Methods

Participants

Four unilateral hand replant patients (mean age ± SD = 55.5 ± 5.07), three unilateral hand transplant recipients (age 41.8 ± 5.72), and fourteen controls (age 53 ± 11.09) were recruited from ?. All participants provided informed consent.For participant DR, data was collected on three separate occasions. Data was collected once for all other participants.

Materials

Localization accuracy (locognosia) to dermal stimulation was tested in the absence of target and response visual feedback using a method established by Noordenbos (1972) in which red tinted glasses prevent participants from visually discerning similarly colored spectra. In the current study a pink highlighter was used to mark target locations on the participants palm and an orange water soluble marker for the participants to indicate on their palm where they felt the stimuli.

Procedure

Participants were seated at a table in a quiet room and asked to wear the red tinted glasses. Instructions were given to keep the glasses on until the end of the session. The investigator then briefed participants on the intent of the locognosia task to test their ability in localizing tactile stimuli applied to the palmar surface of the hand. The investigator demonstrated that the pen marks are indiscernible by marking their own palm with the pink target pen. A camera positioned above the participant with top-down view of the table surface and the participants hands was used to record the session from that point. A calibration sheet consisting of fifteen randomly distributed black points (12 pt. font periods) printed on 8.5x11inch printer paper was placed on the table directly in front of the participant and they were asked to accurately mark each black dot with the orange response marker, starting from the top of the page and moving down to assure all target

dots were marked. A separate calibration sheet was completed for each hand to measure the participants base accuracy with the pen given a visible target. Participants were informed that, while potentially tempting given the lack of visual feedback, they should not use excessive force or drag the pen across the paper and that light controlled marks were ideal. This was repeated again prior to the main task. Participants were then asked to rest a hand palm side up on the table while holding the orange response marker in the opposite hand. The participant looked away as the investigator applied fifteen points on the palmar surface of the hand with the pink marker according to a predetermined schematic, see Figure 1. The participant continued to look away as the investigator applied stimuli to a single point using a 6.10 gram Semmes-Weinstein monofilament. The investigator briefly waited for any indentations or discoloration at the target site to disappear before giving a verbal cue for the participant to redirect their gaze and mark the perceived location of the stimuli with the orange pen. The participant was then asked to look away as the investigator measured the distance between the target location and the recent response to the nearest 1 mm. All fifteen points were tested in randomized order. Corresponding measurements were recorded by a second investigator. After a complete pass of all fifteen points on one hand a close up picture of the entire palm was taken next to a ruler for reference. Participants hands were cleaned with hand sanitizer which faded the marks sufficiently to ensure that future targets and responses could be distinguished by the investigator. The procedure was then applied to the opposite hand, starting with application of the pink target marks, and repeated a total of three times for each hand.

References

Noordenbos, W. (1972). The sensory stimulus and the verbalization of the response: the pain problem. *Neurophysiology studied in man, Amsterdam: Excerpta Medica*, 207-214.

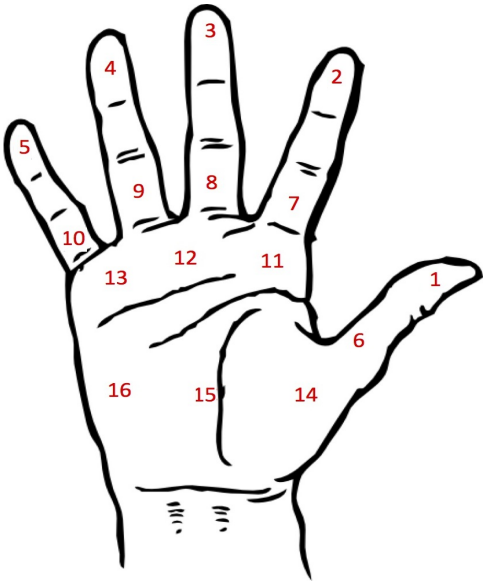

Figure 1. Template for target locations.