

Modulatory Effects on Structural Body Representations

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Paris, 10 October 2016

Primary sensory processing
(basic sensory mechanisms underlying bodily senses)

Body schema
(dynamic model of body posture underlying skilled action)

Body model
(metric properties of the body, size, shape...)

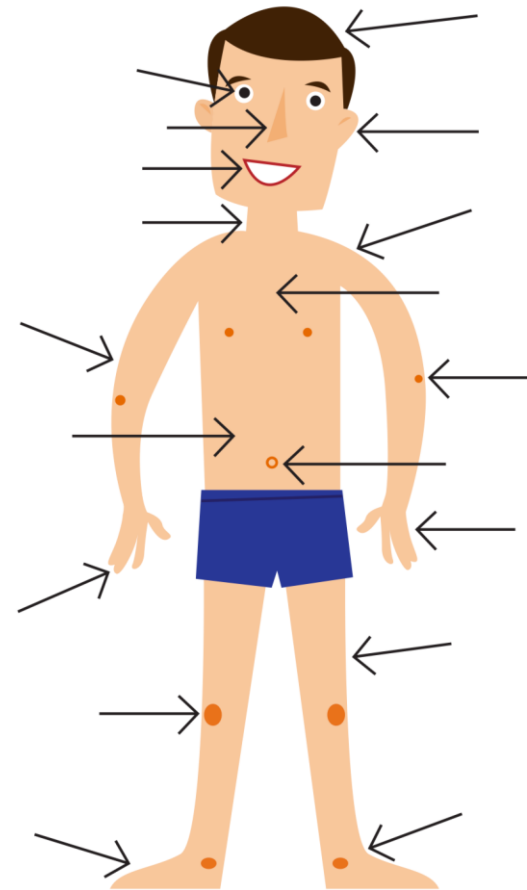
Body structural description
(topological model of the locations and size of body parts relative to each other)

Body structural description

Knowledge of the spatial configuration of bodies is mediated by a representation called the “**body structural description**” (BSD)

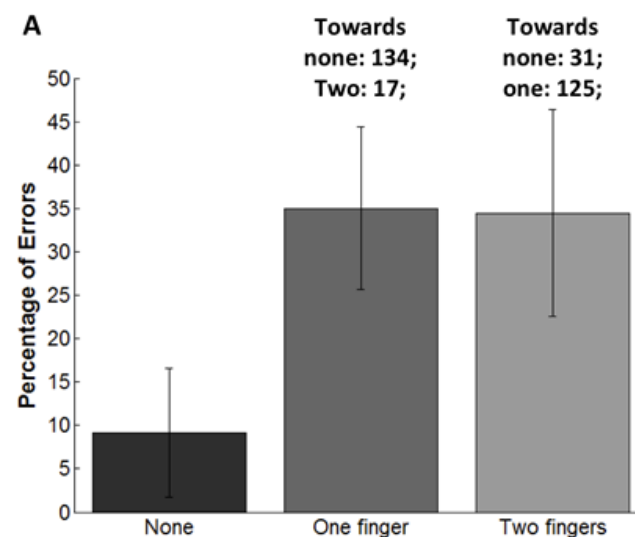
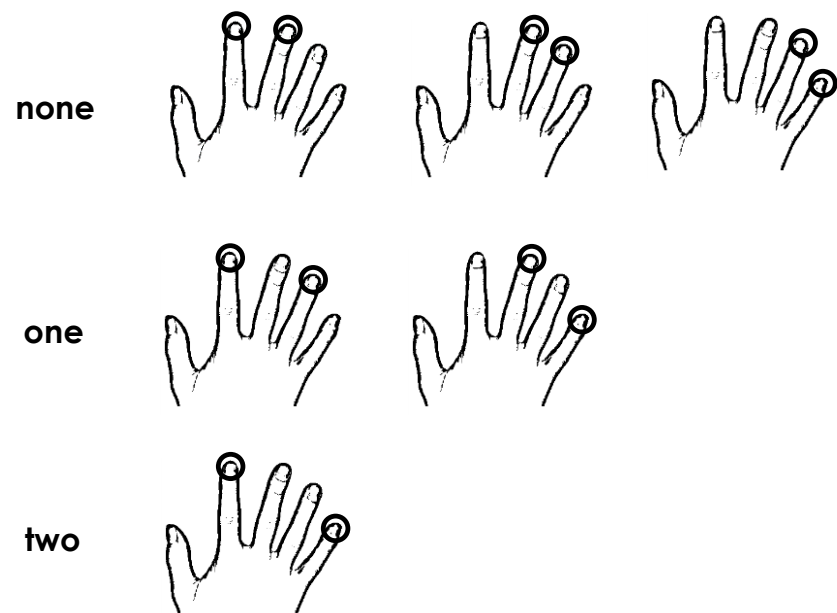
The existence of distinct representations of body structure has classically been supported by neuropsychological evidence of patients with conditions such as autotopoagnosia and finger agnosia.

Such patients fail to point to body parts on verbal command (**autotopoagnosia**) or to identify their fingers (**finger agnosia**), but they are relatively unimpaired in skilled action.



“Finger agnosia” in healthy people

Signs of finger agnosia in healthy people have been found using the **In-Between task** (e.g., Rusconi et al., 2009; Tamè et al., in preparation).

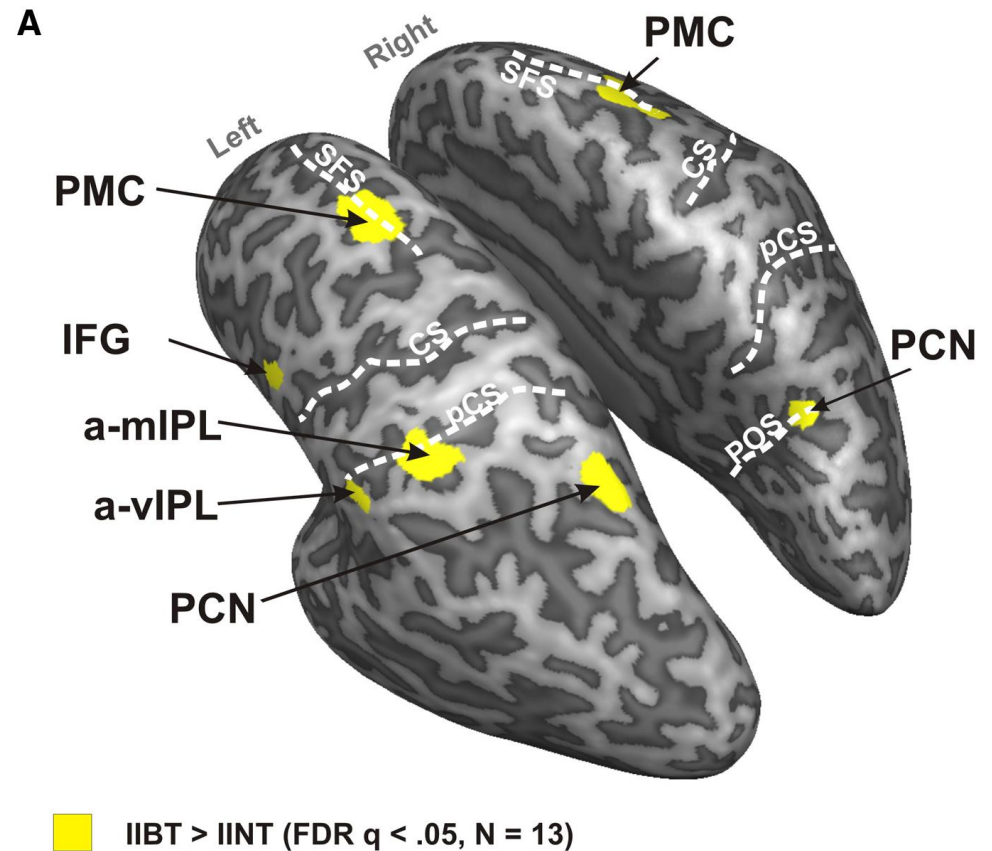
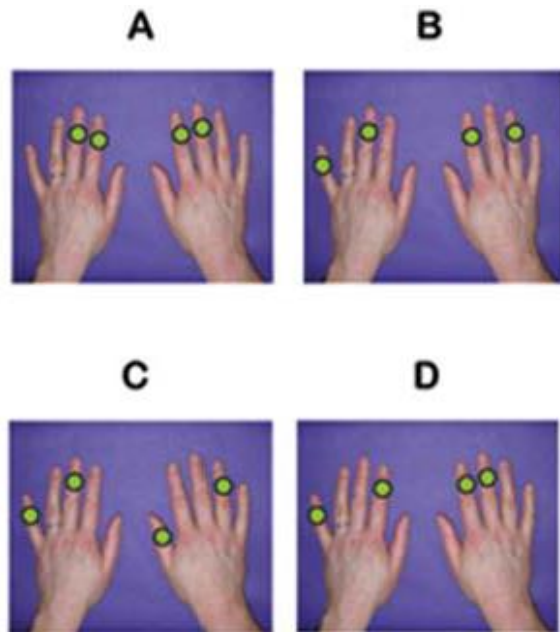


(1) identifying which fingers are touched

(2) locating the touched fingers within a structural model of the hand that represents at least the touched fingers and the untouched fingers

Neural correlates of finger gnosia

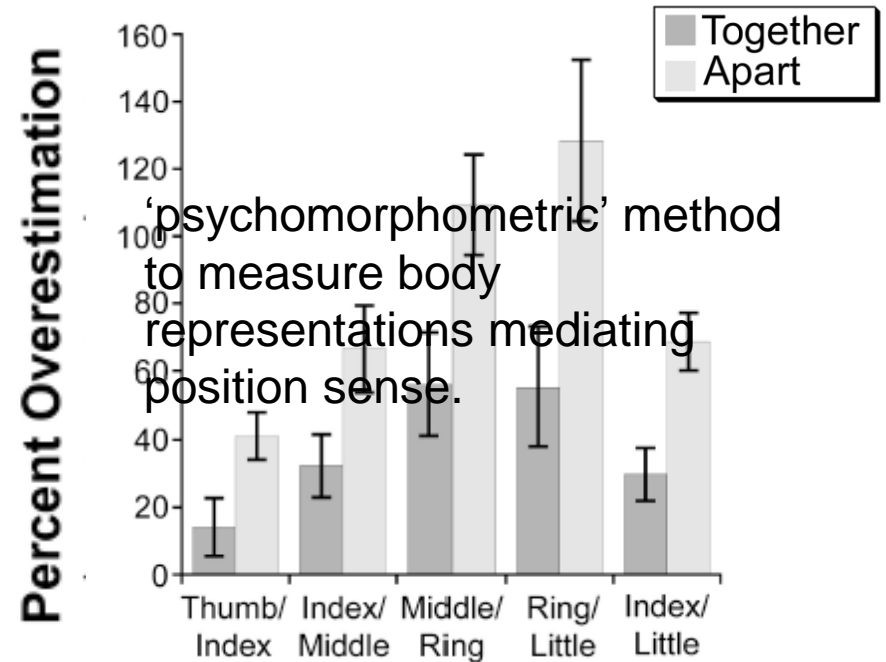
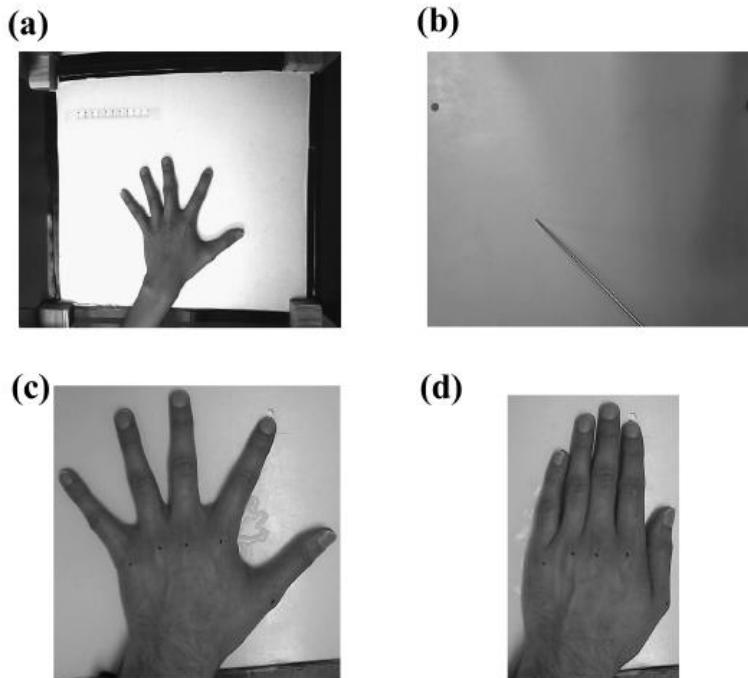
Between hands



The left a-mIPL may provide the core substrate of an explicit bilateral body structure representation for the fingers

Is body structural description fixed?

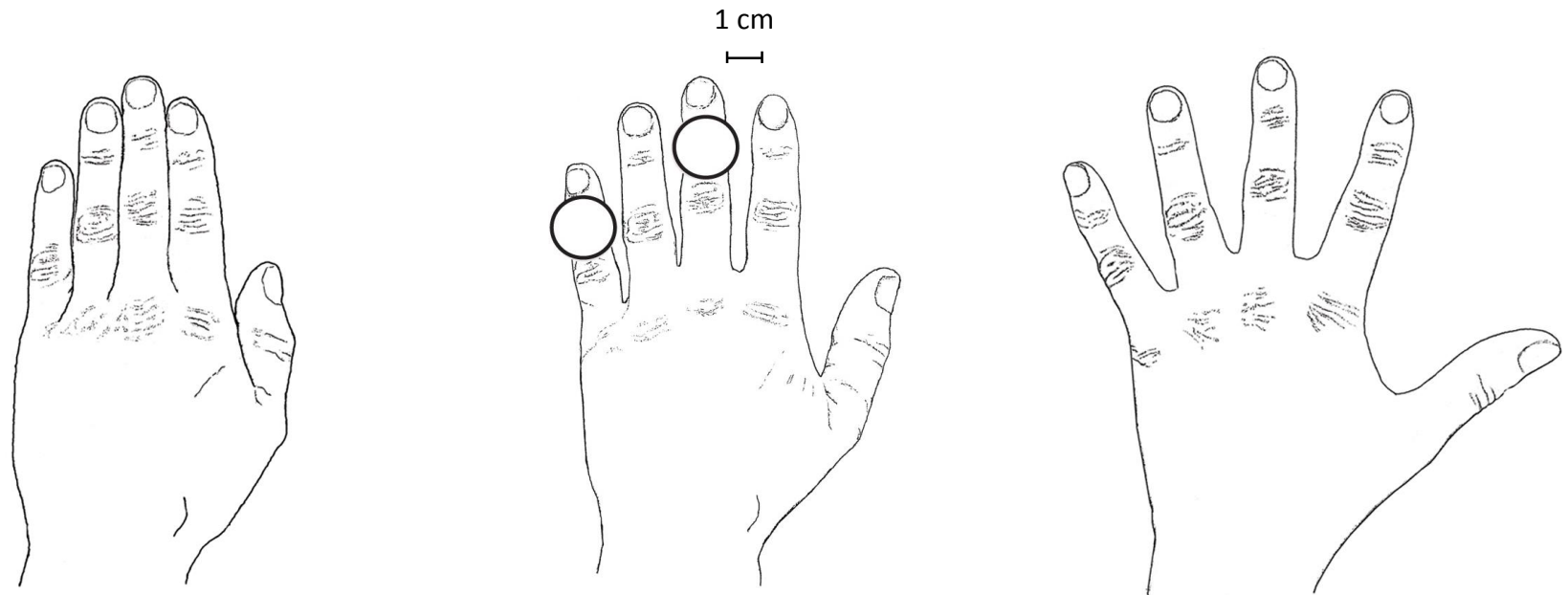
Is the *body structural description* fixed or it can be modulated by the real-time posture of the body?



Postural changes can affect the representation of hand size, with no apparent effect on hand shape.

Aim (In-Between test)

We investigated whether structural body descriptions are modulated by dynamic changes in body posture using the “in-between” test, a classical measure of finger agnosia.



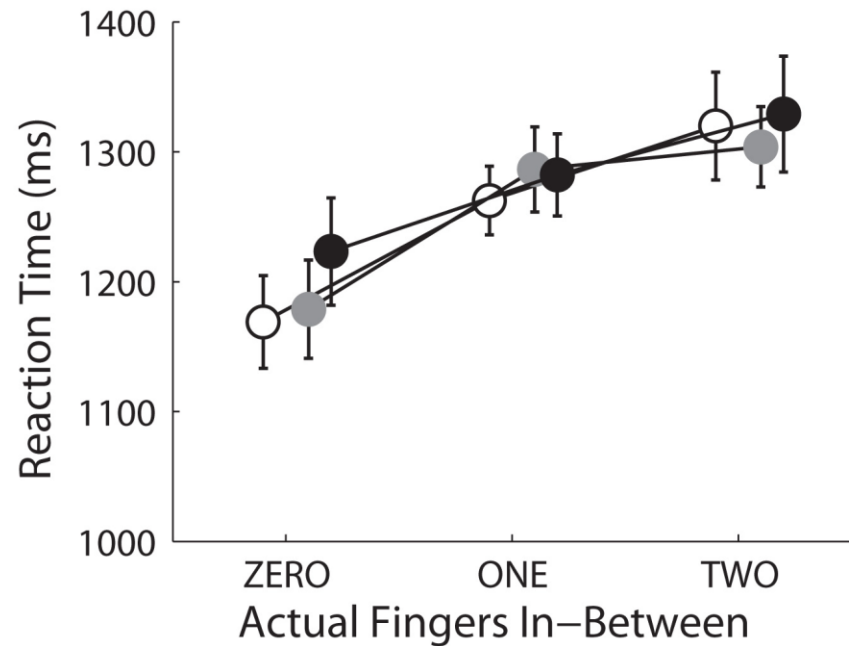
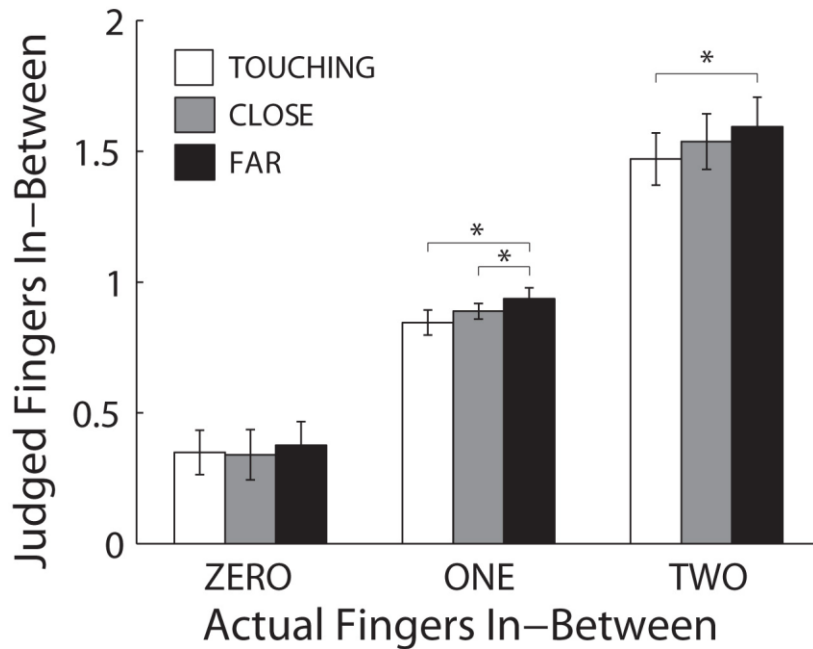
How many unstimulated fingers are
“In-Between” the two touched fingers?

N=30

Tactile stimuli: 5 ms

72 trials x 6 blocks (ABCCBA)

Results (In-Between test)



Overall underestimation of finger numerosity.

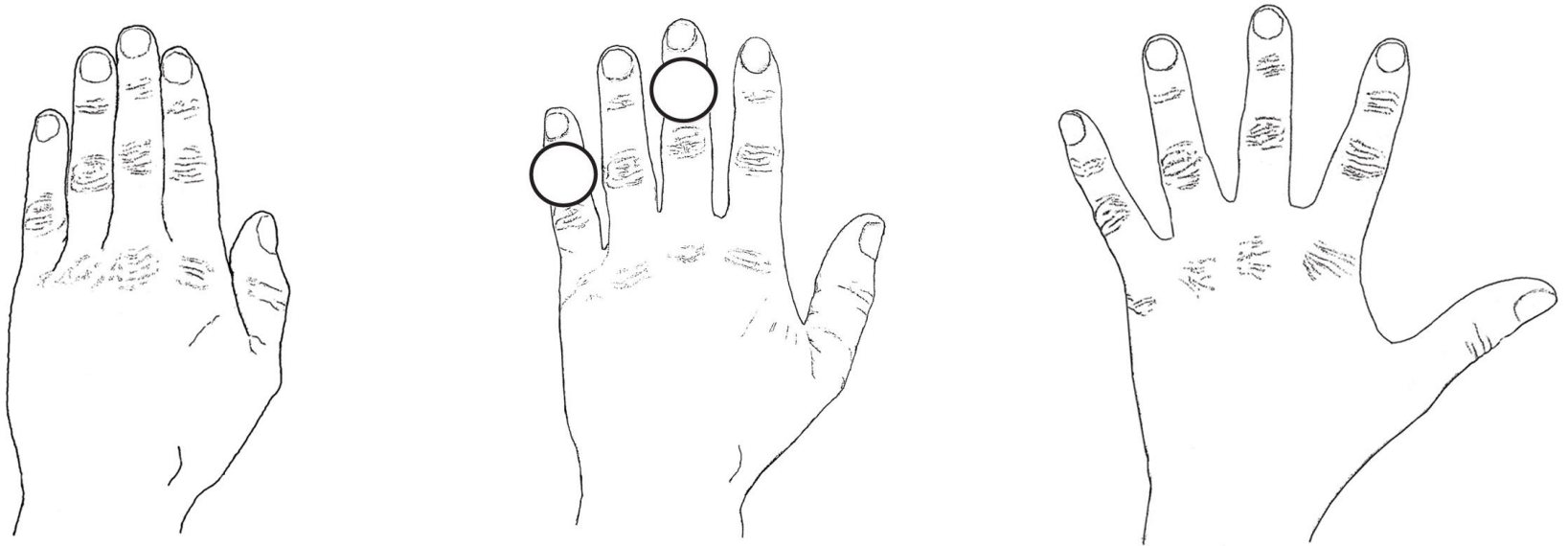
Judgements were higher when the fingers were splayed compared to when they were close or touching.

This effect was present only when tactile stimuli were presented on non-adjacent fingers.

Aim (tactile localisation task)

1. Changes in posture might have altered the representation of the fingers themselves.
2. Alternately, posture may have altered the localisation of touch.

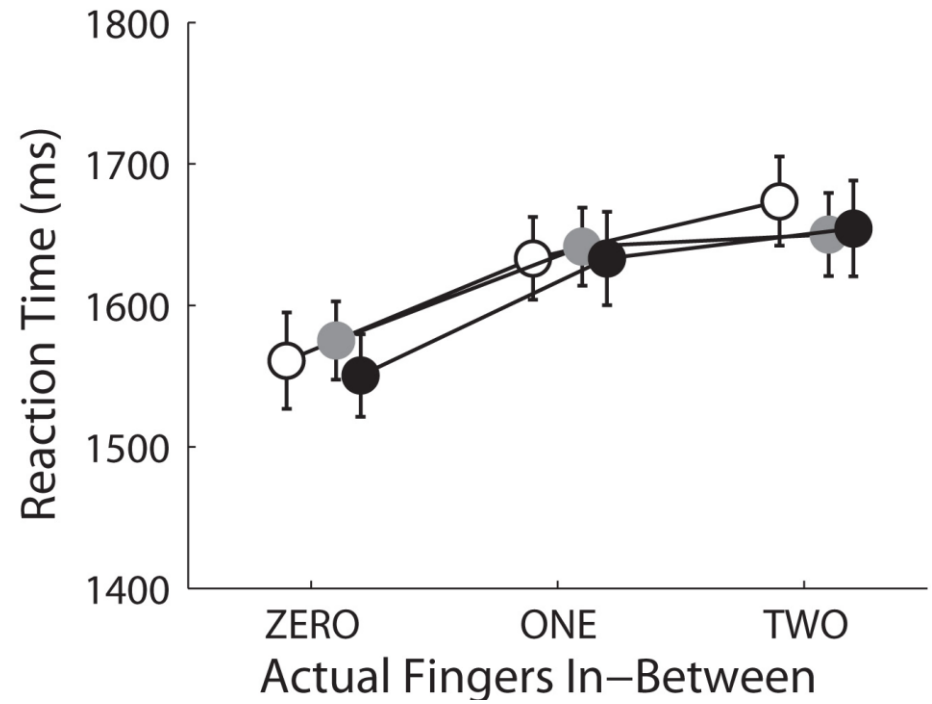
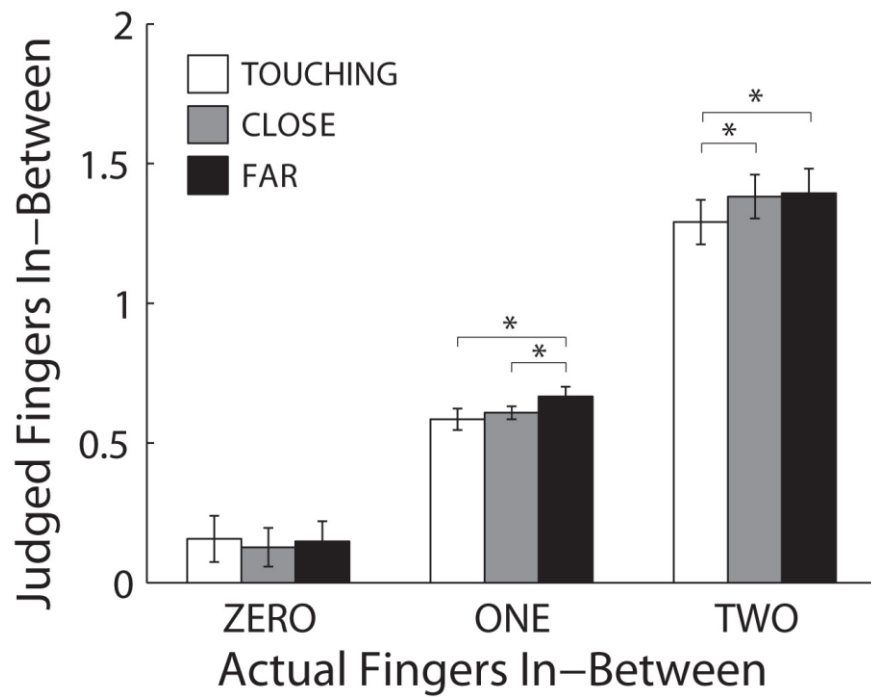
To address this question we used a tactile localisation task in which participants verbally judge which two fingers were touched.



Which fingers were touched?

N=30

Results (localisation task)



Results using the localisation task replicate the ones from the In-Between test.

Therefore, posture alters the localisation of touch on non-adjacent fingers.

Conclusion

- Body structural descriptions are not as fixed as commonly thought
- Adoption of body structural descriptions seem to be required when body parts are not directly adjacent.
- This dissociation can be attributed to the fact that normally, adjacent body parts fingers, are not supposed to change their relative position in space (physical mechanical constraints)

Acknowledgments



Prof. Matthew R Longo

Elanah Dransfield (Research Assistant at Bodylab)

Thomas Quettier (Research Assistant at Bodylab)



Thanks for your attention

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