

Introduction

- Global motion is reported to follow long developmental trajectory with some motion related functions maturing to adult level beyond 16 years of age¹. Global form meanwhile is reported to mature earlier during the visual development.²
- Based on the two-stream hypothesis³ where motion and form are proposed to be processed along largely independent pathways of dorsal and ventral streams and relatively later maturation of motion perception; a dorsal stream deficiency⁴ has been proposed - where visual functions processed under the dorsal stream may be more prone to effects of developmental disorders such as amblyopia⁵, dyslexia⁶ etc.
- There is however, growing evidence that two processing mechanism might not be as independent as initially assumed with substantial dependence on each other to enhance visual perception⁷. One such example is dynamic Glass pattern where illusory implied motion (motion without direction) is experienced along the global orientation of independent frames of static Glass patterns (GP) displayed over time⁸.
- While the development of global motion and global form has been investigated in many studies, how implied motion reliant on both global form and motion cues develops in childhood is not known.

Aims

- To investigate how implied motion coherence thresholds for simple translational and more complex rotational dynamic Glass patterns matures to adult levels in children .
- To analyse if there are differences in coherence thresholds for translational and rotational patterns in children and adults.

Methods

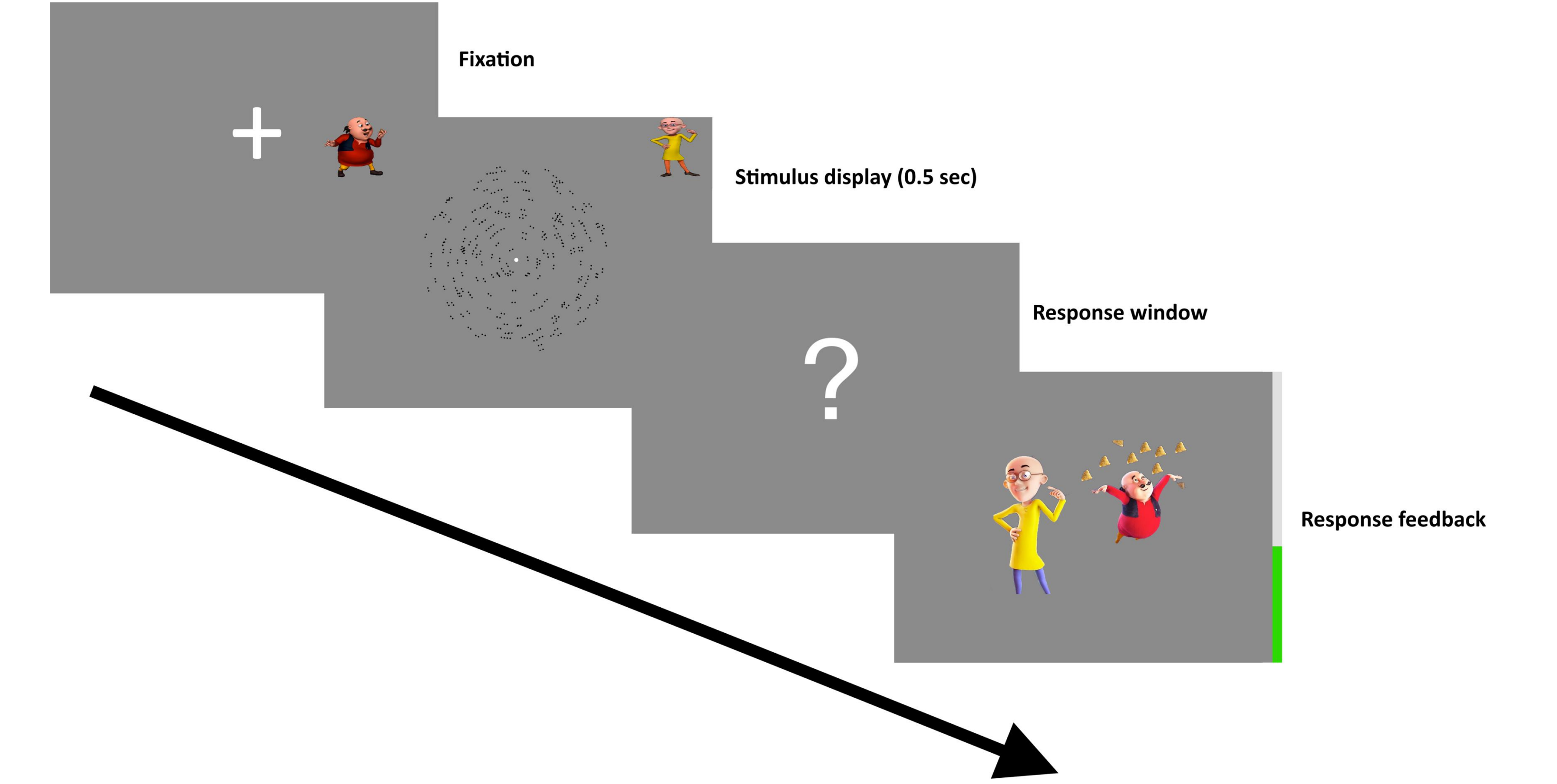
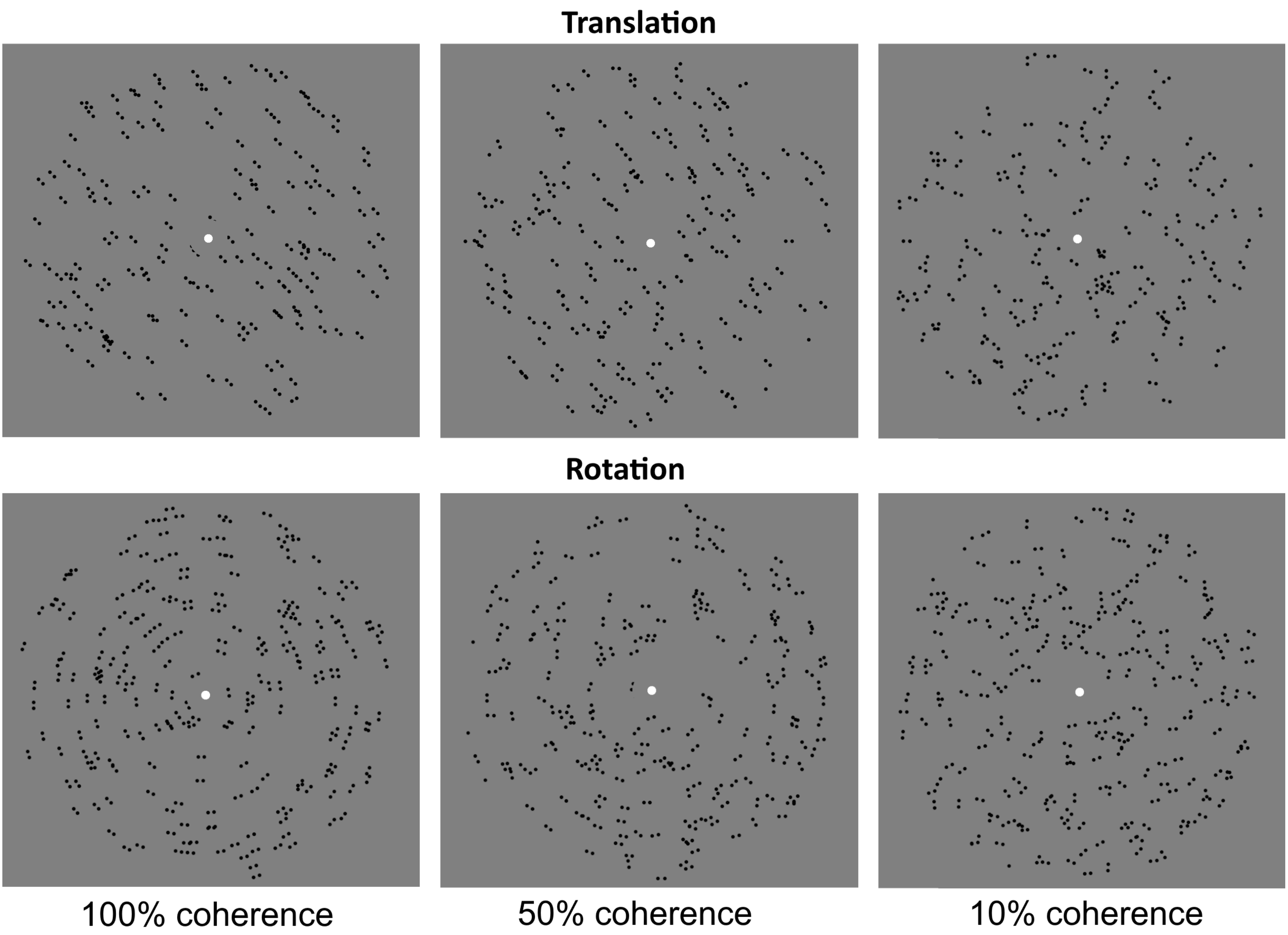
Subjects: $n = 169$ children (6 – 16 years, at least 10 in each age) and 32 adults with normal or corrected to normal VA

Stimuli: Dynamic Glass patterns: Translational and rotational

- 9 independently generated static Glass patterns
- each static GP displayed for 6 frames and replaced – total display time 0.5 secs
- static GP composed of 240 dots (120 dipoles, 0.083° diameter) with dipole distance of 0.133°
- presented in a 10° diameter circular aperture at 50 cm.

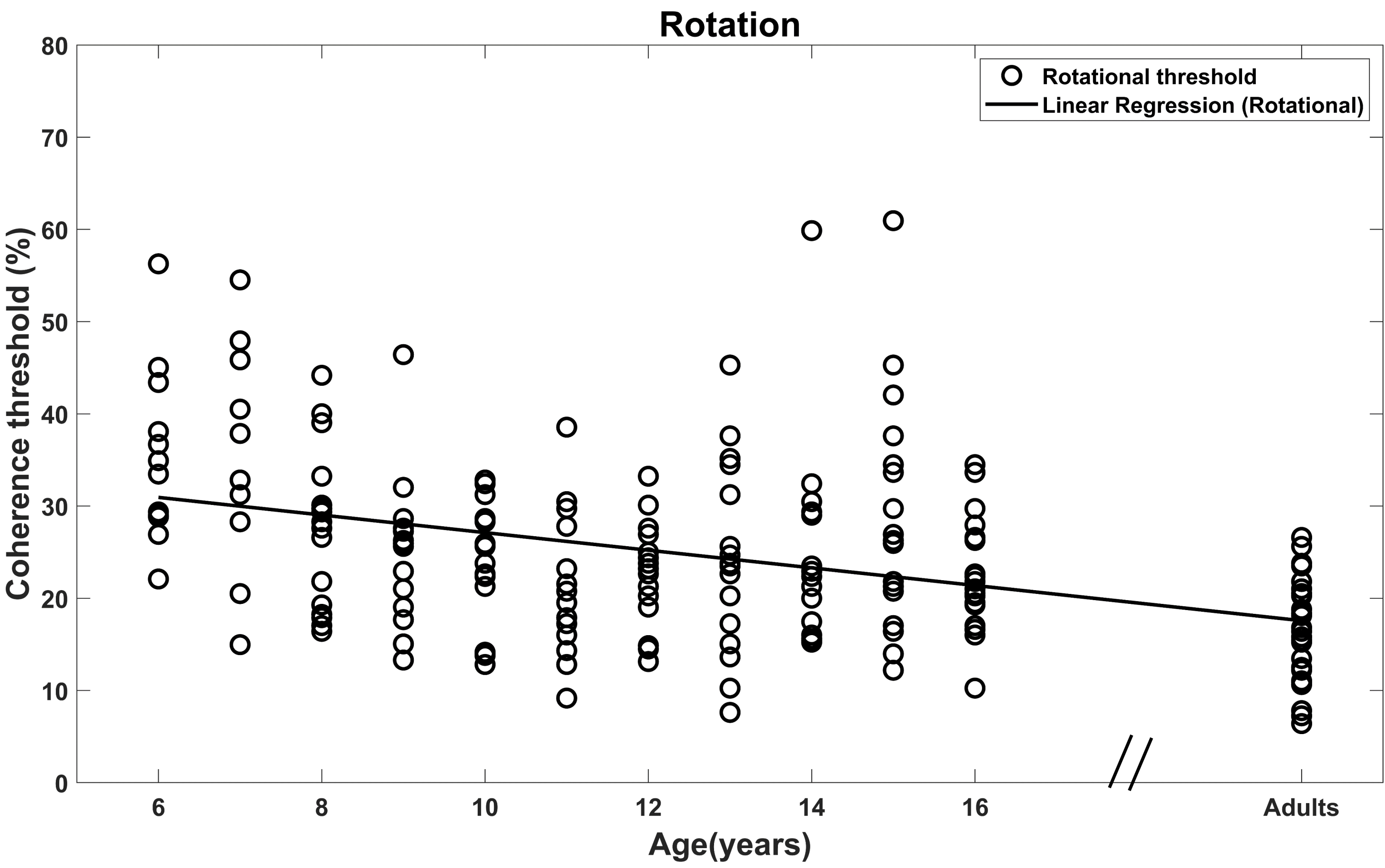
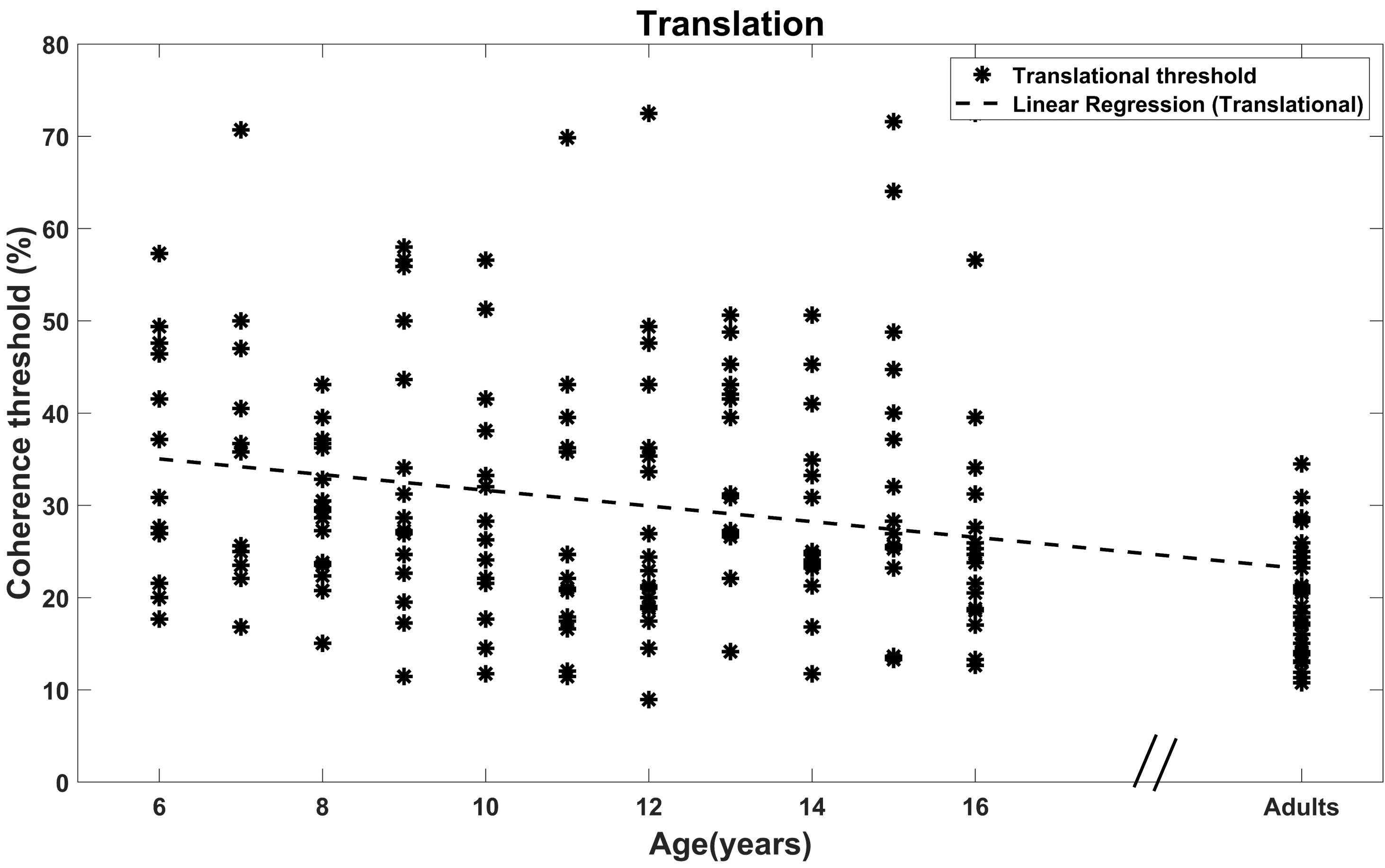
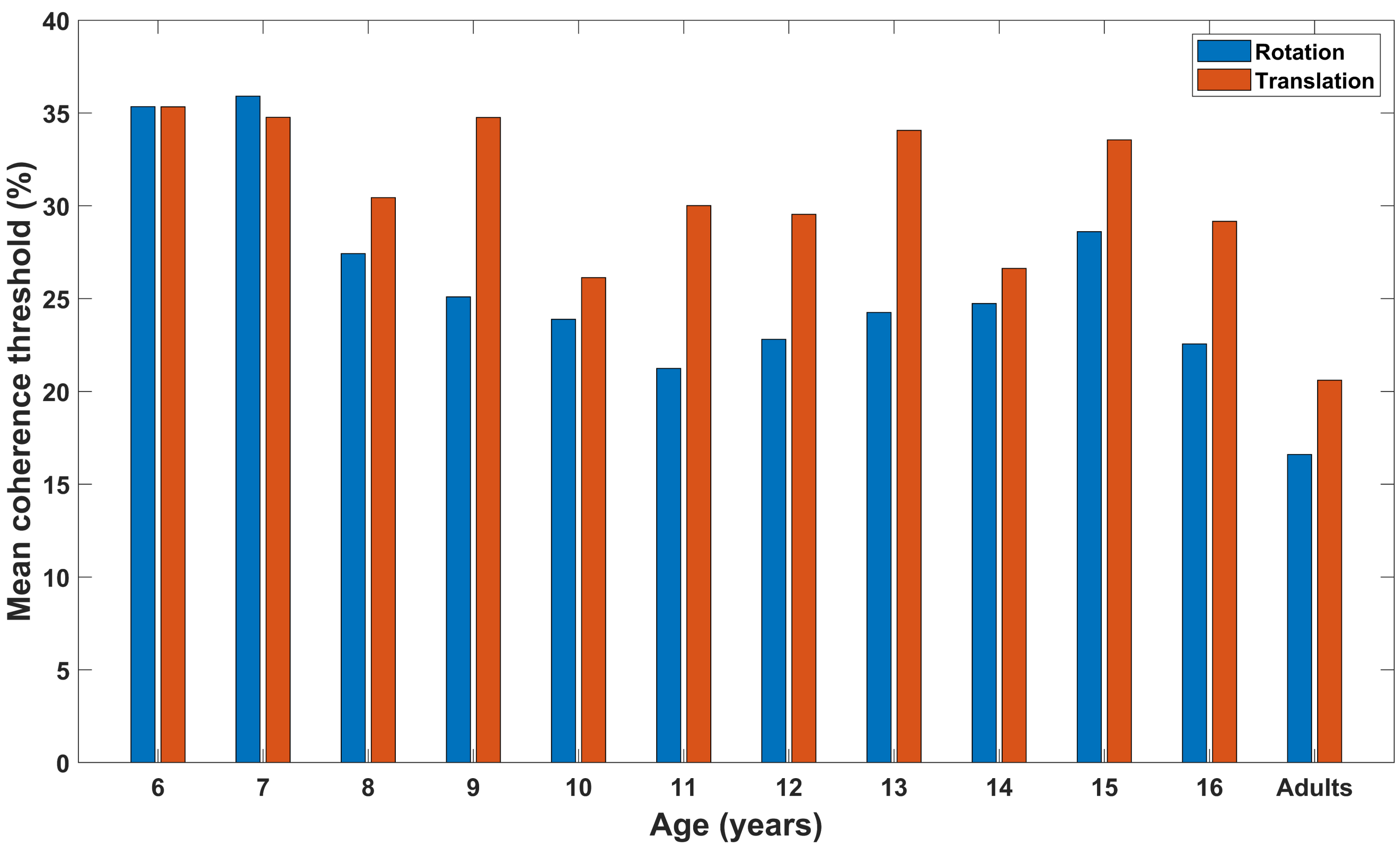
Procedure:

- coherence threshold paradigm
- adaptive 3:1 staircase
- 100 trials or 10 reversals
- threshold: mean of last 7 reversals



Results

- Coherence thresholds for rotational patterns were lower compared to translational patterns for children and adults – statistically significant difference for ages 11, 13 and adults (p 's < 0.05) .
- The thresholds for both rotational and translational patterns improved with age; rotational (35.34 ± 9.41 for 6-year-olds to 16.61 ± 5.36 for adults), translational (35.33 ± 13.08 for 6-year-olds to 20.60 ± 5.89 for adults)
- The thresholds for 6 & 7 years olds were higher compared to adults but beyond 7 years of age, the thresholds for children were similar to the adult thresholds.



Conclusion

- Adults (and some age group of children) have better sensitivity to rotational compared to the translational dynamic Glass patterns.
- The implied motion coherence thresholds for rotational and translational patterns improve with age and reach adult levels at 8 years of age.

References

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