Feature-Label-Ordering

a pre-registered Bayesian replication using MTurk

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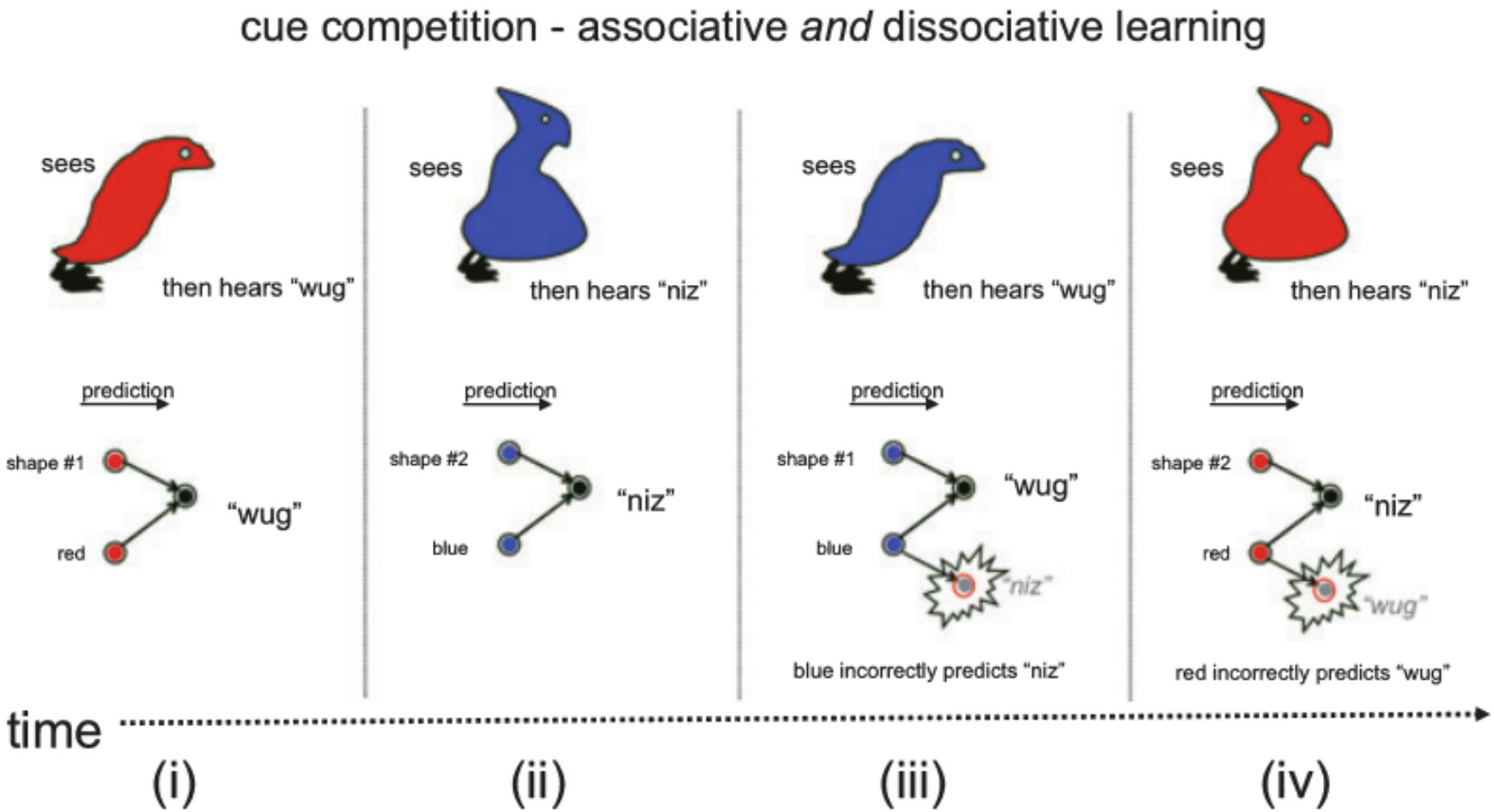
Gregory: "Is there any other point to which you would wish to draw my attention?"
Holmes: "To the curious incident of the dog in the nighttime."
Gregoy: "The dog did nothing in the nighttime."
Holmes: "That was the curious incident."

Error-driven learning

$$V_{ij}^{t+1} = V_{ij}^{t} + \triangle V_{ij}^{t}$$

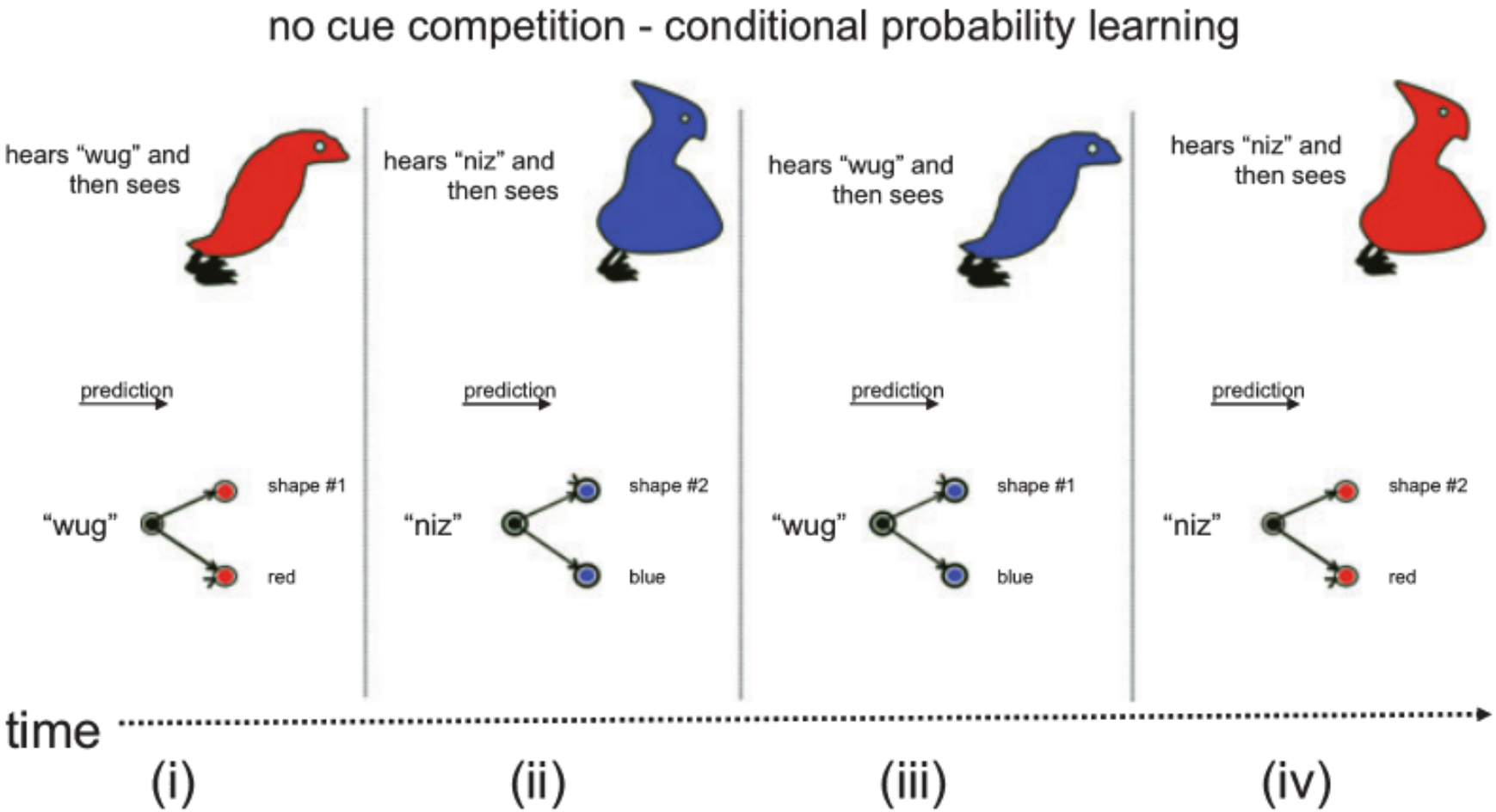
$$\triangle V_{ij}^{t} = \begin{cases} 0, & \text{if ABSENT}(C_i, \text{t}) \\ \alpha_i \beta_1 (\lambda - \sum_{\text{present}(C_j, \text{t})} V_{ij}), & \text{if PRESENT}(C_j, \text{t}) \text{ \& PRESENT}(0, \text{t}) \\ \alpha_i \beta_2 (0 - \sum_{\text{present}(C_j, \text{t})} V_{ij}), & \text{if PRESENT}(C_j, \text{t}) \text{ \& ABSENT}(0, \text{t}) \end{cases}$$

FL-learning vs. LF-learning[1]

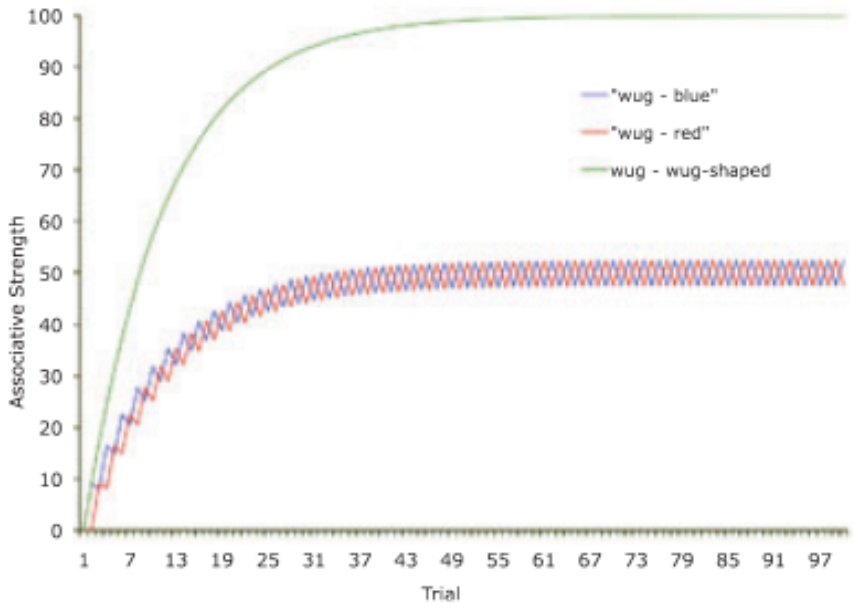


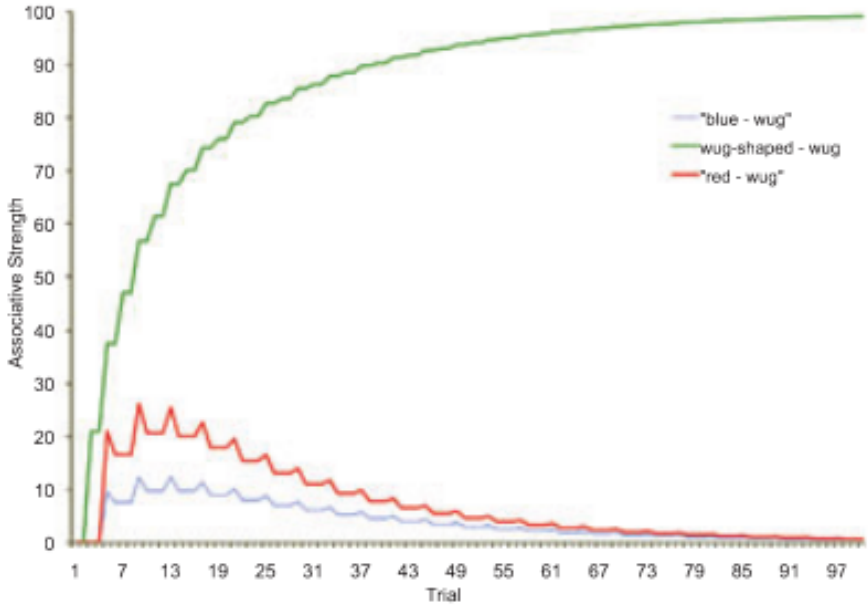
[1] all images from Ramscar et al. (2010)

FL-learning vs. LF-learning



No representation without taxation (Ramscar and Dye, 2009)





Example Trial[2]

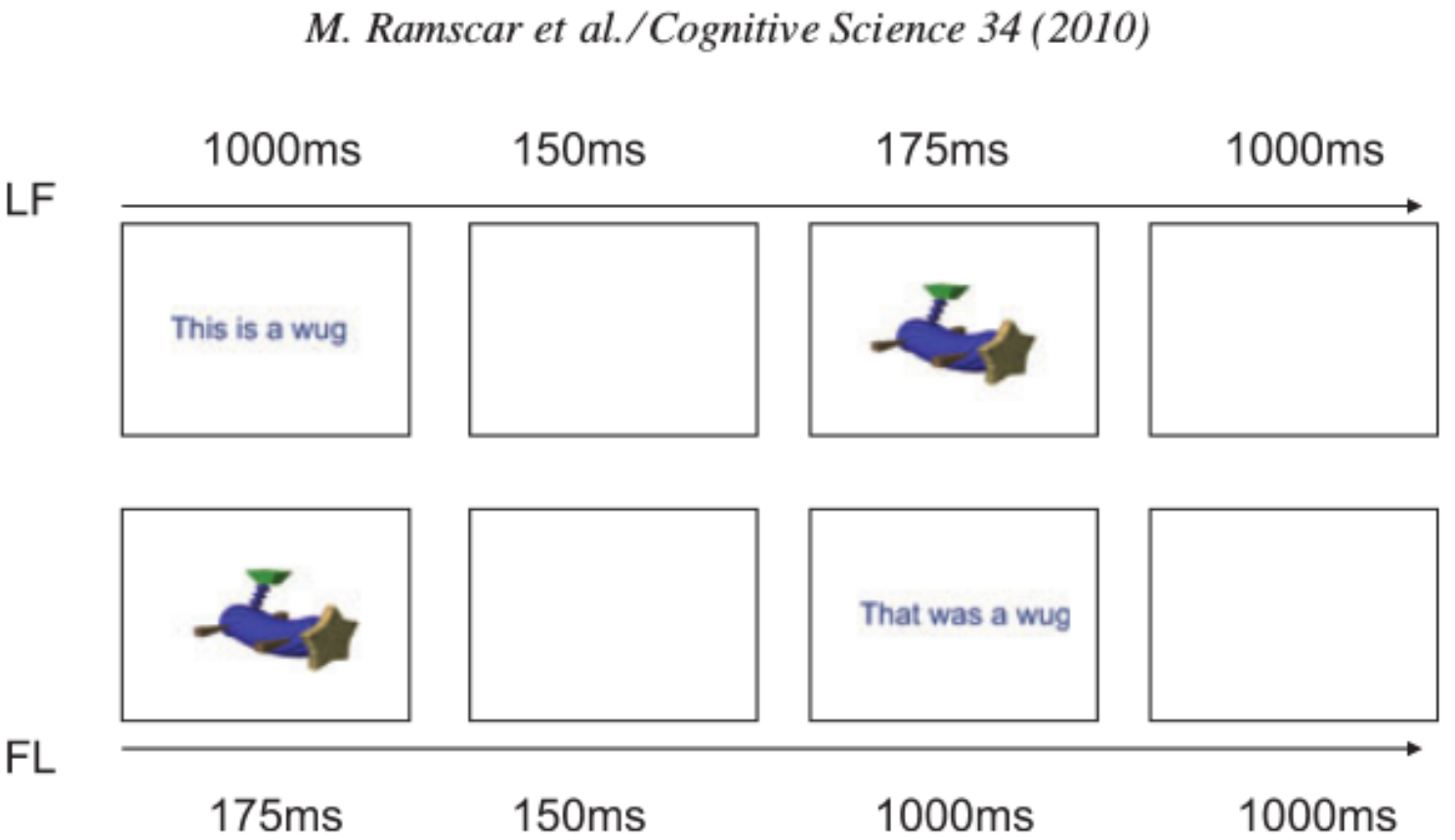


Fig. 10. The temporal (predictive) structure of the training trials in Experiment 1.

[2] great image databases: here

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- Conversely, when trained on LF-examples, they scored higher on the recognition task.
- shows that **improved response-discrimination leads to the original input being less accurately represented**

Our Goal

We want to replicate those results using an Amazon Mechanical Turk sample and using different statistical techniques.

Bayesian Signal Detection Theory

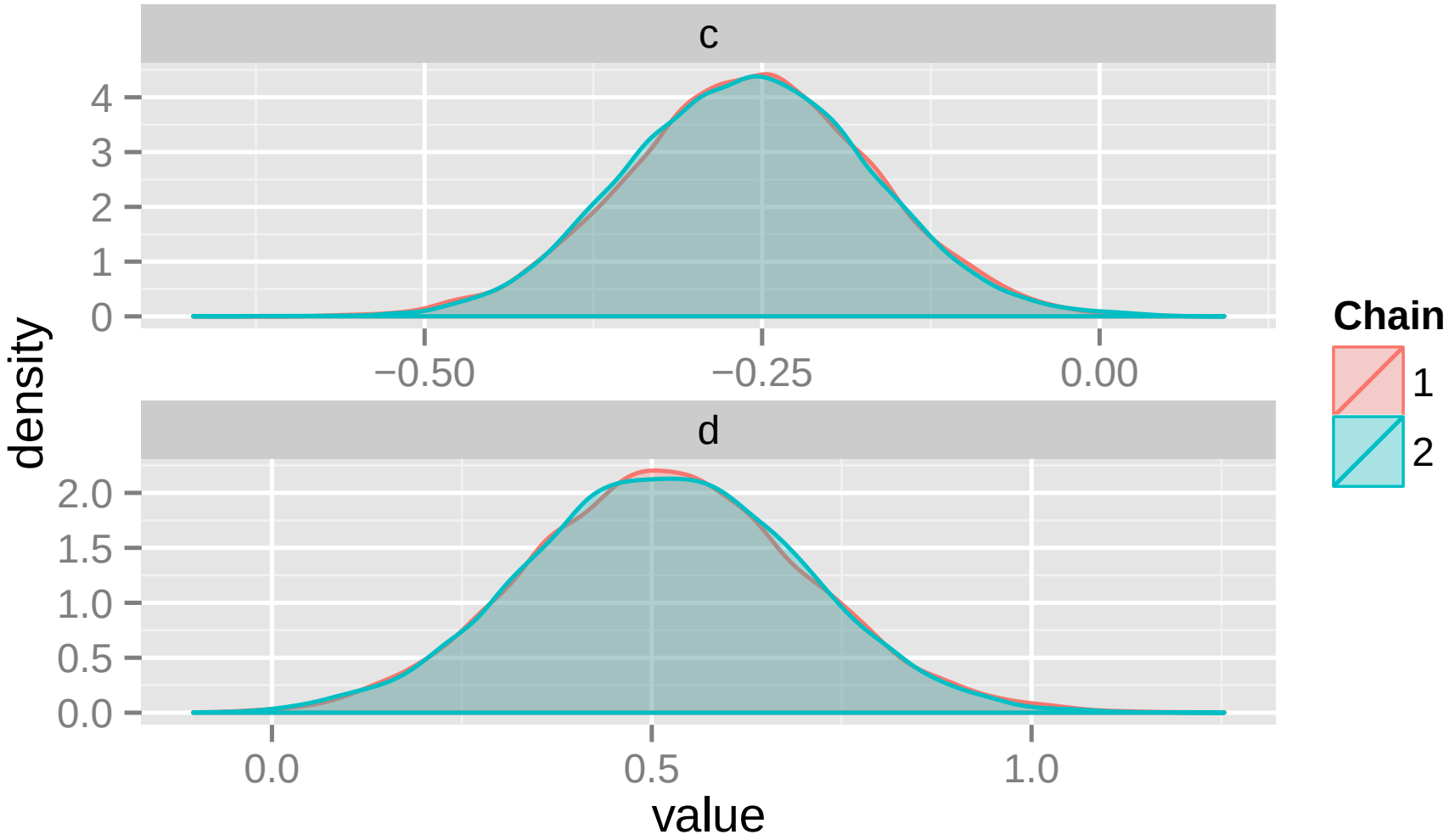
```
library('rjags')

ms <- '
model {
  hits ~ dbin(theta_h, signal)
  falarms ~ dbin(theta_f, noise)

  theta_h <- phi(d/2-c)
  theta_f <- phi(-d/2-c)

  d ~ dnorm(0, .5)
  c ~ dnorm(0, 2)
}'

# see also Lee & Wagenmakers (2013, pp.156)
```

Example

```
library('ggmcmc')

params <- c('d', 'c', 'theta_h', 'theta_f')
data <- list('hits' = 70, 'falarms' = 50,
             'signal' = 70 + 30, 'noise' = 50 + 50)

model <- jags.model(textConnection(ms), data = data,
                    n.chains = 2, quiet = TRUE)

samples <- coda.samples(model, n.iter = 10000,
                        variable.names = params)
```

Example

```
ggs_density(ggs(samples[, 1:2]))
```



Mixed Logit Models

Following Jaeger (2008), Baayen, Davidson, and Bates (2008), and Judd, Westfall, and Kenny (2012), we want to analyze the gathered data using a Mixed Logit Model with *participant* and *stimulus* as random factors.

```
library('lme4')

# example data
head(data, 3)

##   id resp present cor alien learning         task
## 1  1    1       0   0   wug       FL  recognition
## 2  2    0       1   0   niz       FL verification
## 3  3    1       0   0   mob       LF  recognition

# example model
fit <- glmer(cor ~ learning*task + (1|id) + (1|alien),
                   data, binomial)
```

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- implement experiment in JavaScript, run it on Mechanical Turk
- implement Rescorla-Wagner simulations in R (Julia?)
- analyze data using Bayesian SDT and Mixed Logit Models