Reaching with a tool

1. Holding a tool generally changes both the location and the displacement maps.

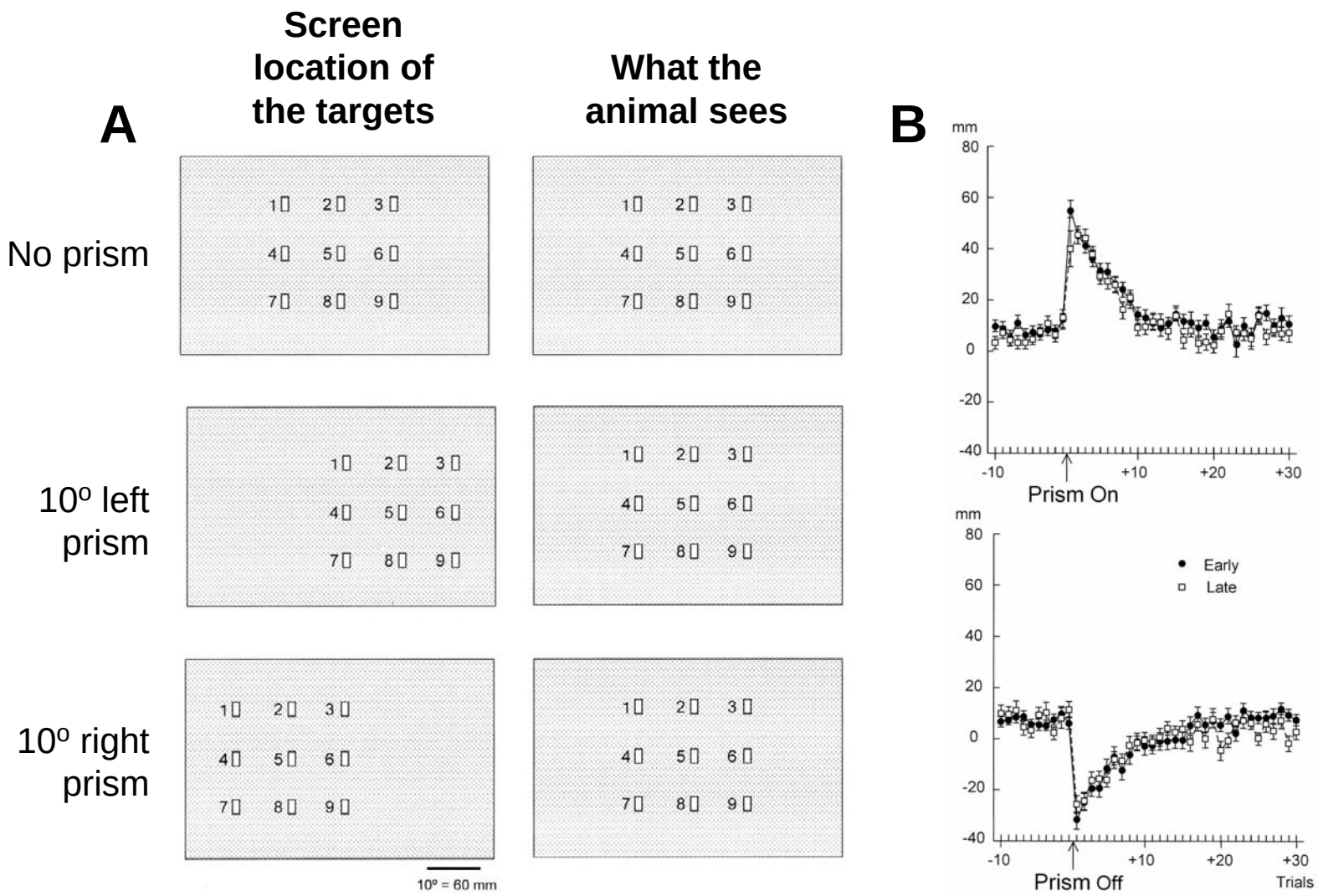
2. Moving a computer mouse involves learning a displacement map, but there may not exist a consistent location map.

Multiple location and displacement maps

Internal models as weights for the maps

Brain regions involved in representing and changing the location and displacement maps

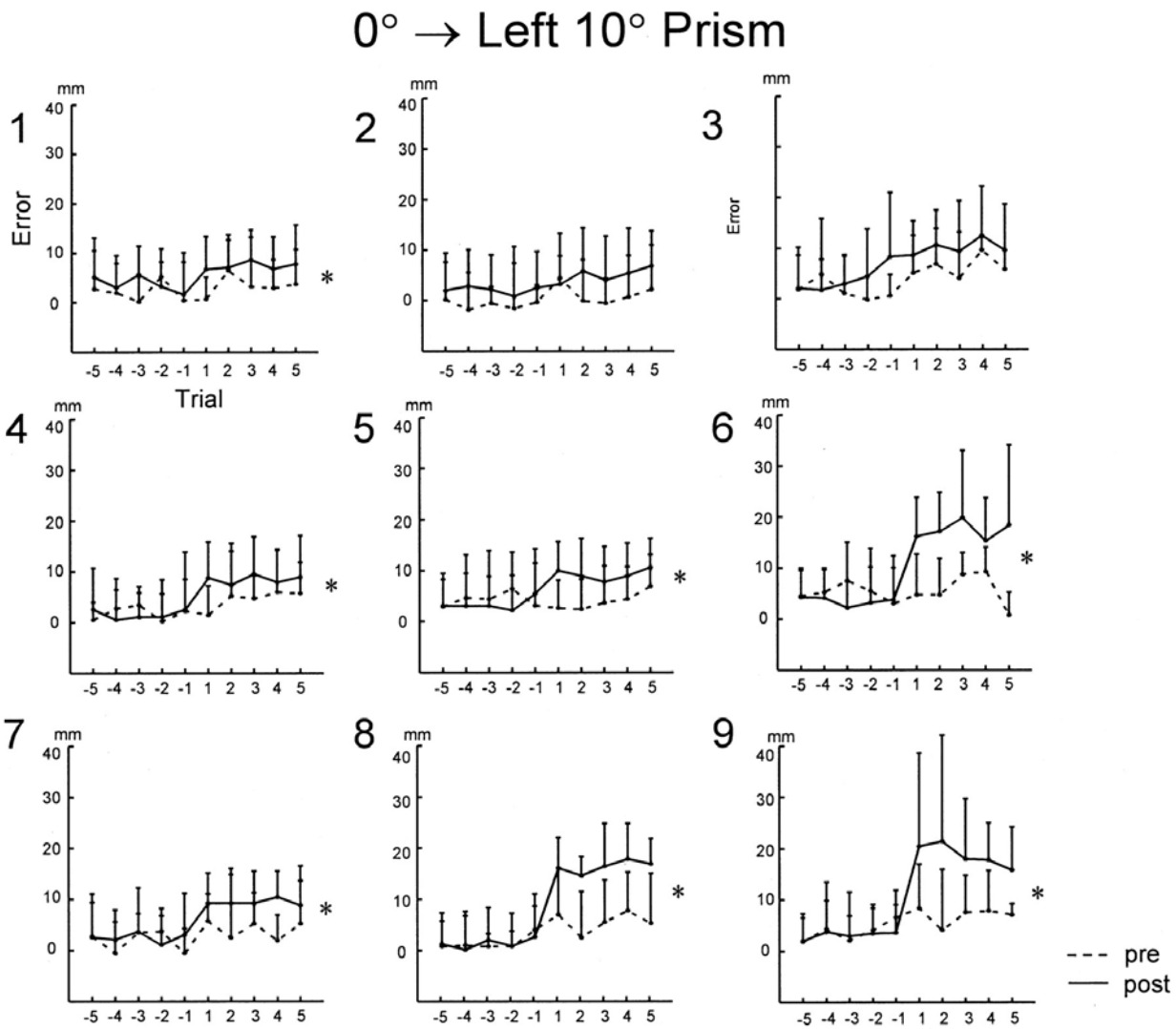
Premotor cortex, posterior parietal cortex, and the cerebellum



Prism adaptation in monkeys. **A**. Location of the 9 targets on the touch screen and the location that the monkey sees these targets when prism glasses are worn. Monkeys always reached with their right arm. **B**. Mean and SE of horizontal error in reaching movements. Early records refer to data from the first 3 months of recording and late records refer to data from the second 3 months of recording.

Kurata and Hoshi (1999)

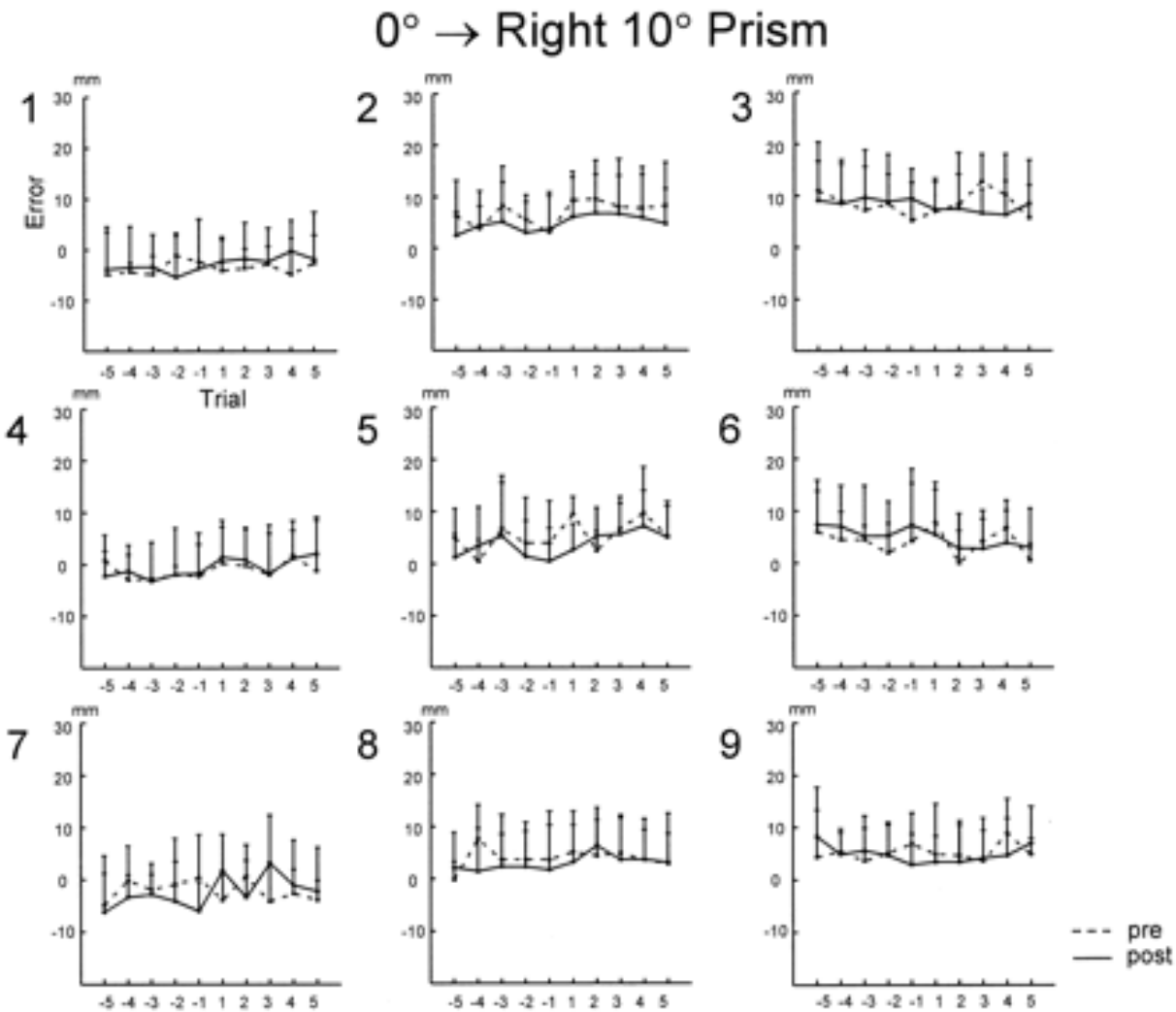
Inactivating the left PM inhibits ability to adapt to a left-shifting prism



Bin size = 5 movements

Kurata and Hoshi (1999)

Inactivating the left PM inhibits does not affect ability to adapt to a right-shifting prism



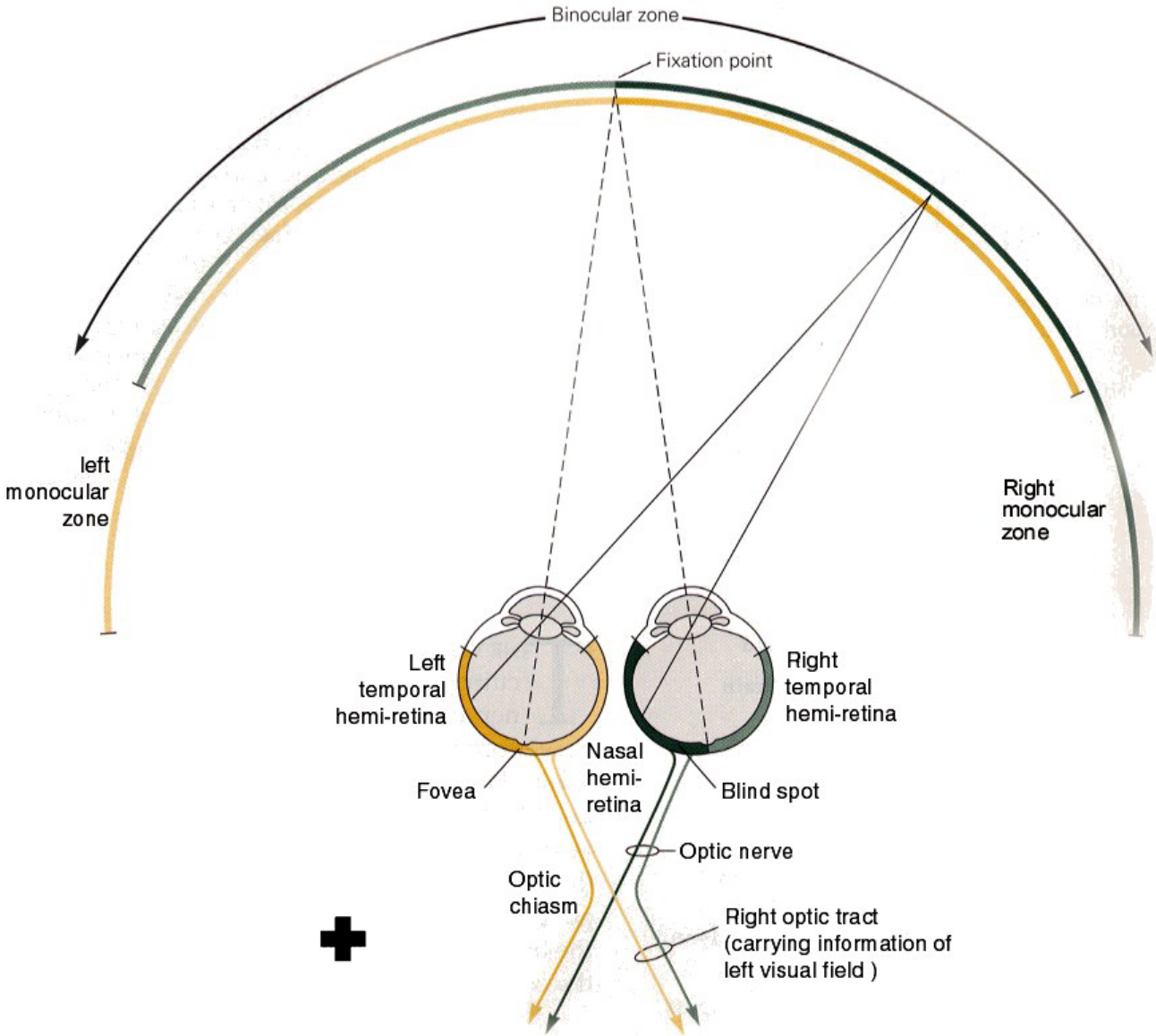
Bin size = 5 movements

Kurata and Hoshi (1999)

Space to the right of fixation is mapped onto the left cortex

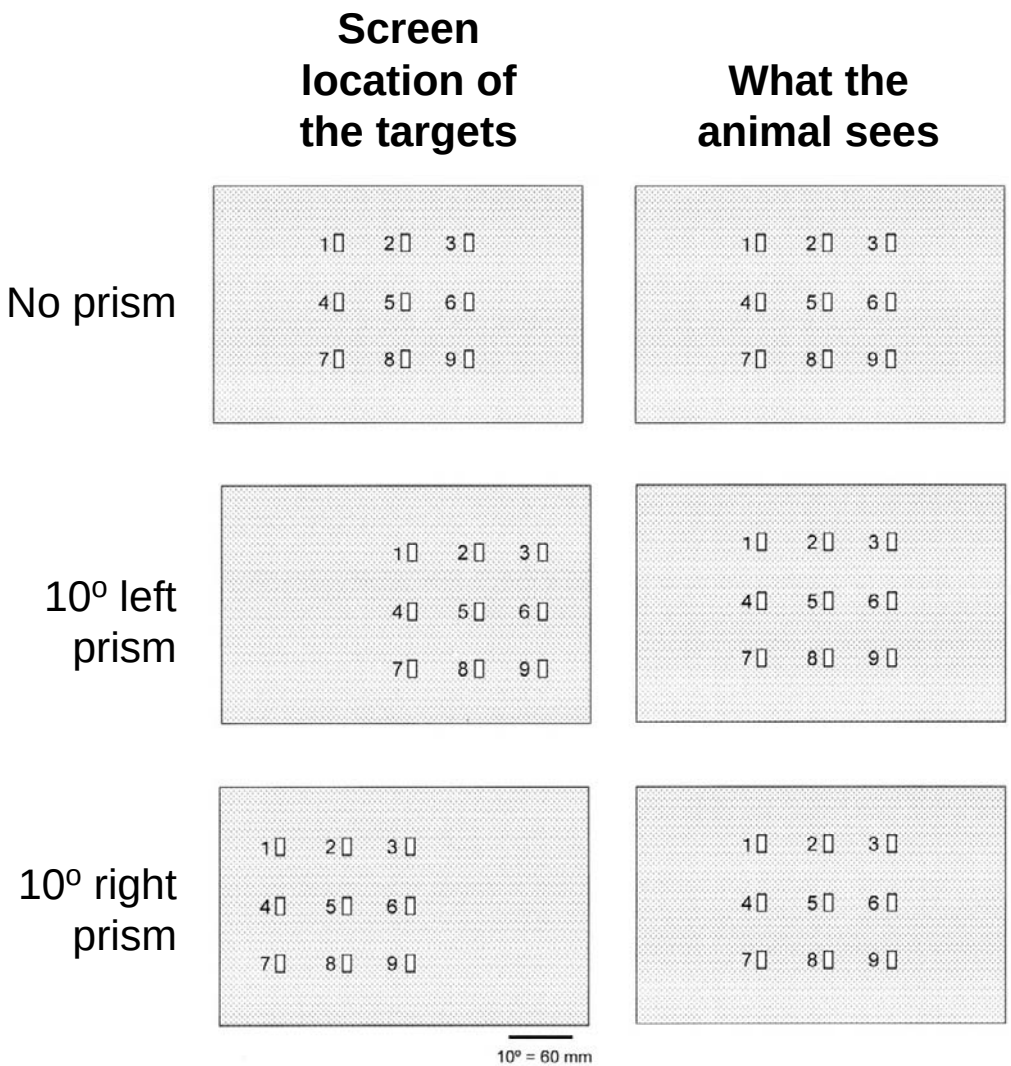
Looking at an object (fixating): image at fixation point falls on the fovea of both eyes.

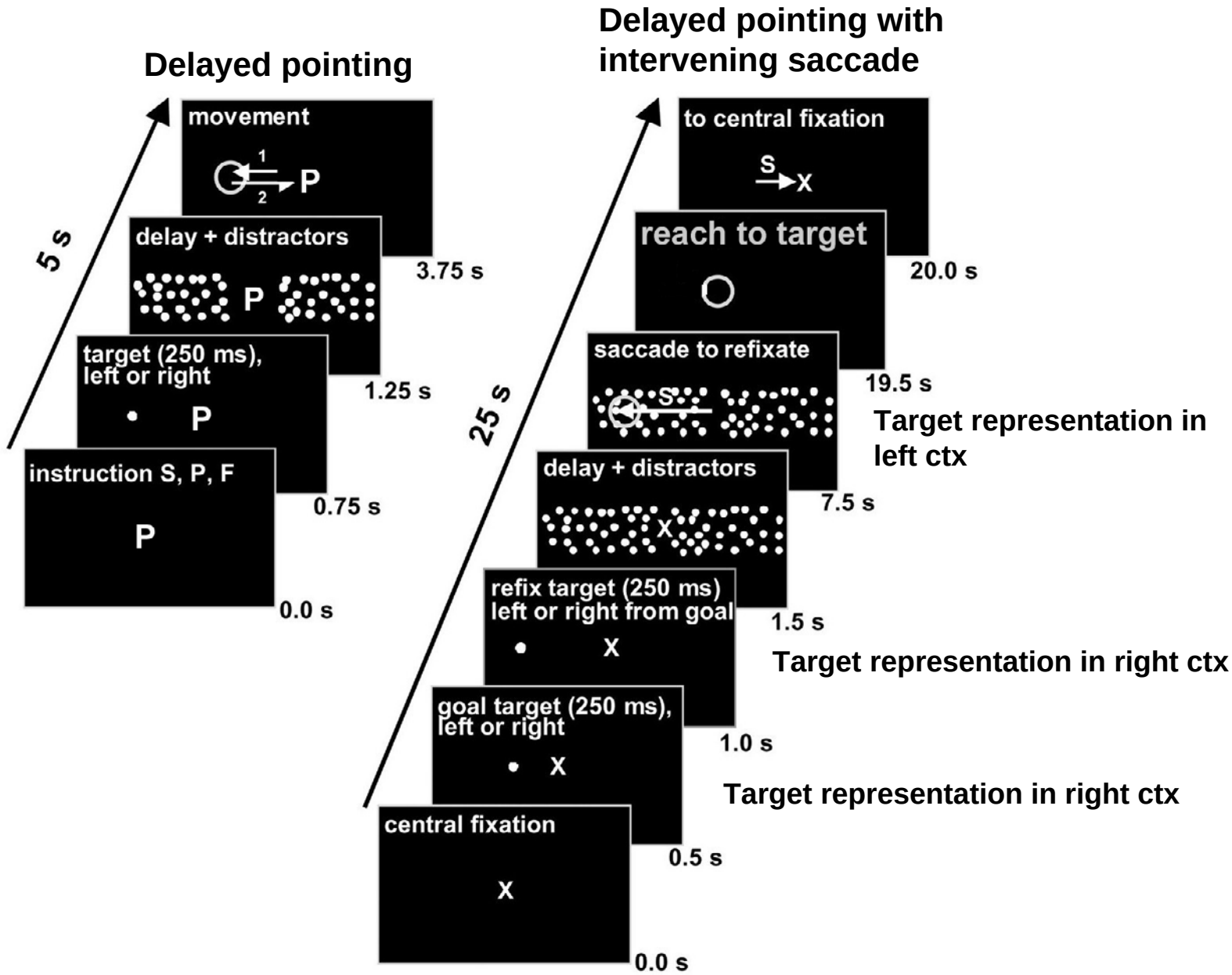
The blind spot is where the axons from the cells on the retina leave the eyes. Here there are no photoreceptors, and the brain is blind to items at this spot. Below, close your right eye and look at the cross with left eye. At about 1.5 feet away from a typical size monitor, the black circle should disappear.



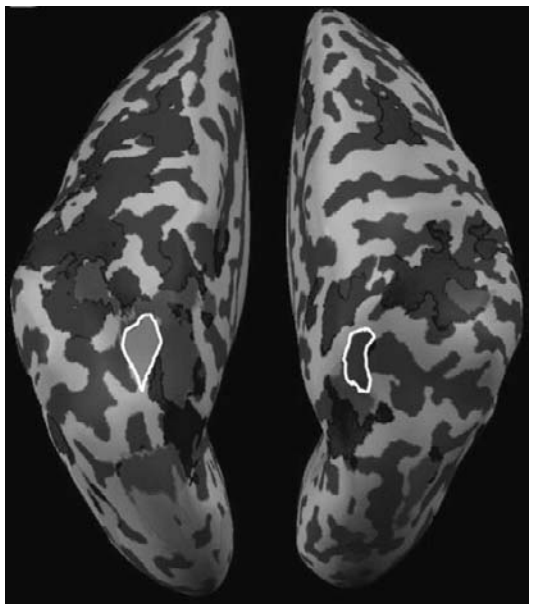
With a left-shifting prism, the hand ends up to the left of the target. The error vector points from the hand to the target.

If you are looking at your hand, this error vector falls to the right of fixation, and is processed by the left cortex.





Medendorp et al. (2003)

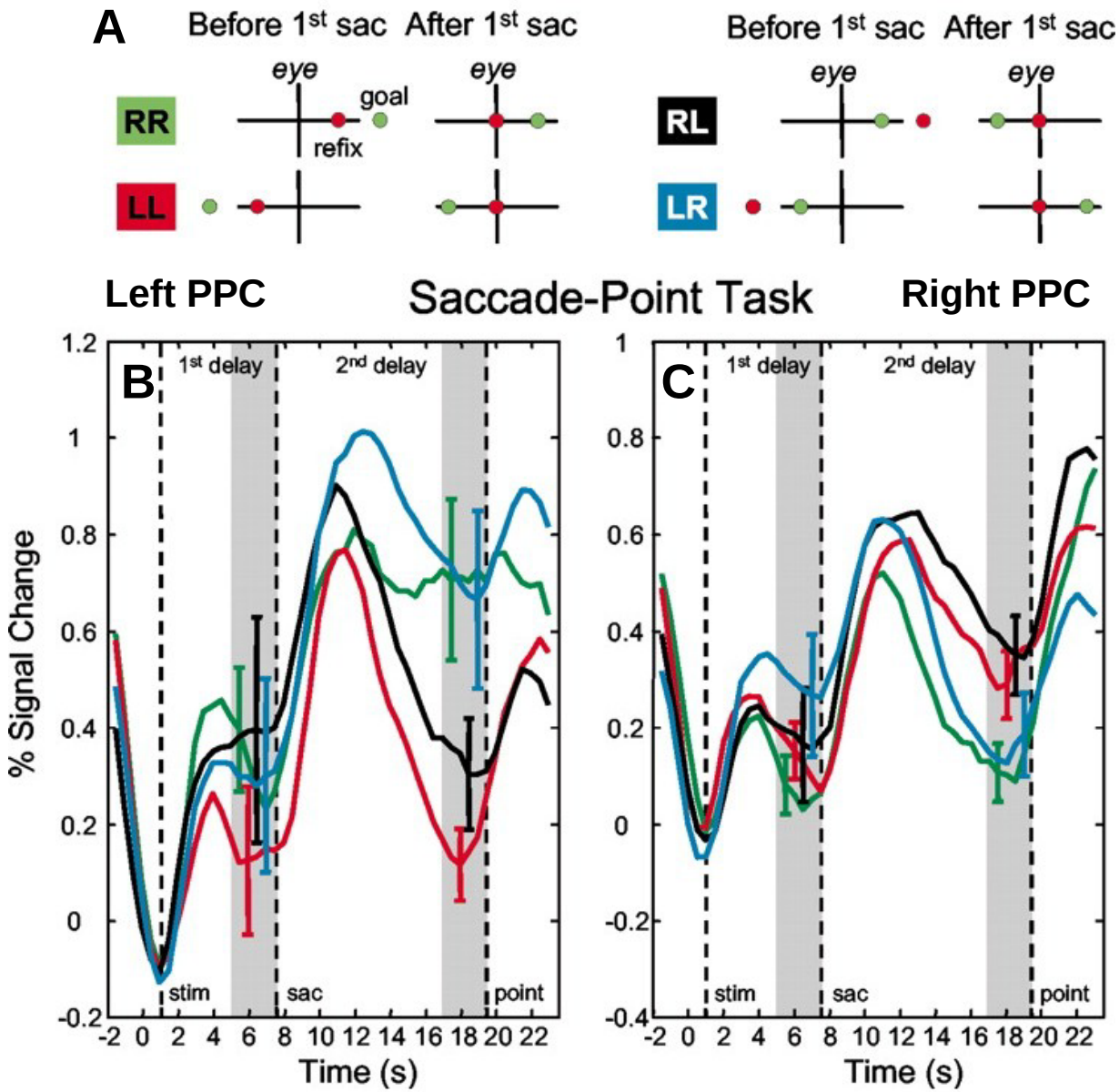


Activation area when the remembered reach target is to the right of fixation

Left of fixation

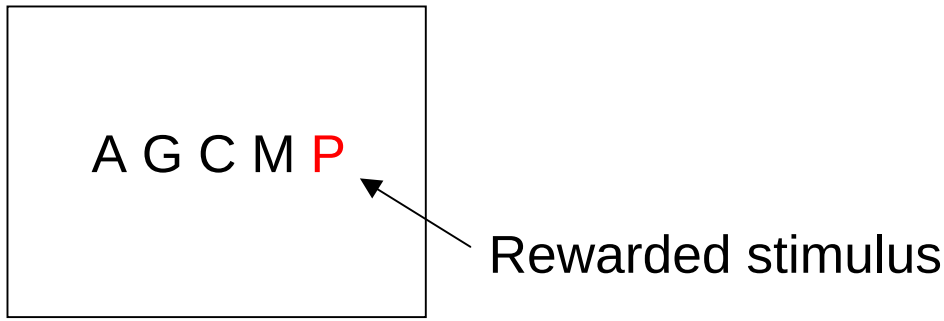
Medendorp et al. (2003)

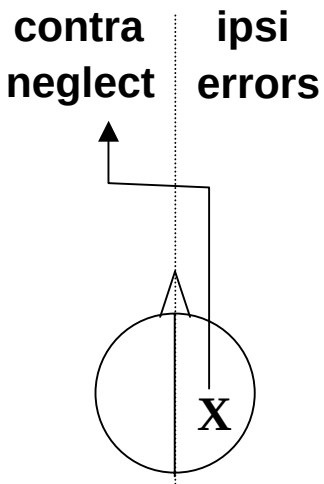
The remembered location of a target is transferred from one cerebral hemisphere to the other within the PPC. ***A***, RR, LL, RL, and LR signify four possible conditions of the intervening saccade paradigm; the first letter signifies initial location of the two targets (R, right hemifield; L, left hemifield), and the second letter refers to the remapped location of the remembered goal location. Left (*B*) and right (*C*) parietal activation (mean ± SE across 6 subjects) for each of the four conditions in the saccade–point task. SEs are plotted at the time point at which they were computed. All time courses are shifted to compensate for the fMRI hemodynamic lag. Dashed lines indicate presentation of stimuli, time of first saccade, and time of pointing, respectively. Gray areas indicate the periods over which the differences between the LR and RL condition were taken.

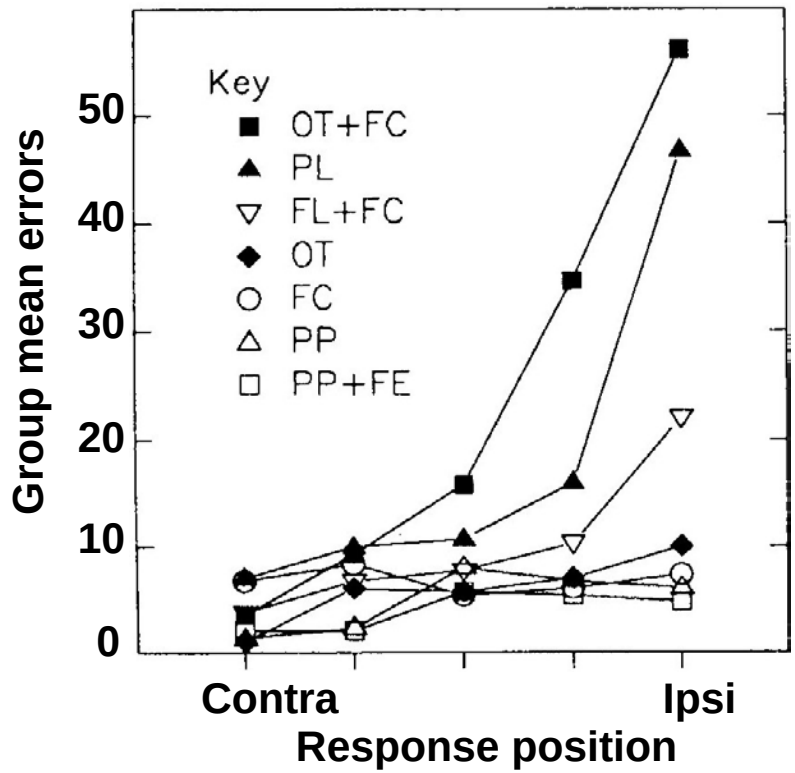


Medendorp et al. (2003)

Cortex of each hemisphere maintains a fixation-centered representation of the visible half-world contralateral to the current fixation point

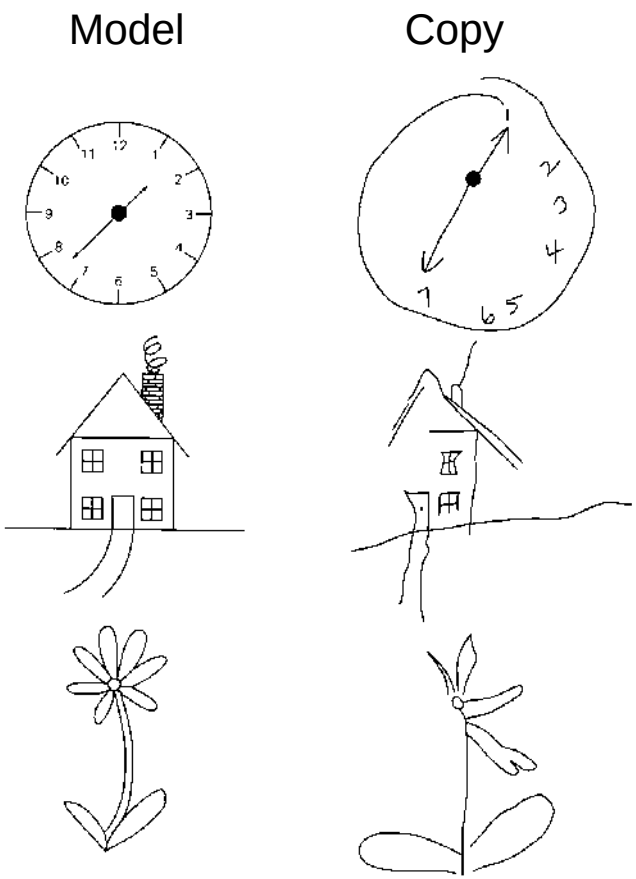


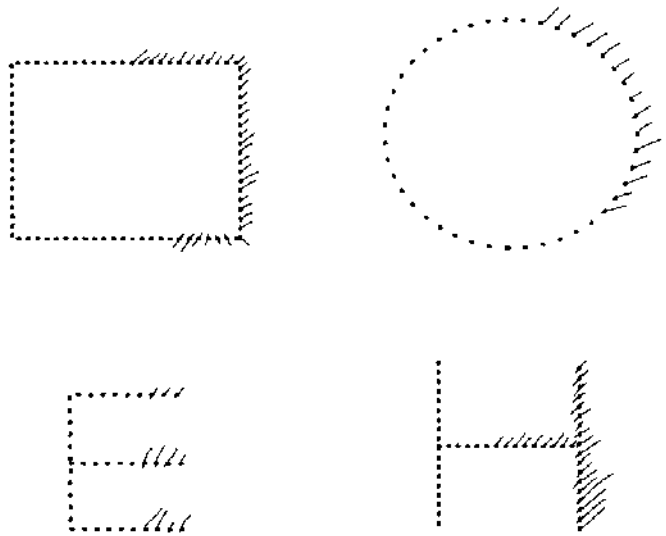




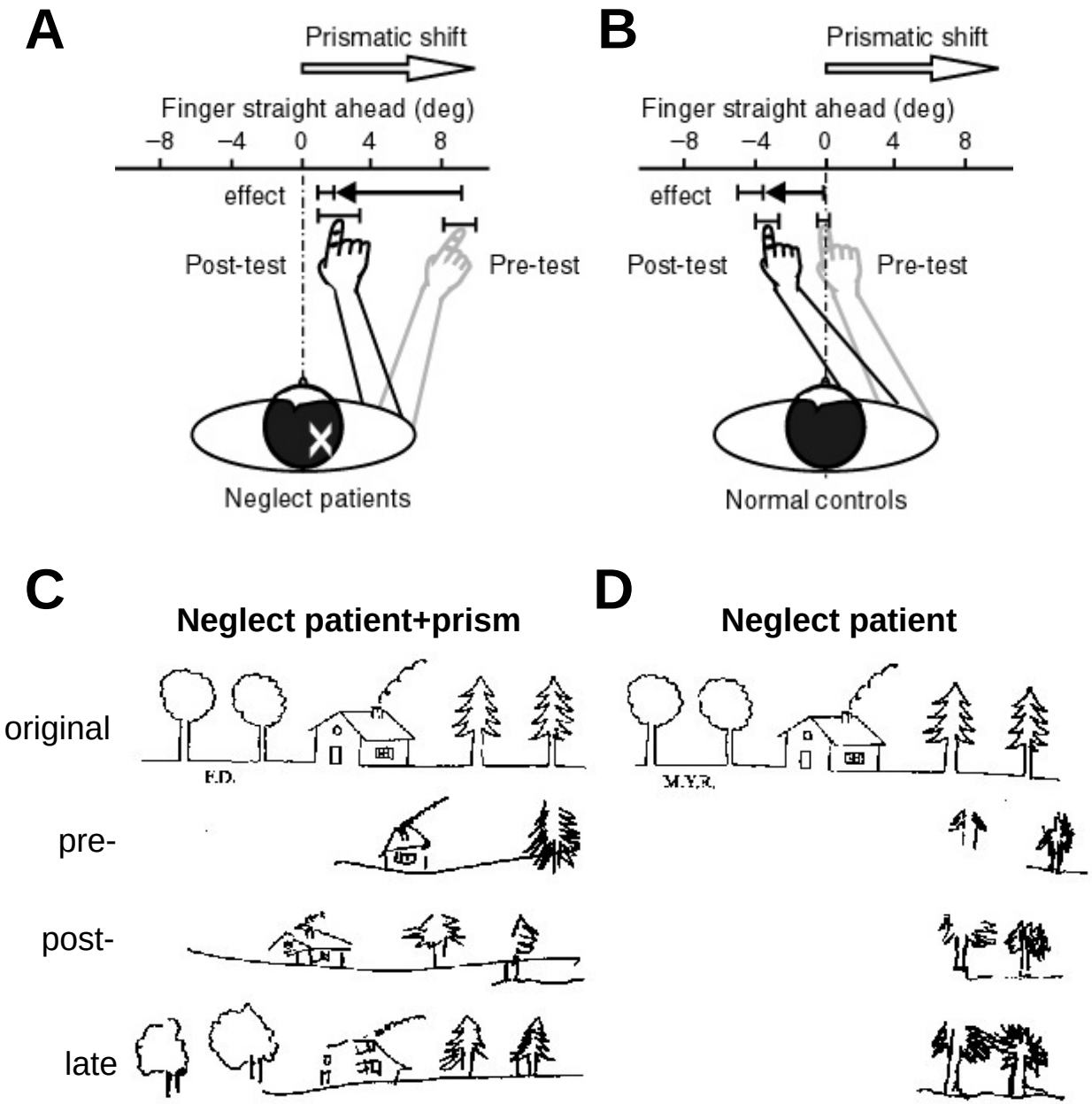
Gaffan and Hornak (1997)

Patients with PPC lesion in the right hemisphere may exhibit neglect of the left visual space





Marshall JC & Halligan PW (1995) Nature 373:521


A
Prismatic shift
Finger straight ahead (deg)
−8 −4 0 4 8
effect
Post-test
Pre-test
Neglect patients
B
Prismatic shift
Finger straight ahead (deg)
−8 −4 0 4 8
effect
Post-test
Pre-test
Normal controls
C
Neglect patient+prism
original
pre-
post-
late
D
Neglect patient

Damage to the posterior cerebellum reduces ability to adapt to prisms