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Mechanisms of Perceptual Learning

Dawn M. McBride, Barbara Anne Dosher

Systematic measurements of perceptual learning were performed in the presence of external or stimulus noise. In the new external noise method [1-2], increasing amounts of external noise (white Gaussian random noise) is added to the visual stimulus in order to identify mechanisms of perceptual learning. Performance improved (threshold contrast was reduced) over days of practice on a peripheral orientation discrimination task-labeling Gabor patches as tilted slightly to the right or left. Practice improvements were largely specific to the trained quadrant of the display. Performance improved at all levels of external noise. the external noise method and Perceptual Template Model (PTM) of the observer identifies the mechanism(s) of performance improvements as due to stimulus enhancement, external noise exclusion, or internal noise suppression. the external noise method was further extended by measuring thresholds at two threshold performance levels, allowing identification of mixtures in the PTM model. Perceptual learning over 8-10 days improved the "filtering" or exclusion of external noise by a factor of two or more, and improved suppression of additive internal noise-equivalent to the stimulus enhancement-by fifty percent or more. Coupled improvements in external noise weighting. Perceptual learning may not reflect neural plasticity at the level of basic visual channels, nor cognitive adjustments of strategy, but rather plasticity at an intermediate level of weighting inputs to decision.