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Effects of a non-informative auditory feedback over touch in the blindness



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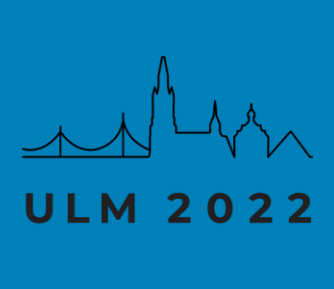
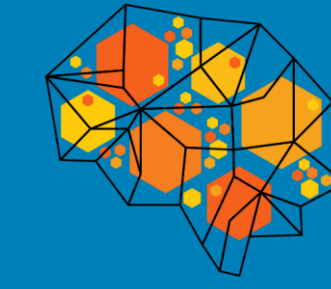


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Introduction

The mechanisms underlying passive and active touch are different, with active touch leading to an attenuation of afferent somatosensory information to the cortex. This is known as *movement-related sensory gating* and could be responsible for a worse encoding [1,2,3]. When we have multisensory information one sense can dominate the perception according to its reliability [4]; if noise is added to the signal, its reliability changes, thus their dominance [5]. When there is ambiguity, we integrate multisensory information to infer the most likely interpretation of the sensory input [6]. However, this process is vulnerable to the loss of a sensory modality: the lack of visual calibration over the tactile and audio modality can modulate their integration, with blind individuals showing a reduced multisensory interaction [7].

How a non-informative sound might affect the tactile performance during passive and active touch in blind and sighted individuals?

Method

Participants:

- 18 sighted : 12 women; age mean +- SD: 35.11 +- 11.72
- 18 blind: 10 women; mean age +- SD: 41.67+- 11.9 years)

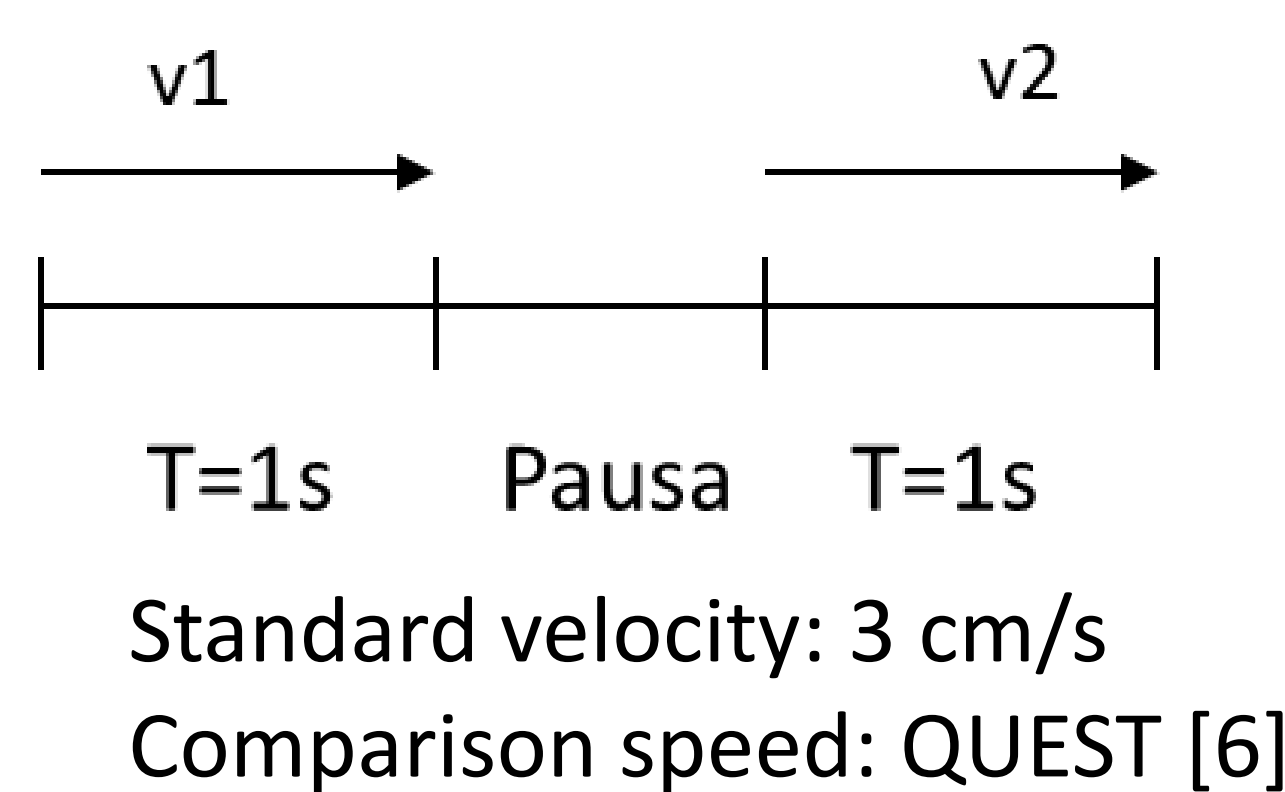
Conditions:

Passive and Active

- Unimodal tactile (T)
- Bimodal audio-tactile (AT)

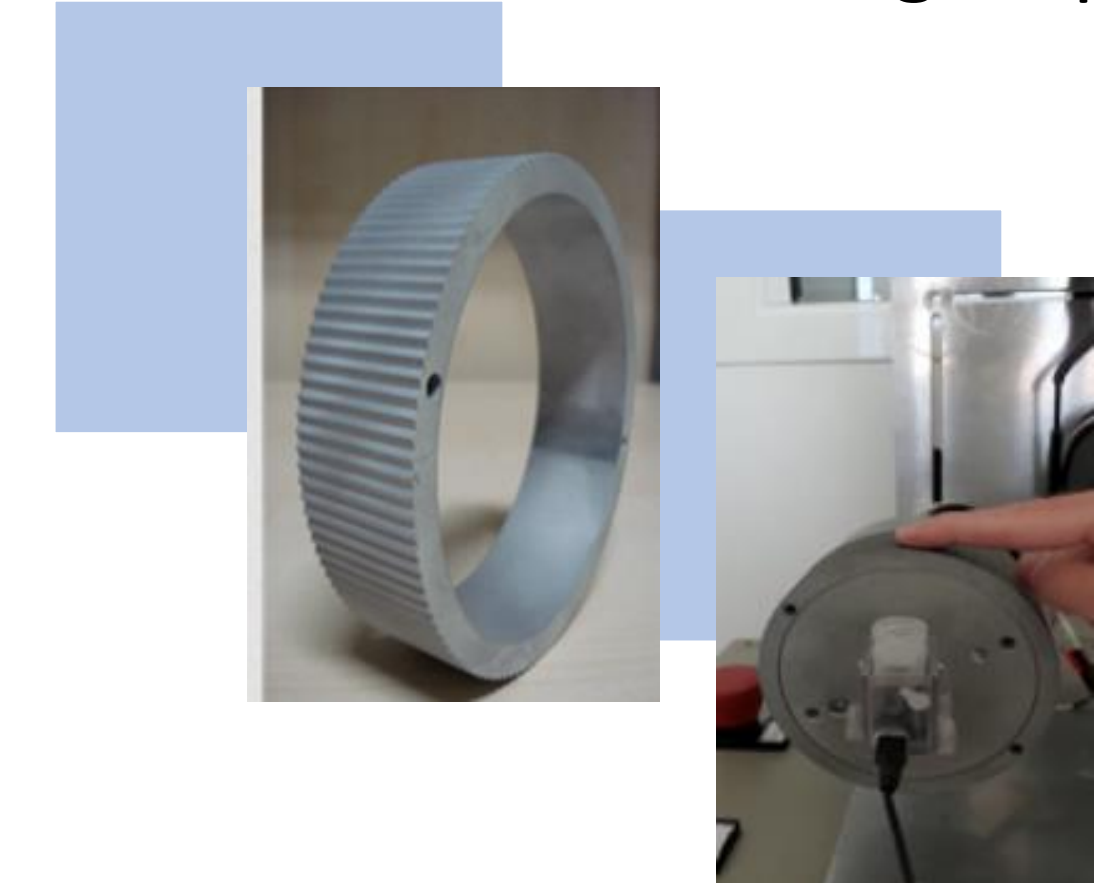
Task:

2AFC - Sequence of two movement with different speeds and to discriminate which was faster between the two.

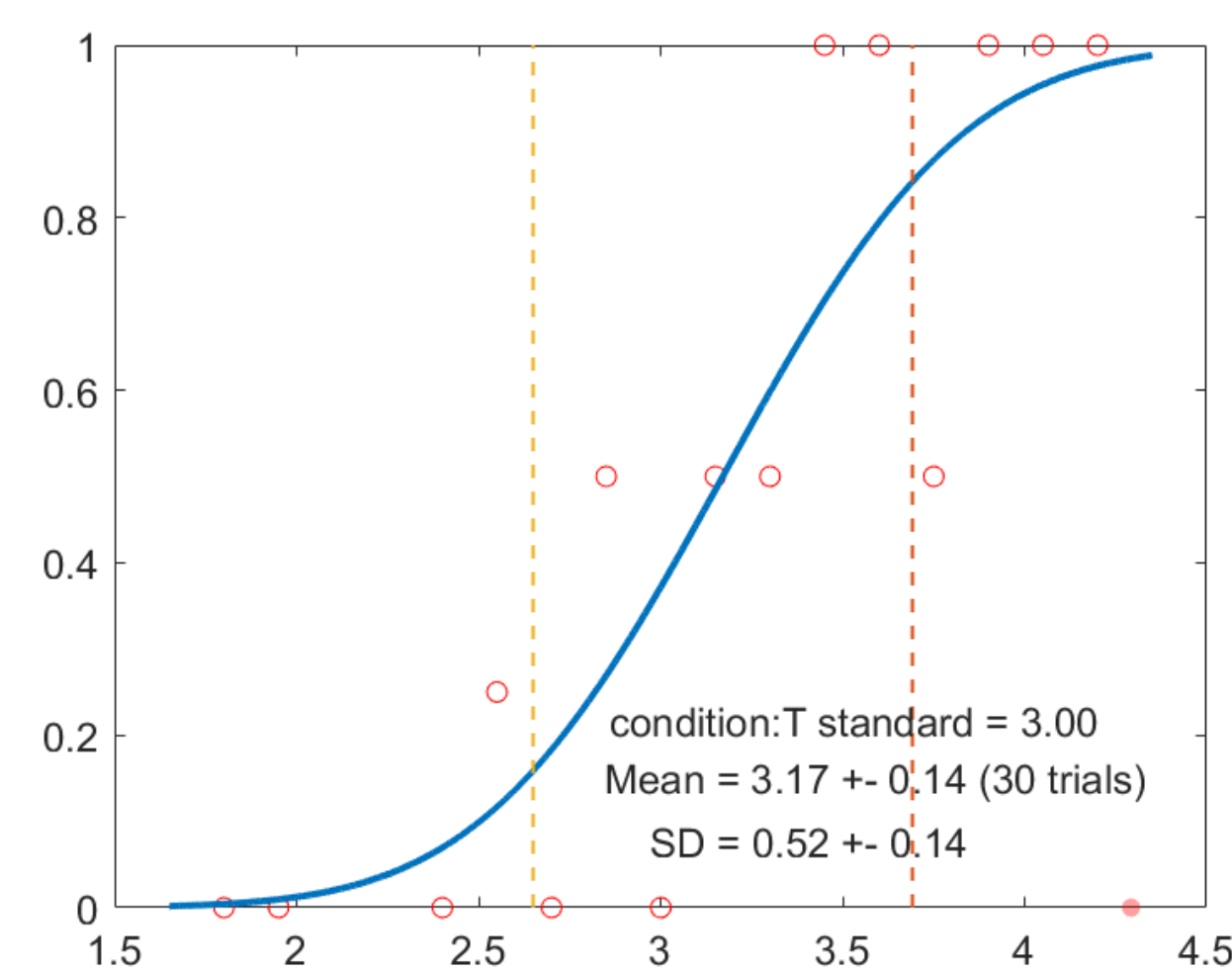


Stimulation:

- Tactile stimulus: 10 cycles/cm
- Tactile area of stimulation: fingertip of index

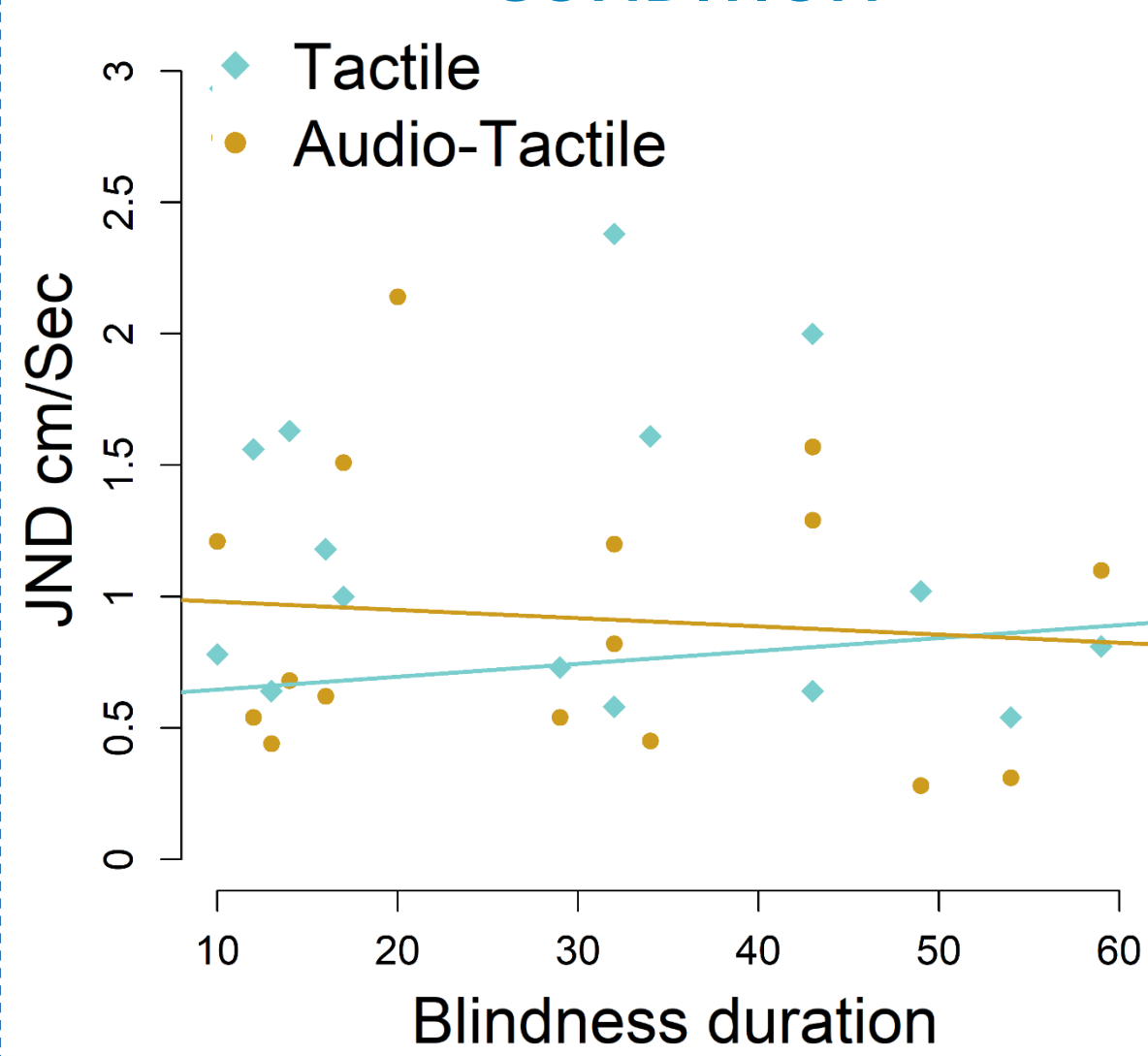


Results

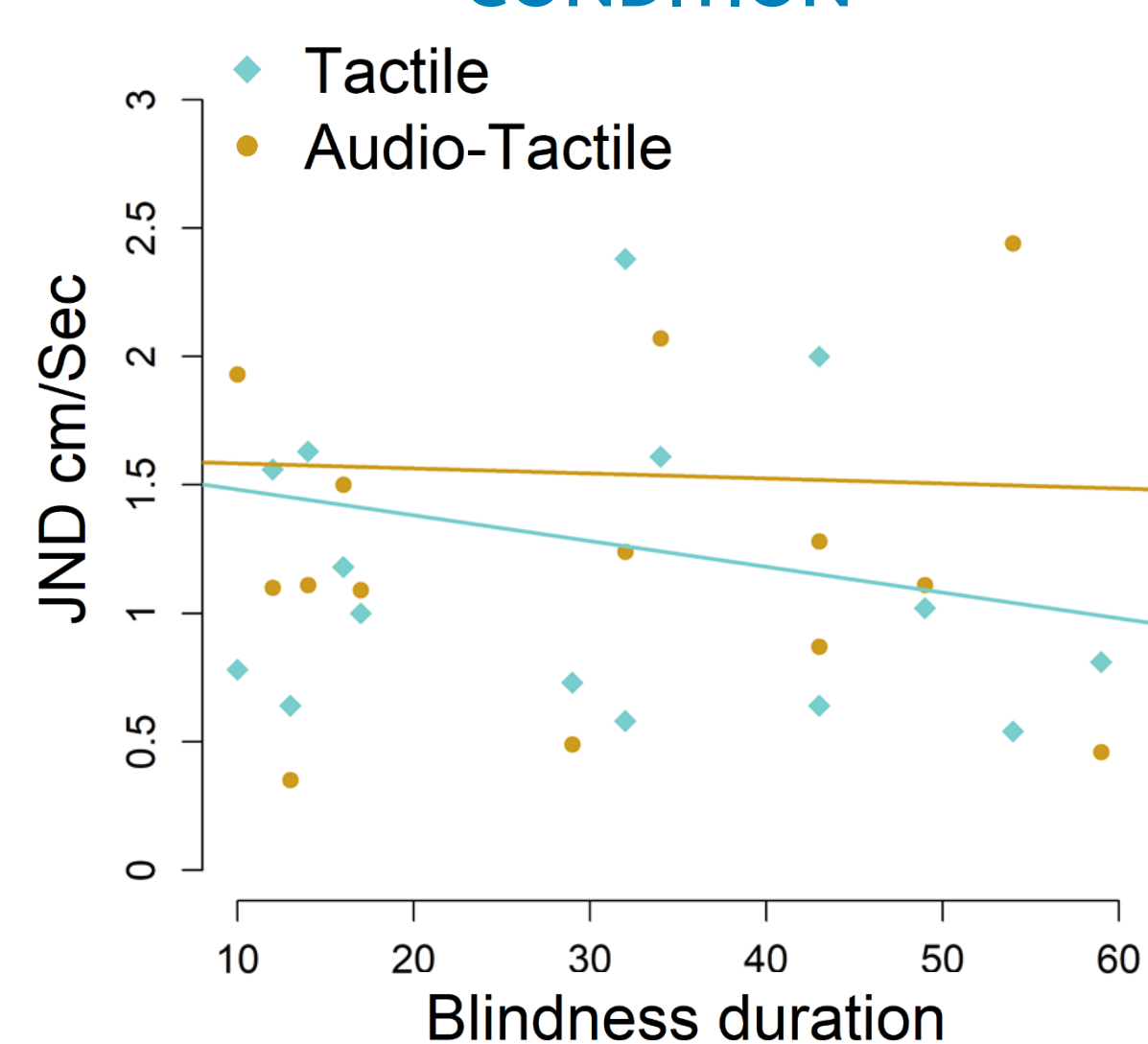


Data fitted to Cumulative Gaussians
Threshold or just noticeable difference (JND) from the SD of the psychometric curve

BLINDNESS DURATION - PASSIVE CONDITION

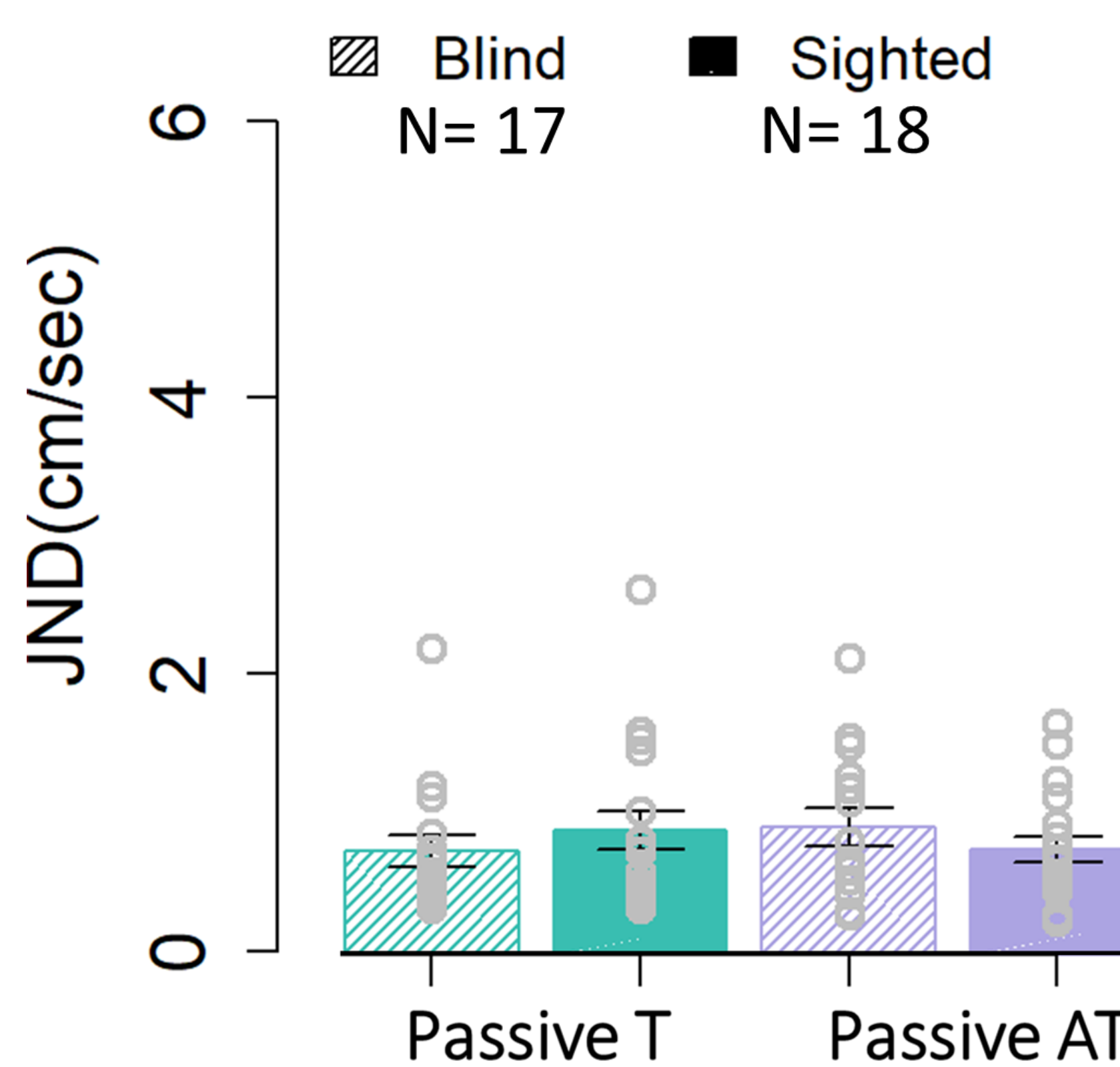


BLINDNESS DURATION - ACTIVE CONDITION

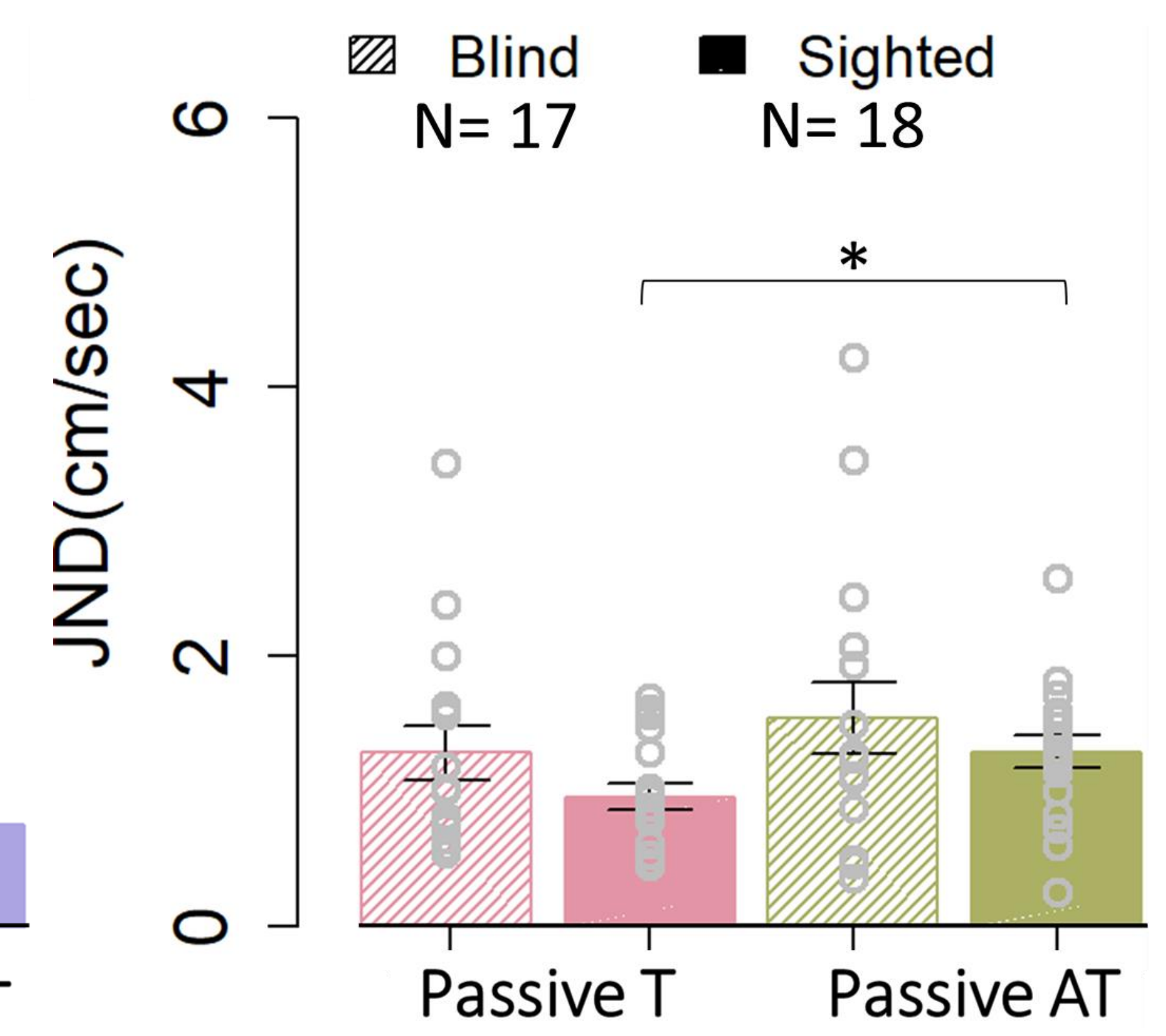


No correlation blindness duration and performance

PASSIVE CONDITION



ACTIVE CONDITION



Significant difference between T and A-T conditions in the active condition ($p=.0462$) only for the sighted group

Conclusions

Sighted individuals:

- No differences between the tactile and audio-tactile conditions during passive touch
In our case, tactile information might be reliable enough not to require extra sensory information.
- Significant difference between the tactile and audio-tactile conditions during active touch
The somatosensory gating, as it reduced the amount of sensory information processed by the cortex [2], might increase the ambiguity of tactile information, making sighted participants more vulnerable to the noise of the auditory signal.

Blind individuals:

- No differences between the T and A-T conditions during passive touch
- No differences between the T and A-T conditions during active touch

Our results support the presence of reduced audio-tactile interactions in blind individuals [7] and suggest that it might be responsible for higher resistance to noisy interference, despite the somatosensory gating originating from the self-generated movement in this group

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