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Towards the study of bodily-self location early in life

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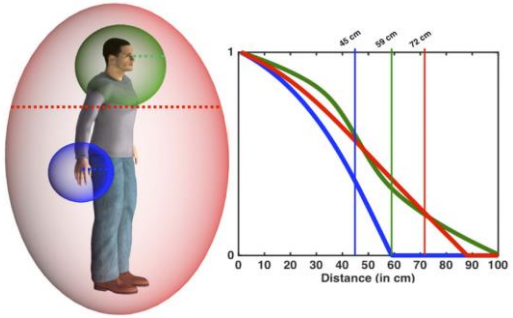
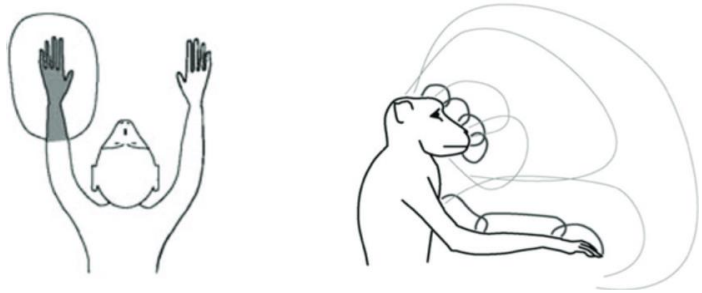
Bodily-self location

Multisensory integration responses increase as a function of the proximity of the auditory/visual stimulation to the tactilely stimulated body district

The spatial modulation of multisensory integration can be considered as a proxy of the ability to localize the bodily-self in space



Serino et al., 2015

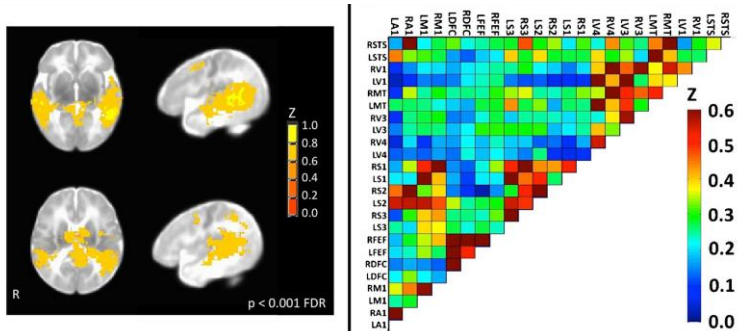


Graziano et al., 2006

When does bodily-self location emerge in the ontogenetic development?

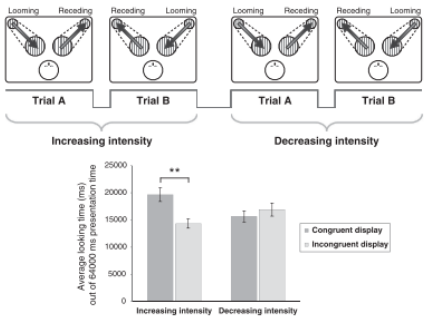
Bodily-self location early in life

1 The functional architecture allowing multisensory integration is already present at birth



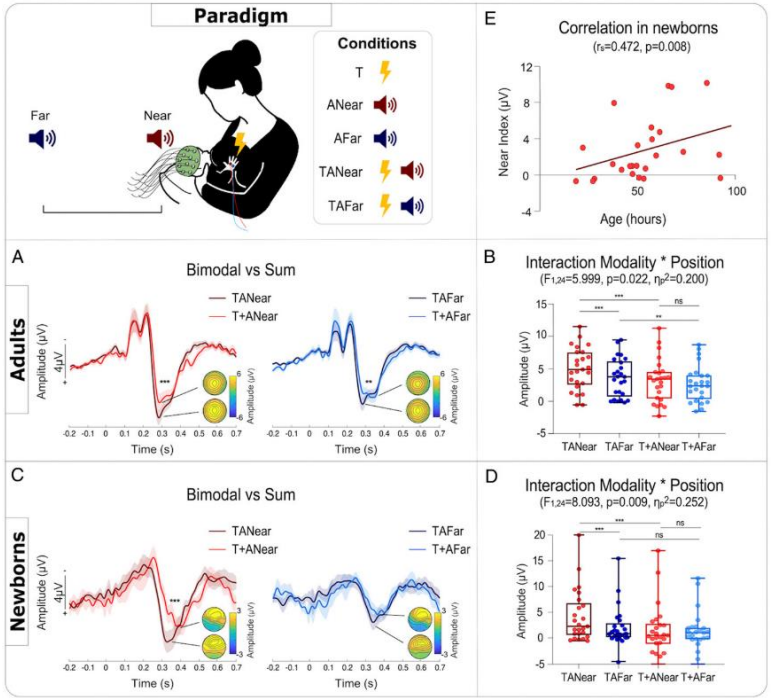
Sours et al., *Brain Imaging Behav* (2017)

2 Newborns are sensitive to the spatial congruency of crossmodal stimuli directed toward their own body



Orioli et al., *Curr Bio* (2018)

3 Multisensory integration is spatially modulated at birth, suggesting **whole-body self representation in space**

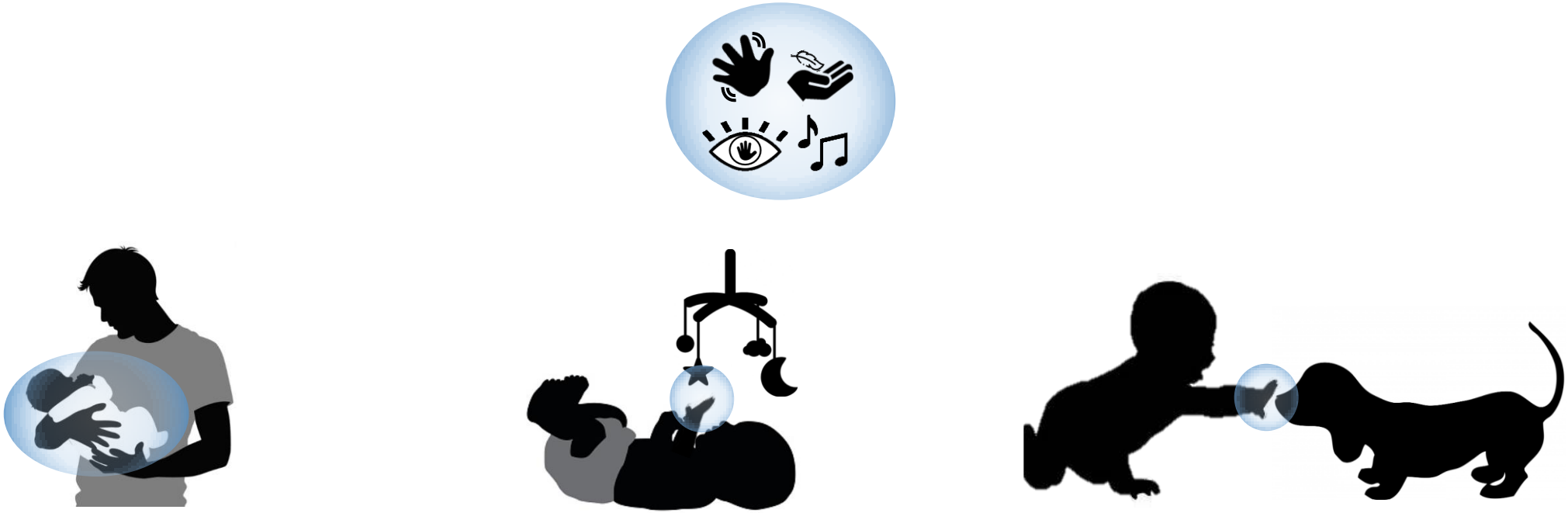


Ronga et al ... Garbarini, *PNAS* (2021)

! Newborns are able to localize the own body *as a whole* in space

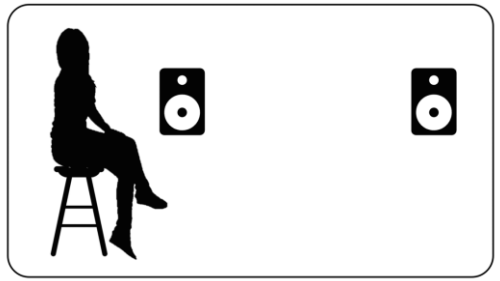
General concept

Within the ***motor context***, by repeatedly observing the contingency between proprioceptive, tactile, auditory and visual signals regarding the self-hand, we may build a hand-centered bodily-self representation in space along the first months of life

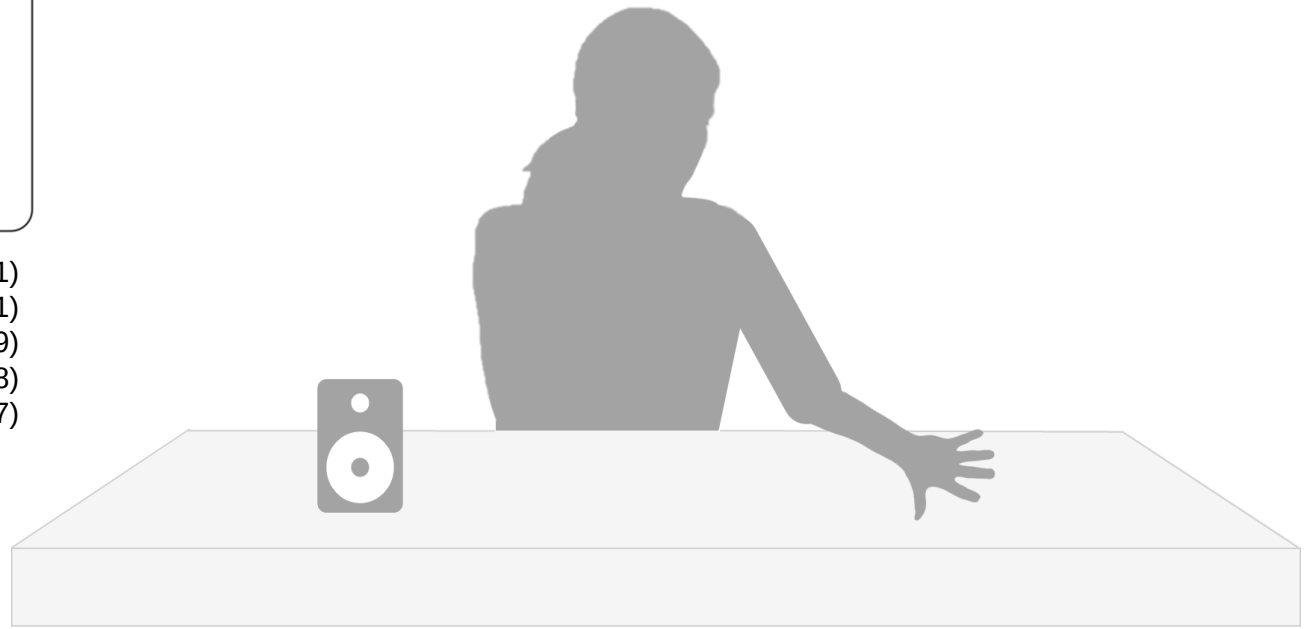


Postural manipulation paradigm

To manipulate the sounds' proximity to the left hand, the sound location is not modified, but a postural manipulation is leveraged by moving the participants' hand to reach two positions



Ronga et al., *PNAS* (2021)
Ronga et al., *Cortex* (2021)
Noel et al., *Neuroimage Clinical* (2019)
Bernasconi et al., *Cerebral Cortex* (2018)
Serino et al., *Psychol Sci* (2007)



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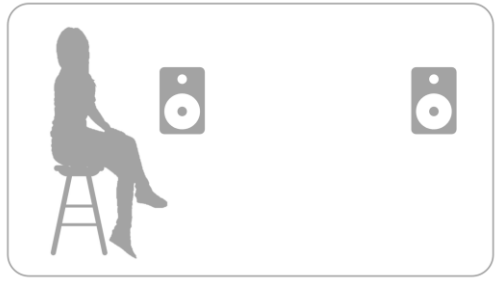

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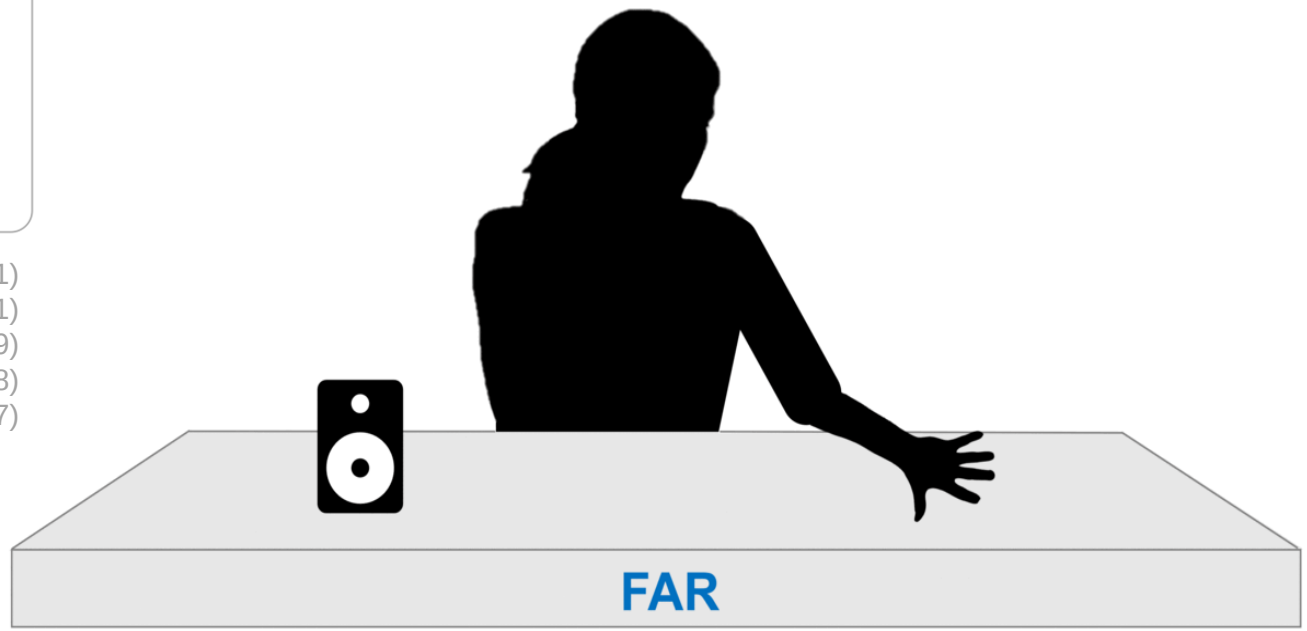

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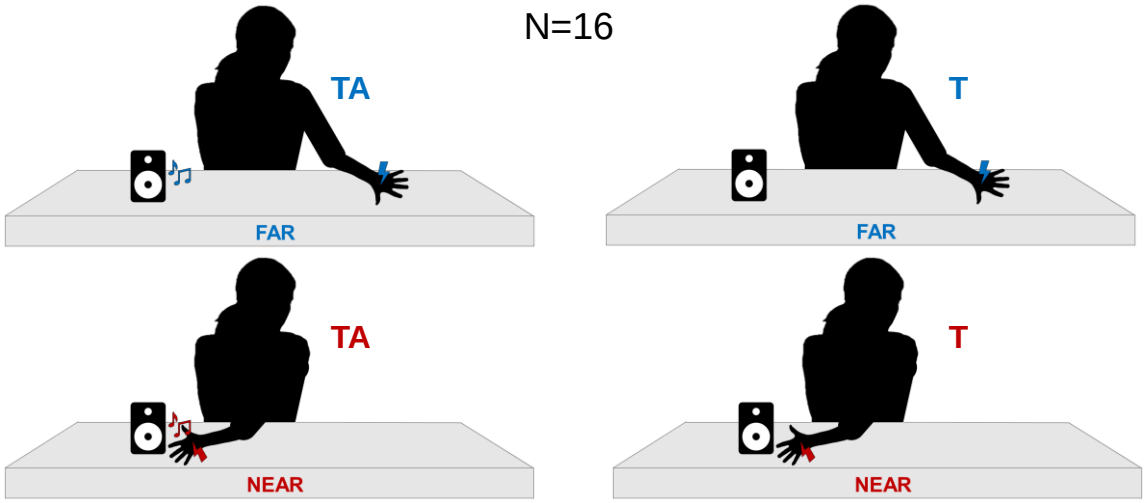
Pilot behavioural experiment

N=16



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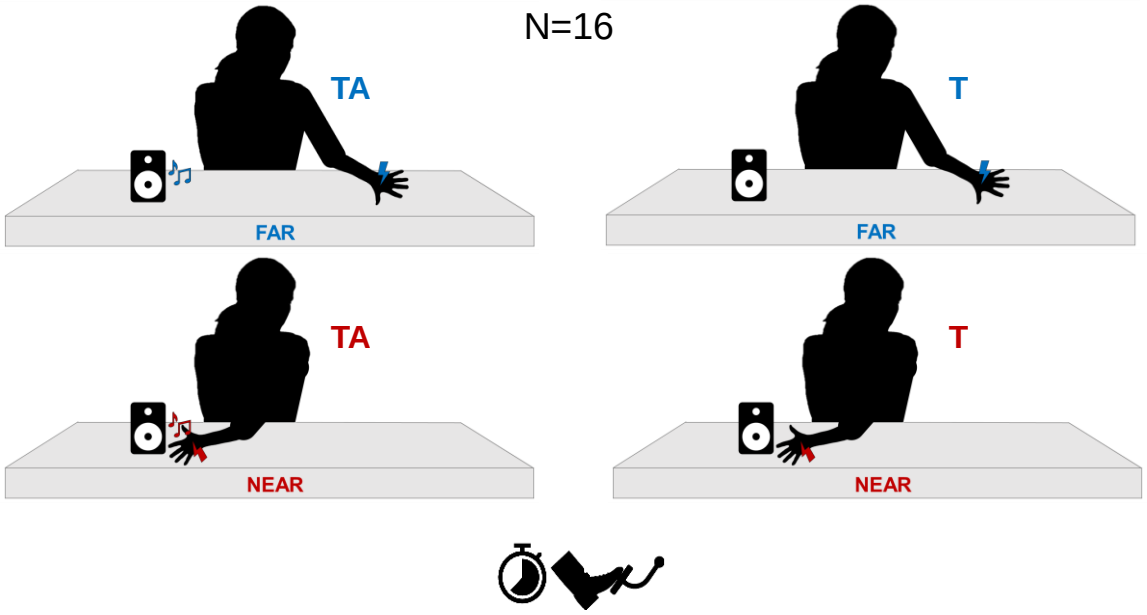
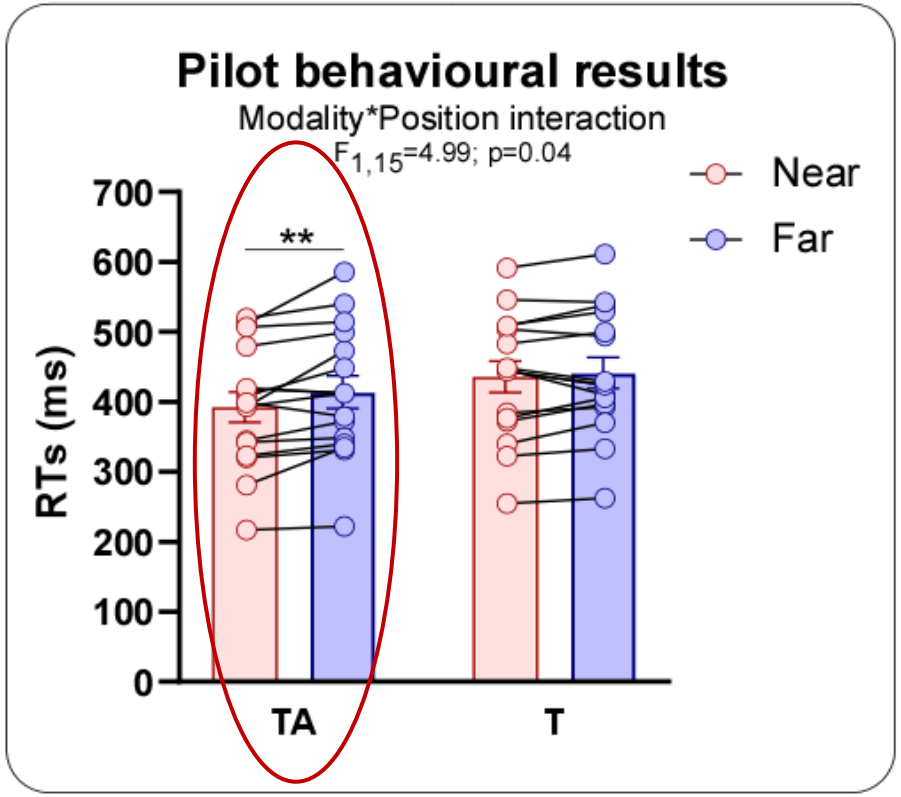
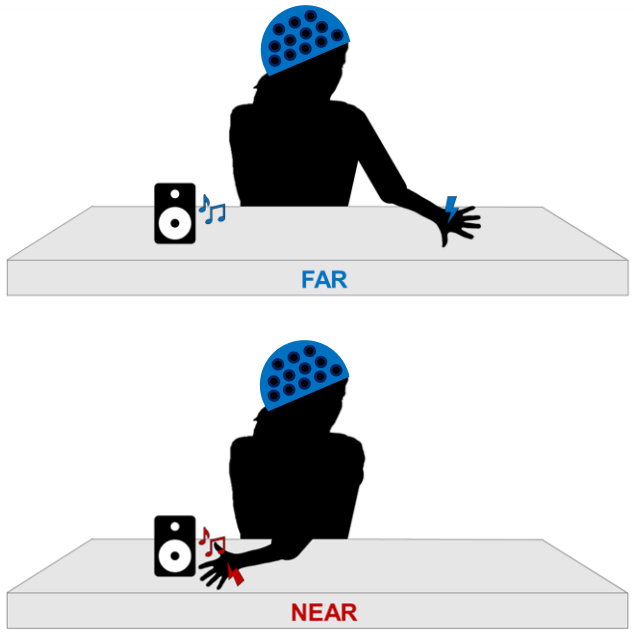




Postural manipulation paradigm

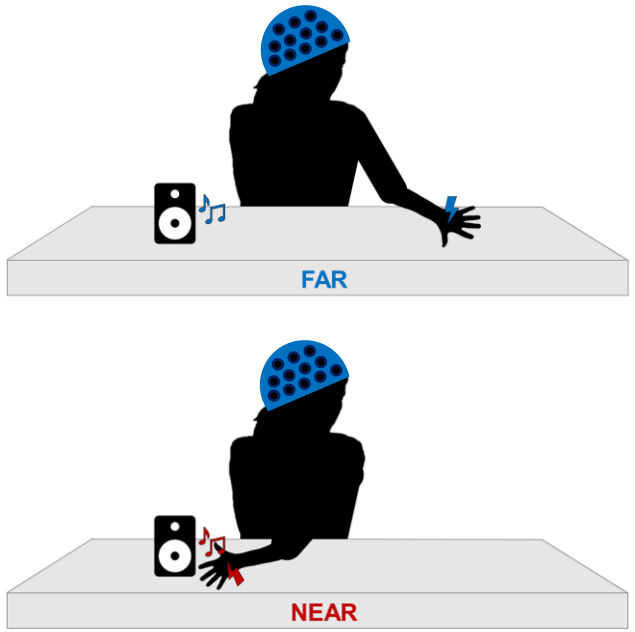
EEG experiment



N=25

Postural manipulation paradigm

EEG experiment



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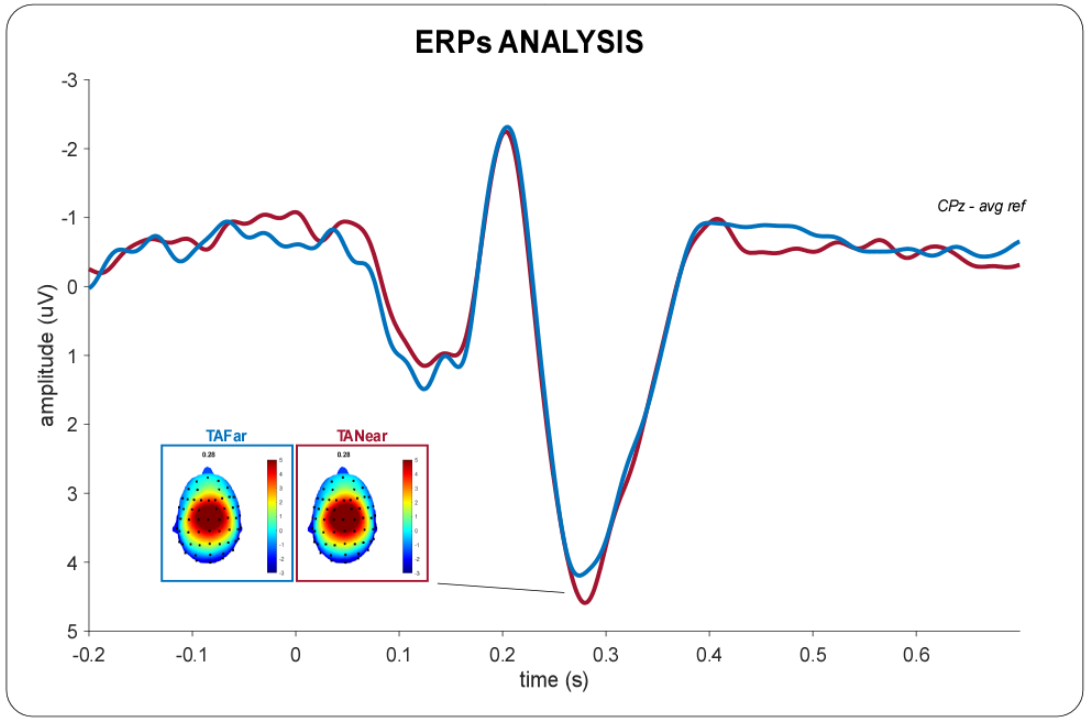

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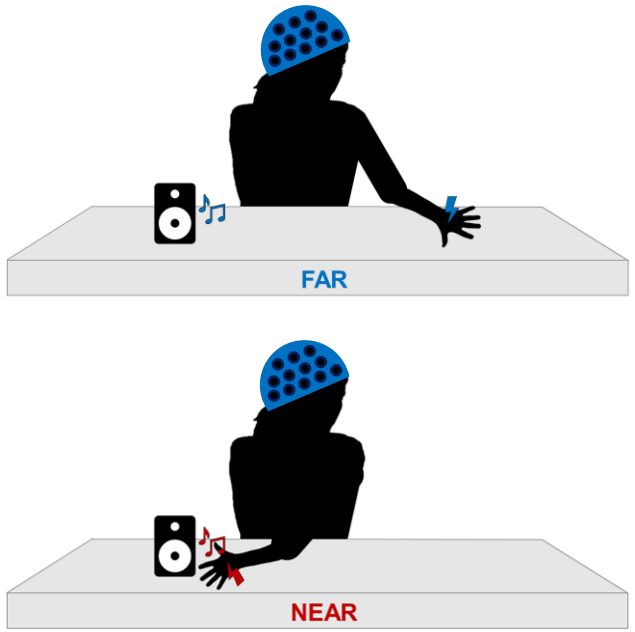

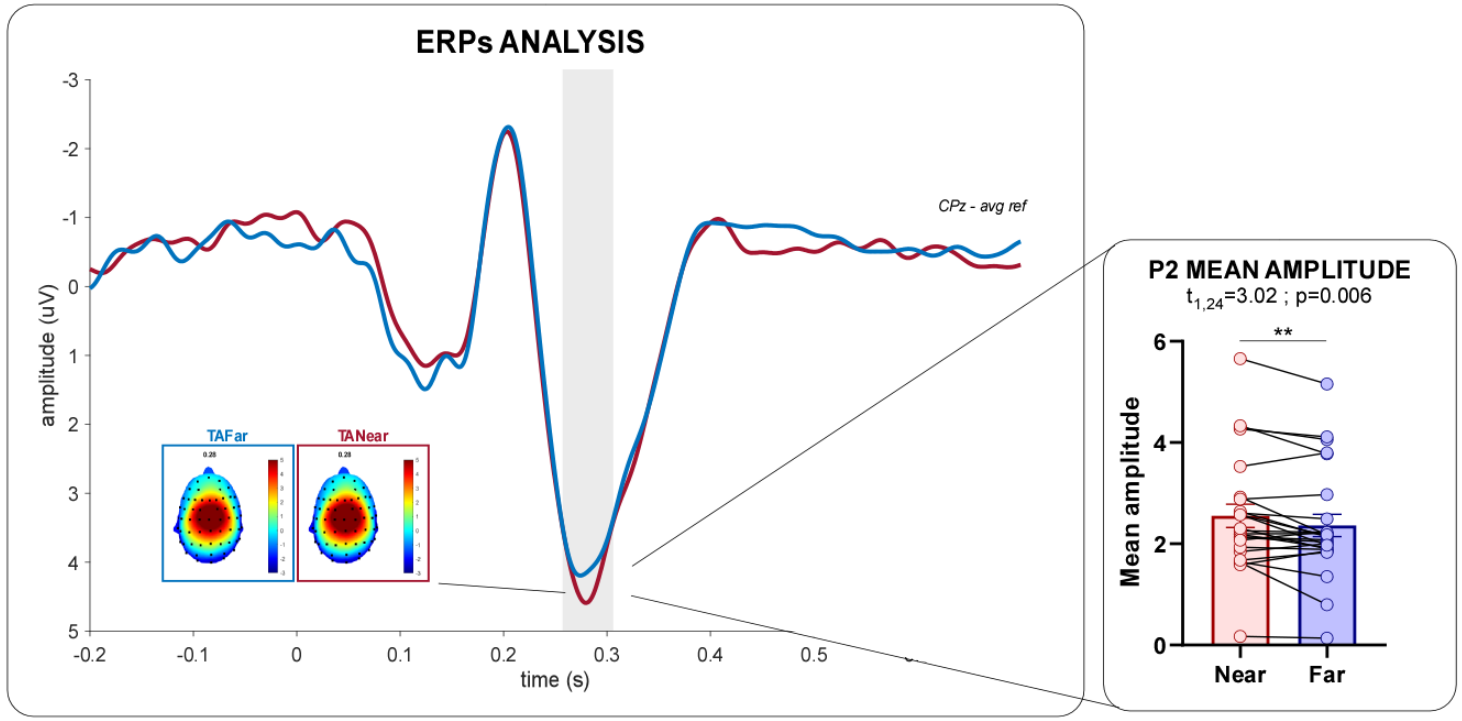

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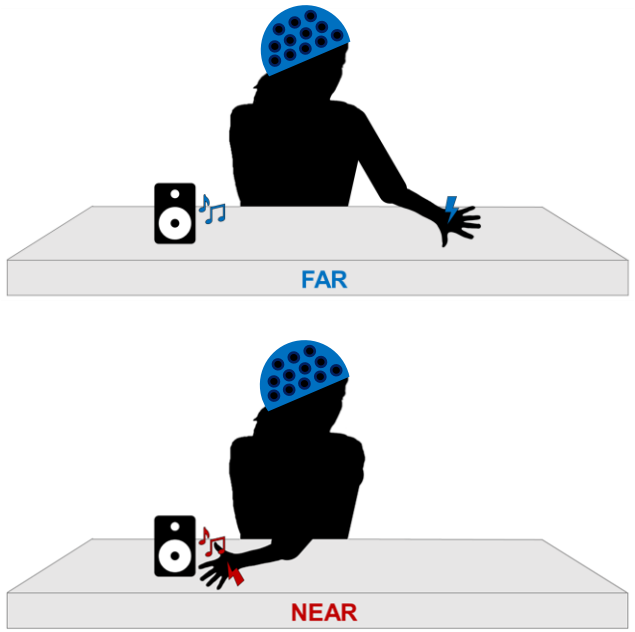

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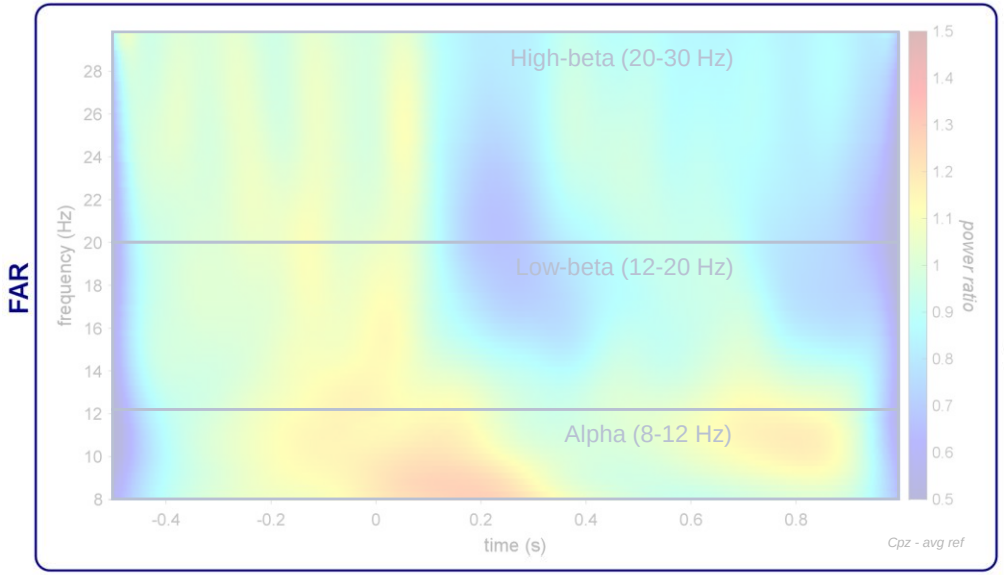
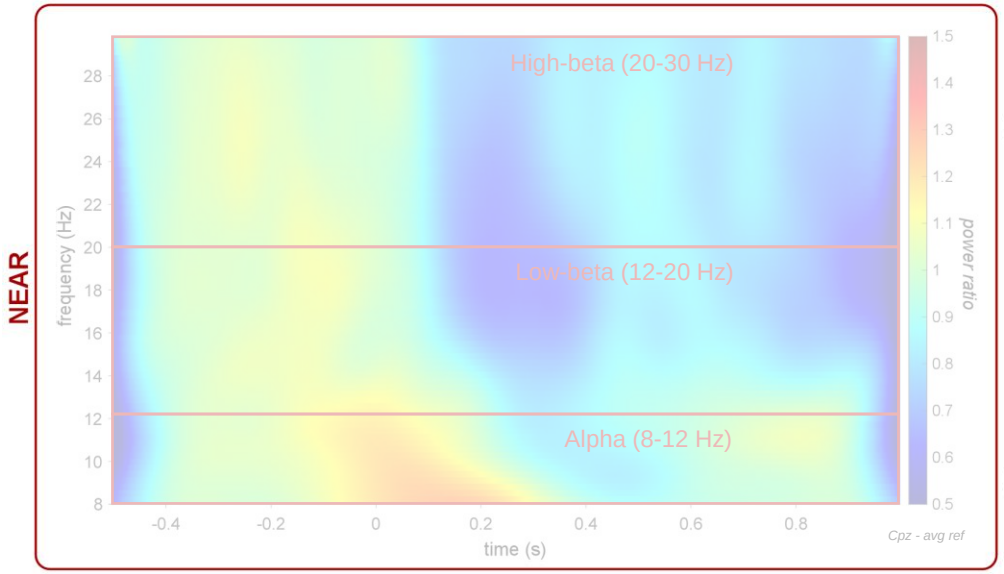
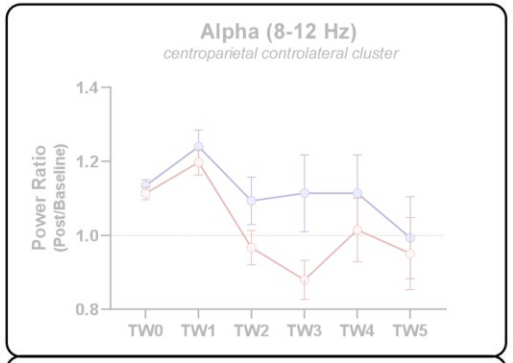
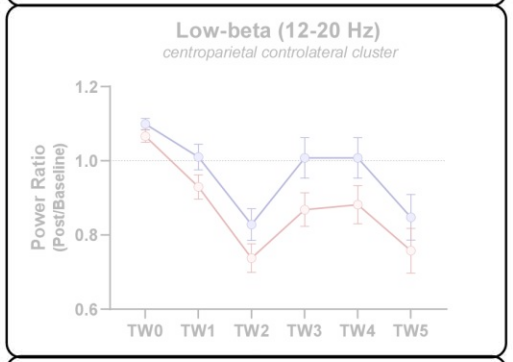
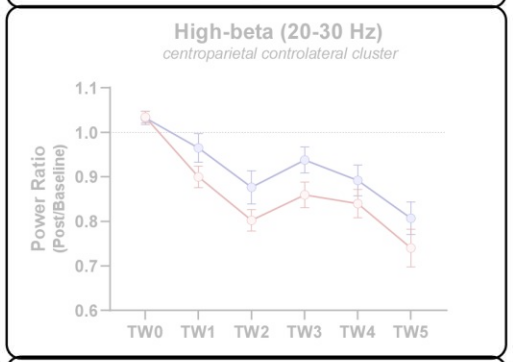
TIME-FREQUENCY ANALYSIS









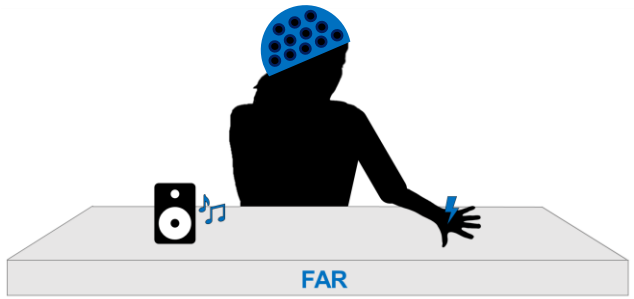


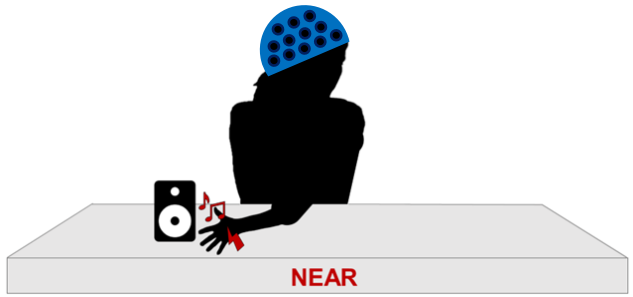
TW0=-0.2-0 s; TW1=0-0.2 s;
TW2=0.2-0.4 s; TW3=0.4-0.6 s;
TW4=0.6-0.8 s; TW5=0.8-1 s

Near
Far

Postural manipulation paradigm

EEG experiment





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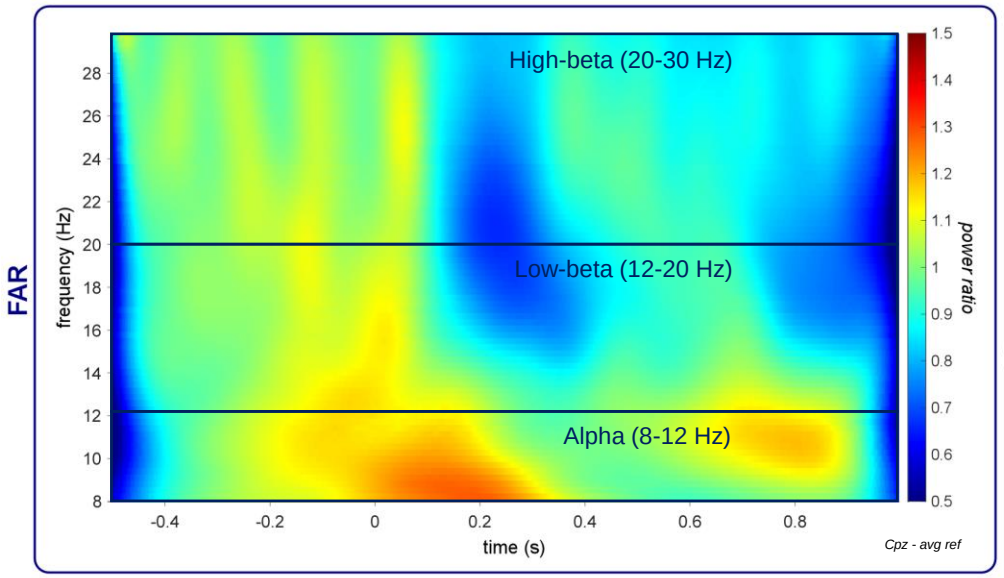

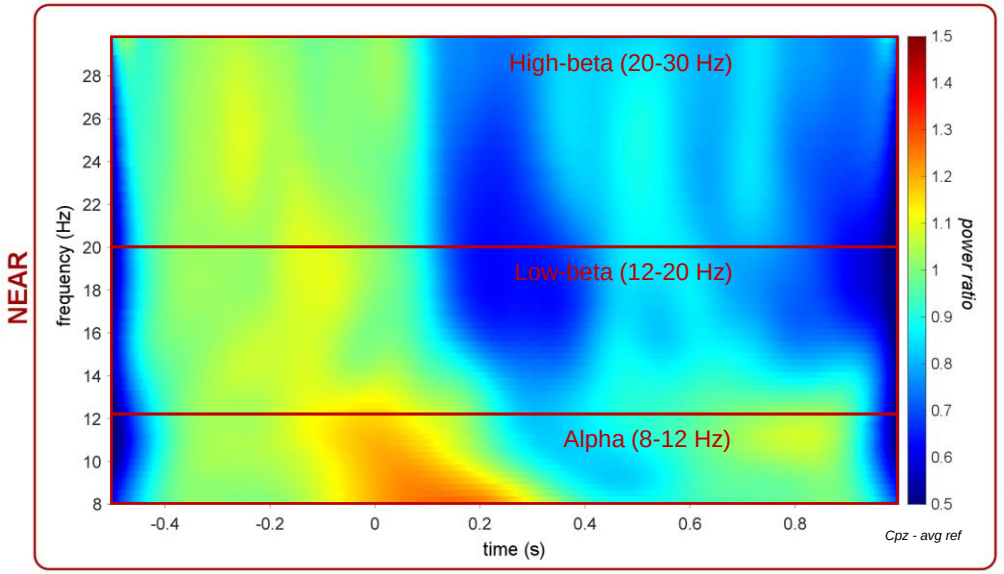

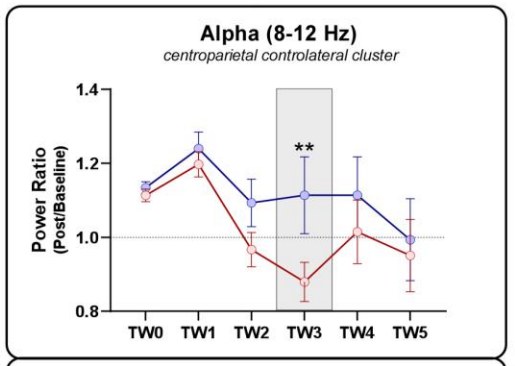

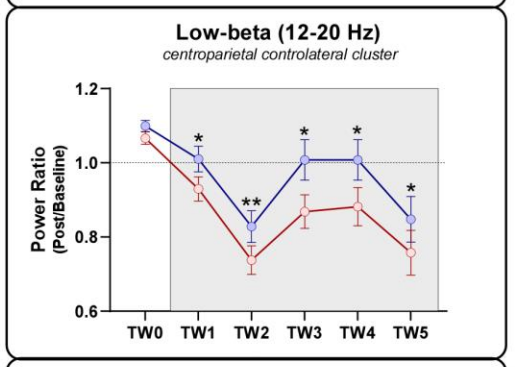

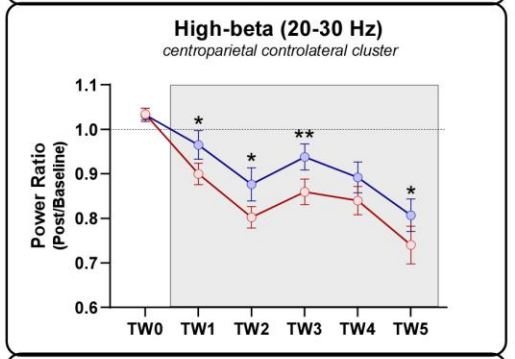

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Near
Far

Discussion

Our postural manipulation paradigm successfully measured behavioral and electrophysiological markers of hand-centred bodily-self location in adults

The present work paves the way for longitudinal studies addressing the emergence of bodily-self location in relation to motor skills development early in life

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Società Italiana di Psicofisiologia e Neuroscienze Cognitive

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Thank you for your attention!

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