

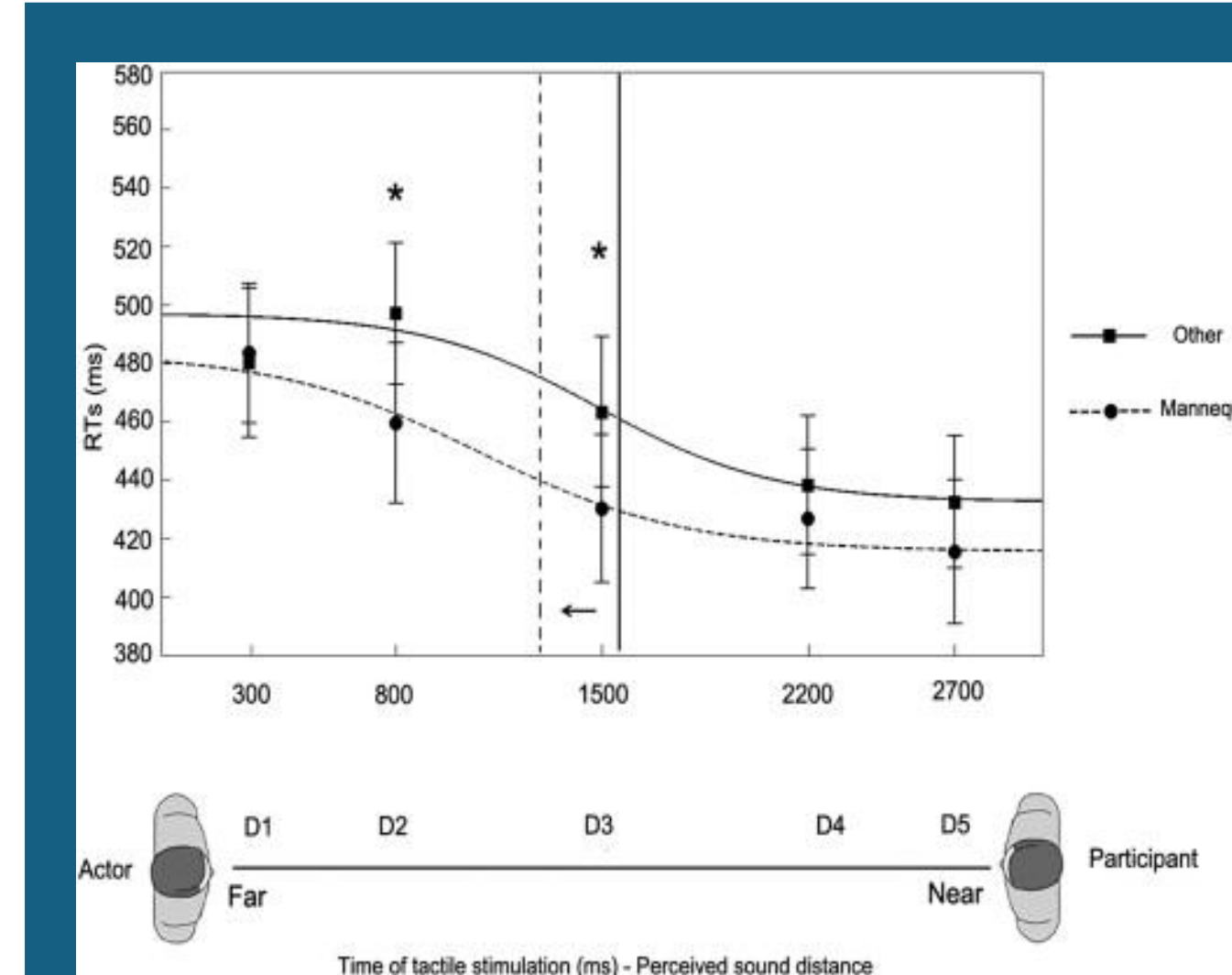
Exploring Motor and Social Contributions to Peripersonal Space: A Pilot VR Study

Michele Scandola¹, Emmanuele Tidoni²

1- University of Verona; 2- University of Leeds



Peripersonal space (PPS) is the area surrounding the body in which we can interact with the environment. Its neural representation is mediated by visuotactile bimodal neurons¹.



PPS contracts in the presence of others, particularly when they are perceived as non-collaborative².

The contraction of PPS caused by the presence of others may arise because they are perceived as social agents, motor agents, or both. However, current evidence does not distinguish among these three hypotheses. This study aims to address this research question.

Methods

We pre-registered three experimental studies in Virtual Reality.

Across all experiments, participants view an avatar 2.5 meters from them. Each task includes 180 trials:

Visuo-tactile: A visual stimulus approaches from one of seven distances while a tactile stimulus is delivered to the right hand (12 trials per distance).

Tactile-only: A right-hand tactile stimulus occurs at one of seven matched time points without a visual stimulus (12 trials per time point).

Catch: A visual stimulus appears without tactile stimulation (12 trials).

Each trial begins with an auditory alert. Participants respond to tactile stimuli as quickly as possible by pressing a button with their left hand.

Exp 1: replicating²

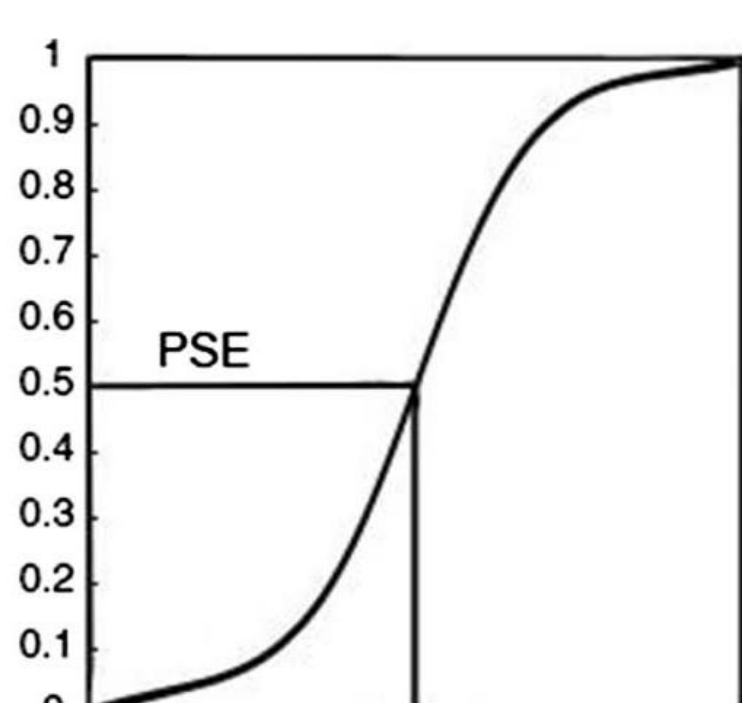
- Mannequin condition
- Human condition

Exp 2: motor-only PPS modulation

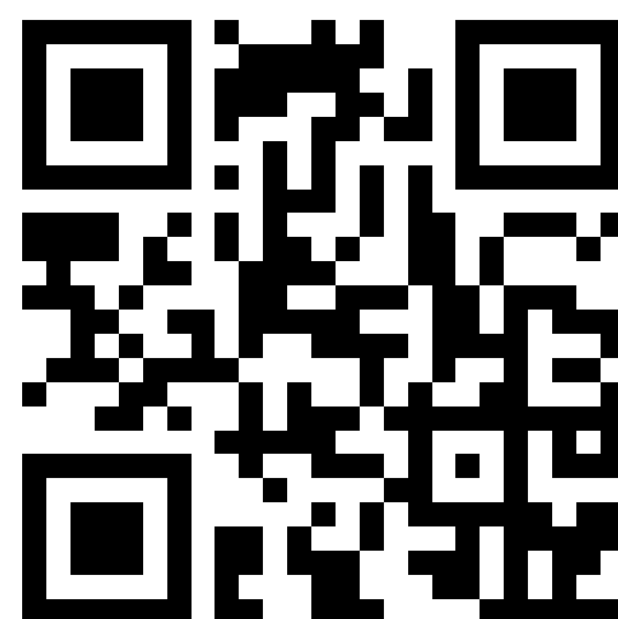
- Moving non-social robot condition
- Human condition

Exp 3: social-only PPS modulation

- Non-moving social robot condition
- Human condition



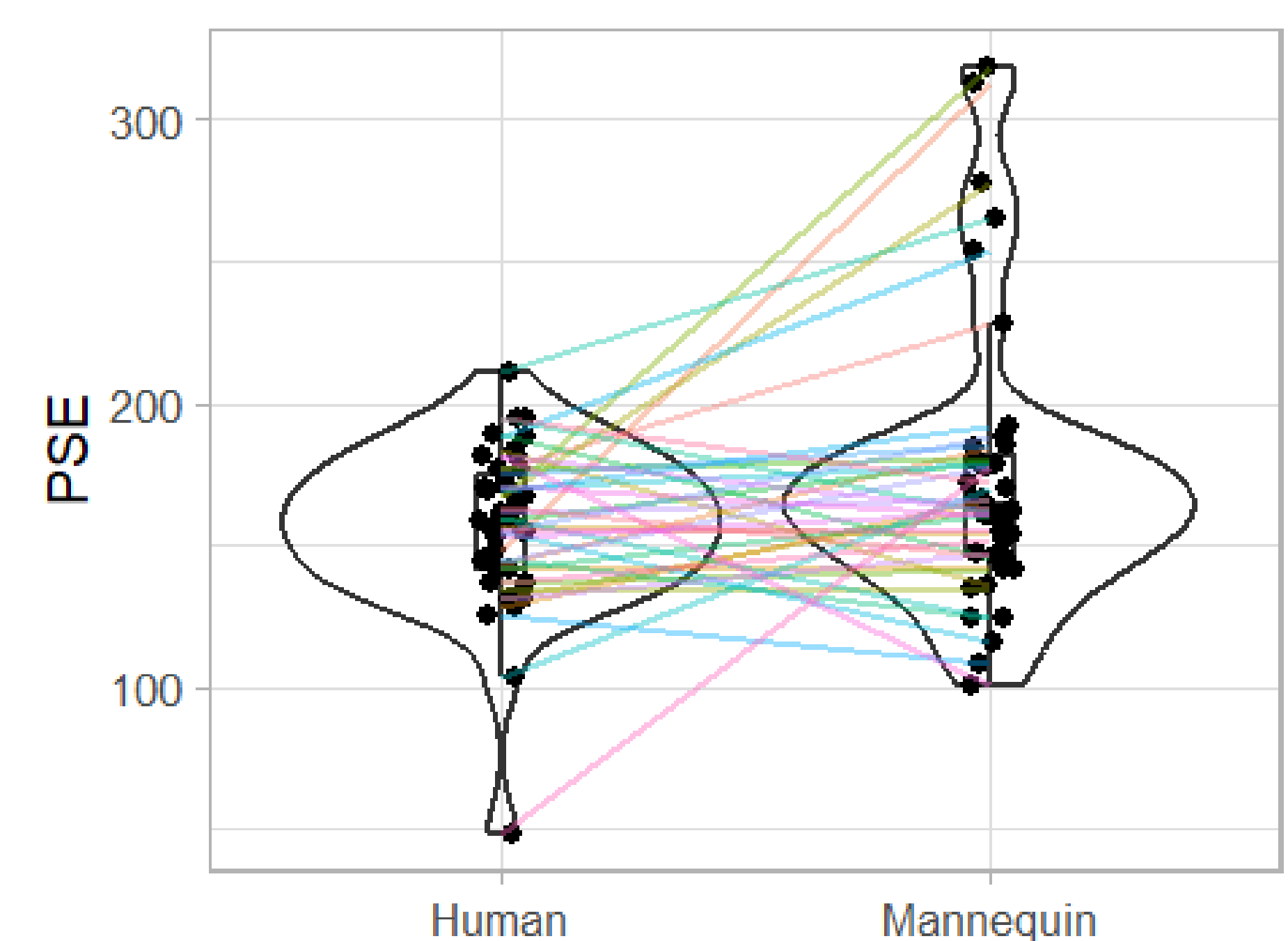
From the Reaction Times curve, we computed the PPS boundary as the PSE of a sigmoid function.



Results

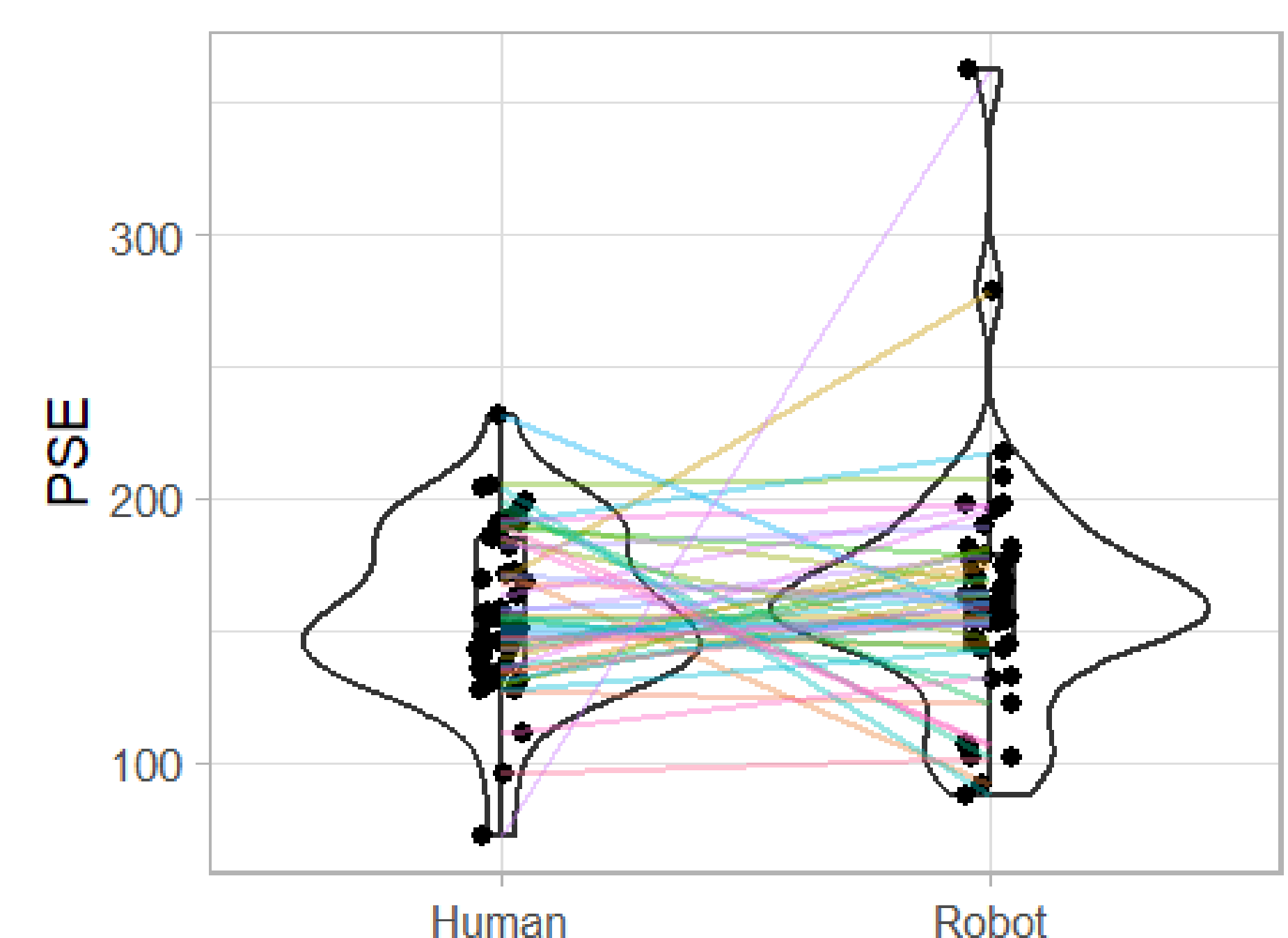
Exp 1:

40 participants (20F)
 $F_{(1,39)} = 4.79$, $p = .035$
 $\eta^2 = .11$, $BF_{10} = 3.45$



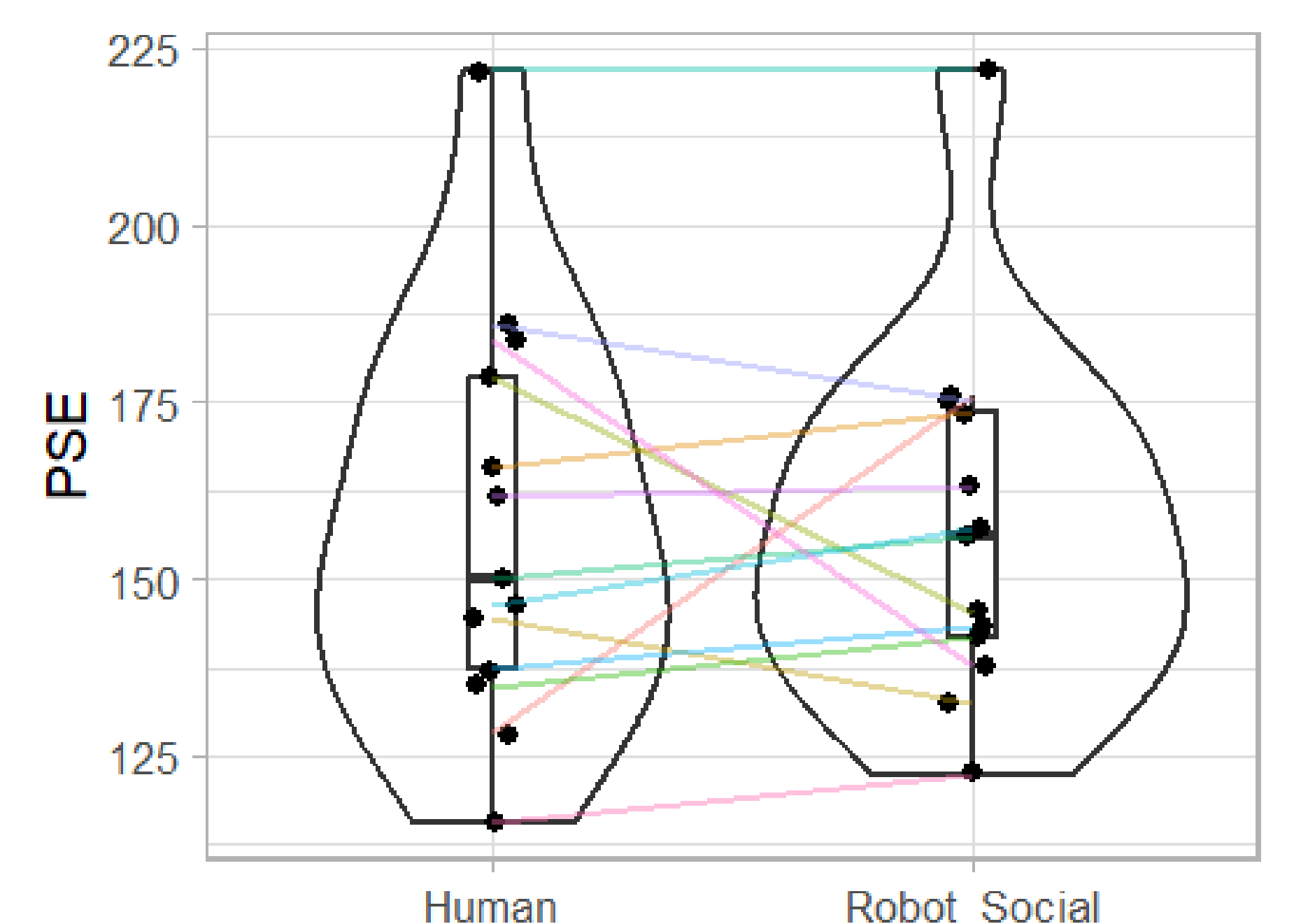
Exp 2:

45 participants (24F)
 $F_{(1,44)} = 0.25$, $p = .622$
 $\eta^2 = .03$, $BF_{10} = 0.90$



Exp 3:

13 participants (7F)
 $F_{(1,12)} = 0.01$, $p = .920$
 $\eta^2 < .01$, $BF_{10} = 0.54$



Conclusions: Apparently, both motor-only and social-only reduce PPS.



REFERENCES

- [1] Di Pellegrino, G., & Làdavas, E. (2015). Peripersonal space in the brain. *Neuropsychologia*, 66, 126-133.
- [2] Teneggi, C., Canzoneri, E., Di Pellegrino, G., & Serino, A. (2013). Social modulation of peripersonal space boundaries. *Current biology*, 23(5), 406-411.