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Does visual experience shape body schema ?

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Introduction

The representation of touch on our body is not veridical. For instance, tactile distances across the limb (mediolateral) are always perceived as larger than those running along the limb (proximodistal).

This tactile anisotropy reflects distortions in body-shape representation, such that the arms are perceived wider than they are.

This anisotropy of tactile distance perception is hypothesized to be modulated by the visual experience of the body, in addition to tactile acuity.

To causally test the role of visual experience on body map representation, we compared tactile distance perception in sighted and congenitally blind people.

Materials and Method

- 17 Sighted Control (SC) and 19 Early Blind (EB) participants
- 12 blocks of trials: Body Part(Arm, Wrist, Hand) X Surface(Dorsal, Ventral) X 2
- 5 types of stimuli X 4 repetitions = 20 trials per block
- Stimulus pairs = Mediolateral vs. proximodistal axes: 2:4,2:3,3:3,3:2,4:2 cm
- Task: "Which one is larger, first or second?"
- Measured Points-of-Subjective-Equality (PSEs)



Fig 1. Tactile stimuli

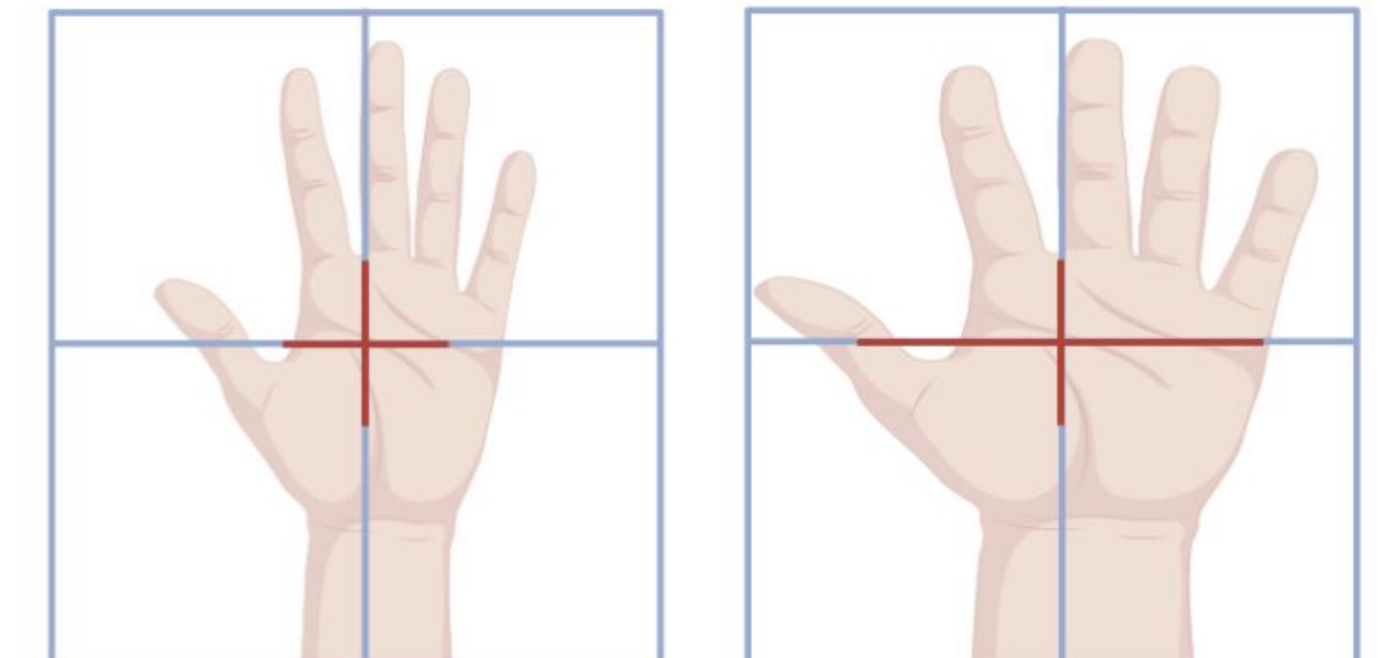


Fig 2. ML distances are perceived larger than PD distances

Results

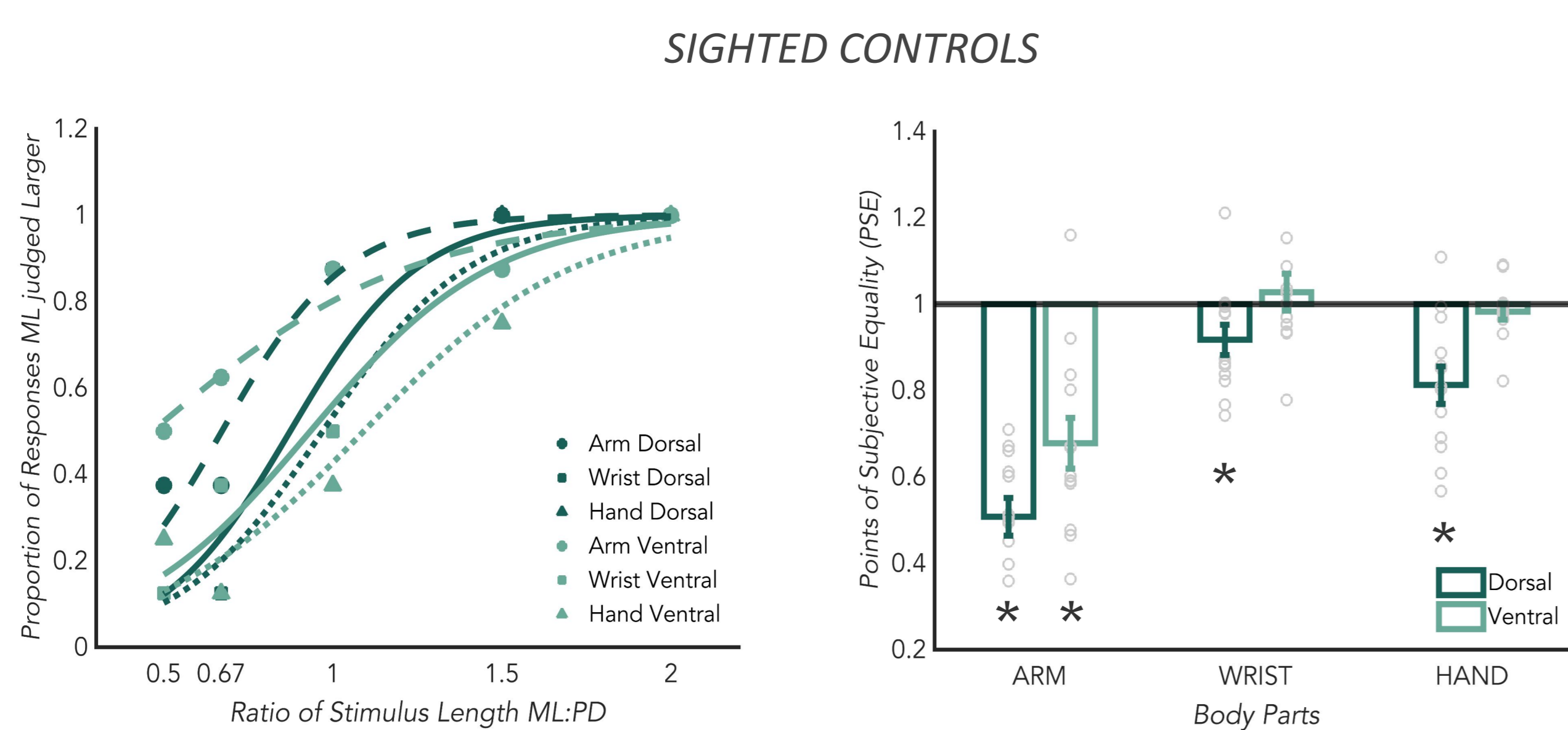


Fig 3. (A) Psychometric curve fit for the different skin locations on one participant in the group SC (B) PSE for the group SC split between the dorsal and ventral surfaces. It is defined as the point at which the psychometric curve crosses the y-axis at 0.5 for each participant.

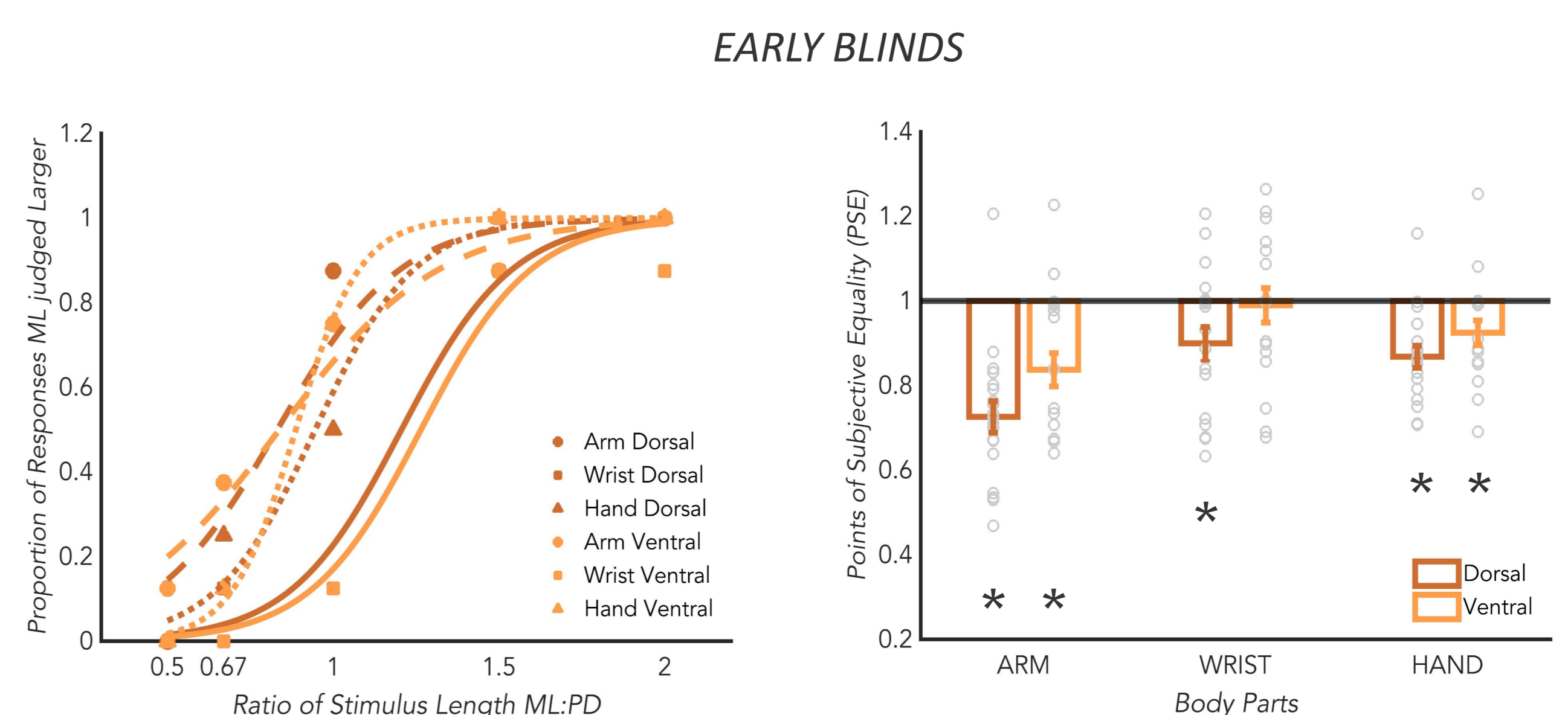


Fig 4. (A) Psychometric curve fit for the different skin locations on one participant in the group EB (B) PSE for the group EB split between the dorsal and ventral surfaces. It is defined as the point at which the psychometric curve crosses the y-axis at 0.5 for each participant.

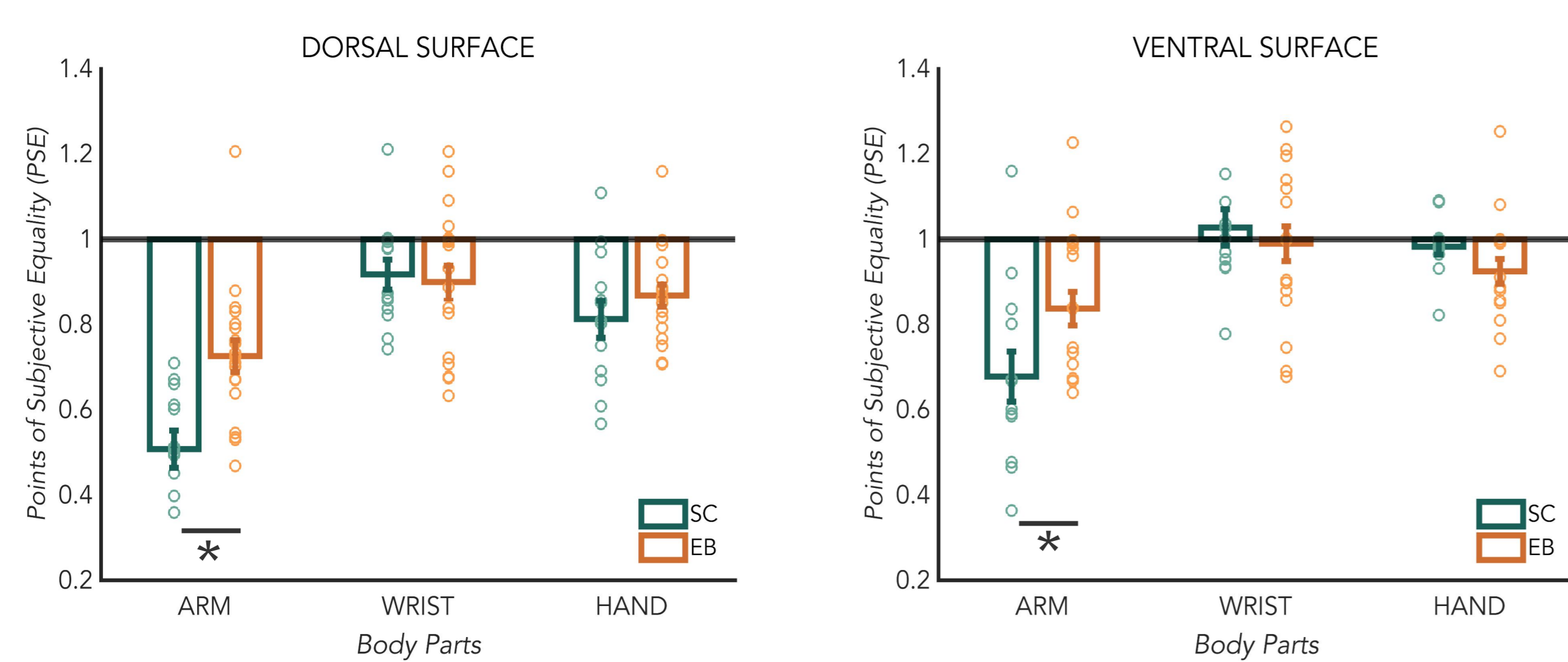


Fig 5. Points of subjective equality (PSEs) for Arm, Wrist and Hand, split between the (A) Dorsal and (B) Ventral surfaces. PSE values below 1 represent more bias towards ML being perceived to be larger than PD. PSE values equal to 1 show veridical responses.

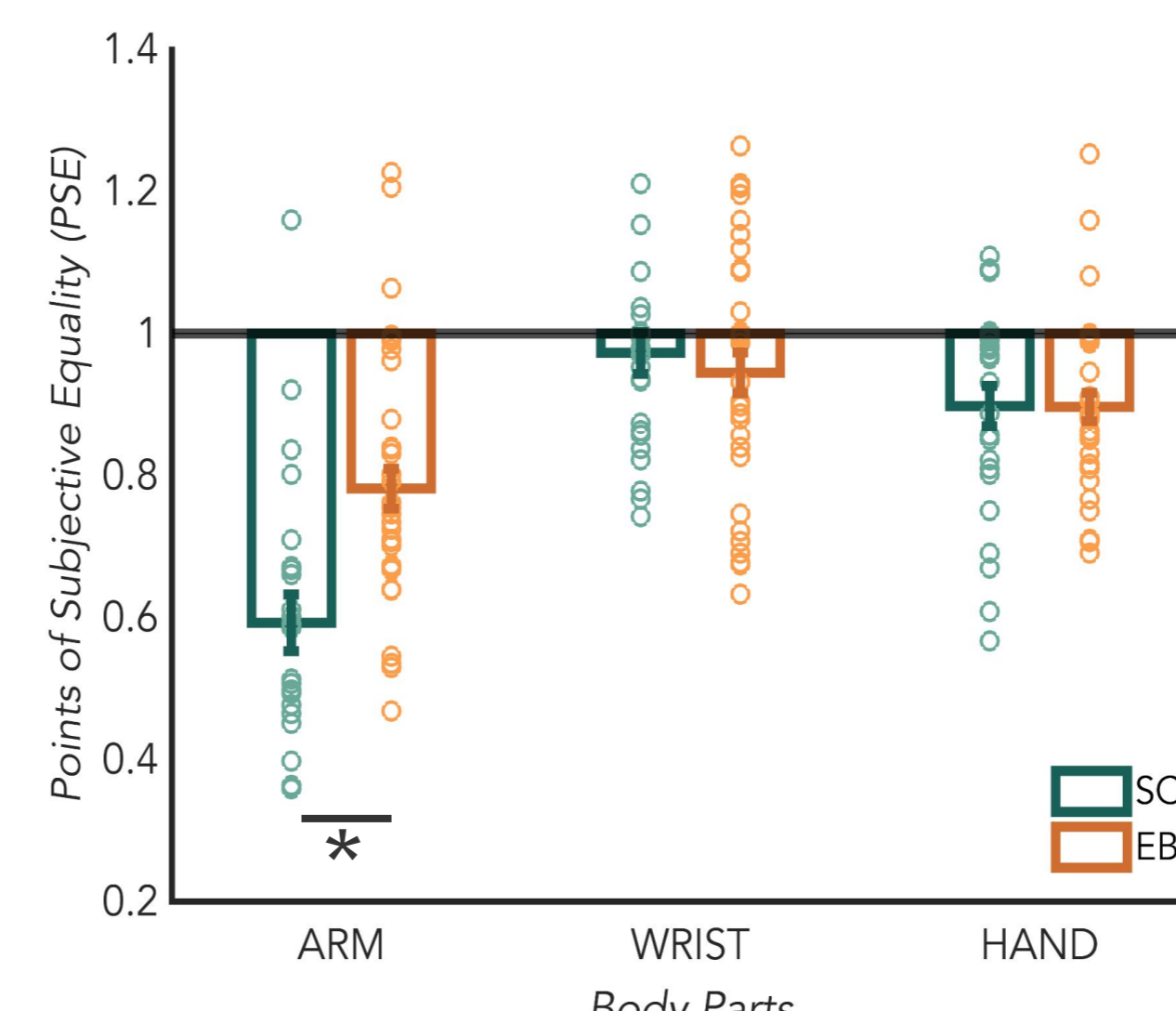


Fig 6. Points of subjective equality (PSEs) for Arm, Wrist and Hand collapsed over the Dorsal and Ventral surfaces.

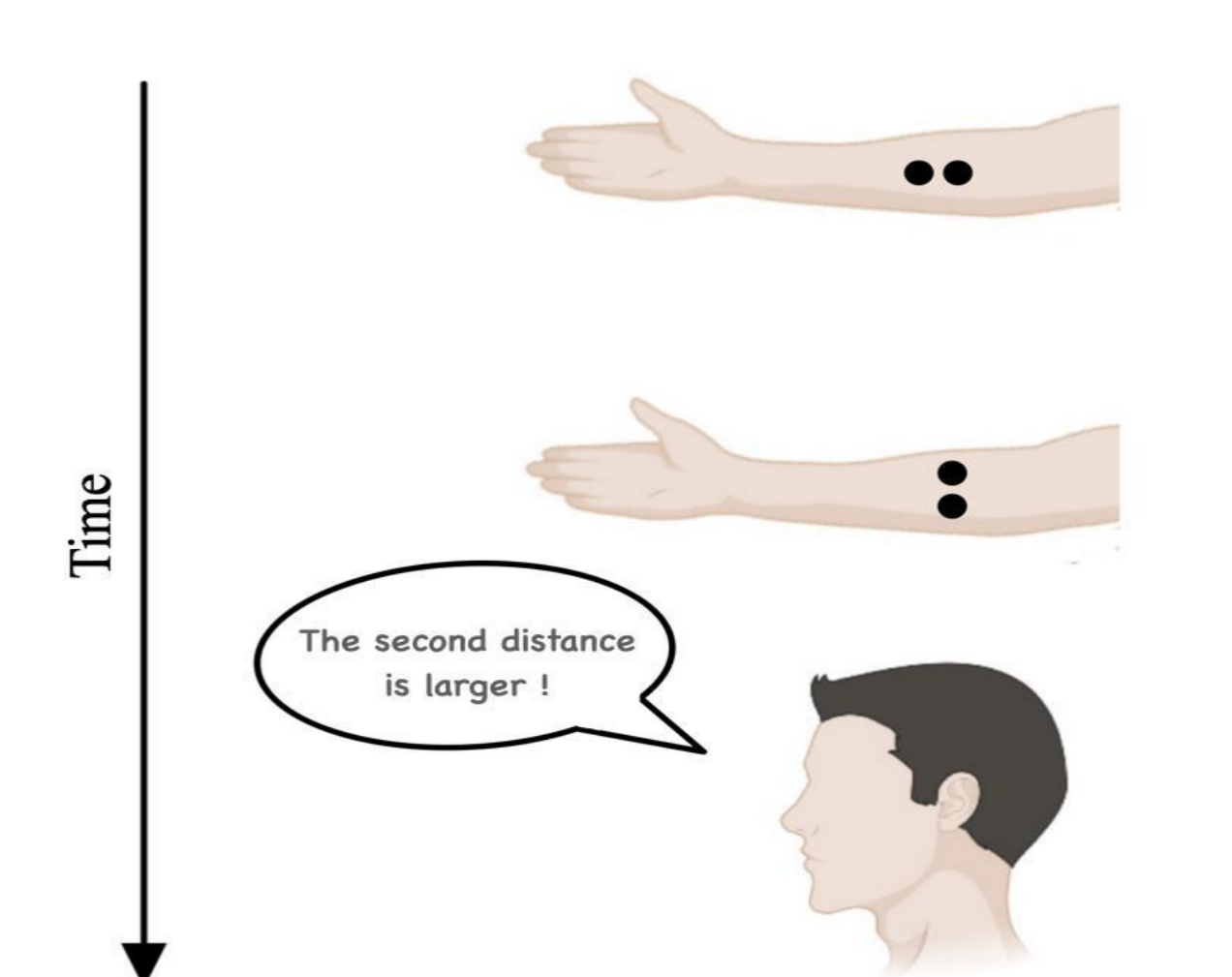


Fig 7. Schematic representation of the experiment showing that ML distances are perceived larger than PD distances

Conclusions

Tactile anisotropies are present in both sighted and early blind individuals. **This suggests that the body is generally perceived wider and this phenomenon is independent of visual experience.**

The anisotropies are modulated by vision only on arms and not on hands, since blind people showed lowered anisotropy than sighted people only on arms.

This suggests that vision is partially modulating body schema.

References

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