Proprioceptive recalibration generalizes relative to hand position

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Generalization patterns in adaptation

When we adapt movements to a rotation of the visual feedback of hand position, we change planned reach directions, and recalibrate where we feel our hand: closer to the visual feedback. How these two changes generalize speaks to the underlying error-processing.

monitor
reflective surface
touch screen
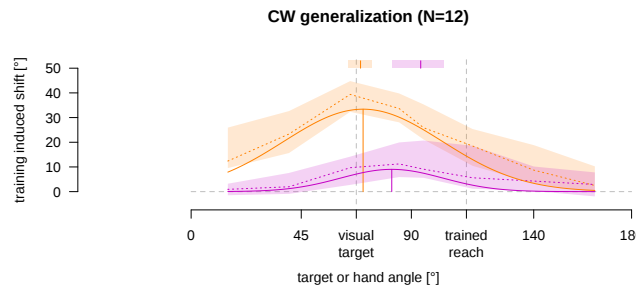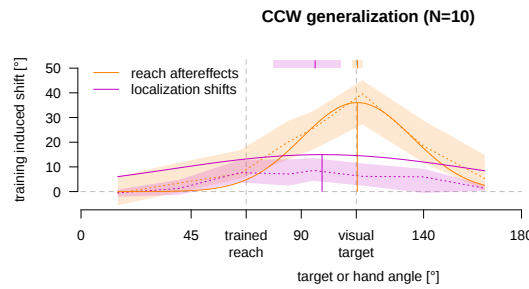
no-cursor reaches
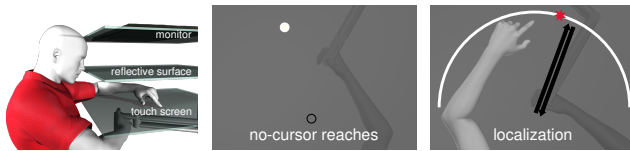
localization

In all paradigms, participants trained with a single target, with both aligned and rotated feedback, alternated with no-cursor reaches and localization.

localization shifts

exposure
classic

hand angle [°]

reach aftereffects

target angle [°]
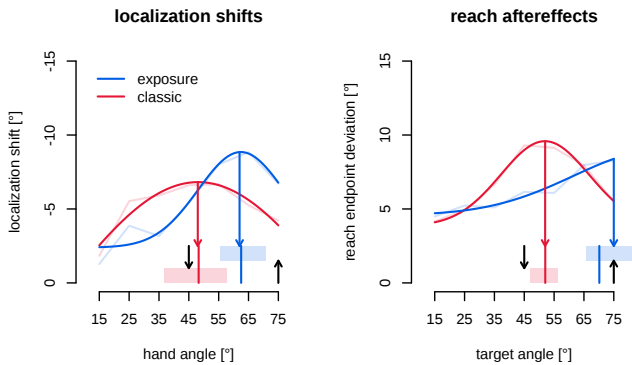
Previously, we saw active hand localization and reach aftereffects with maximum generalization at different points depending on training type (Mostafa et al., 2019). Here we compare generalization of active localization shifts and reach aftereffects within classic training.

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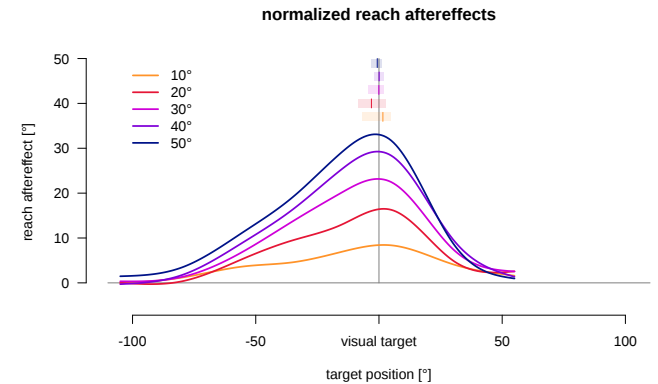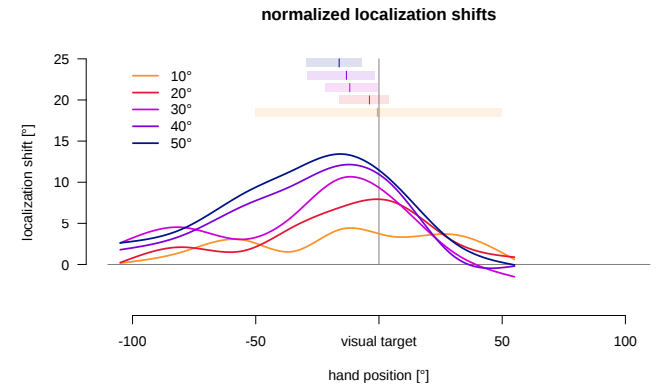## Proprioception recalibrates towards the trained hand position

In a first experiment, participants trained with an abrupt 45° rotation. Training was interleaved with test trials: open-loop reaches to one of 8 targets to assess reach aftereffects, or passive hand localization to the same targets to asses afferent-based hand localization shifts.

CCW generalization (N=10)

reach aftereffects
localization shifts

target or hand angle [°]

CW generalization (N=12)

target or hand angle [°]

In a second experiment, we test these two measures but gradually increase the rotation to 50° in steps of 10°.

localization shifts

10°
20°
30°
40°
50°

CCW (N=14)
CW (N=16)

hand position [°]

reach aftereffects
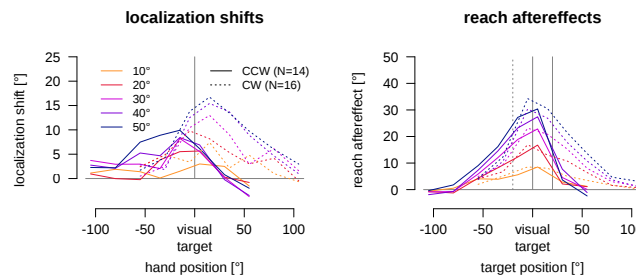
target position [°]

Proprioceptive recalibration scales with rotation and generalizes *between* trained target and actual hand position

normalized localization shifts

10°
20°
30°
40°
50°

hand position [°]

normalized reach aftereffects

10°
20°
30°
40°
50°

target position [°]

We asked people to draw where they would move their hand in order to get the cursor to a set of targets:

2   3   4   5

Sensory discrepancy; not motor error

The proprioceptive signal that is recalibrated may be the one experienced in training: where we feel our hand.