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Abstract Title:	Patterns of generalization constrain the encoding of learned increases and decreases in gain of the VOR.
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Recent studies suggest that the plasticity mechanisms underlying increases and decreases in the amplitude, or gain, of the vestibulo-ocular reflex (VOR) are different (Li et al, 1995; Boyden and Raymond, 2003; Kuki et al, 2004). To obtain insights on how these mechanisms may be different, we examined the extent to which each form of motor learning in the VOR generalizes to different frequencies of head rotation. Previous studies reported that motor learning in the VOR can be relatively specific to the rotational frequency used to induce learning, and that the extent of generalization can depend on the training frequency (low vs. high) (Lisberger et al, 1983; Raymond and Lisberger, 1996; Iwashita et al, 2001). However, these studies did not systematically compare generalization of increases and decreases in gain. We trained mice to increase or decrease their VOR gain at either a low (0.5 Hz) or high (2 Hz) head rotation frequency, and measured the VOR at test frequencies of 0.5, 1, 2, and 5 Hz before and after training. Consistent with previous data, learning induced at the higher frequency tended to generalize more. Nevertheless, for both training frequencies, we found differences in the extent to which learning generalized after gain up training compared with gain down training. After training which increased the VOR gain, learning was preferentially expressed at the training frequency, suggesting relative specificity of gain increases. In contrast, gain decreases generalized more to other frequencies of head rotation: significant decreases in gain occurred at all of the test frequencies, in addition to the training frequency. These results provide evidence that, regardless of the training frequency, gain increases and decreases are encoded in distinct ways, perhaps at different synapses.

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