Probability Cuing Improves Perceptual Judgments

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Probability Cuing in Feature Space

Background:

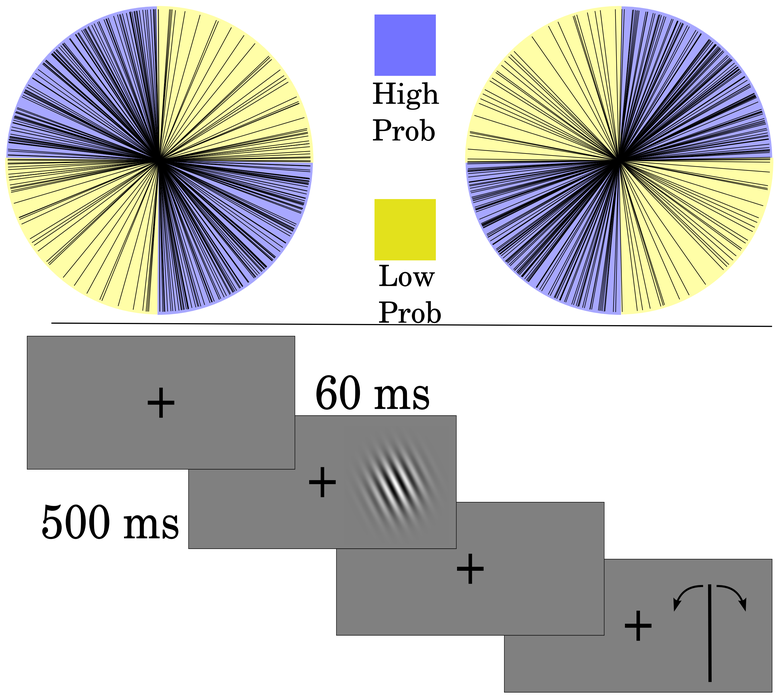
- Spatial and endogenous attentional cues are:
  - probability cues [1]
  - lead to faster and better responses [2]

Hypotheses:

- If the effectiveness of attentional cues are borne by the probability information they communicate, then,
  - probability cuing will improve response speed and accuracy
  - probability cue effects will be feature and position specific,
  - probability cue learning will be fast and malleable

References:
1. Anderson, B. (2011) There is no such thing as attention. *Frontiers in Psychology* 2:246.
2. Anderson, B. & Druker, M. (2013) Attention improves perceptual quality. *Psychonomic Bulletin & Review*, 20:120.

Orientation Judgments of Biased Displays



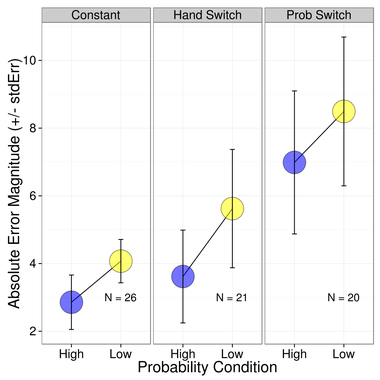
Experimental Specifics

Experiment 1 ("Constant" n = 26):
- Equal probability L/R and all angles (aggregated)
- L tilt on L and R tilt on R (or vice versa) 4:1.
- Manual adjustment of "meter" using keyboard.
- Half participants used R hand other half L hand.
- Five blocks (150 trials each).

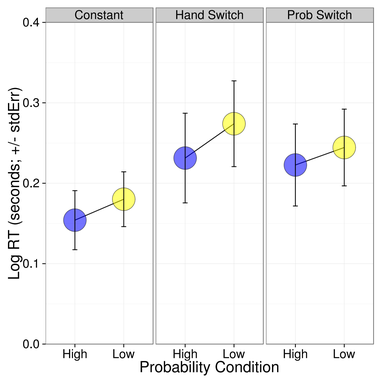
Experiment 2 (Hand Switch n = 21):
- Same as "Constant" except,
  - Four blocks 150 trials each
  - After Block 2 participants switched responding hand

Experiment 3 (Probability Switch n = 20):
- Same as "Constant" except,
  - Four blocks 150 trials each
  - After Block 2, high probability tilt directions switched sides.

Probability Cuing: Faster, More Accurate



Average errors for high and low probability ranges for all three studies. Anova shows a marginal effect of study ($p = 0.1$;$F(2,64) = 2.3$) and a significant effect of probability condition with $p < 0.001$ ($F(1,64) = 17.7$), and with no interaction.



Response are faster for high probability stimuli. Anova shows no effect of study and no interaction. The probability condition is significant at $p < 0.001$ ($F(1,64) = 20.4$).

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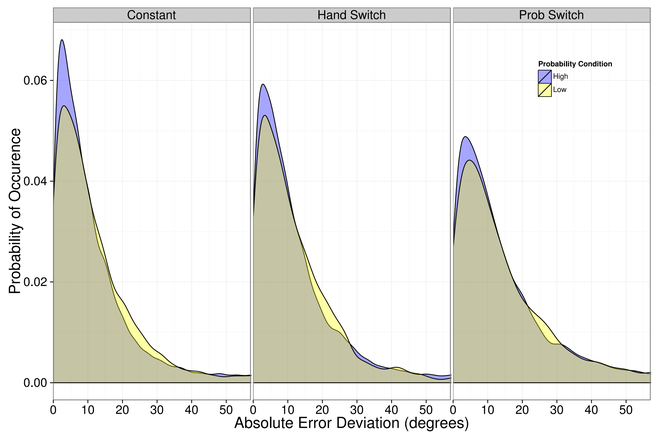
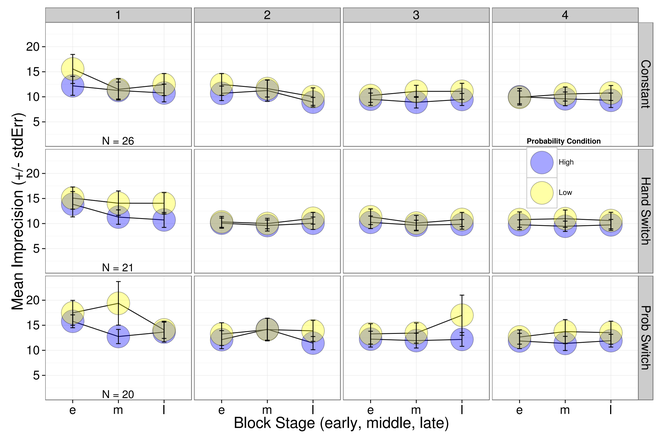
Probability Cuing Improves Precision



Precision improves for probable stimuli. This figure shows the distributions of error for each study pooled across participants. The effect was evaluated with an Anova. There was a significant effect of experiment ($p = 0.003$, $F(2,64) = 6.4$), probability ($p = 0.05$, $F(1,64) = 3.8$), and an interaction of precision `x' study ($p = 0.01$, $F(2,64) = 4.5$).

Probability Updating is Relatively Fast



To calculate how quickly the high probability advantage developed, we plotted the precision for each third of each block stage (50 trials per stage:150 trials per block:4 blocks per study). All studies showed advantages for high probability trials within the first 50 trials. The lower row shows the study where probability was switched. An advantage for the new high probability orientations, appears relatively quickly.

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