# Viewing time account of spatial cueing and performance-based rewards

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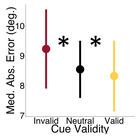
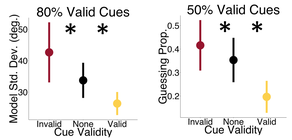
## Why?

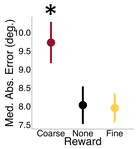



Valid cues improve orientation judgment median, absolute errors.[1]

**Is this because they communicate importance?**

Work demonstrating differential effects of cue probability support this hypothesis.[2]

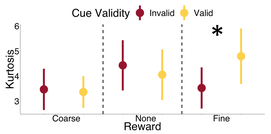



Reward is another mechanism that communicates importance and reward effects have been shown to be similar to those of cueing.[3]

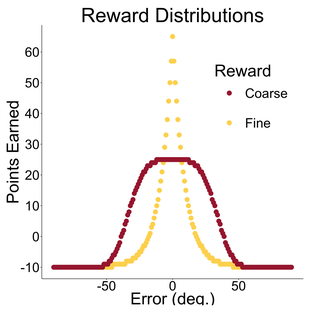
**What if reward and cueing are manipulated in the same task?**

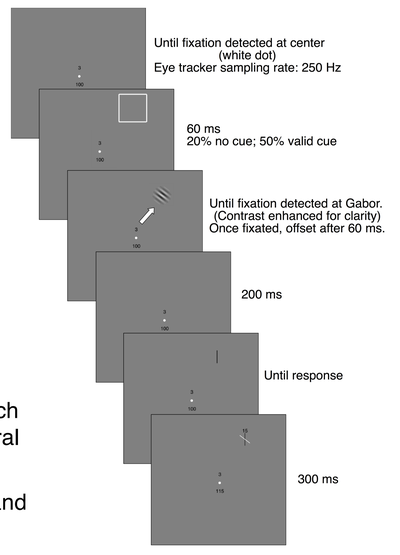
Prior work has show it is possible they interact to affect response distribution shape (kurtosis).[3]




**Research Question: Can changes in the efficiency with which sensory information is evaluated result in increased available viewing time for transient stimuli, thus accounting for these results?**

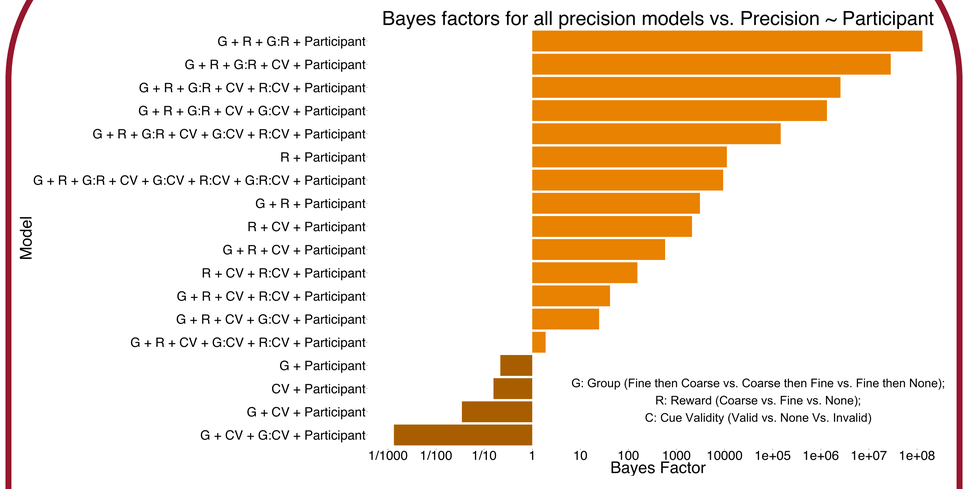
## Procedure

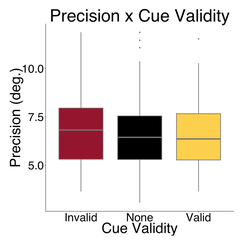


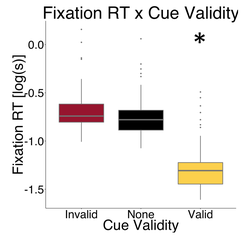



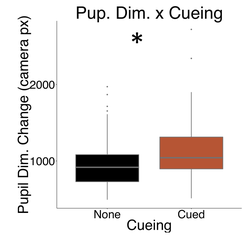

- Top 20% won a chocolate bar
- Top 10% won $5.00
- Percentile position updated after each response and displayed above central fixation.
- Reward distributions were blocked and counterbalanced between-subjects

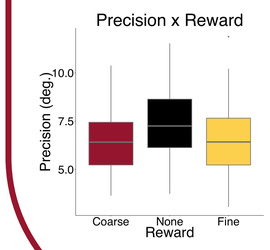
## Results

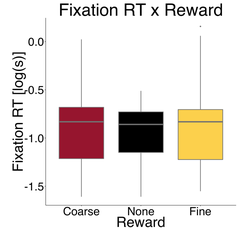




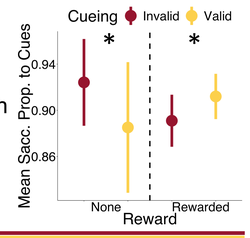
∗ = statistically significant

## Spatial Cueing

- The most preferred model according to the Bayes Factor analysis included no effects of cueing.
- Effects of cueing on precision (median, absolute error) were eliminated with fixed viewing times.
- This cannot be explained by an ineffective cue as fixation response times were faster on valid trials and there was a detectable pupillary response to cues.
- These results can be accounted for by increases in visual search efficiency with valid spatial cues: visual search is more efficient when target locations are known and this affords more time to consolidate the stimuli into memory.

## Reward

- Reward effects did not parallel attentional effects suggesting that reward and attention are different.
- Reward may affect vigilance instead of visual search efficiency as suggested by the observation that saccade bearings towards valid cues were more frequent when participants earned rewards.




## Summary

**Spatial cueing effects are eliminated when viewing time is fixed suggesting that visual search is more efficient when target locations are known and this affords more time to consolidate the stimuli into memory when it appears for a fixed duration.**

**Reward effects were different from attentional effects suggesting it may not be accurate to describe reward effects as effects on attention. Further, the frequency of irregular saccade angular bearings toward spatial cues was greater on invalid trials for the rewarded conditions, but was greater on valid trials for the no reward condition providing some evidence that reward may increase vigilance to valid cues.**

Britt Lab Website

Connect with Christie

[1]Anderson, B. & Druker, M. (2013). Attention improves perceptual quality. PB&R; [2]Haskell, C. R. M. & Anderson, B. (2016). Attentional effects on orientation judgements are dependent on memory consolidation processes. QJEP; [3]Haskell, C. R. M. (2016). Ph.D. Dissertation. University of Waterloo