Memory for Emails: BRM Revision Analyses

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1 Reading the Data

```
> cell_demo = read.csv("cell_demo.csv", header = TRUE, sep = ",")
> cell = read.csv("cell_withitems_complete_new.csv", header = TRUE, sep = ",")
> cell = merge(cell, cell_demo, by = "ID")
> cell$ID = as.factor(as.character(cell$ID))
> ## We need to account for the fact that contacts chosen from the end of
> ## the year will have fewer messages since it is the last time they were
> ## contacted -- so only messages from that month. We scale the
> #number of messages by the factor of the month to see this effect
>
> ## Also, need to control for too many messages
>
> #cell = cell %>% filter(Messages <= 35)
>
> cell$ScaledMessages = cell$Messages*cell$Month
```

1.1 Adding New Predictors

Within-Person and Grand Mean Centering

```
> library(dplyr)
> ## aggregate per subject all IVs and DVs
> cell_agg = group_by(cell, ID) %>%
+    summarise_at(vars(Accuracy, TimeJudgmentDistance,
+                  ScaledMessages, Vividness, Sentiment), mean)
> colnames(cell_agg) = c("ID", "acc_mean", "time_mean",
+                         "messages_mean", "vividness_mean", "sent_mean")
> cell_sd = group_by(cell, ID) %>%
+    summarise_at(vars( ScaledMessages), sd)
> colnames(cell_sd) = c("ID", "messages_sd")
> cell_messages_mean_sd = merge(cell_agg, cell_sd, by = "ID")
> ## merge aggregate info with long data
> cell = merge(cell, cell_agg, by = "ID", all.x = T)
> ## person and grand-mean centered scores using original and aggregate
> library(dplyr)
```

```
> cell = cell %>% mutate(acc_pc = Accuracy - acc_mean,
+                 time_pc = TimeJudgmentDistance - time_mean,
+                 messages_pc = ScaledMessages - messages_mean,
+                 vividness_pc = Vividness - vividness_mean,
+                 sent_pc = Sentiment - sent_mean)
```

2   Accuracy Model

```
Generalized linear mixed model fit by maximum likelihood (Laplace
  Approximation) [glmerMod]
 Family: binomial  ( logit )
Formula: Accuracy ~ Month + scaled_m_mean + scaled_m_pc + (1 | ID) + (1 |
    ItemNo)
   Data: cell

     AIC        BIC    logLik deviance df.resid
   857.8      886.3    -422.9     845.8       841

Scaled residuals:
    Min       1Q   Median        3Q       Max
-4.0755   0.2055   0.3880   0.5368   1.3475

Random effects:
 Groups Name         Variance Std.Dev.
 ID     (Intercept) 0.35216  0.5934
 ItemNo (Intercept) 0.06732  0.2595
Number of obs: 847, groups:  ID, 44; ItemNo, 31

Fixed effects:
               Estimate Std. Error z value Pr(>|z|)
(Intercept)    1.17556    0.42977   2.735  0.00623 **
Month         -0.20126    0.02790  -7.213 5.46e-13 ***
scaled_m_mean  0.12043    0.07598   1.585  0.11296
scaled_m_pc    0.84055    0.26290   3.197  0.00139 **
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Correlation of Fixed Effects:
           (Intr) Month  scld_m_m
Month      -0.163
scaled_m_mn -0.742 -0.069
scaled_m_pc -0.533 -0.365  0.140
```

3   TimeModel
```

```
Linear mixed model fit by REML t-tests use Satterthwaite approximations to
  degrees of freedom [lmerMod]
Formula: TimeJudgmentDistance ~ Month * DatingErrorType * Sentiment +
    (Month | ID) + (1 | ItemNo)
   Data: cell_td_incorrect
Control:
lmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

REML criterion at convergence: 1762.1

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.1404 -0.5535 -0.1750  0.1631  6.9009

Random effects:
 Groups   Name        Variance Std.Dev. Corr
 ID       (Intercept) 0.13853  0.3722
          Month       0.01373  0.1172   -1.00
 ItemNo   (Intercept) 0.00000  0.0000
 Residual             1.67742  1.2952
Number of obs: 500, groups:  ID, 44; ItemNo, 29

Fixed effects:
                                                Estimate Std. Error         df
(Intercept)                                     0.825347   0.159187 150.500000
Month                                           0.137600   0.029335  67.500000
DatingErrorTypeTime Expansion                   1.035220   0.318875 454.200000
Sentiment                                      -0.008574   0.011530 454.100000
Month:DatingErrorTypeTime Expansion            -0.159544   0.052728 490.400000
Month:Sentiment                                 0.003169   0.001968 486.200000
DatingErrorTypeTime Expansion:Sentiment         0.083154   0.022262 469.100000
Month:DatingErrorTypeTime Expansion:Sentiment  -0.012701   0.003844 489.700000
                                                t value Pr(>|t|)
(Intercept)                                       5.185 6.86e-07 ***
Month                                             4.691 1.37e-05 ***
DatingErrorTypeTime Expansion                     3.246 0.001255 **
Sentiment                                        -0.744 0.457475
Month:DatingErrorTypeTime Expansion              -3.026 0.002610 **
Month:Sentiment                                   1.611 0.107898
DatingErrorTypeTime Expansion:Sentiment           3.735 0.000211 ***
Month:DatingErrorTypeTime Expansion:Sentiment    -3.305 0.001021 **
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Correlation of Fixed Effects:
          (Intr) Month  DtETTE Sntmnt Mn:DETTE Mnth:S DETTE:
```

```
Month       -0.833
DtngErrrTTE -0.435   0.303
Sentiment   -0.479   0.358   0.233
Mnth:DtETTE  0.339  -0.341  -0.850  -0.189
Mnth:Sntmnt  0.382  -0.436  -0.176  -0.810   0.223
DtngErTTE:S  0.246  -0.178  -0.497  -0.515   0.420     0.415
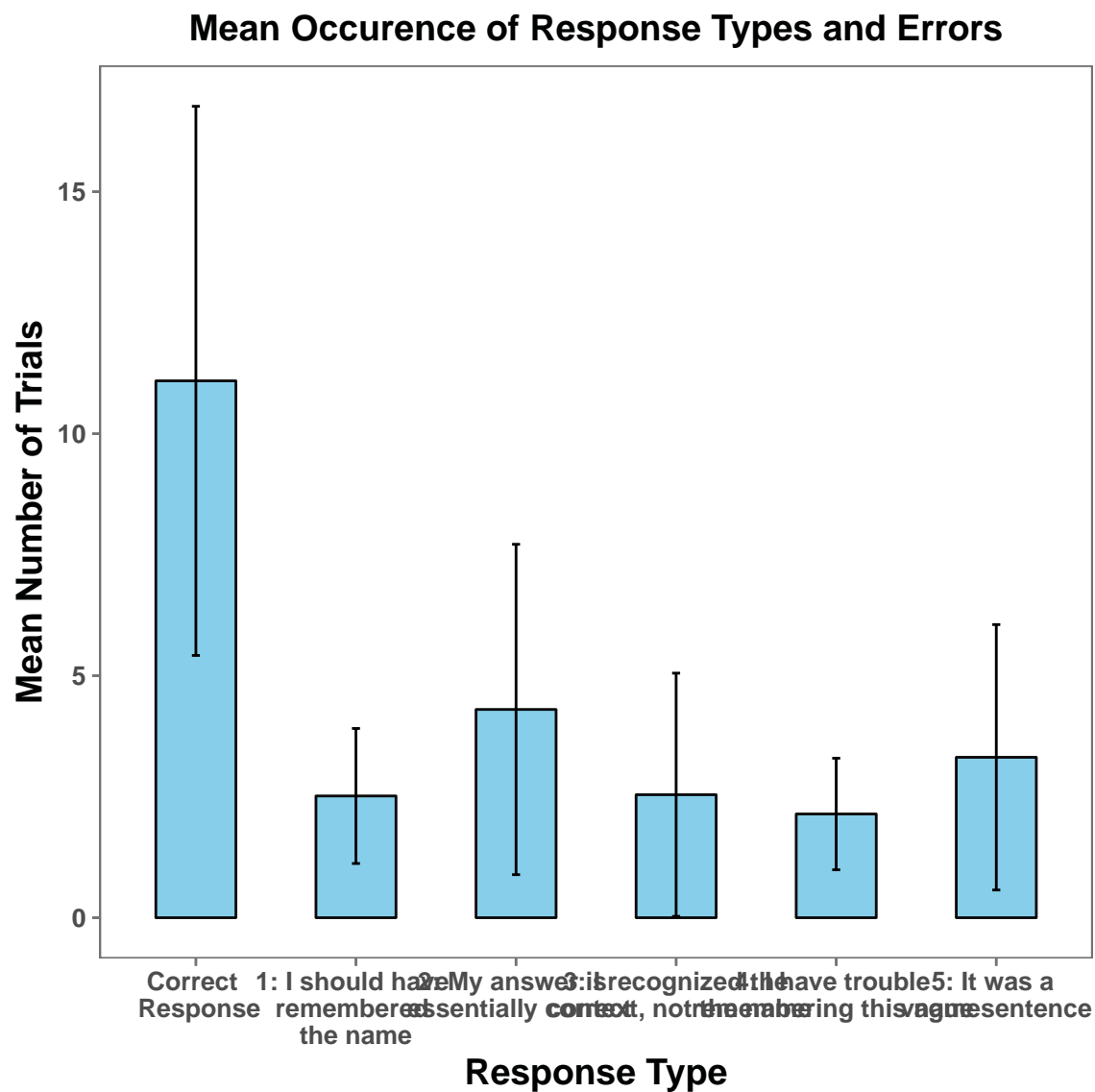Mnt:DETTE:S -0.191   0.212   0.397   0.410  -0.482    -0.506  -0.831
```

```
Analysis of Deviance Table (Type II Wald chisquare tests)

Response: TimeJudgmentDistance
                                  Chisq Df  Pr(>Chisq)
Month                           20.5276  1   5.878e-06 ***
DatingErrorType                  6.3248  1   0.0119059 *
Sentiment                        5.2796  1   0.0215767 *
Month:DatingErrorType           27.7990  1   1.346e-07 ***
Month:Sentiment                  0.0053  1   0.9420792
DatingErrorType:Sentiment        3.1639  1   0.0752848 .
Month:DatingErrorType:Sentiment 10.9198  1   0.0009514 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1
```

4   Descriptive Graphs

Mean Occurence of Response Types and Errors

5   Retrieval States

```
              Month RecallBeforeHint
Month          1.00             0.16
RecallBeforeHint  0.16          1.00
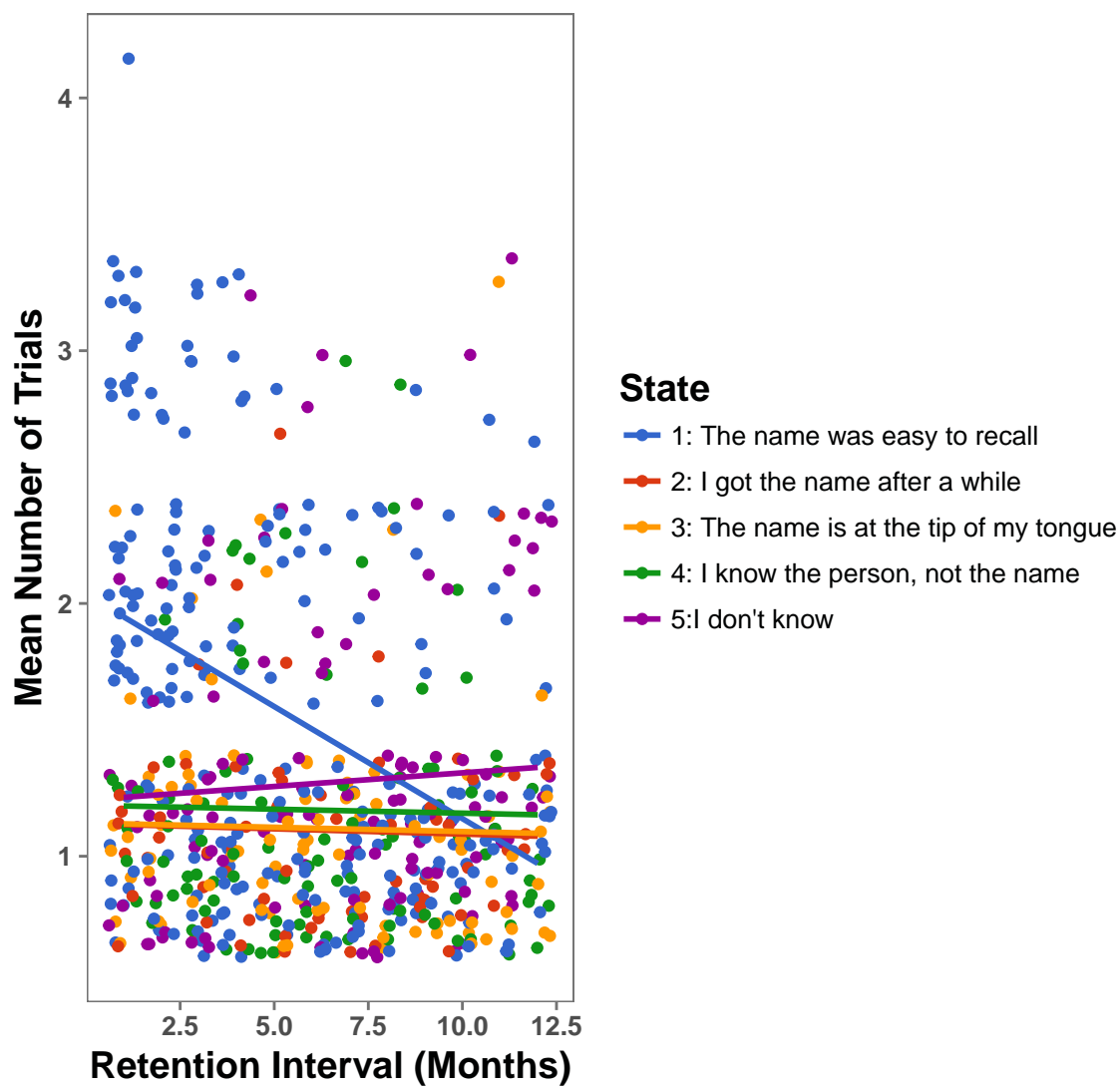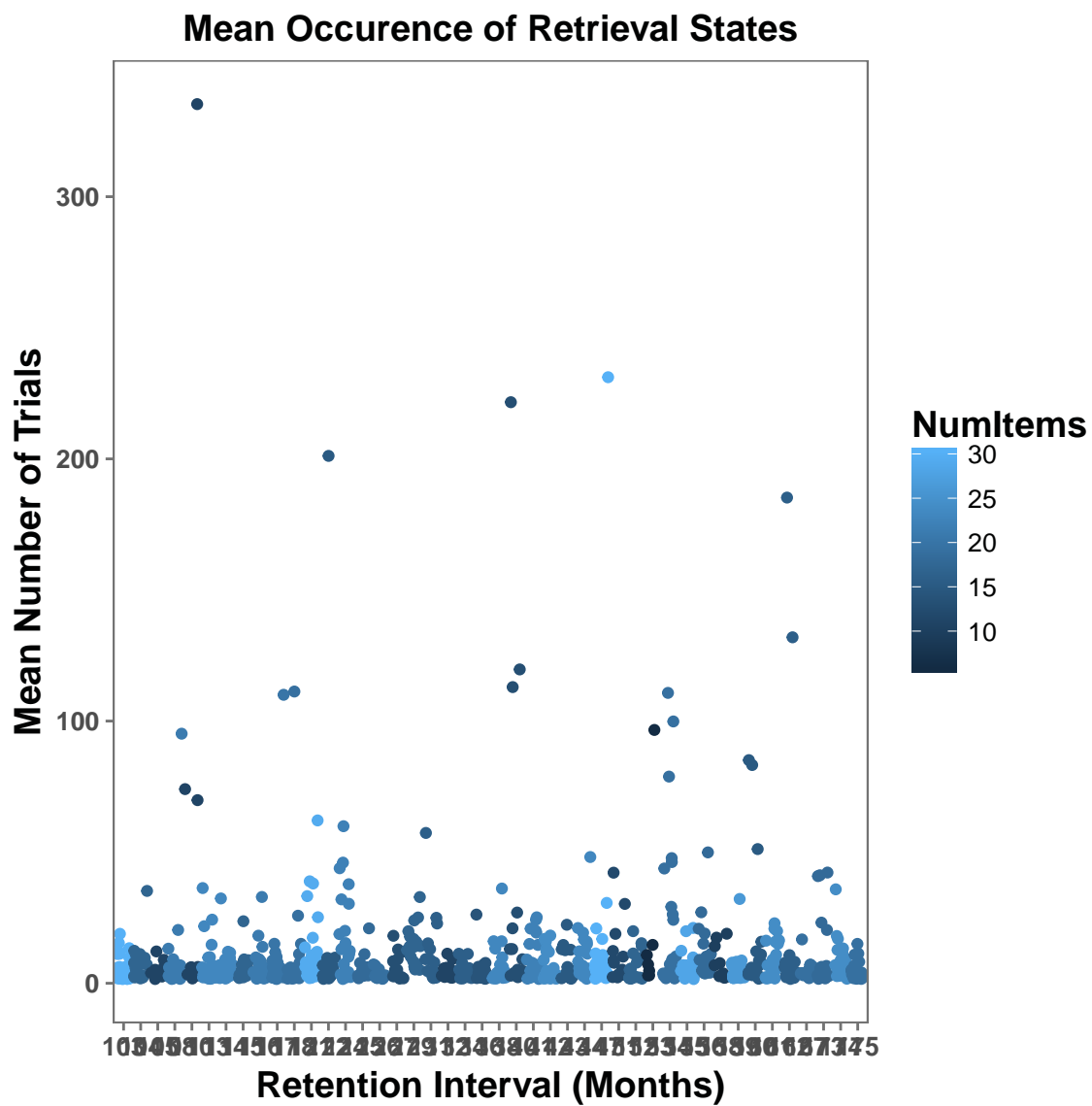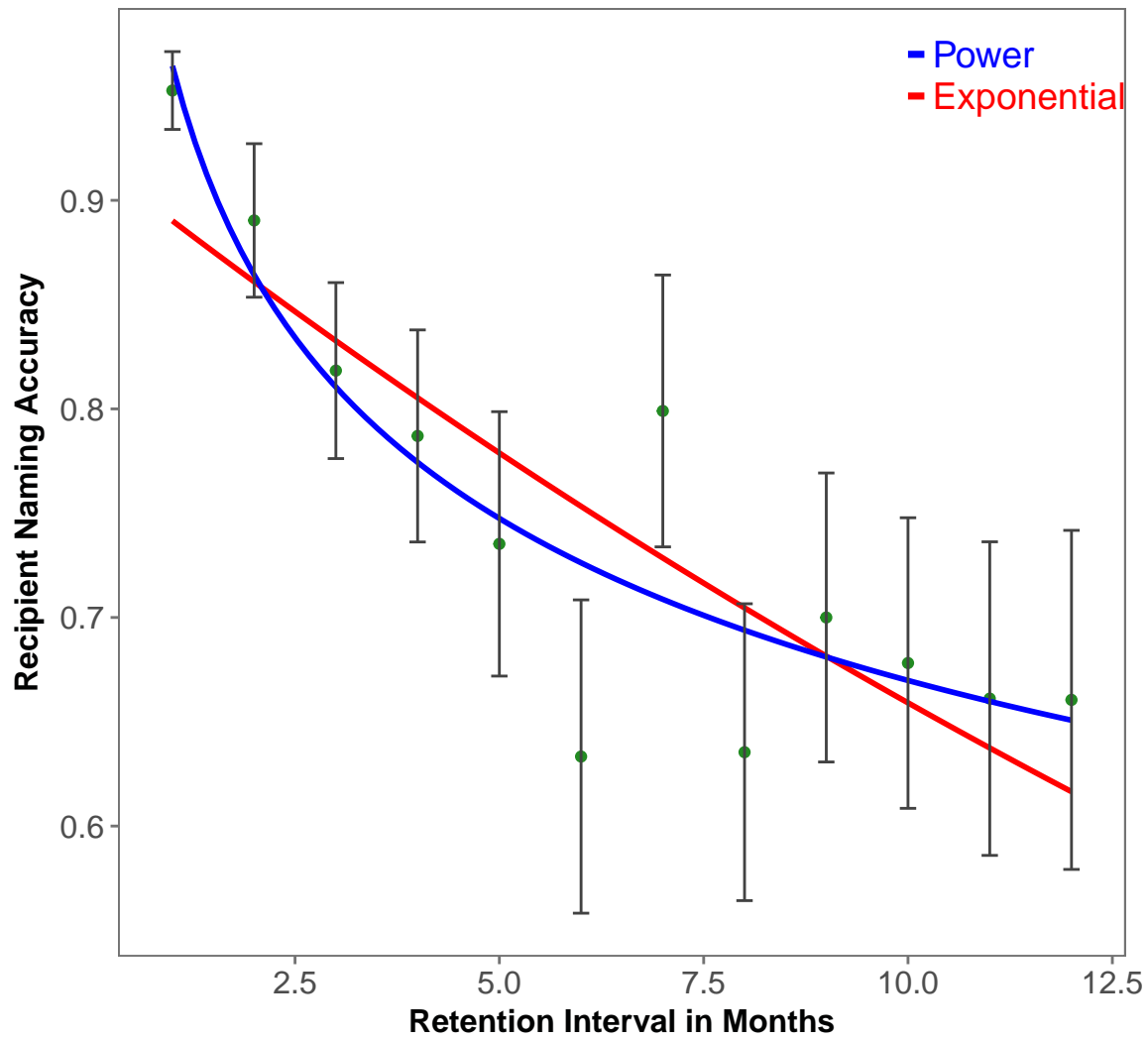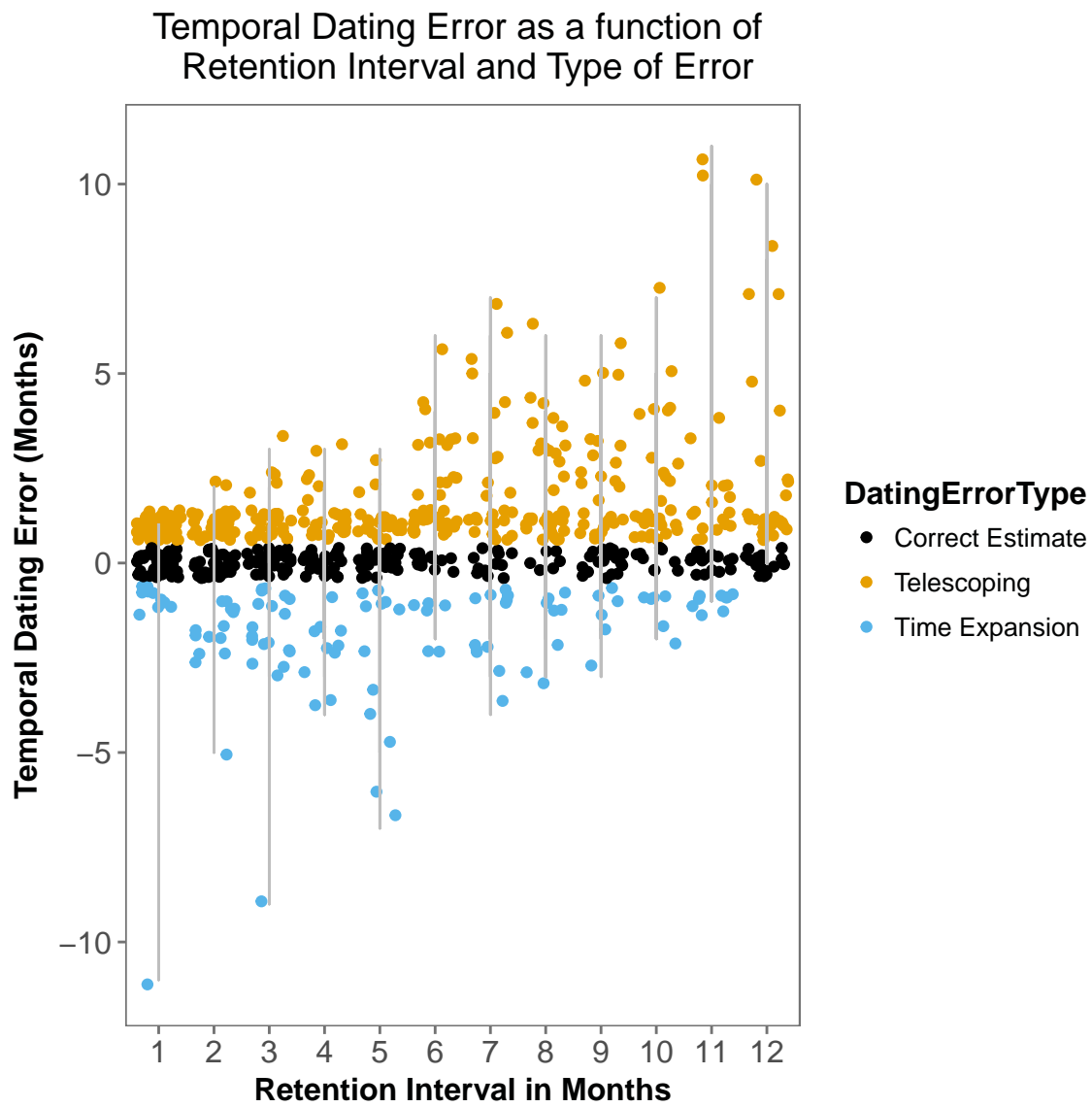
n= 632
```

```
P
                Month RecallBeforeHint
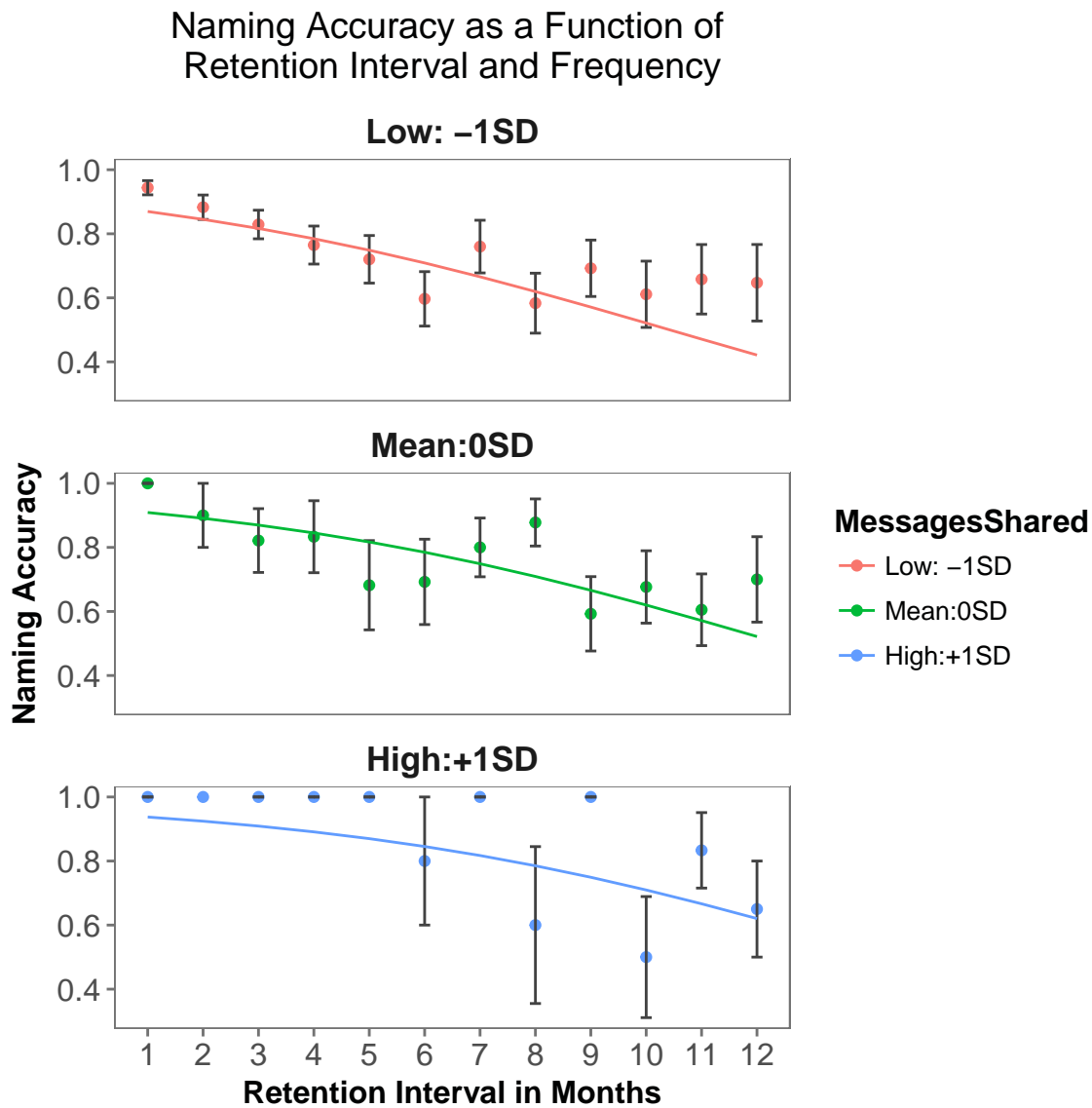Month                      0
RecallBeforeHint   0
```

Mean Occurence of Retrieval States

State
- 1: The name was easy to recall
- 2: I got the name after a while
- 3: The name is at the tip of my tongue
- 4: I know the person, not the name
- 5: I don't know

6 Messages sent

Mean Occurence of Retrieval States

7 Raw Plots

7.1 Accuracy Figure

Naming Accuracy as a Function of Retention Interval and Frequency

7.2 Power and Exp

```
[1] "italic(y) == \"0.964\" ~ italic(x)^\"-0.158\""
```

```
[1] "italic(y) == \"0.93\" ~ italic(x)^\"-0.035\""
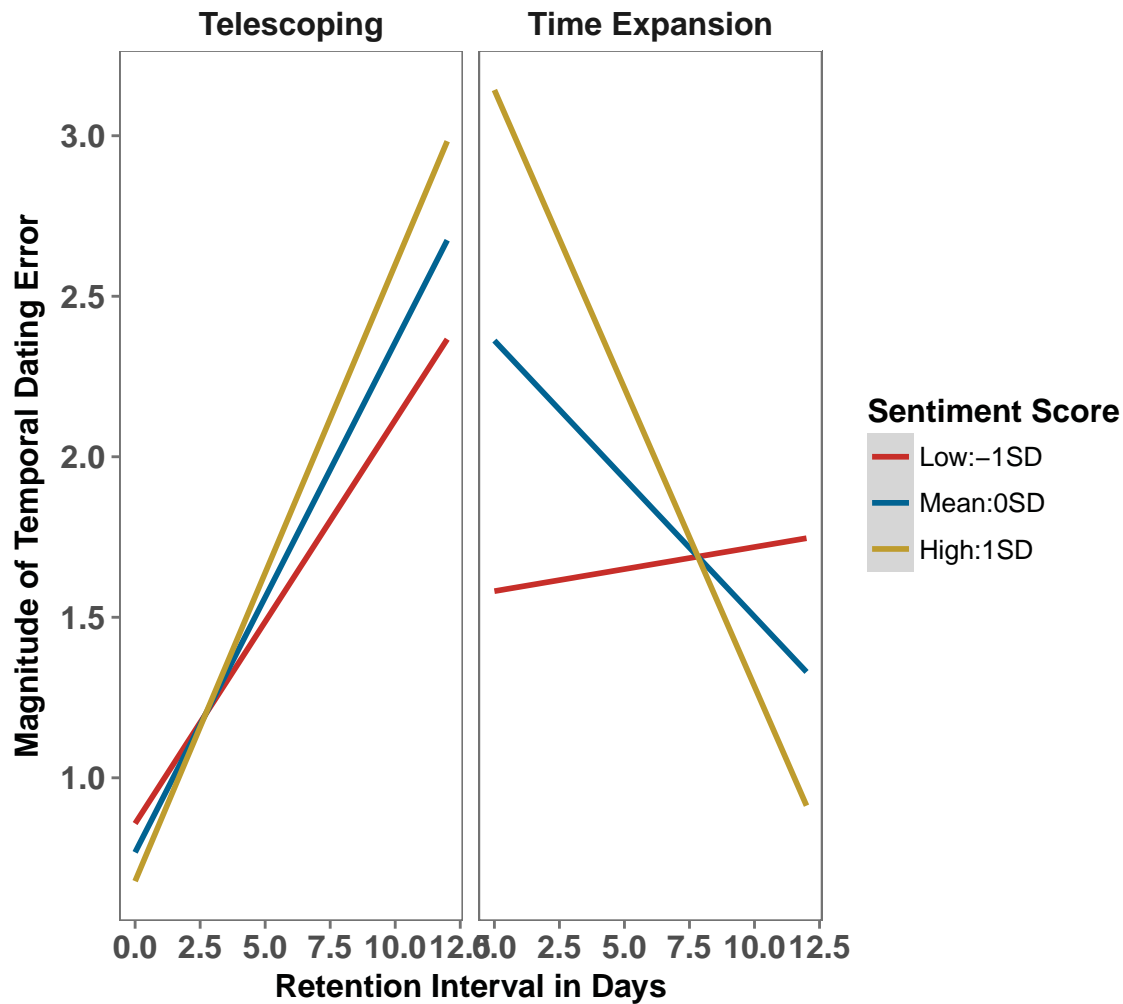```

Naming Accuracy as a Function of Retention Interval

## 7.3 Time Error



Temporal Dating Error as a function of
Retention Interval and Type of Error

## Temporal Dating Error as a function of
## tion Interval, Type of Error and Sentiment Score

## 7.5 Sentiment 3 way



Dating Error as a Function of Sentiment,
Retention Interval and Dating Error Type

## 7.6 Cue Distribution

```
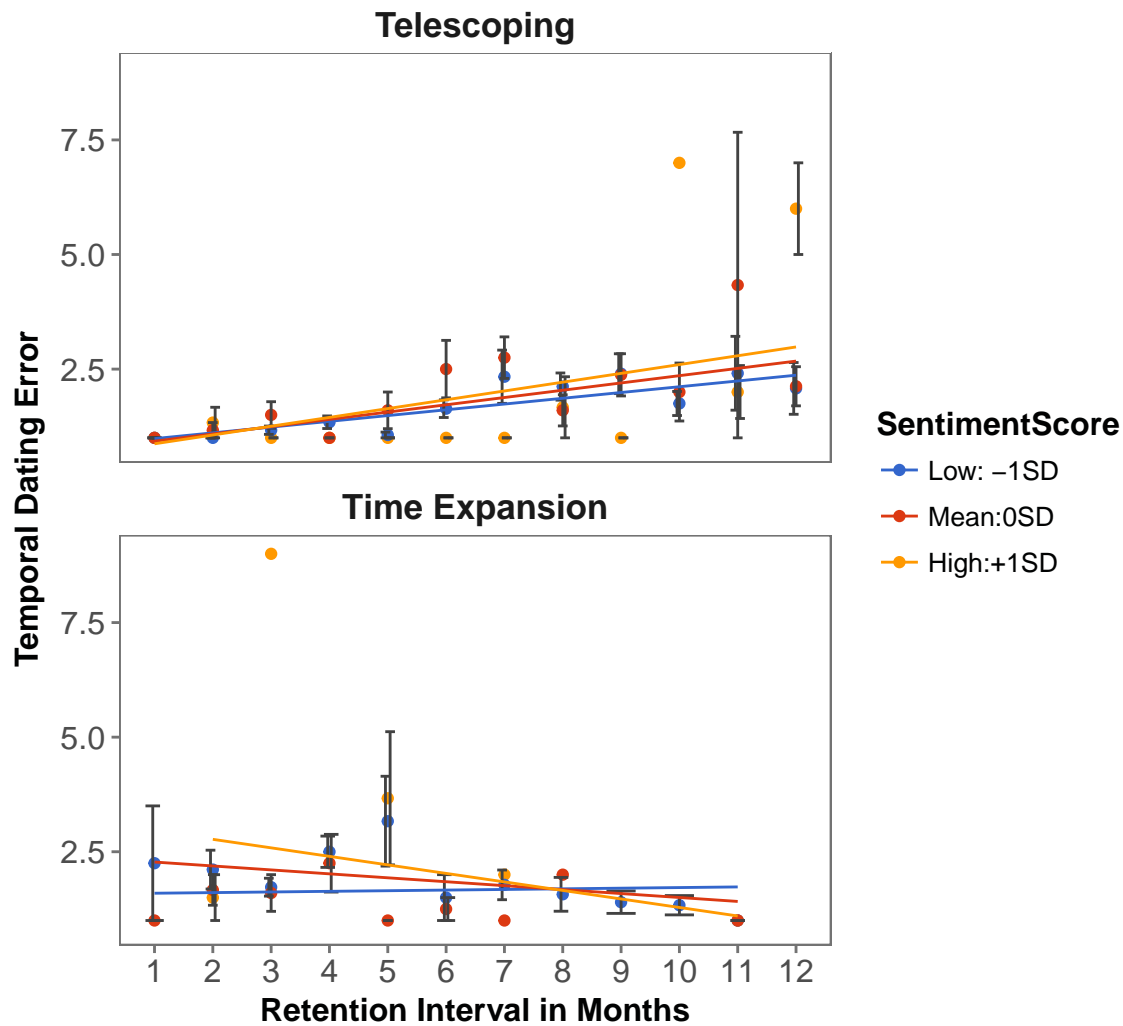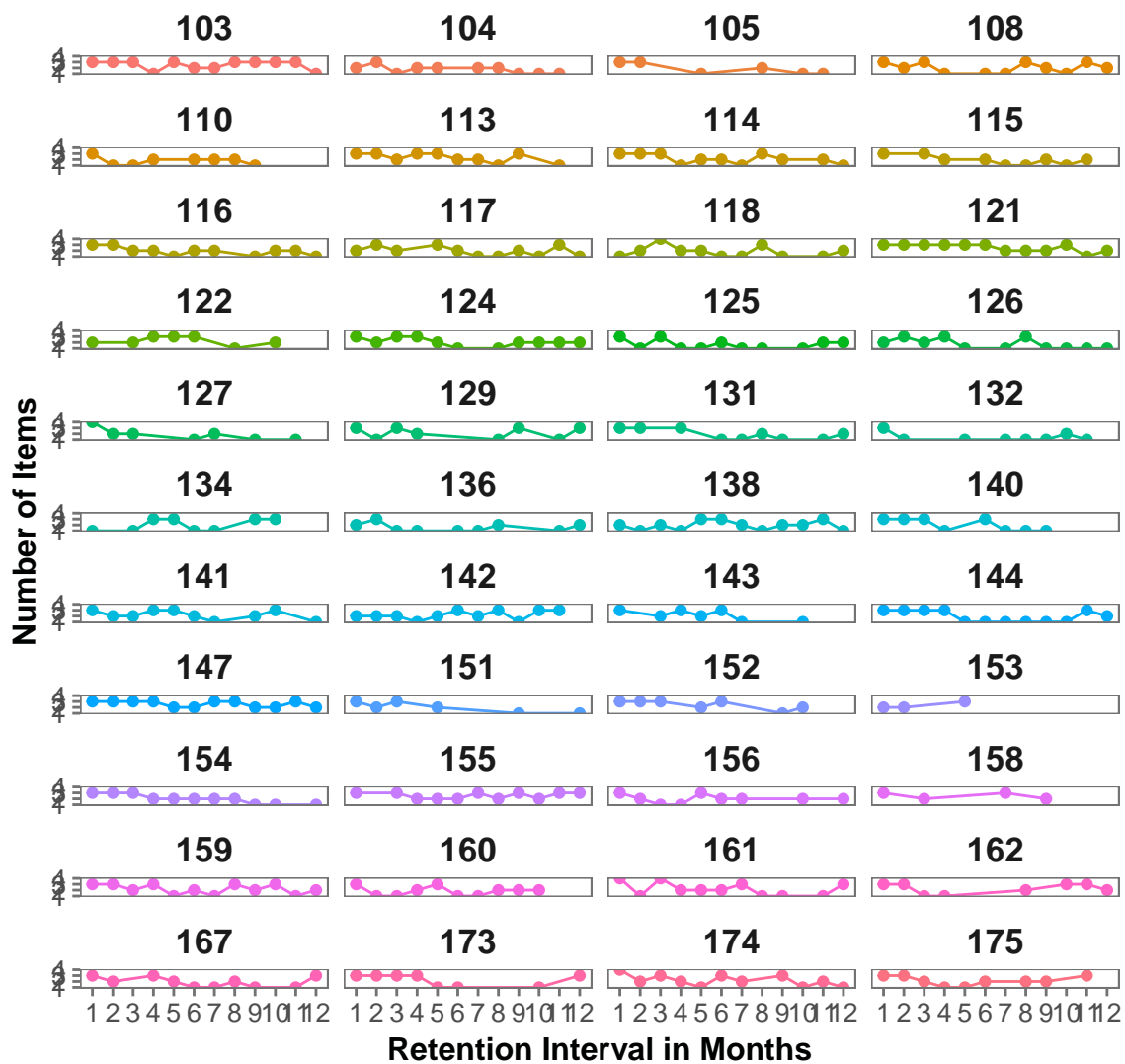[1] 10.37209
```

```
[1] 0.9517717
```

Distribution of Sentence Cues Across the Retention Interval

8   guesswork numbers

Distribution of Sentence Cues Across the Retention Interval