Abstract
While feedback is clearly crucial for learning, most models of category learning say nothing about what underlies the processing of feedback information. How people process feedback information makes a difference to how they learn: Watson and Blair (2008) found that time spent on feedback in just the first 10 trials predicted whether a participant was more or less likely to become a learner. We present two category learning experiments with varying category structure difficulty that manipulated the duration of feedback on each trial (1 second vs. 9 seconds), and analyze measures of learning and attention among learners.

Methods

Experiment 1

- Feature 1, Feature 2, Feature 3
- Category (A1, A2, B1, B2)

"Complex" category structure. Feature 2 and Feature 3 relevance depends on Feature 1 value.

Procedure
Procedure was similar for both experiments. Participants were asked to classify stimuli (designed to look like micro-organisms) based on three features for a maximum of 264 trials. Each trial consisted of four phases: 1) fixation cross, 2) stimulus presentation, 3) category selection, 4) feedback.

Experiment 2

- Feature 1, Feature 2, Feature 3
- Category (A1, A2, B1, B2)

"Simple" category structure. Category depends only on features 1 and 2. Value of Feature 3 is always irrelevant.

Dependent measures of interest
- Fixation Duration -gaze data collected with Tobii eye trackers -sampling at 120 Hz precision, 0.5° visual angle -fixations aggregated from raw data using method from Salvucci & Goldberg (2000)
- Criterion Point -measure of learning: indicates point at which participant has learned the structure -in these experiments, set to 9 correct responses in a row

Results
Because category structure had no effect on learning, results from both experiments were combined into one model.

Using a linear mixed effects model, using individual subjects as grouping factors, we show a substantial effect of feedback duration on fixation duration (p < .05). We were interested in this because our experiment designs changed the intertrial interval, which is known to affect value calculations mediating fixation durations and saccadic velocity. (Haith et al. 2012)

Criterion points and feedback duration
Across both experiments, subject criterion points were related to their feedback condition (p < .05 using a Wilcoxon rank sum test). Those in the longer condition (9s) tended to learn the category structure earlier than those in the shorter condition (1s). This is consistent with the finding by Bourne et al. (1965) that learning improves and then declines with increased feedback time, with the optimal duration at 9 seconds for simple tasks.

References

Summary
- As demonstrated by Bourne et al. (1965), people learn faster when given more time to look at feedback. Our criterion point results support this—participants in the 9s feedback condition showed earlier criterion points in both experiments.
- Overt attention (as measured by eye fixations) was affected by feedback duration. Fixation durations were longer for participants in the 9s feedback group.
- Watson and Blair (2008) predict learning from fixation durations during the first ten trials. In these experiments, we did not compare learners with non-learners. However, among learners, fixation durations did not predict criterion point. That is, time spent looking at feedback in the first 10 trials did not predict how quickly participants could learn.

Research Questions
1. How do differences in feedback duration correspond to differences in learning?
2. How do changes to feedback duration affect attention?