



Children's cortical responses to optic flow patterns show differential tuning by pattern type, speed, scalp location, and age group

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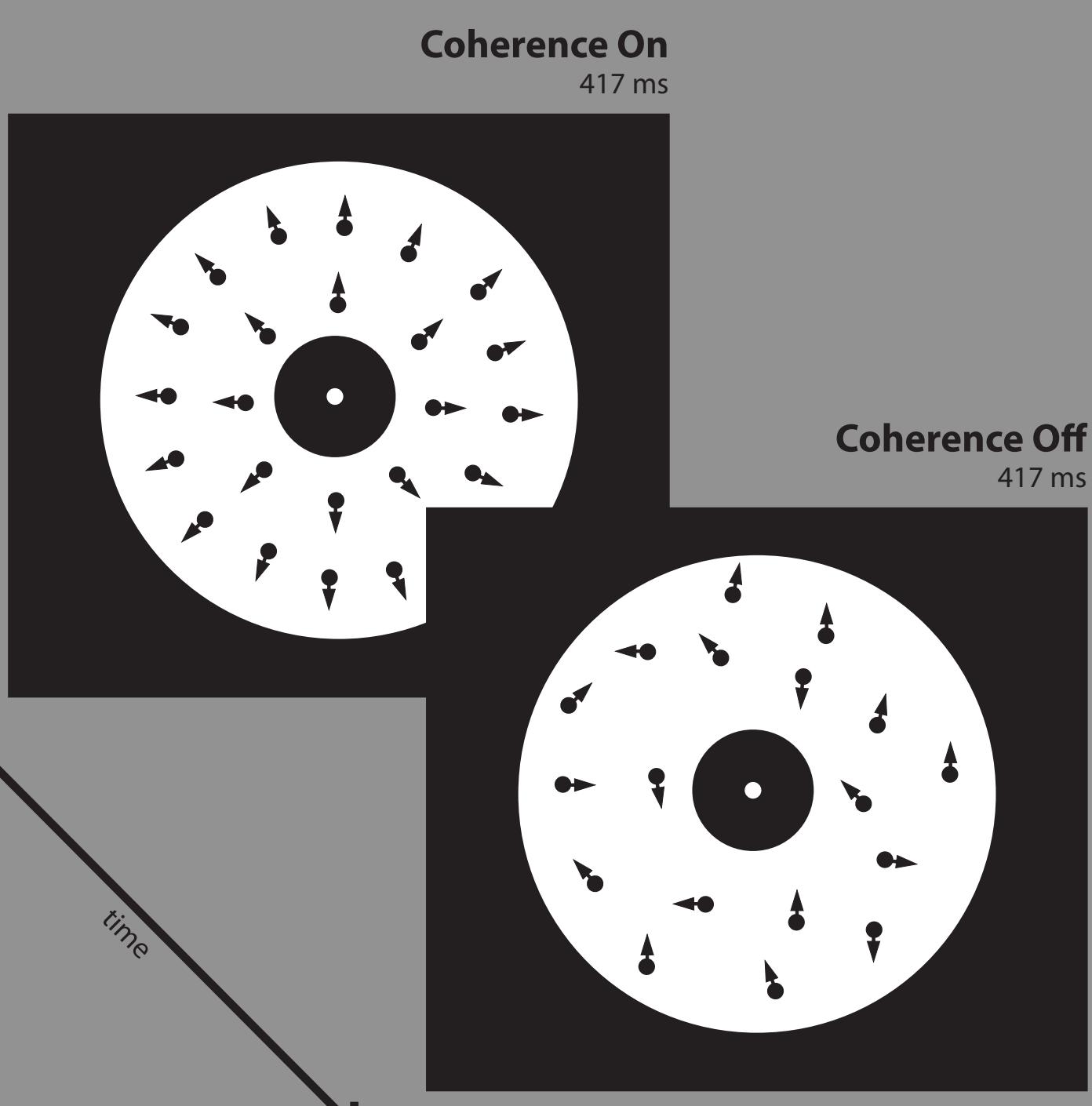
Research Questions

- Q: Does speed tuning vary across optic flow pattern types?
- Q: Does speed tuning vary by visual cortex region?
- Q: How does child tuning compare to adults'?
- Compared responses to three coherent optic flow patterns types at three speeds
- N=23 school-age children (49-109 months, M=76.80 months, S.D.=18.62 months)

Methods

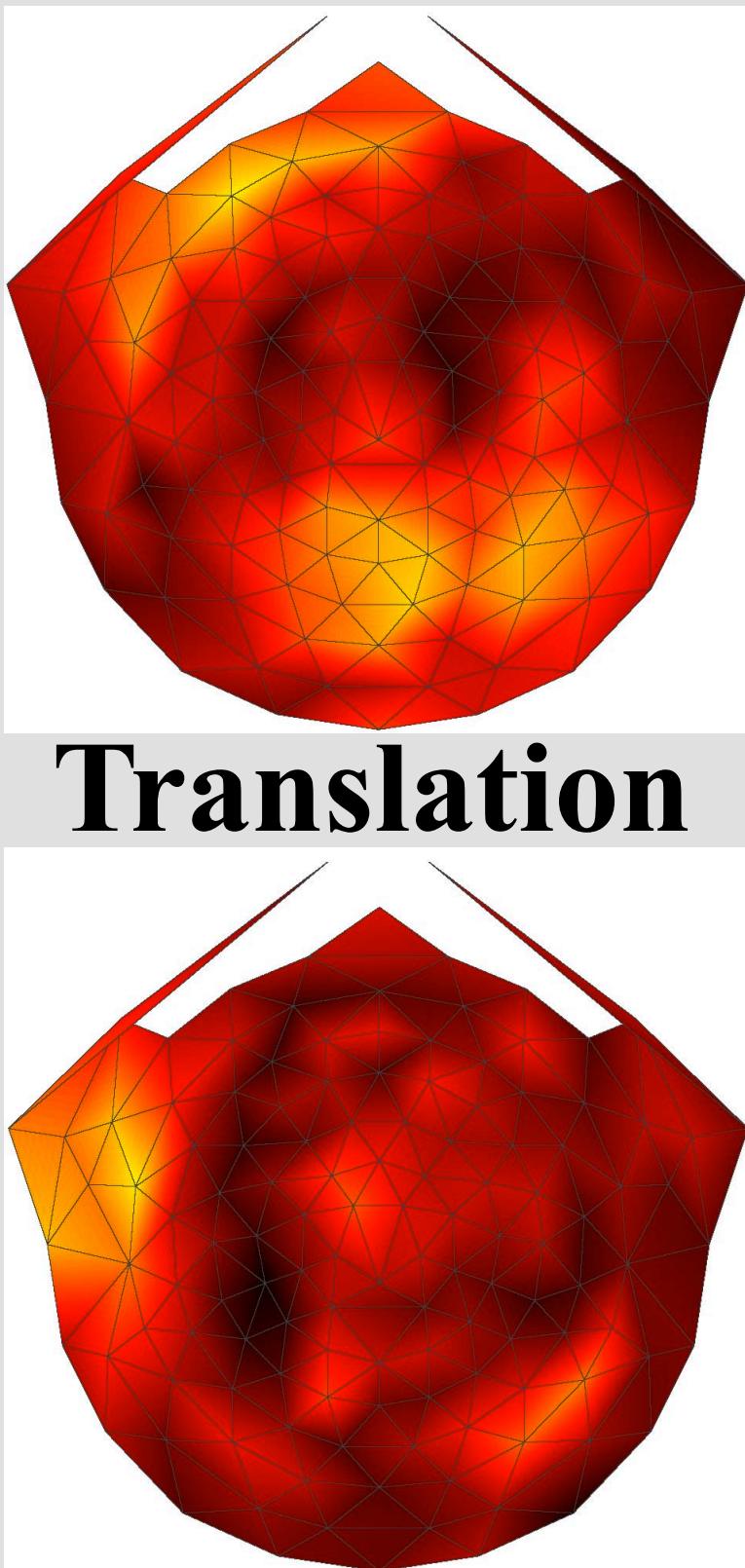
Displays modulated from 100% coherent to 0% coherent at 1.2 Hz.

Flow patterns: Radial, Rotational, and Translational.



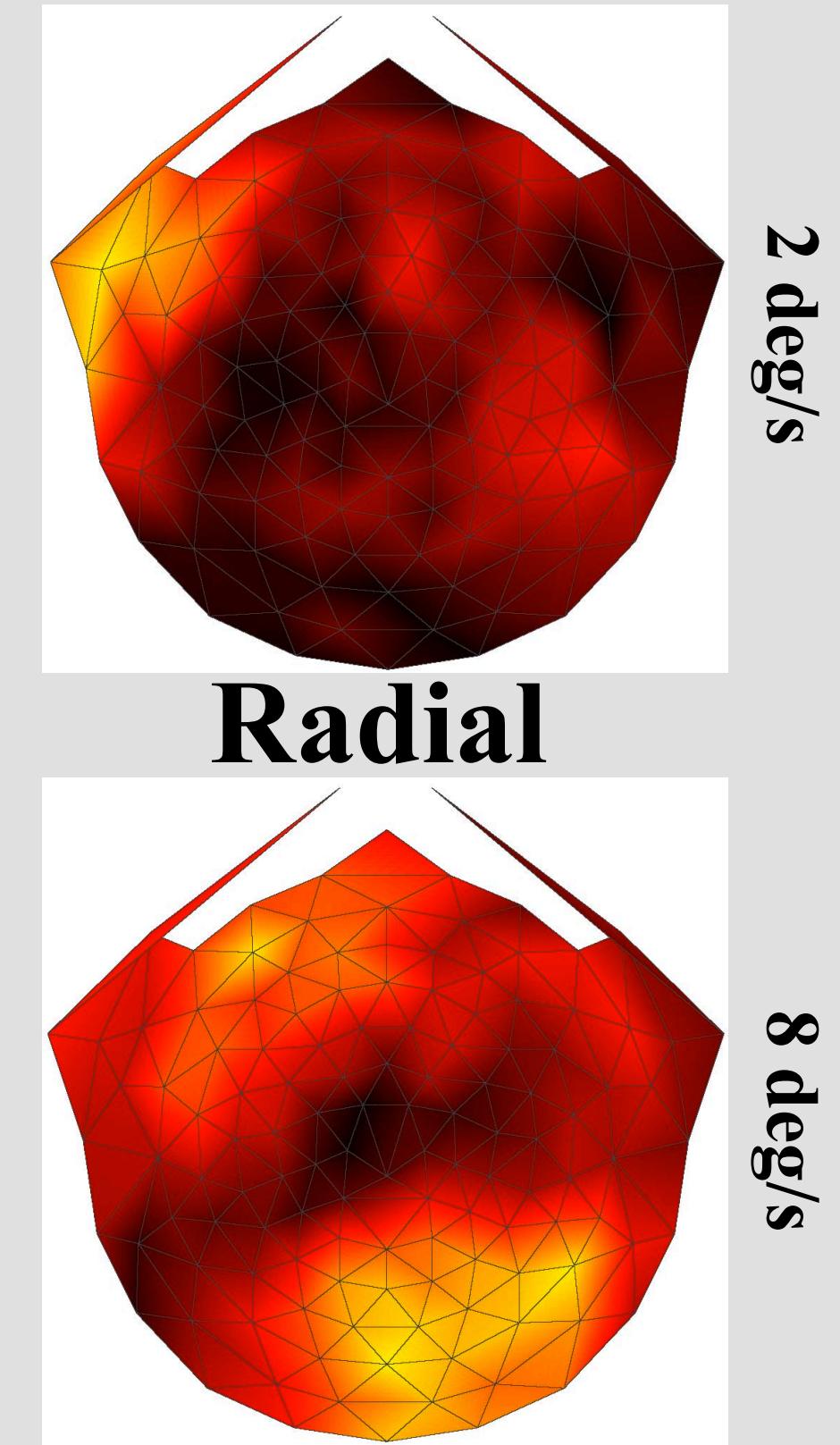
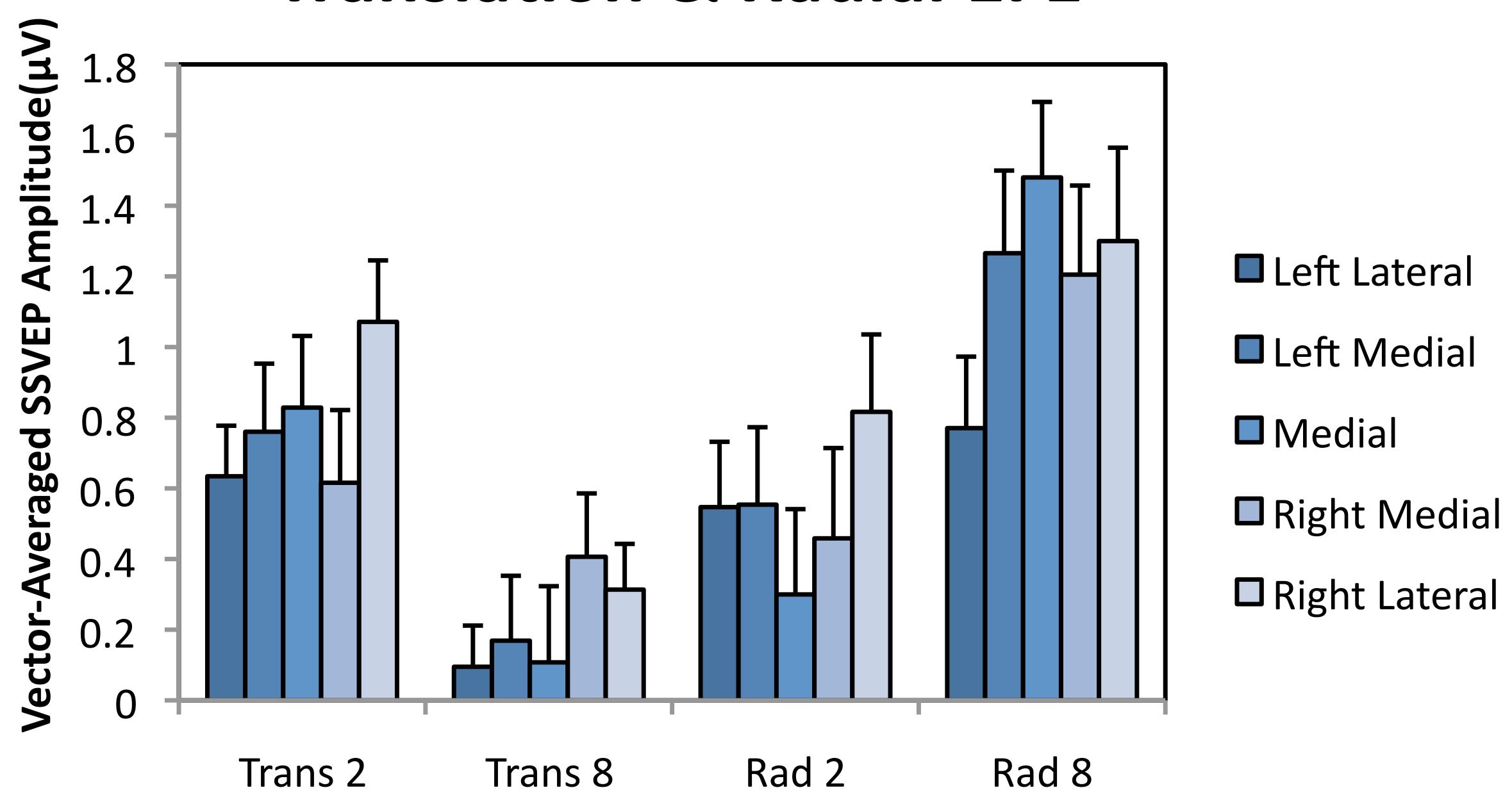
Dot Size: 7 arc min white dots
Mean Luminance: 43.244 cd/m²
Contrast: 90%
Modulation Type: On/Off Square
Figure Modulation rate: 1.2 Hz (F1)
Dot update rate: 24 Hz (F2)
View Distance: 60 cm

2 deg/s
8 deg/s



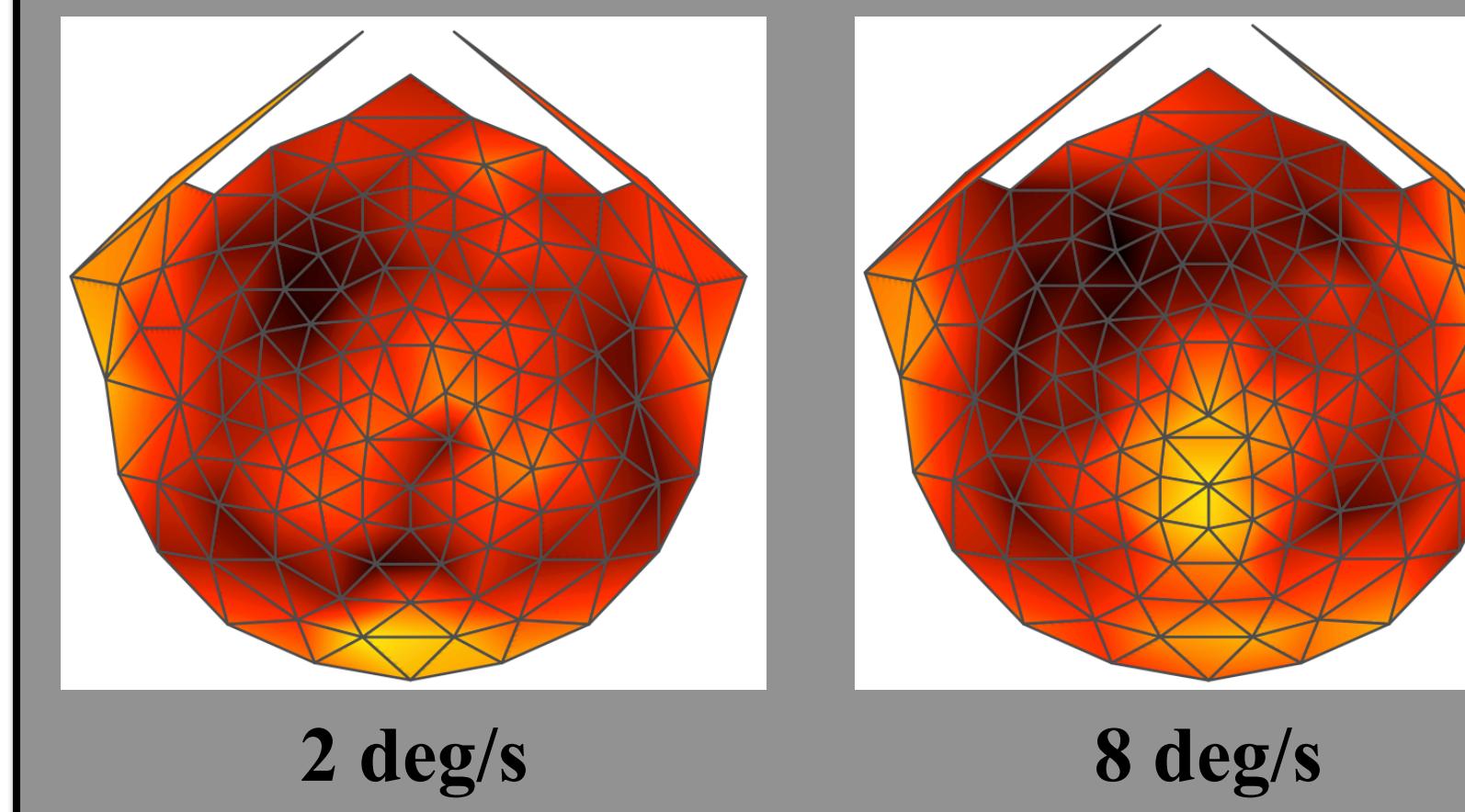
Youngest (49-61 months)

Translation & Radial 1F1

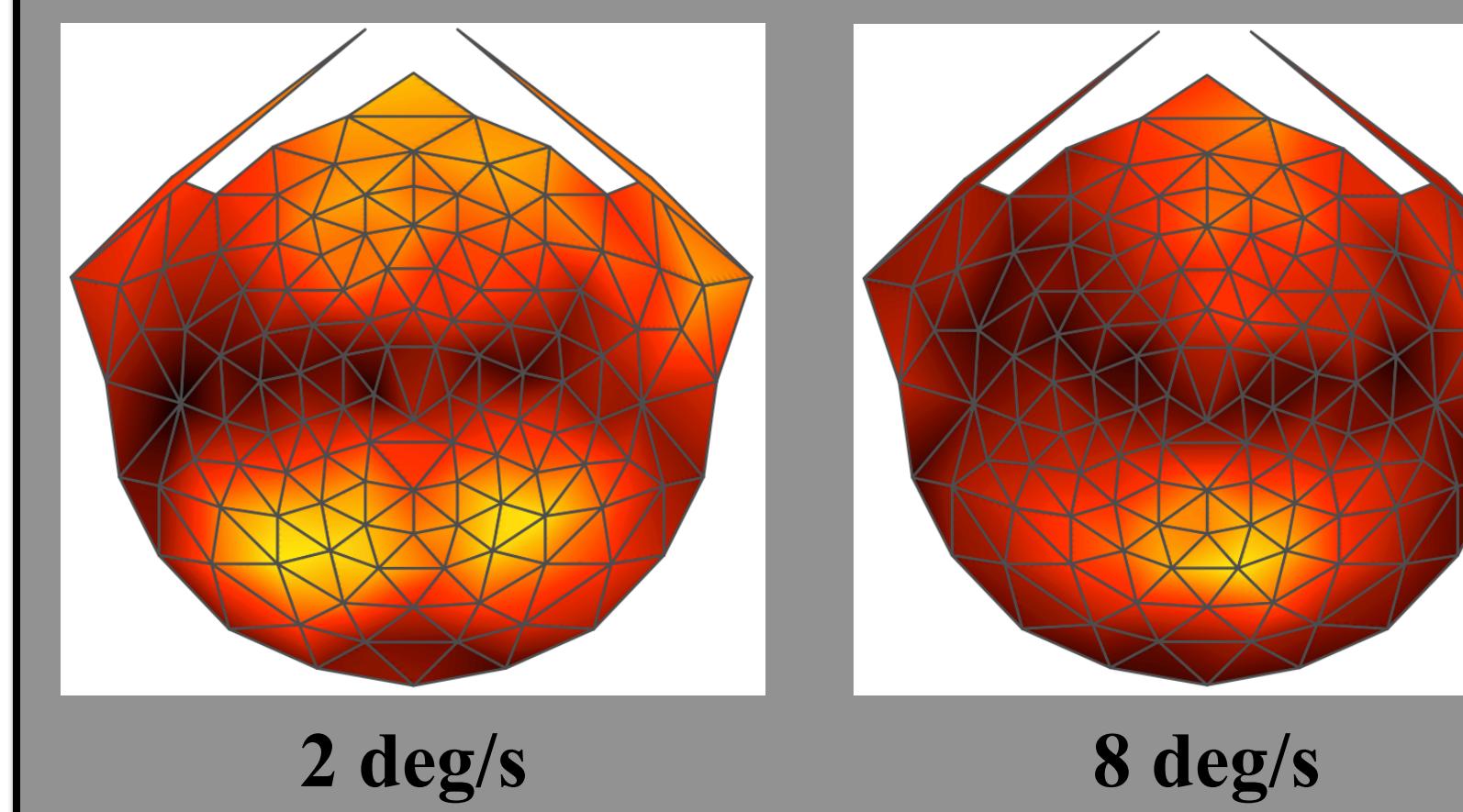


Adults

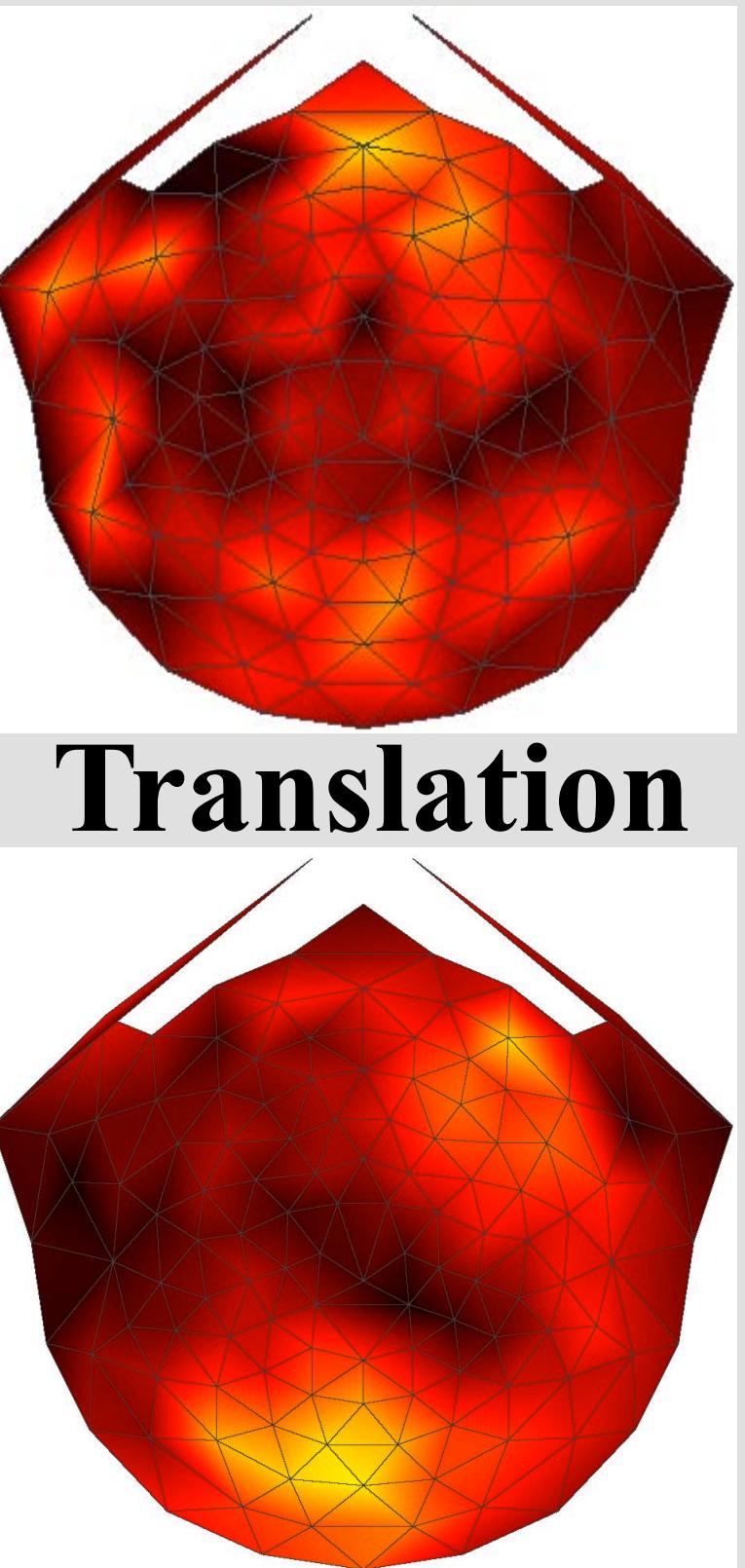
Translation



Radial

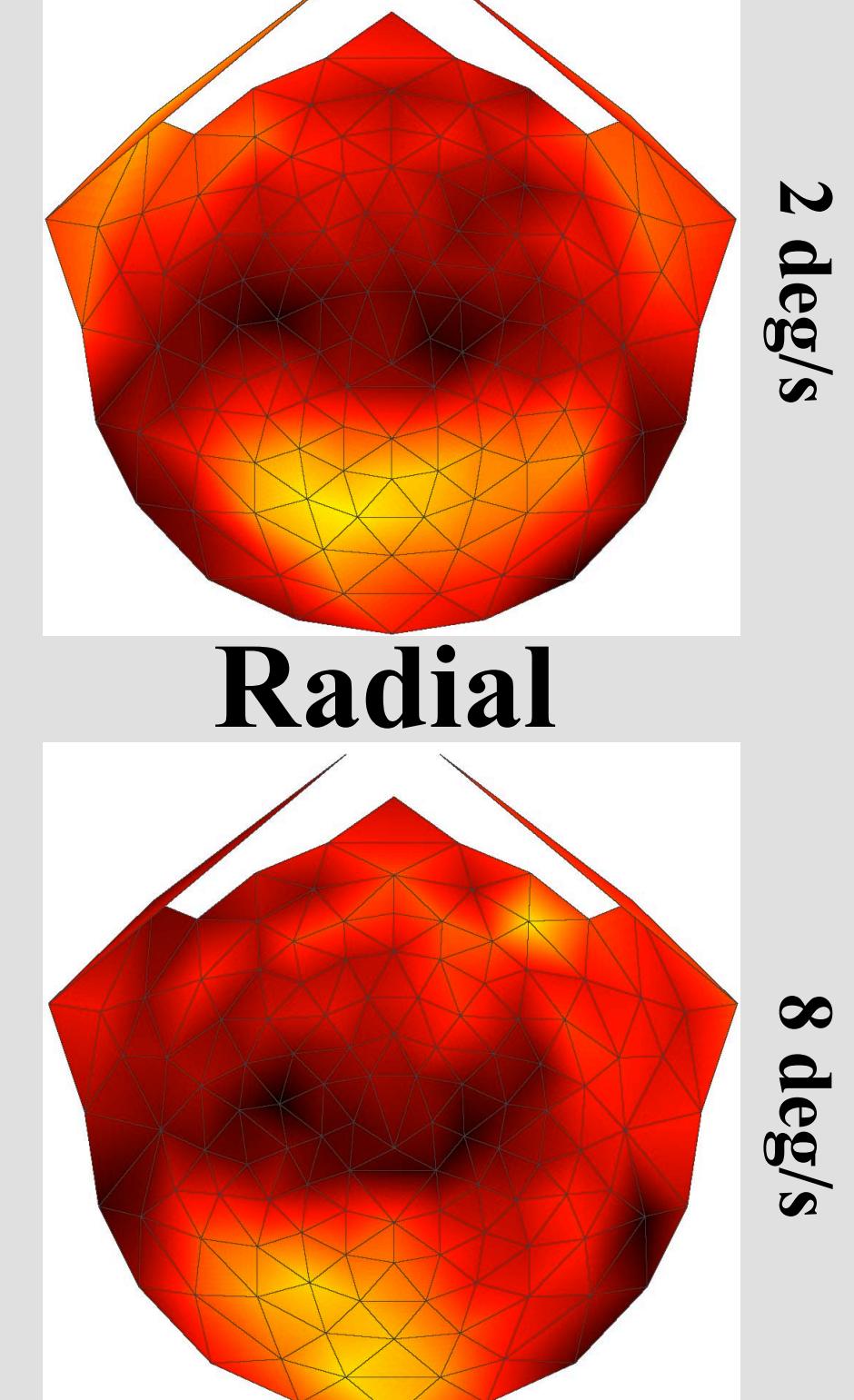
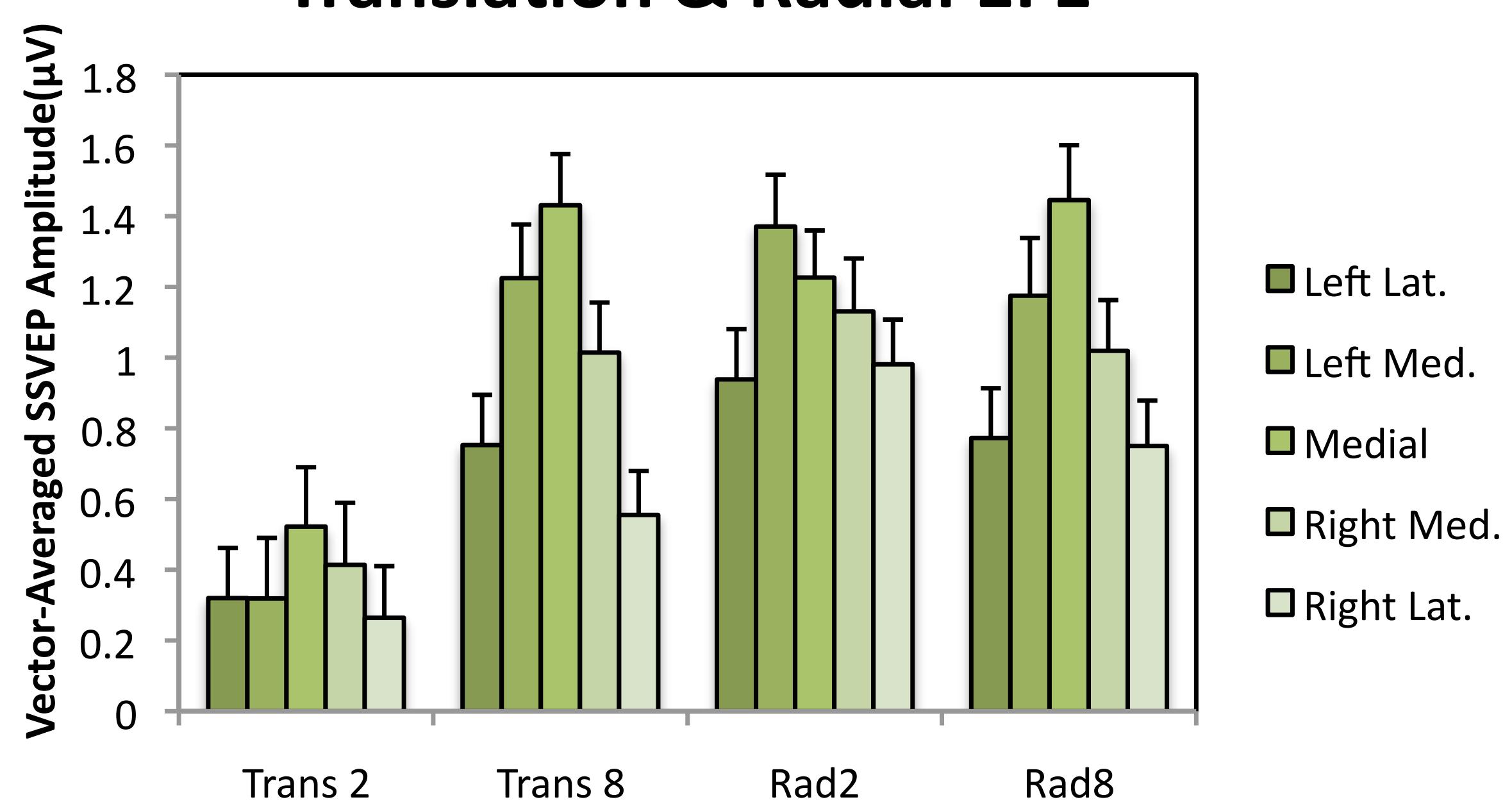


2 deg/s
8 deg/s

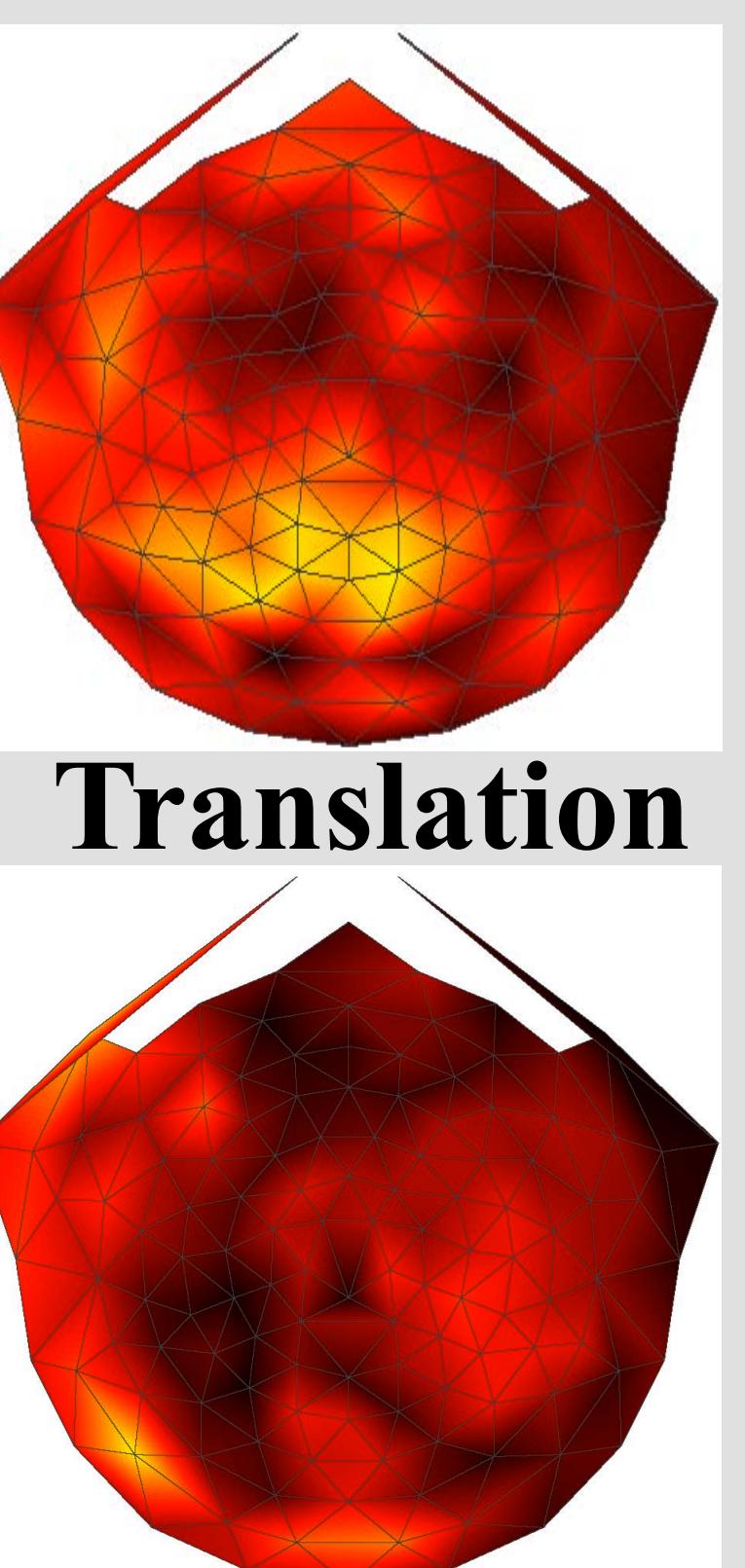


Middle (72-84 months)

Translation & Radial 1F1

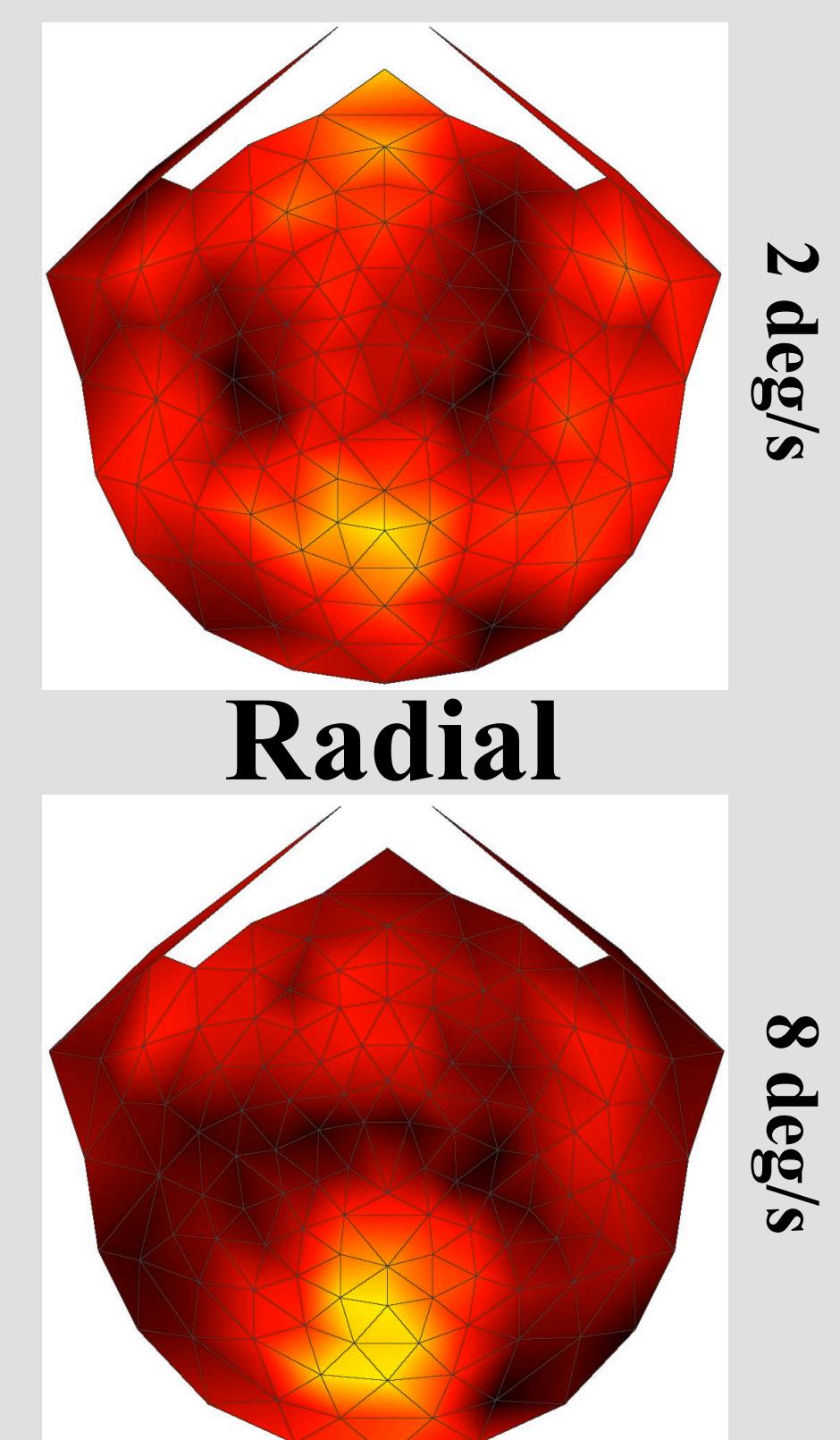
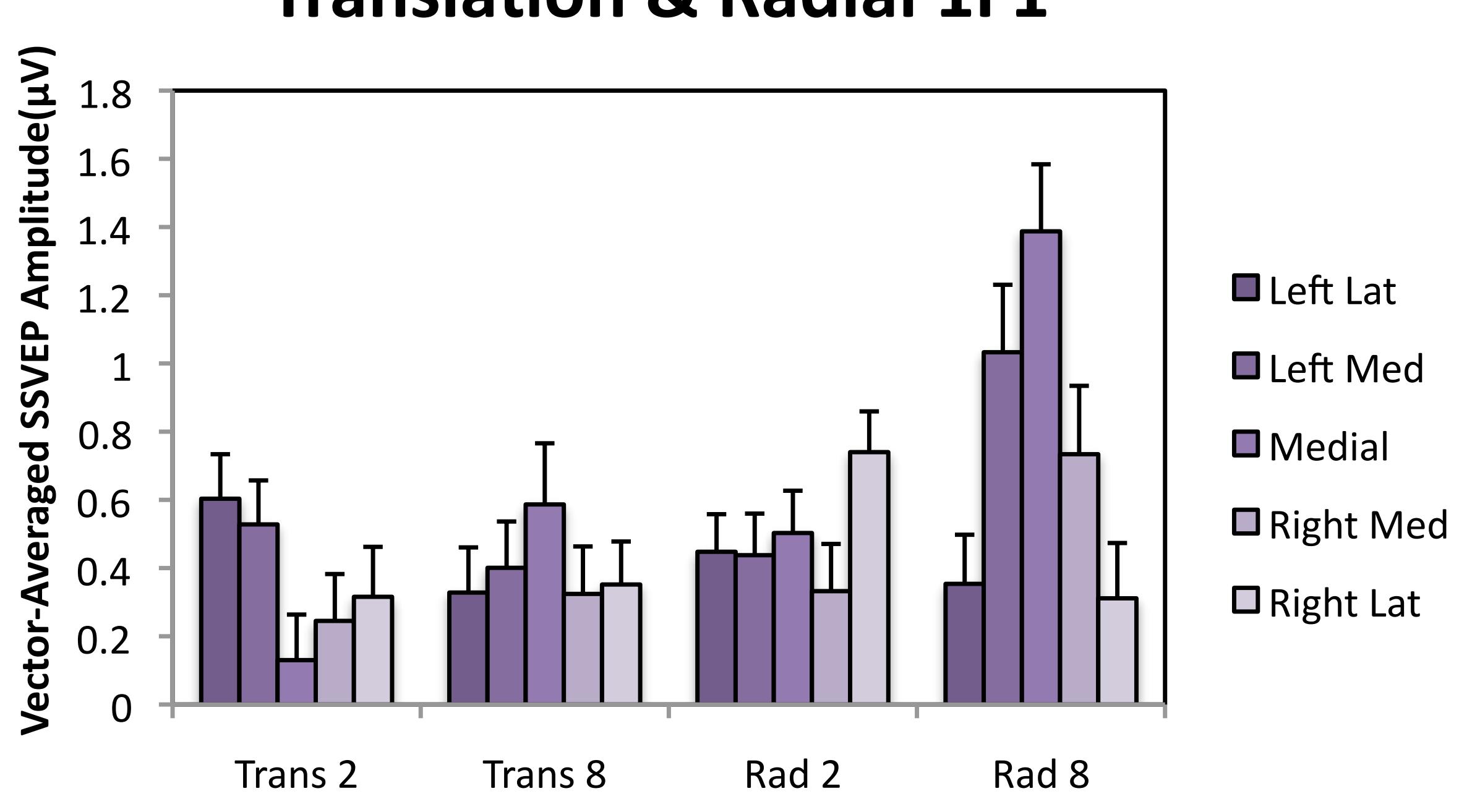


2 deg/s
8 deg/s



Oldest (87-109 months)

Translation & Radial 1F1



Discussion

- Cortical networks for processing of optic flow patterns develop over a prolonged time period.
- Pattern type x speed x scalp region x age interaction
- Dorsomedial activation to time varying flow.
- Radial response ≠ translation.

References

- Gilmore, R. O., Hou, C., Pettet, M. W., & Norcia, A. M. (2007). Development of cortical responses to optic flow. *Visual Neuroscience*, 24(6), 845-856.
- Hou, C., Gilmore, R. O., Pettet, M. W., & Norcia, A. M. (2009). Spatio-temporal tuning of coherent motion evoked responses in 4-6 month old infants and adults. *Vision Research*, 49(20), 2509-2517.
- Fesi, J.D., Thomas, A.L., Hwang, K.R., & Gilmore, R.O. (2011) Cortical responses to time-varying optic flow patterns show differential tuning by pattern type, speed, and scalp location. Vision Sciences Society Annual Meeting, May 6-11, 2011.