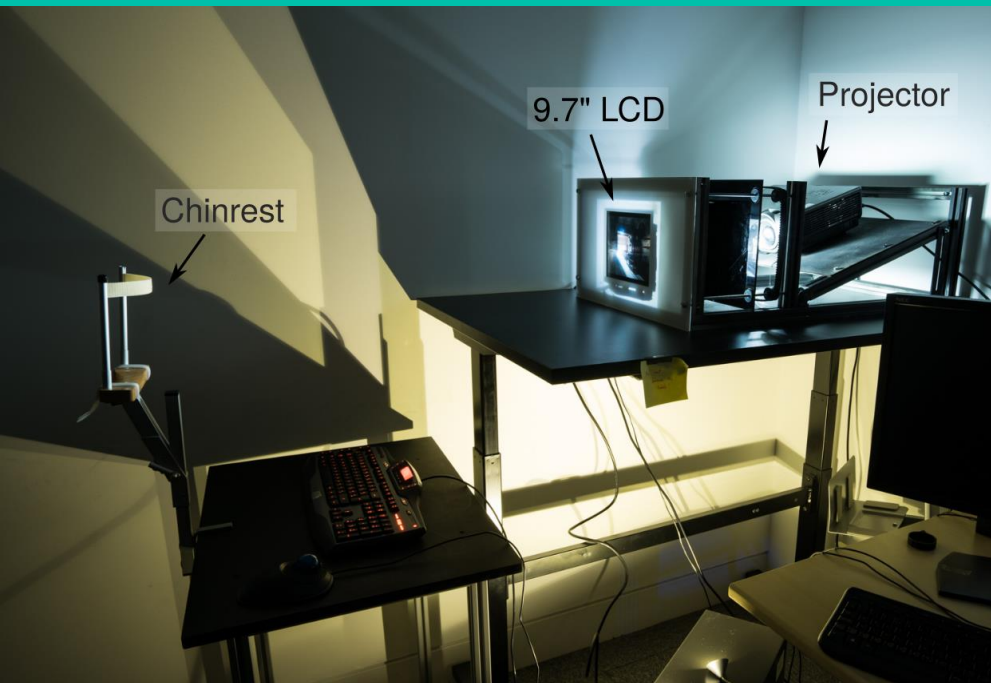


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- Custom-built HDR displays^[4]

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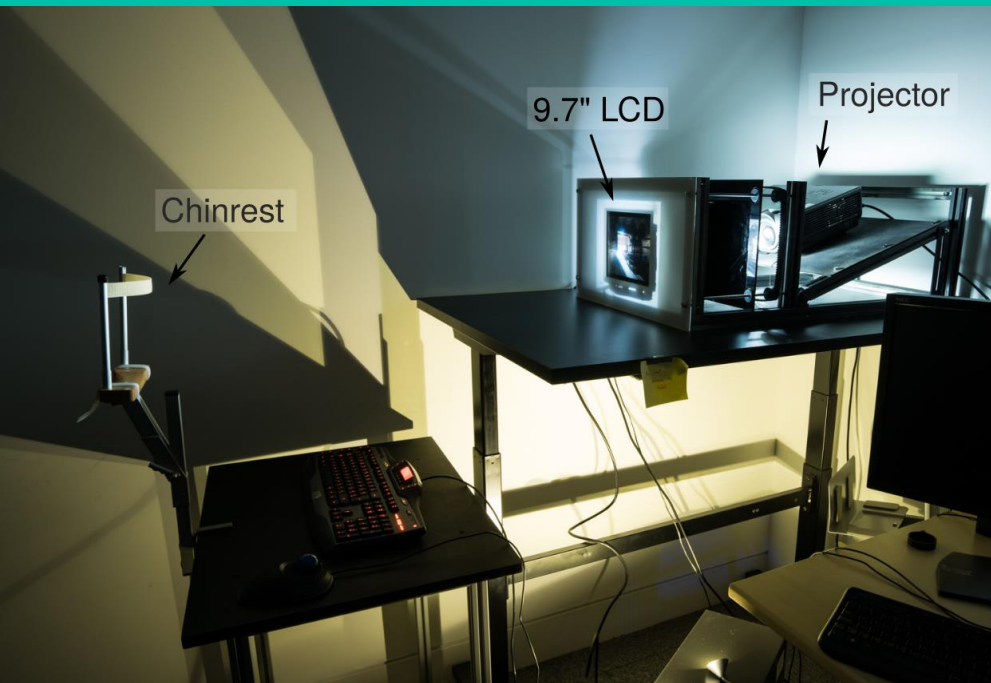


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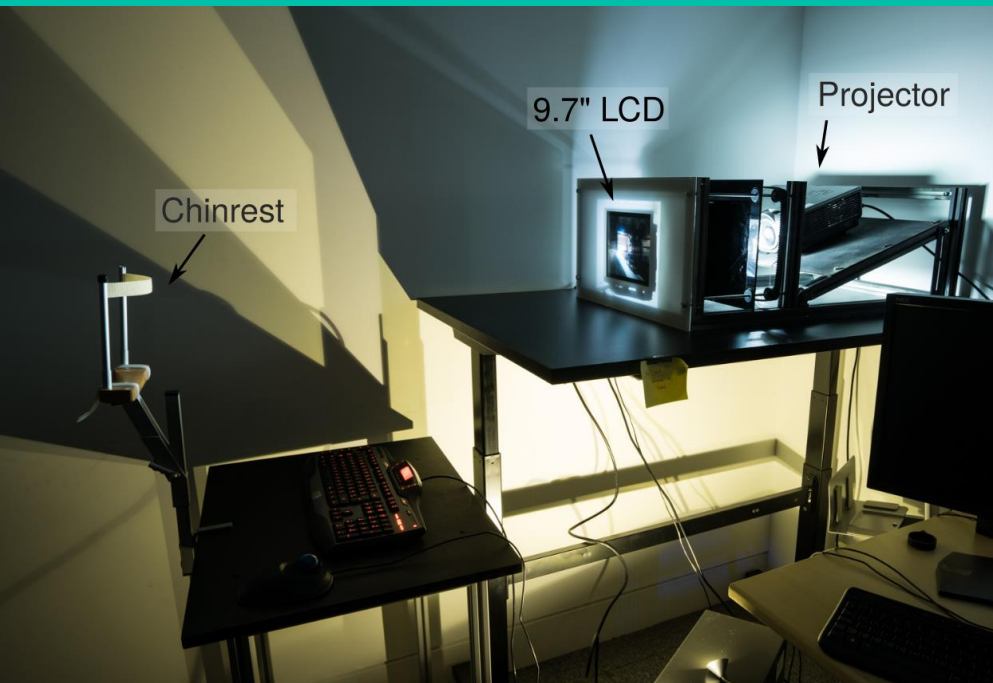


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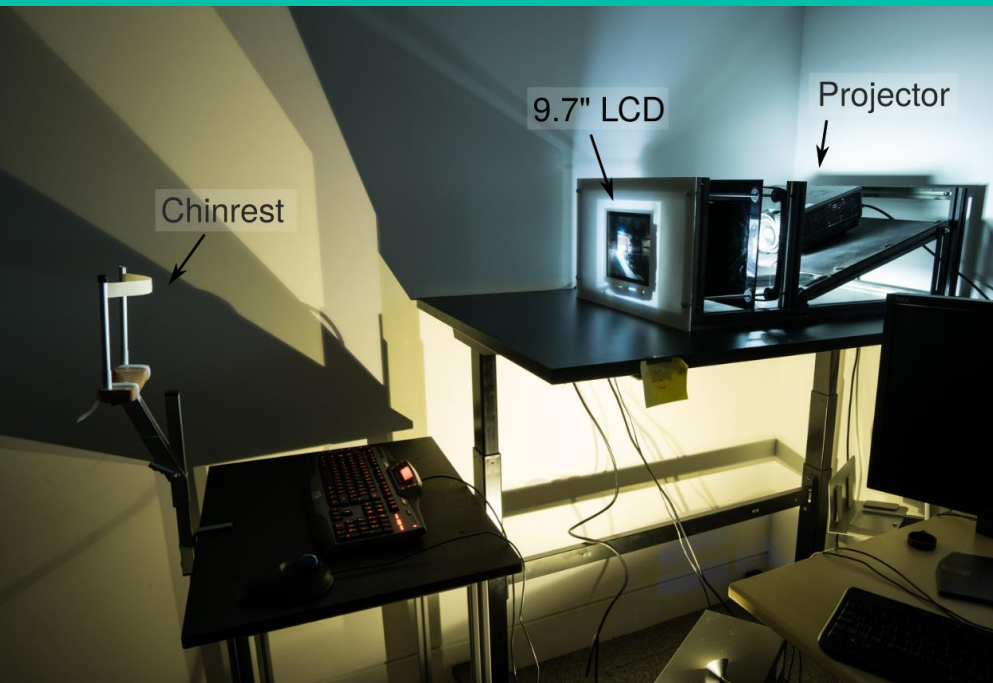


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- 3 color directions
- Mean luminances: 0.02, 0.2, 2, 20, 200, 2000, and 7000 cd/m^2



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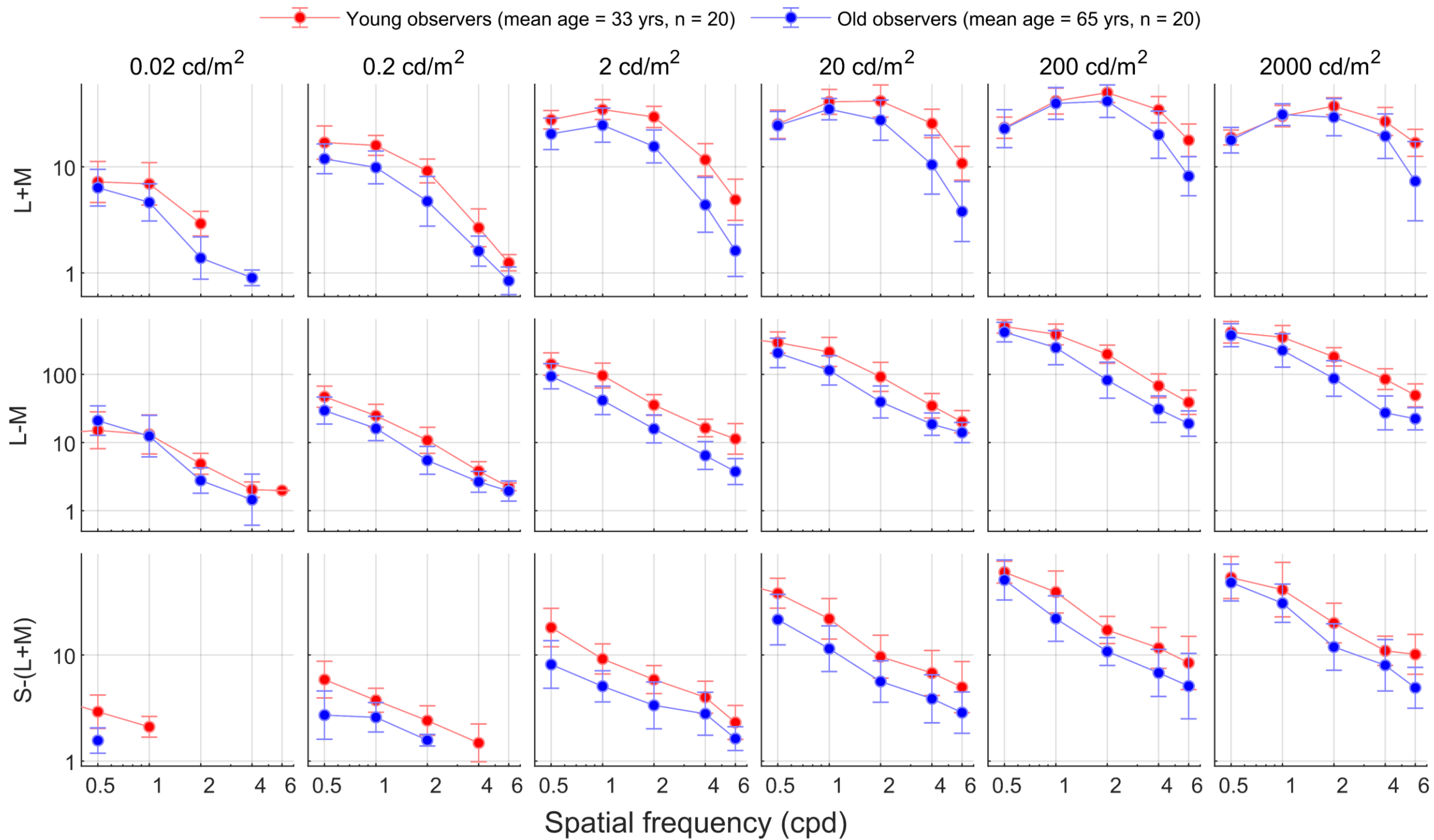
- 4AFC detection task
- Initial contrast threshold estimate using method of adjustment
- 5 spatial frequencies and 3 color directions interleaved within each session
- Single mean background luminance for each session to ensure adaptability
- Viewing distance: 91 cm; Display size: $12.5^\circ \times 9.4^\circ$

OBSERVERS

- Color normal observers
- 20 young participants; mean age: 33 years
- 20 older participants: mean age: 65 years

RESULTS

- GENERAL TRENDS
- AGE-DEPENDENCE
- PARAMETRIC MODELLING



GENERAL TRENDS

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- Contrast sensitivity functions (CSFs):
 - Increases with background luminance up to around 200 cd/m^2
 - Declines after 200 cd/m^2 in luminance channel
 - Becomes fairly constant after 200 cd/m^2 in chromatic channels

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- The difference is roughly constant across colour directions and light levels
- Older observers show larger decline in sensitivity for higher spatial frequencies at high photopic light levels

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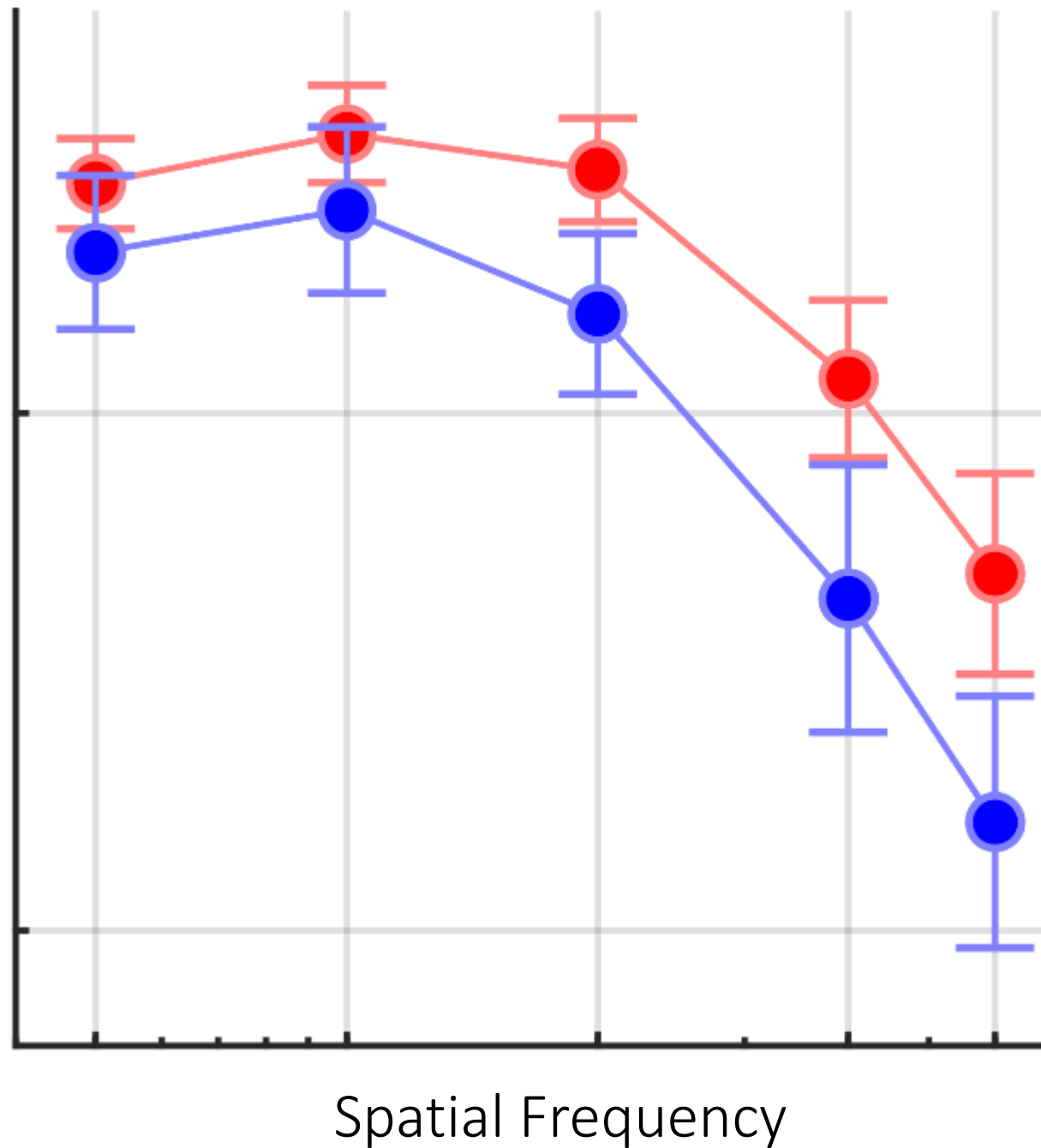
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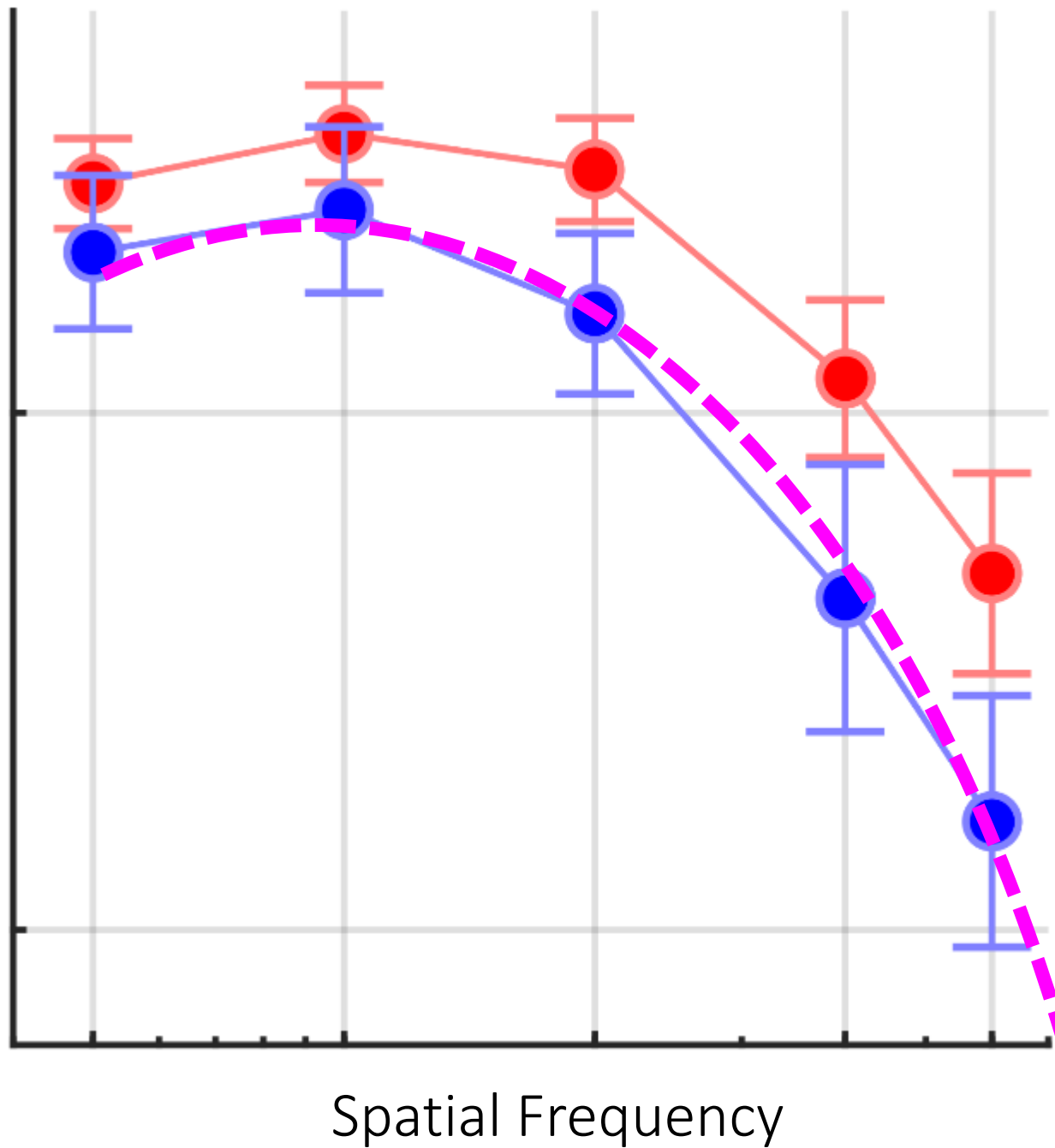
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- Rate of decrease in peak sensitivity and cut-off frequency is luminance dependent

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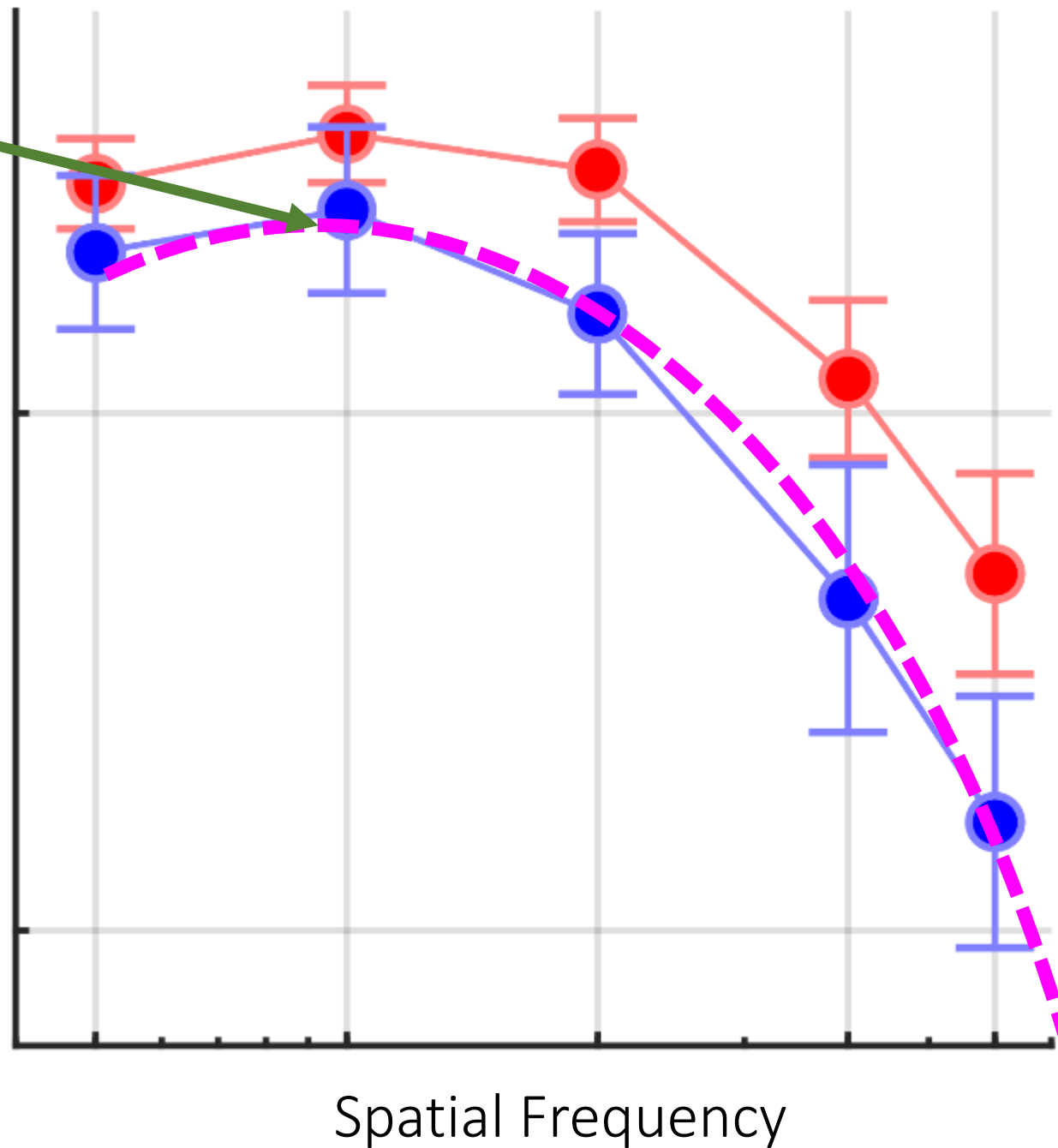


ACHROMATIC SENSITIVITY



Peak
sensitivity

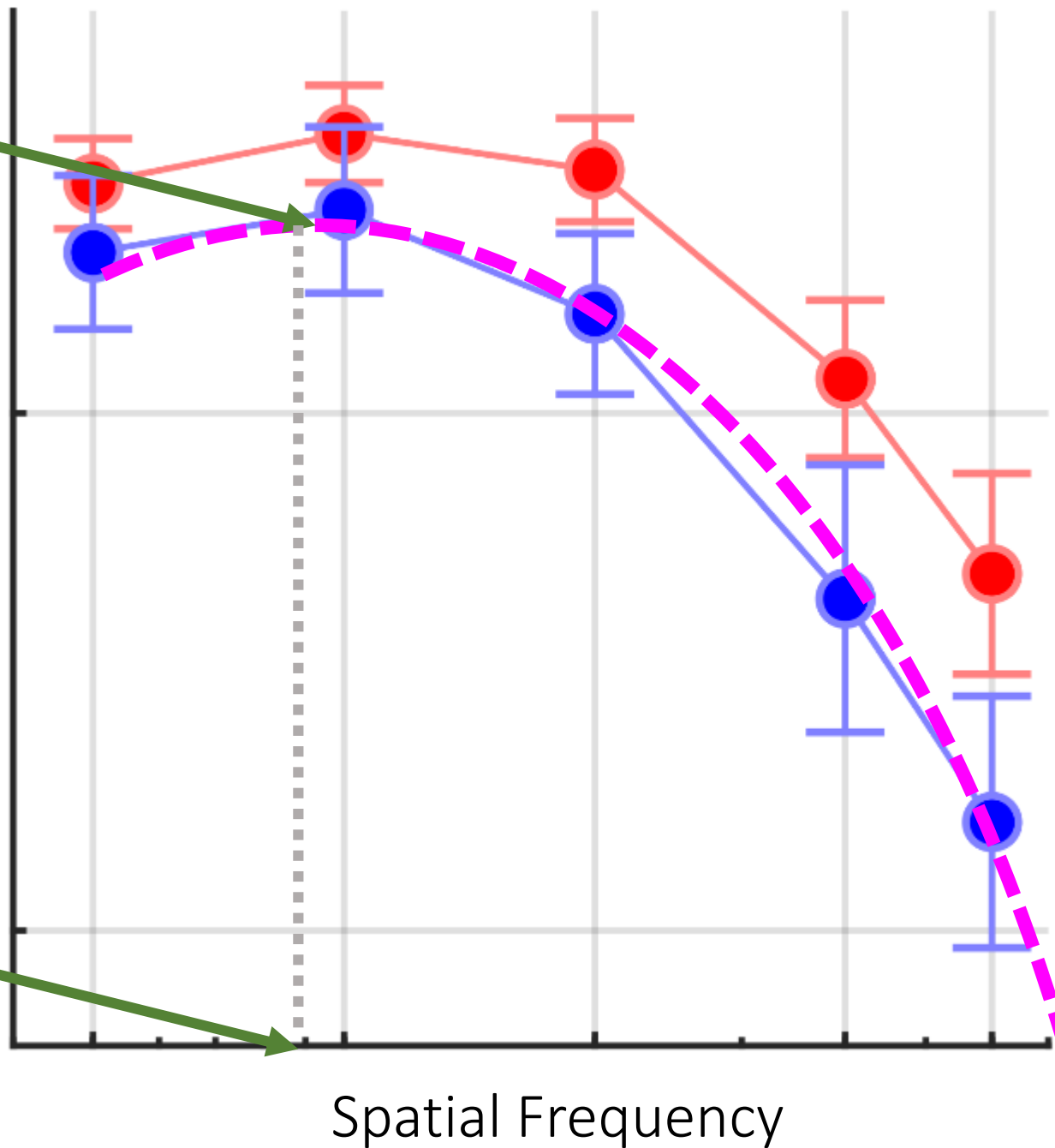
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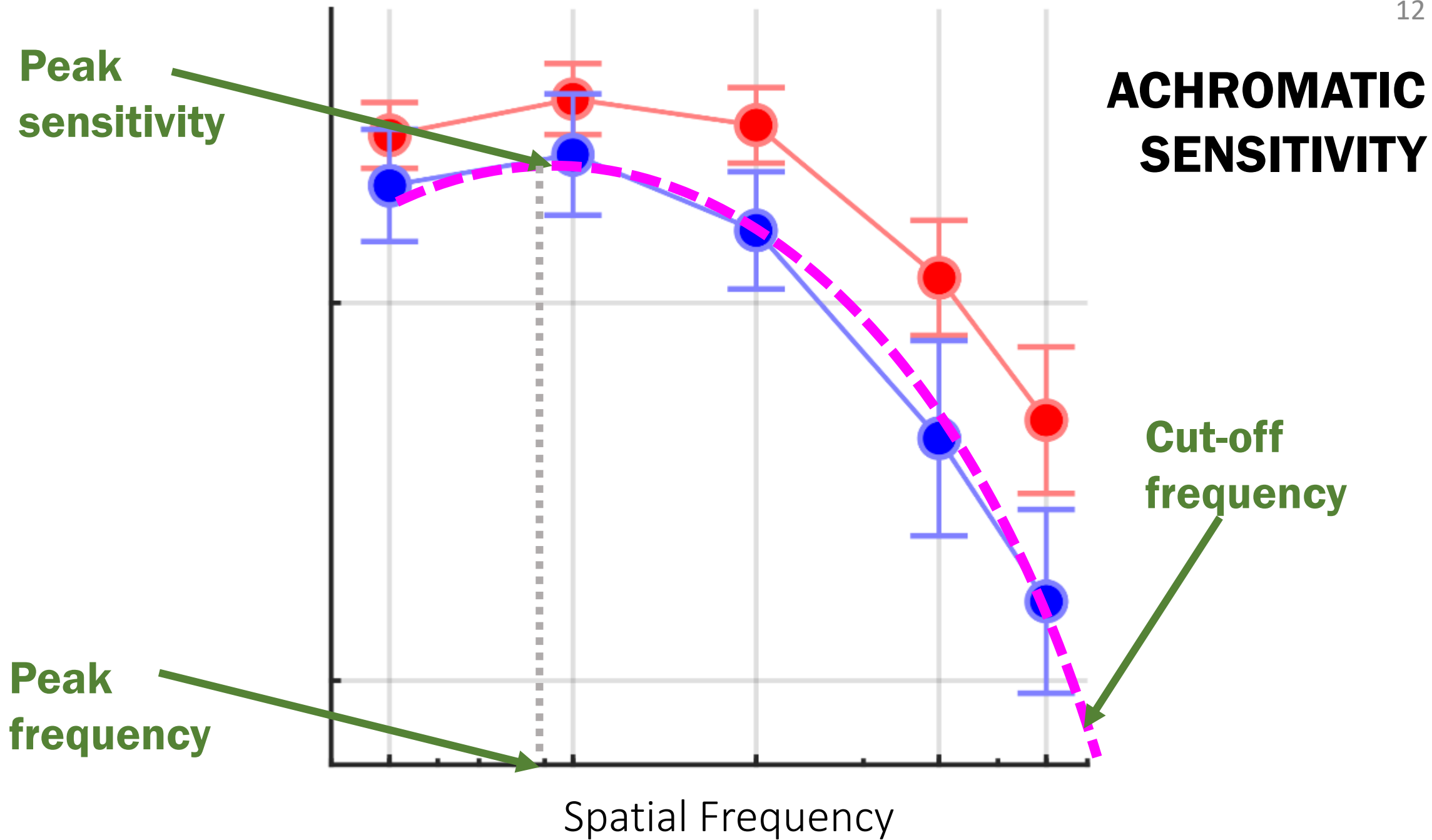
ACHROMATIC SENSITIVITY

Peak sensitivity

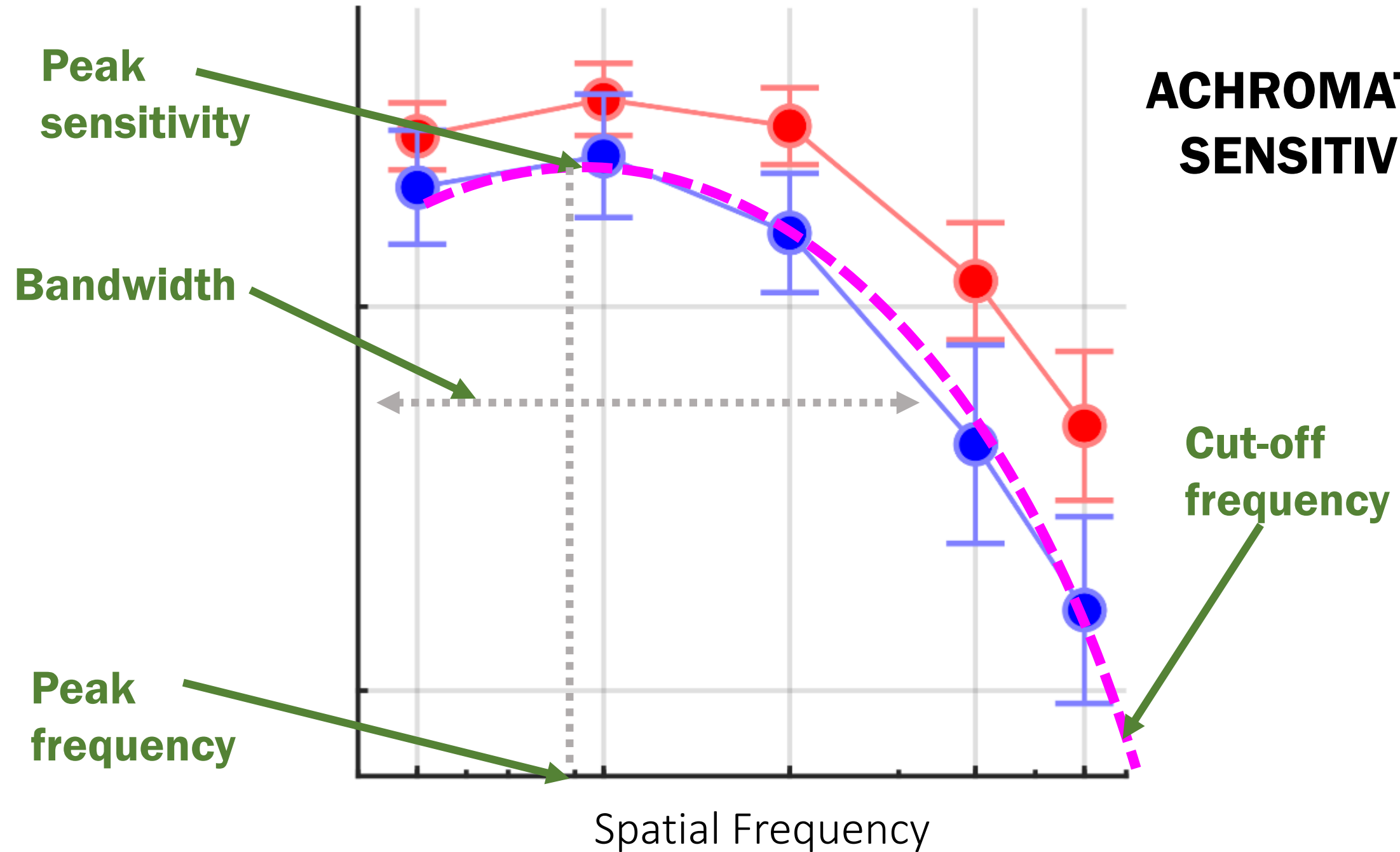
Peak frequency



Spatial Frequency



ACHROMATIC SENSITIVITY



Peak sensitivity

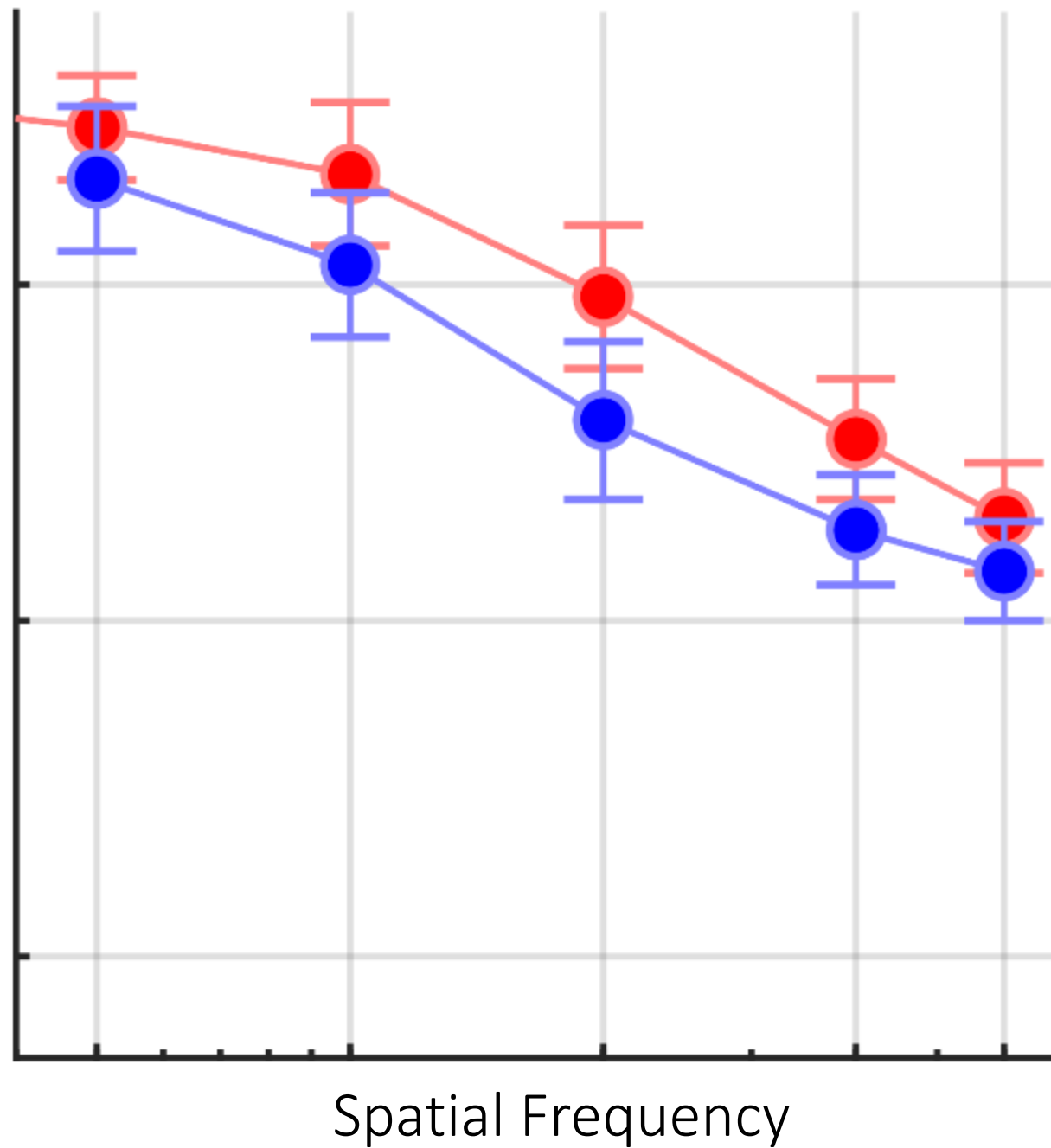
Bandwidth

Peak frequency

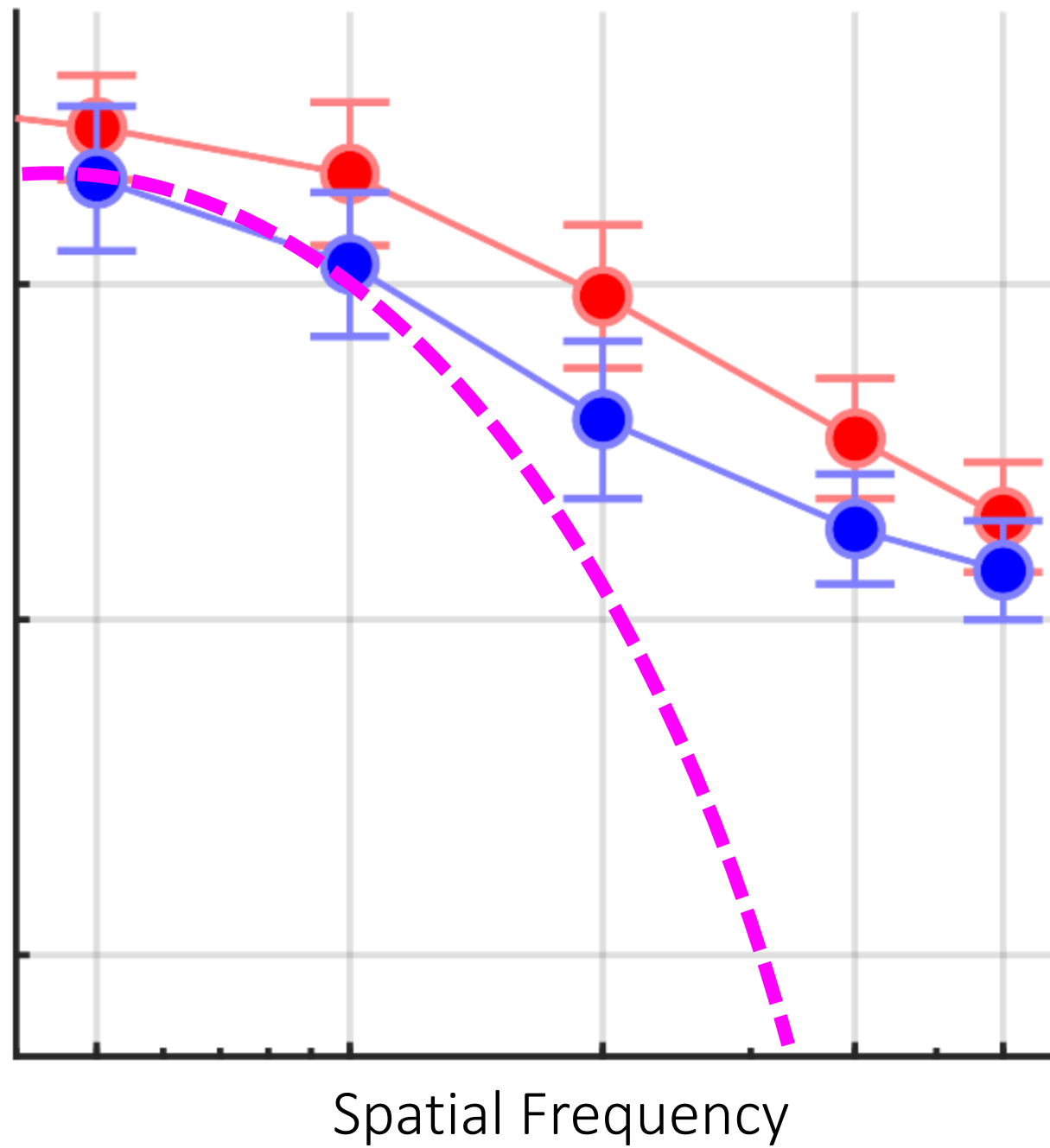
Cut-off frequency

Spatial Frequency

CHROMATIC SENSITIVITY

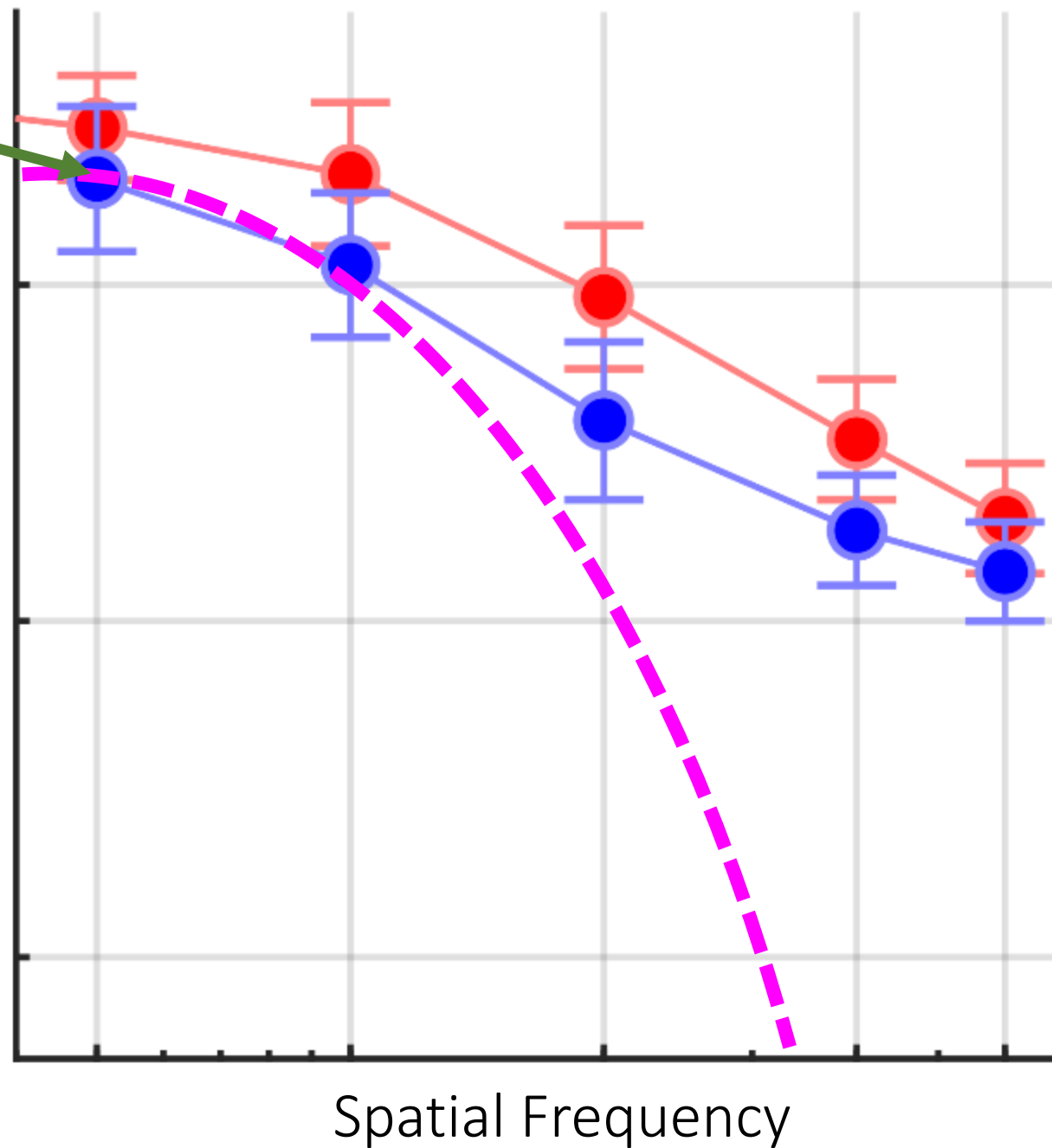


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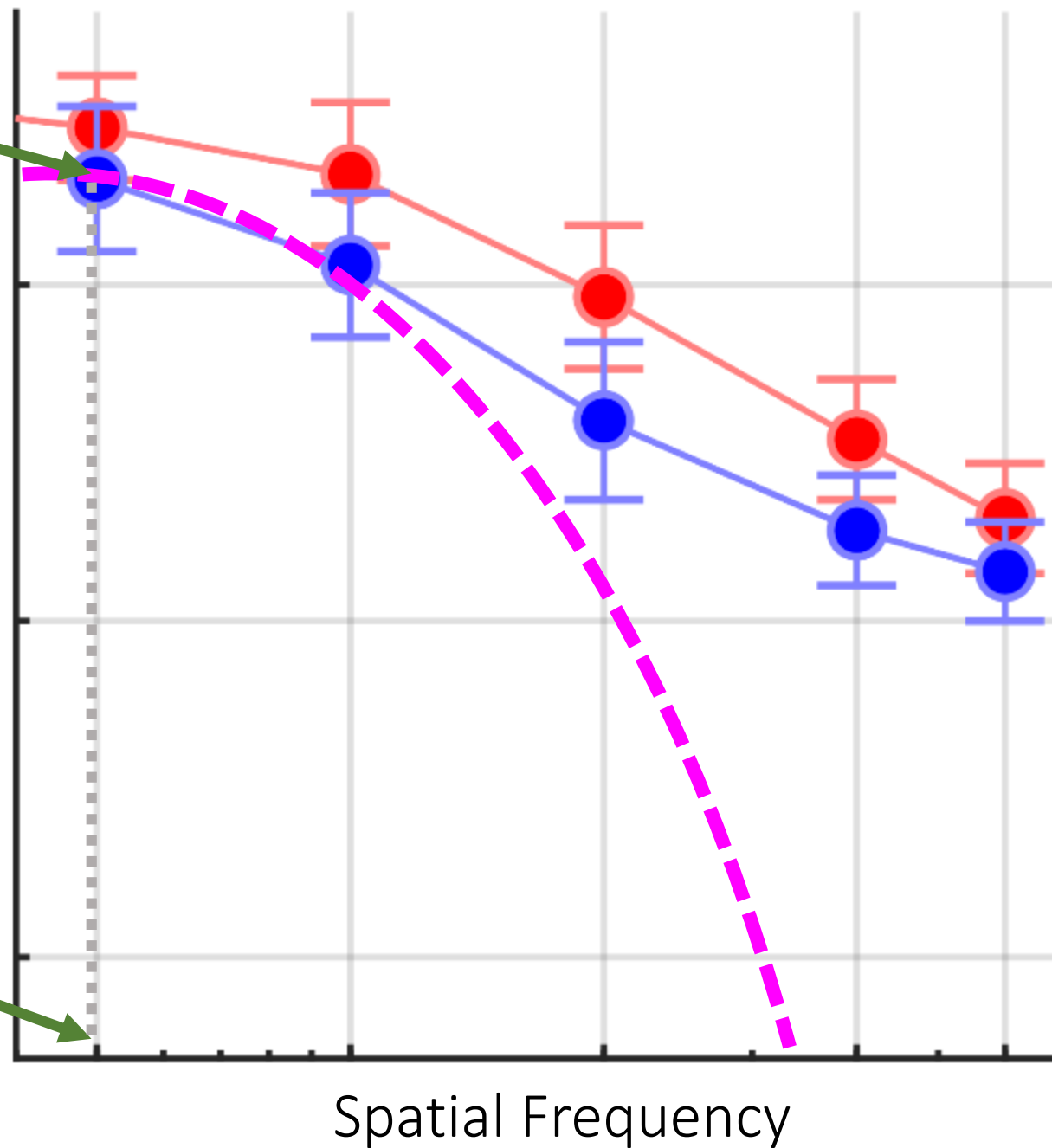


Spatial Frequency

Peak
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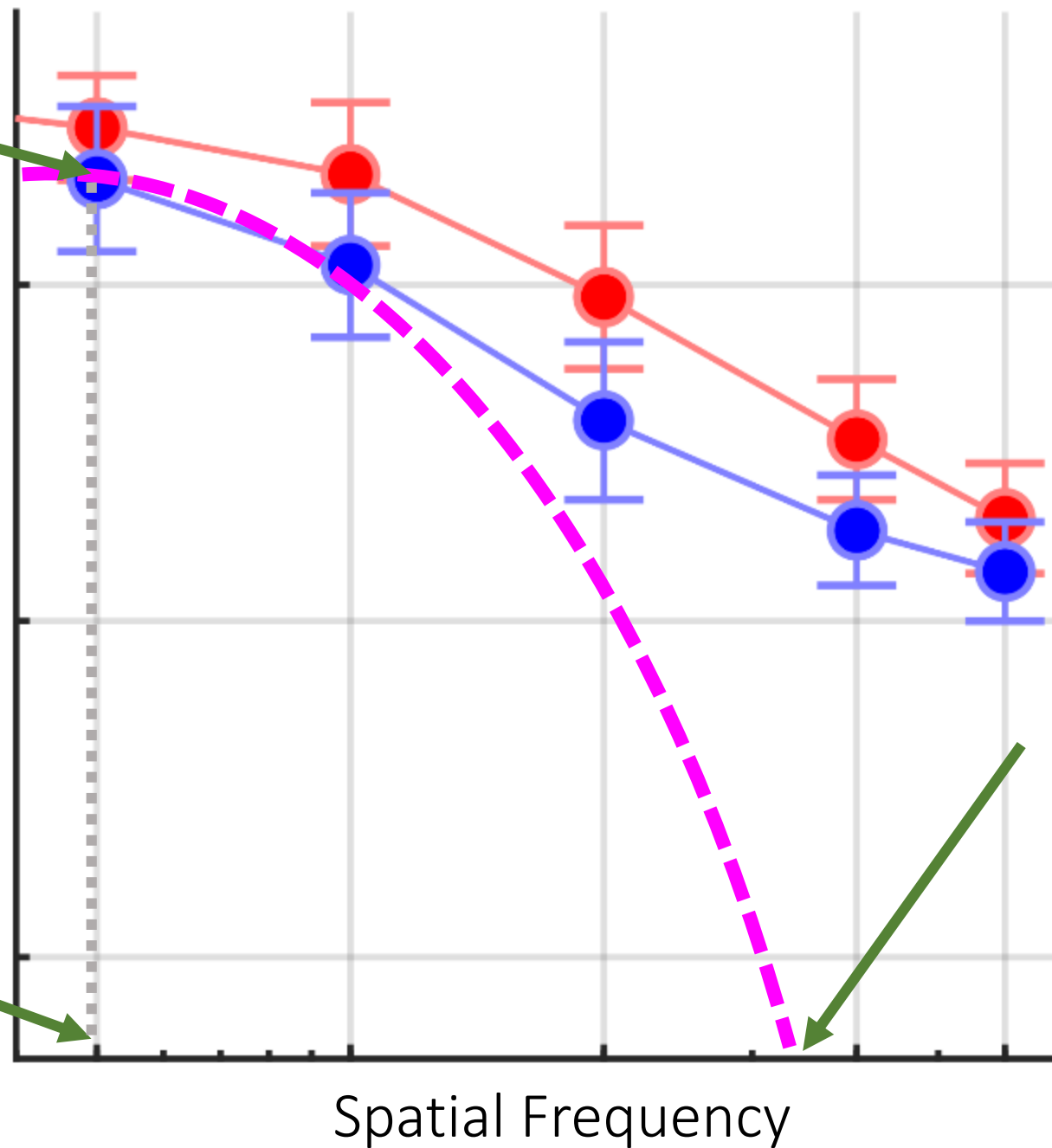
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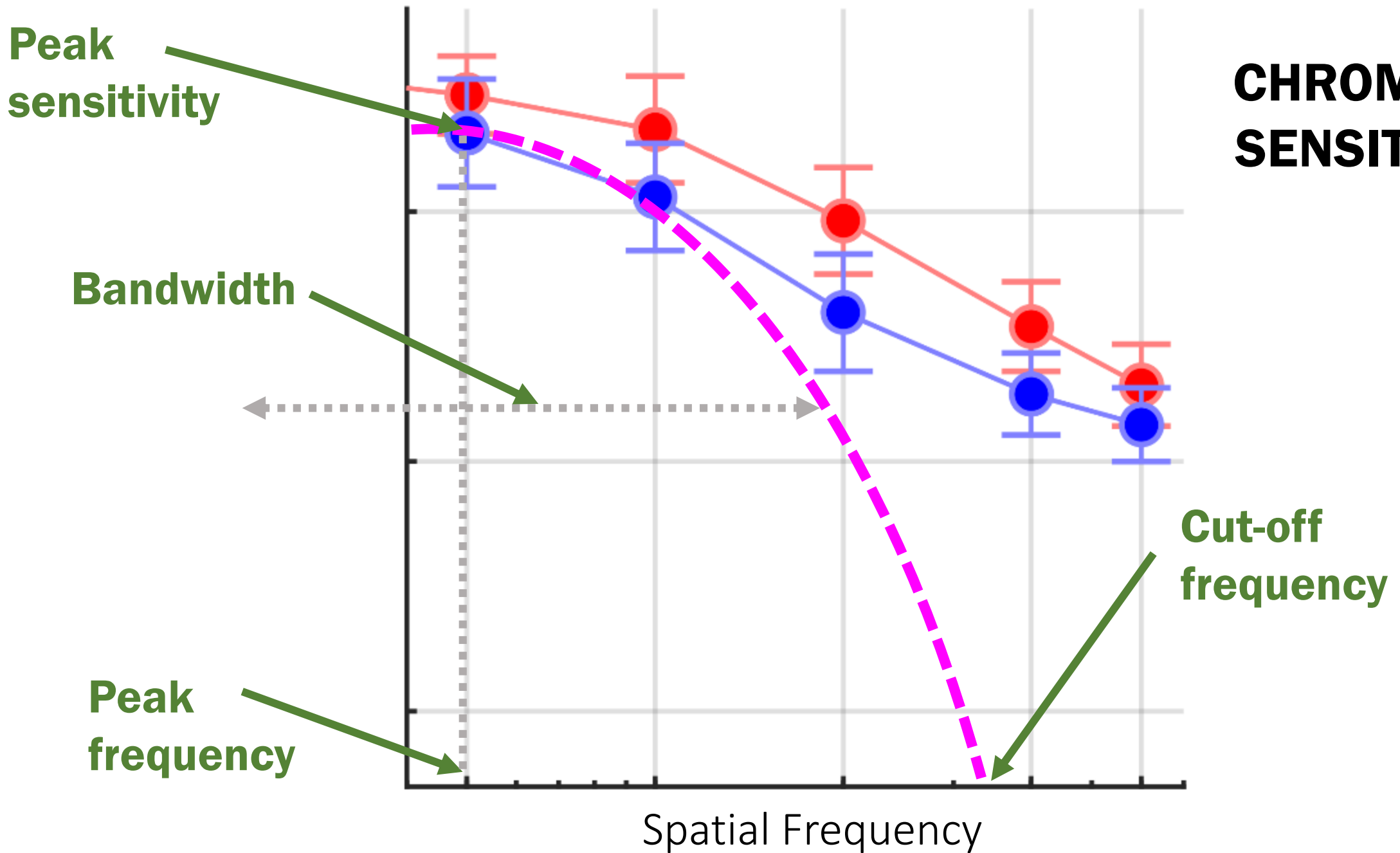
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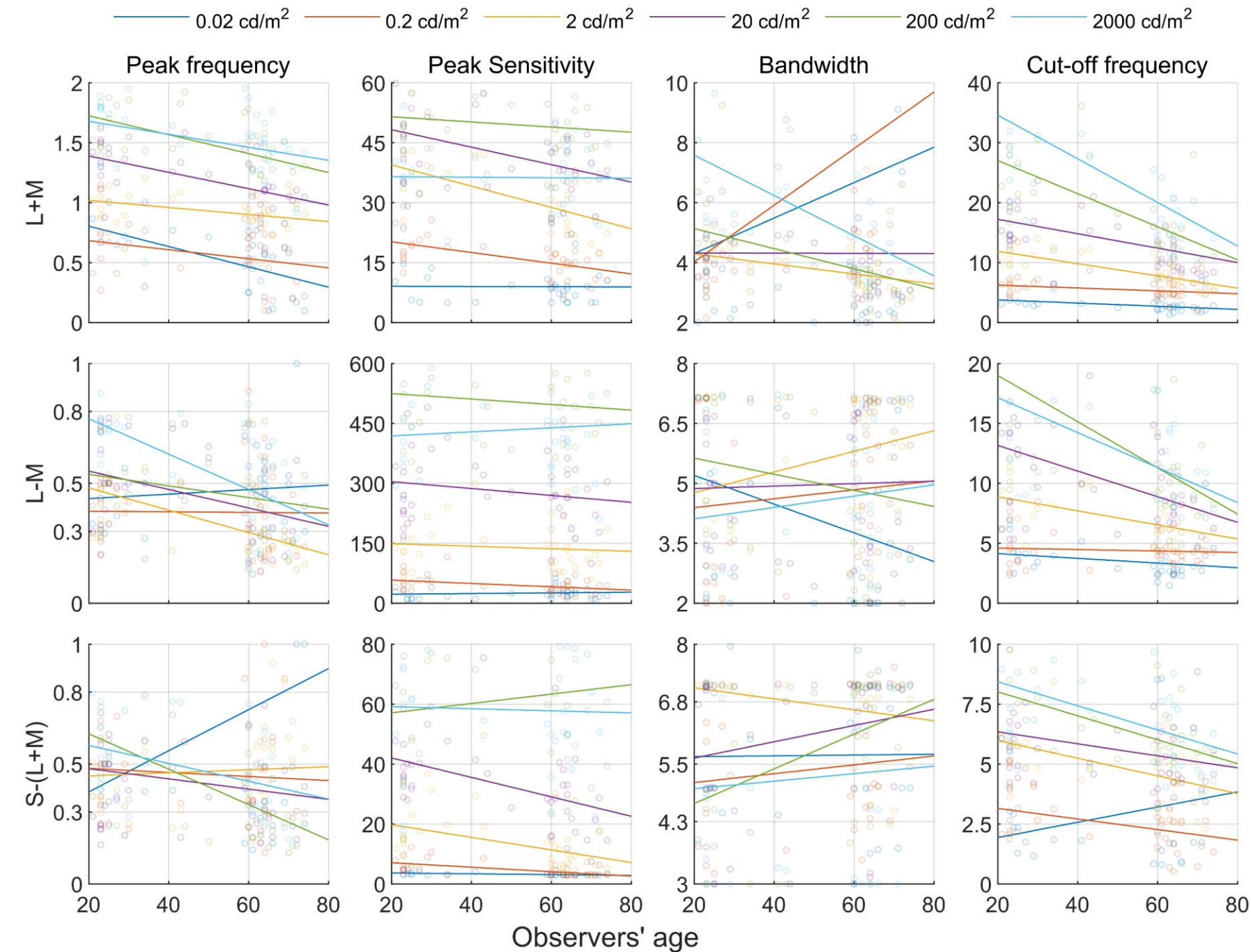
**Cut-off
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Spatial Frequency

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Linear regression lines fitted to age vs. optimized values of log-parabola parameters.

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- At higher luminances, sensitivity of higher spatial frequencies are deteriorated with age more than that of lower frequencies

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- Developing framework for an age-adaptive display algorithm

ACKNOWLEDGEMENTS

This research has been supported by:

- *EPSRC EP/P007503*
- *Apple Inc*
- *Summer vacation bursary program*



Special thanks to our interns Kristof Santa and Olivia Kingston for collecting valuable data