Observers dynamically adapt perception in a changing environment
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Introduction
Expectations inform perception. Surprising observations degrade performance in visual detection¹.
However, people update their expectations when exposed to a surprising observation².

Research question: How do observers update their expectations when perception is degraded by surprise? Does perceptual performance evolve over the course of the experiment as participants learn to expect changes?

Methods
Peripheral stimuli presented at random locations drawn from a truncated normal distribution around a mean

![Peripheral stimuli](image)

Trials in runs of 10-20 trials, each run has a new mean, so location on first trial within a run is surprising
Participants monitor for a contrast change at periphery and for a grey ring around fixation
Change in distribution triggers surprise and updating²,³

Decayed changepoint probability can quantify changes in distribution.

Analysis and Results
Observations with higher changepoint probability lead to worse perception³. We calculated a decayed changepoint to ask whether this effect decreased as participants learnt to expect change.

![Decayed changepoint probability](image)

Decayed changepoint probability performs better than unaltered changepoint probability

model <- glmer(hitrate ~ decayedCP + latency + (1 + decayedCP | P), data=data, family=binomial)

Discussion
Hitrate decreases with increasing changepoint probability. Decayed changepoint probability predicts hitrate better than raw changepoint probability.

People have worse perception of unexpected observations, but adapt perception to lessen the negative impact of a changing environment.

Participants learn to expect changes in the mean of a Gaussian distribution and can use this knowledge to be less hampered by the changes. Future research may ask the extent to which poor perception necessitates poor learning.

References