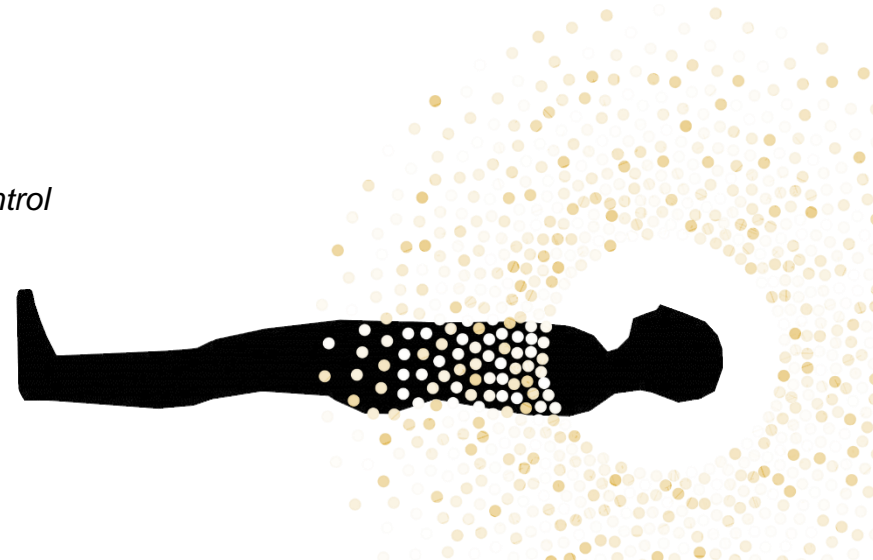


# Influence of magnetic vestibular stimulation on self-motion perception

**Gerda Wyssen**

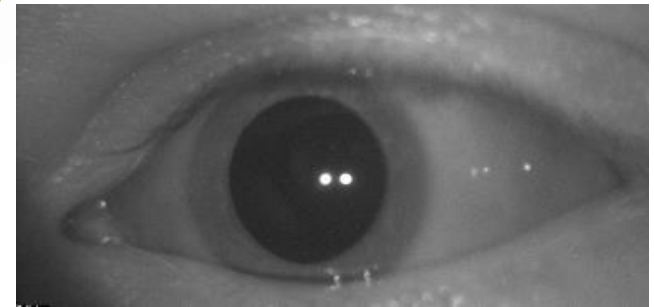
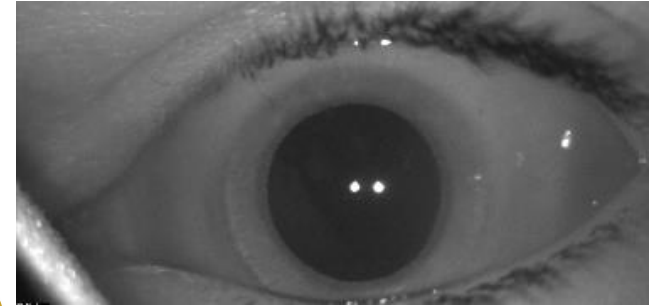
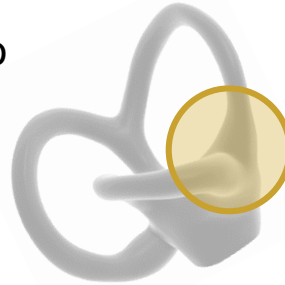
*High order vestibular processing, spatial orientation & postural control*

May 11, 2022 - Barany Conference XXXI, Madrid



# Magnetic vestibular stimulation (MVS)

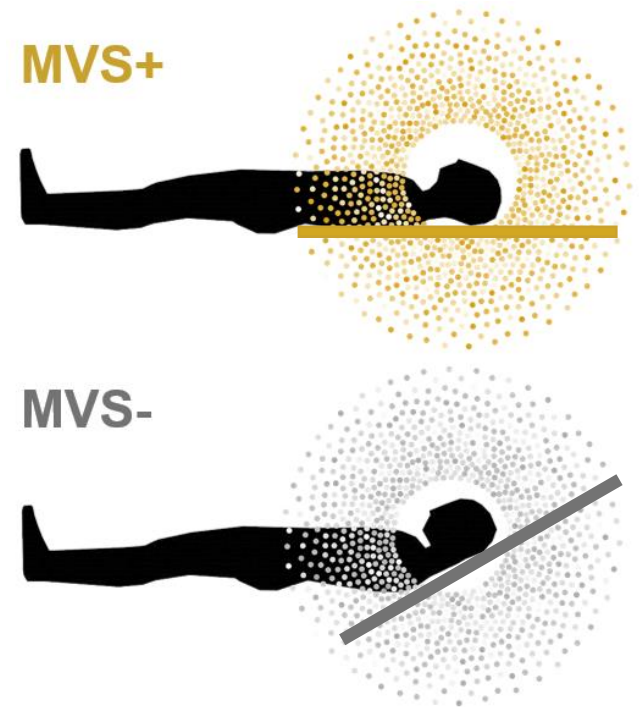
- inside strong magnetic fields
- elicits nystagmus, dizziness & vertigo
- Lorentz-forces acting on cupula of the SCCs (lateral, superior)



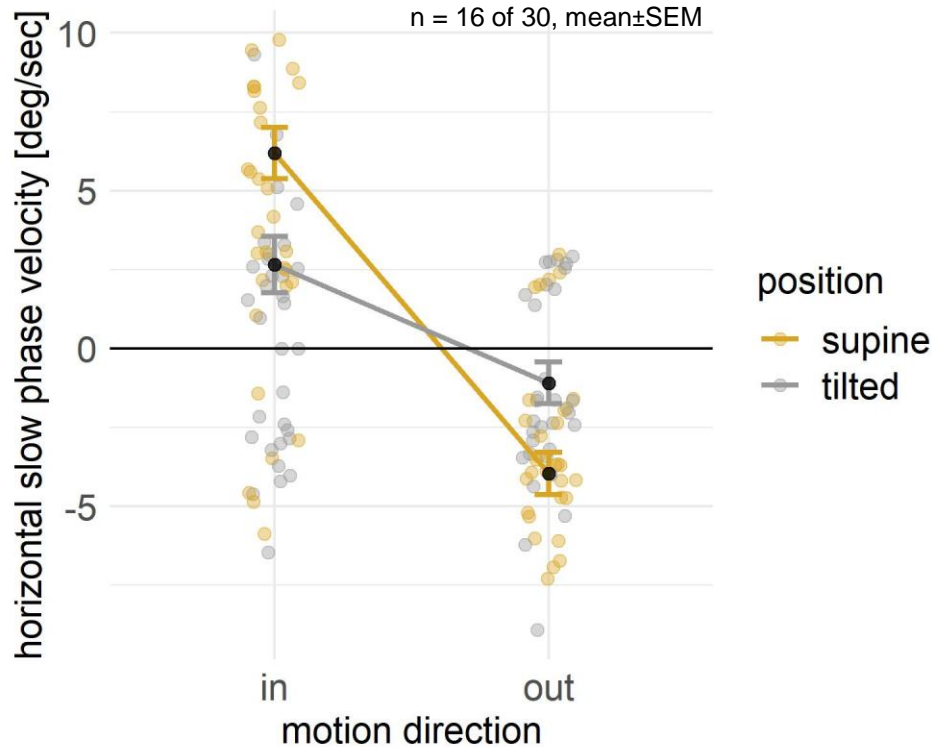
**How are nystagmus, self-motion perception and higher cognitive functions affected by MVS?**

# Manipulating MVS strength

- MVS strength depends on the position of the vestibular organ in reference to the magnetic field
- MVS is stronger in supine (**MVS+**) and weaker in head tilted position (**MVS-**)
- In our study we compared nystagmus, self-motion perception and also spatial cognition between these two head positions.



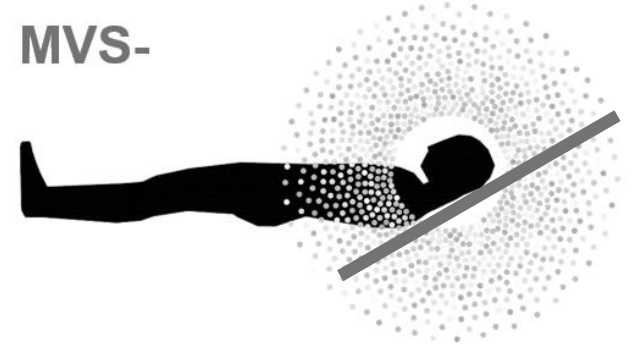
# Manipulating MVS strength



MVS+



MVS-



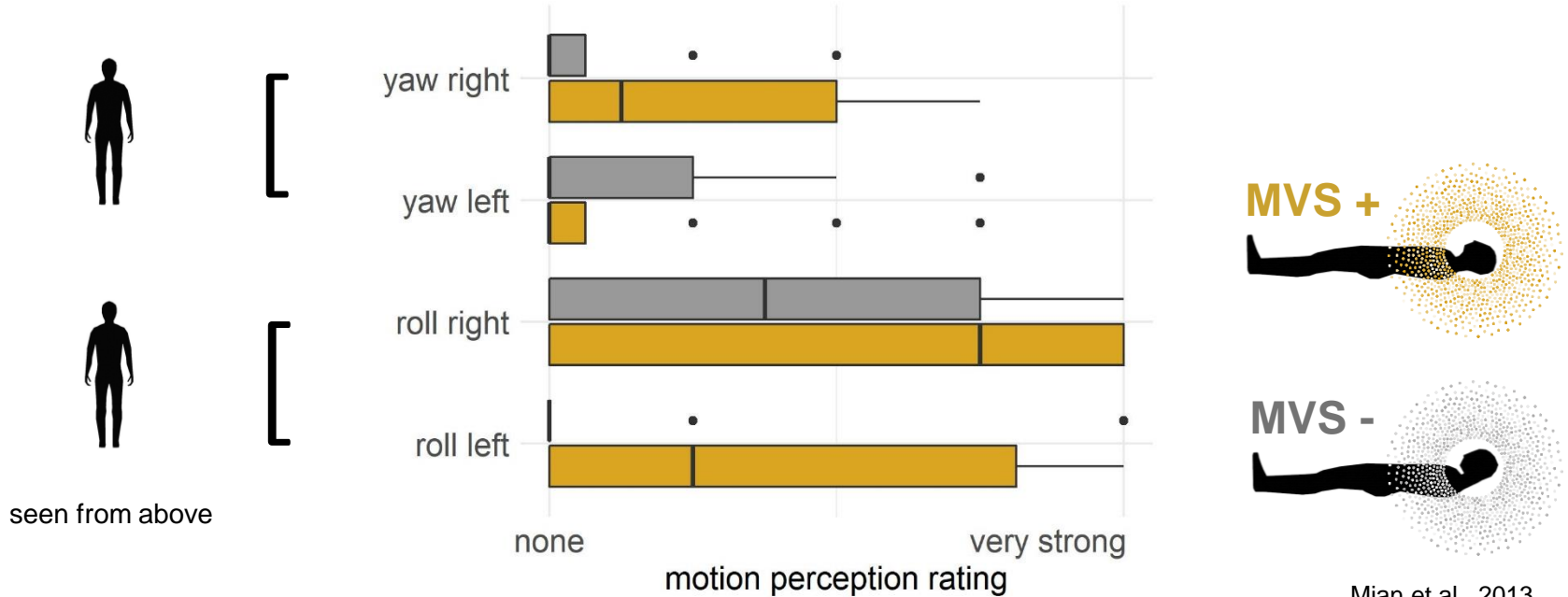
# Measuring MVS in the 7 Tesla Scanner

- MRI scanner Magnetom Terra 7T, Siemens
- Eyetracking Visual Eyes 515b, Interacoustics, OpenIris (Otero-Millan et al. 2015)
- Inner ear imaging CISS sequence
- Magnetic field strength Magnetometer THM1176-HF, Metrolab
- Self-motion perception ratings
- Spatial cognition task



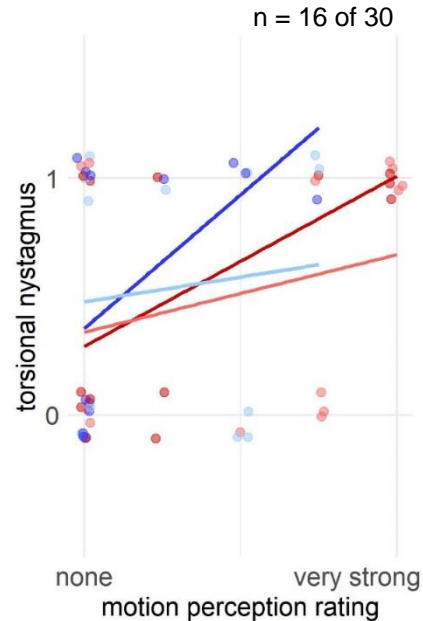
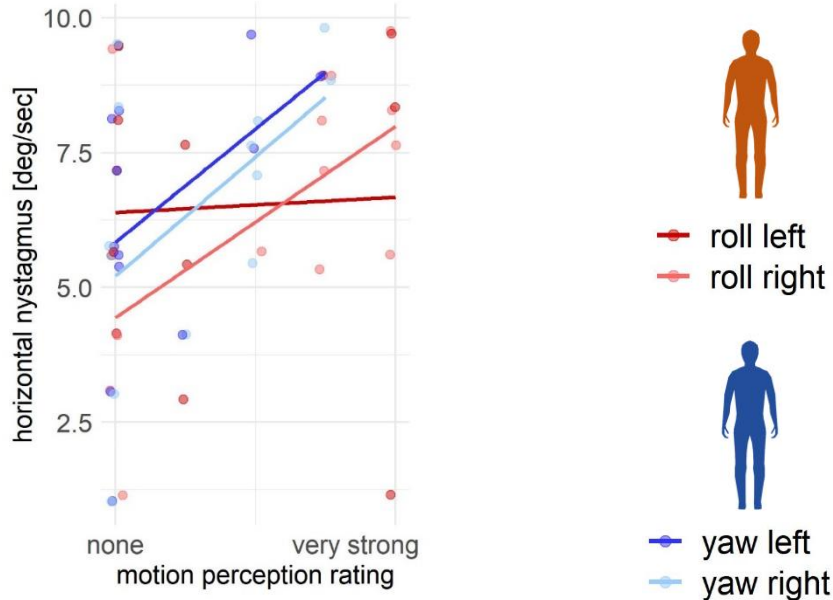
# Self-motion perception under MVS

Which illusory self-motion do participants perceive when being moved inside?



# Self-motion perception & nystagmus

Does horizontal and torsional nystagmus predict self-motion perception direction?



# Spatial cognition under MVS

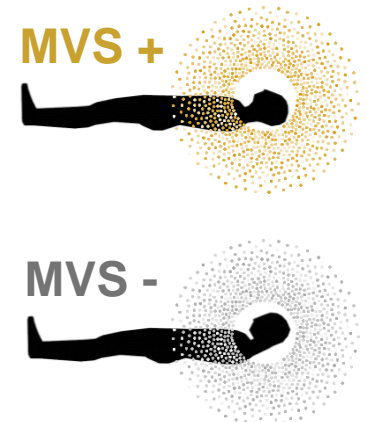
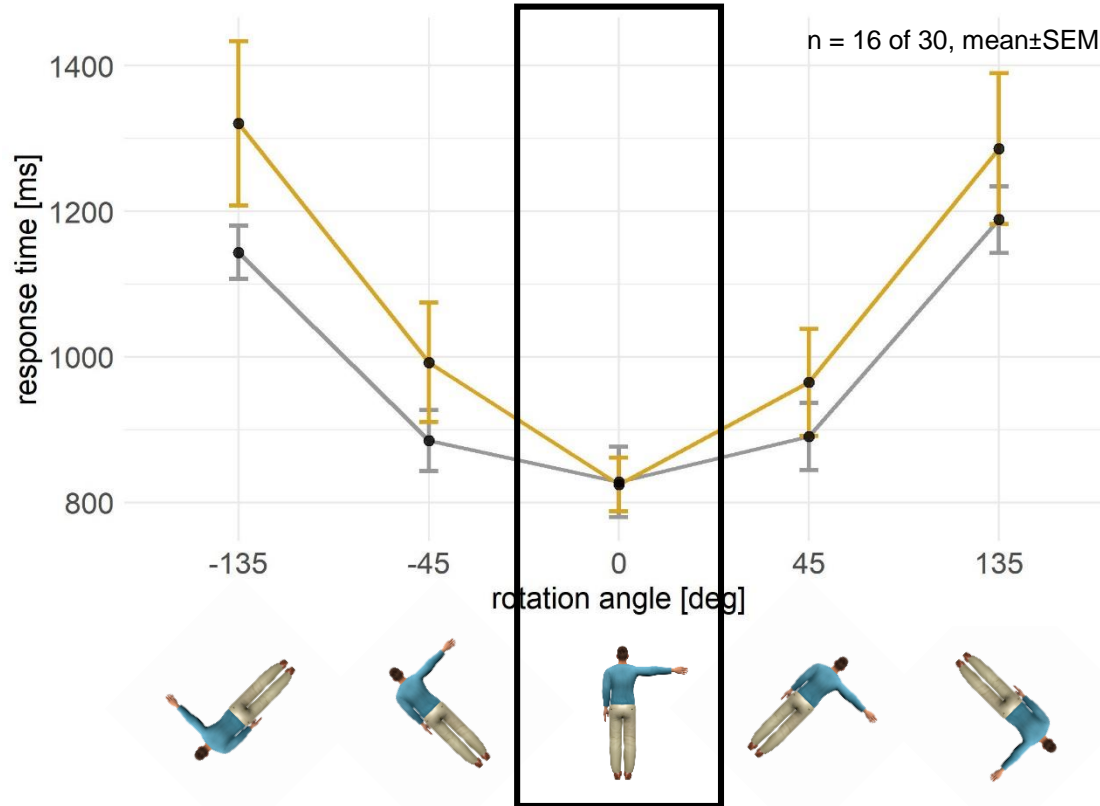
- MVS influences higher order processes: resting state activity and spatial attention
- Does MVS influence performance in cognitive tasks relying on vestibular information?



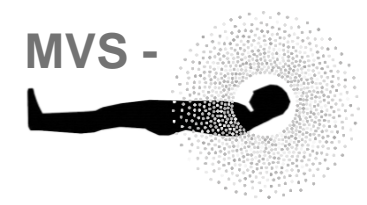
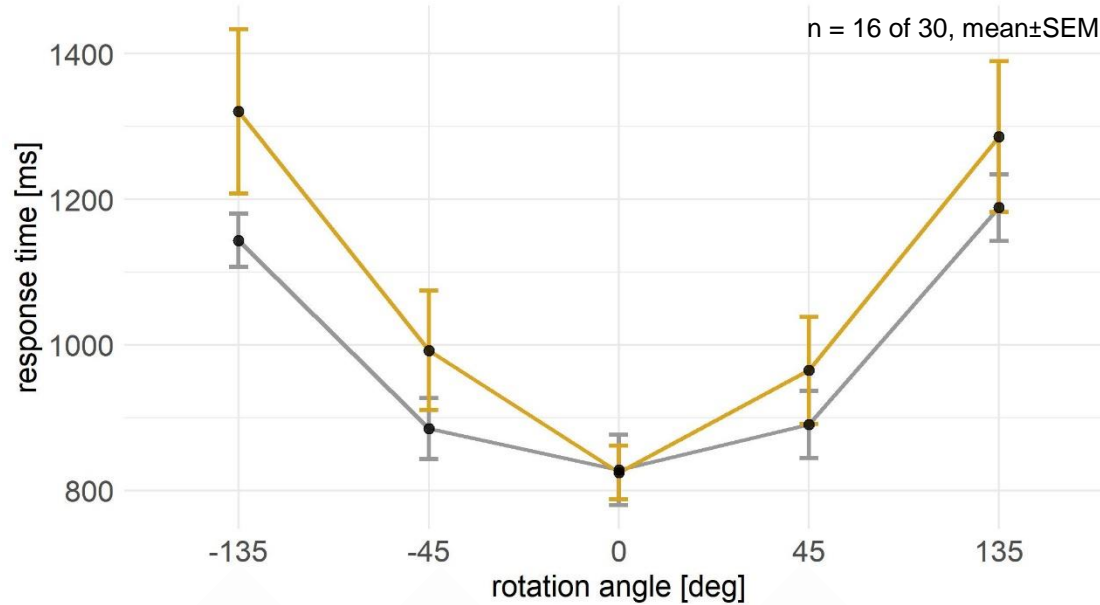
Which arm is stretched out?



# Spatial cognition under MVS

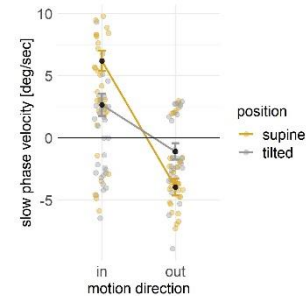
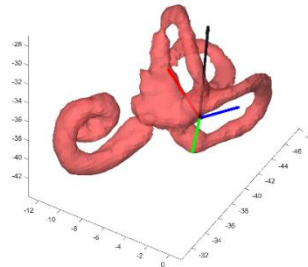
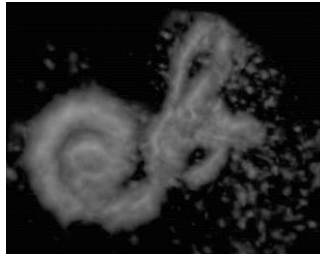


# Spatial cognition under MVS



# Conclusions and outlook

- First evidence for an MVS effect on spatial cognition tasks such as mental rotation: MVS is relevant for fMRI studies investigating spatial cognition and vestibular patients
- Role of prior knowledge on self-motion perception?
- Next step: connecting orientation of inner ear structures from MR data to measures of nystagmus, perception and mental rotation task



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