

Protocol: Attention and body representation in Complex Regional Pain Syndrome

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Aims

- **Complex Regional Pain Syndrome (CRPS)** is a disorder of severe chronic pain in one or more limb(s) (Fig 1A).
- Altered **body representation** (Fig 1B) and **attention bias** away from the affected limb might contribute to physical symptoms. There is evidence that increasing attention to the affected side could reduce CRPS symptoms.
- Studies in healthy subjects show a **relation between body representation and attention bias**. Previous studies suggest that attention bias is predominantly present when information is presented within frames of reference that include interactions with the body or when body-related stimuli are used.
- We test this hypothesis by:
 1. **Presenting stimuli nearer versus further away**
 2. **Using body-related versus neutral stimuli**
 3. **Inducing mental rotation of body parts versus objects**

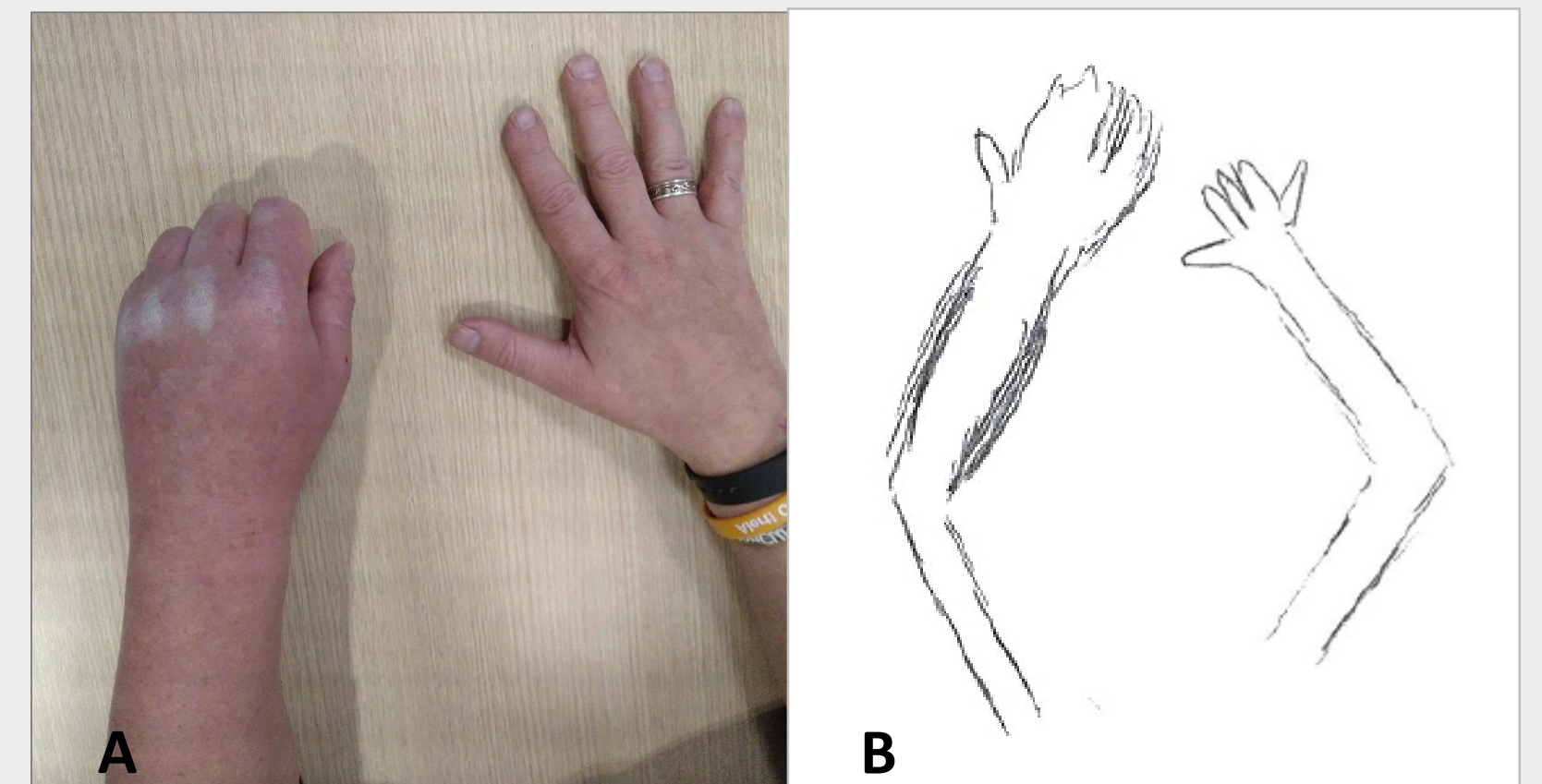


Fig 1. (A) Picture of someone with CRPS in his left hand. (B) Drawing based on description of mental image provided by someone with CRPS, showing distortions in body representation.

Participants

- **CRPS:** 20 upper, 20 lower limb
- **Other pain:** 20 upper, 20 lower limb
- **Pain-free controls:** 20 for the upper, 20 for the lower limb group

Questionnaires

- Body Perception Disturbance Scale
- Brief Pain Inventory to measure

Experimental tasks

Four behavioural tasks with eye-tracking are administered in near and far space (Fig 2).

- **Body and neutral stimuli** are used.
- In addition to task-specific measures, we compute **oculomotor attention bias** based on the first fixation direction and latency, and fixation frequency and duration. An attention bias manifests as less looking time and/or smaller saccades in the affected field.
- A **body-specific attention bias** is indicated by greater bias when scenes contain body parts versus neutral objects, when scenes include the affected/painful limb versus other limbs, and when presented in near versus far space.

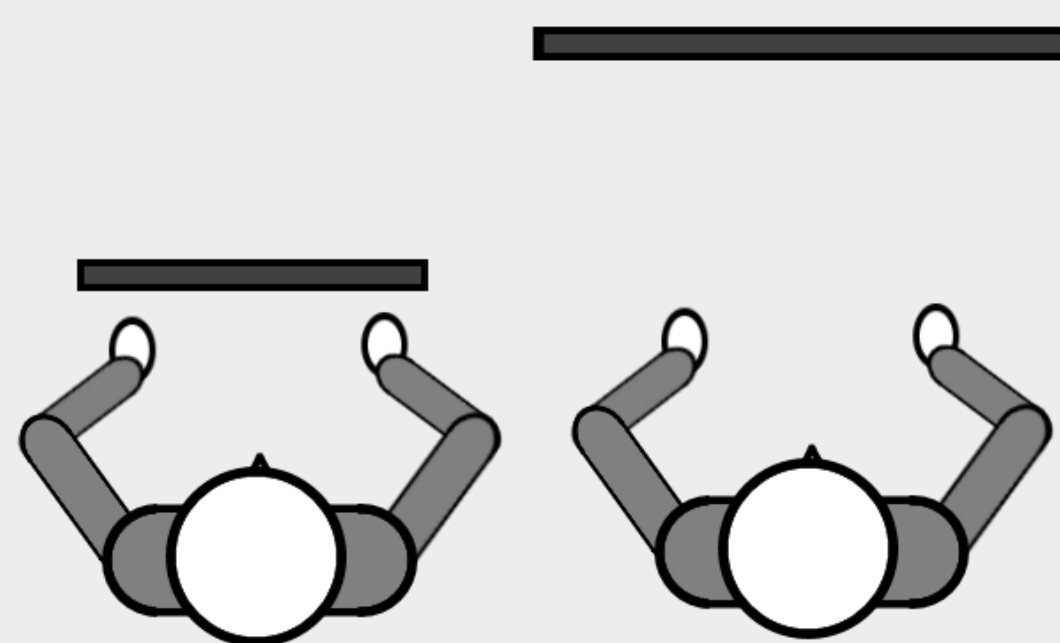


Fig 2. Near (60cm) and far space (150cm) set-up

Analysis

Bayesian Repeated Measured analyses are planned to analyse differences between groups and conditions.

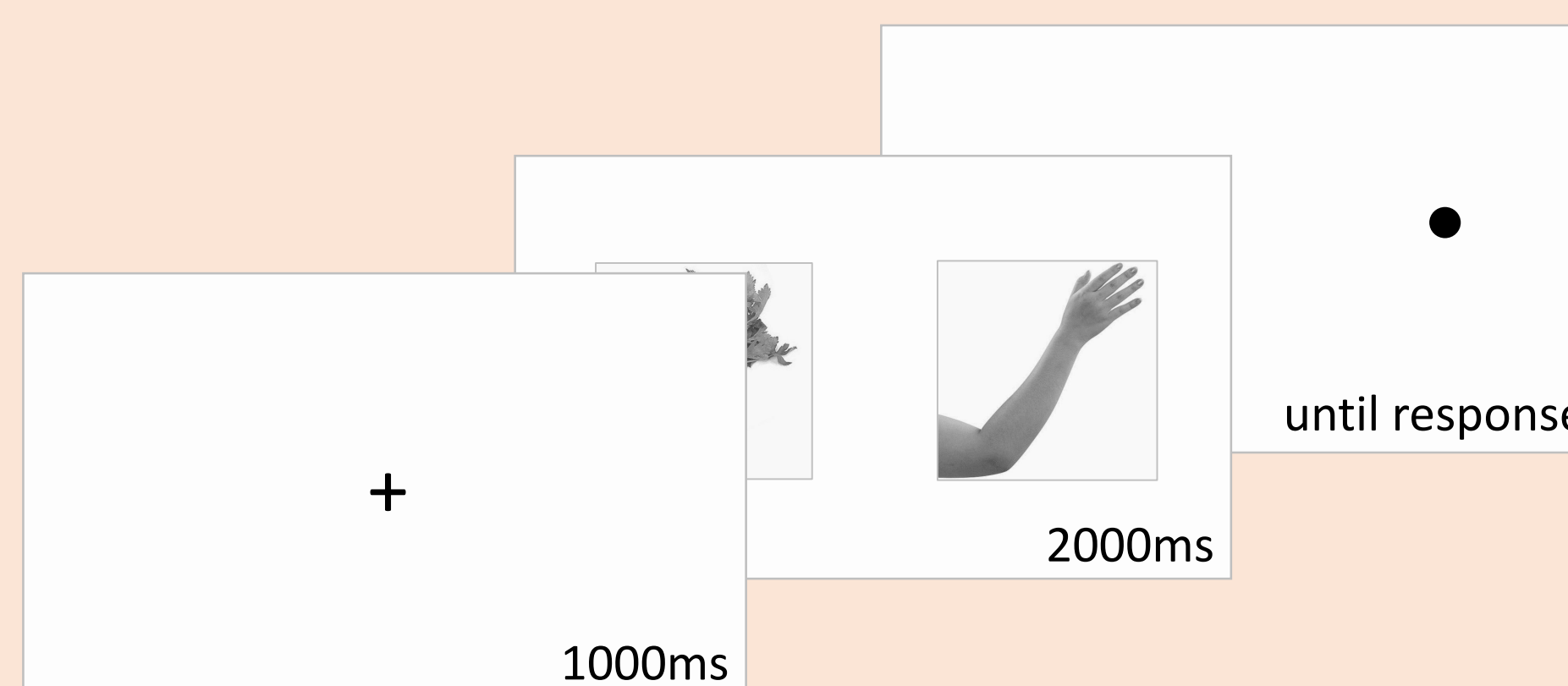


Fig 3. Dot-probe: Participants look at pictures (Fig 5) presented left and right. The pictures disappear and a dot appears left or right. Participants have to report the dot's location as fast as possible. An attention bias manifests as faster responses for the unaffected side.

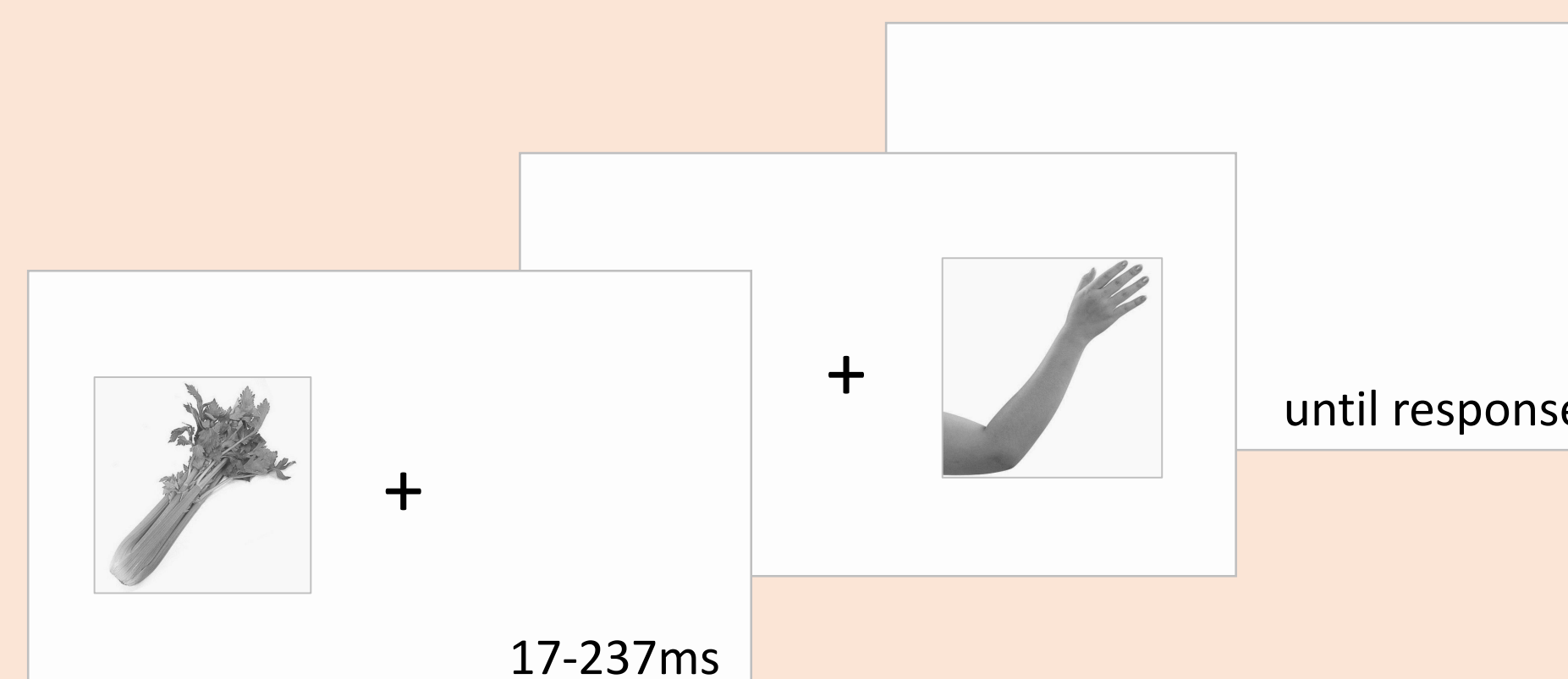


Fig 4. Temporal order judgement: Two pictures (Fig 5) are shown consecutively left and right with a 17-237ms delay in between. Participants indicate which picture appeared first (or second). An attention bias manifests as perceiving the image on the affected side as being first.



Fig 6. Cancellation: Participants find and mark stimuli arranged among distractors. The figure shows examples of templates used: body versus neutral stimuli, with and without mental rotation. An attention bias manifests as more targets found at the unaffected side



Fig 5. The figure shows examples of body, neutral, and mixed stimulus pairs that are used in the dot-probe and temporal order judgement task.



Fig 7. Free exploration: Participants look at scenes that do or do not include body parts. The figure shows a heat map of eye movements over one scene. We expect an oculomotor bias towards the unaffected side.

Discussion

This work will shed light on how and why attention bias can develop in the absence of brain injury. It will lay the foundation for attention bias to be measured clinically, and provide information about the underlying mechanisms of an emerging treatment for CRPS. Finally, it will provide theoretical insights in the interaction between body representation and spatial attention.