

Analysis file accompanying Beck and Vasishth's article *Multiple Focus*, to appear in Journal of Semantics

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1 Preliminaries

Load data:

```
> e1datafiller <- read.table(file = "e1datafiller.txt")  
> colnames(e1datafiller) <- c("subject", "itemtype", "item", "rating",
```

```

+      "RT")
> e2datafiller <- read.table(file = "e2datafiller.txt")
> colnames(e2datafiller) <- c("subject", "itemtype", "item", "rating",
+      "RT")
> e1e2 <- read.table("targetcontrol.txt", header = FALSE)
> colnames(e1e2) <- c("Subject", "Expt", "item", "cond", "rating",
+      "RT", "binary")

```

The mean ratings for fillers for each session:

```

> (meanfillere1 <- with(e1datafiller, tapply(rating, IND = list(item),
+      mean)))

```

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------|----------|----------|----------|----------|----------|----------|----------|----|
| 3.933333 | 3.933333 | 3.800000 | 3.933333 | 3.866667 | 3.733333 | 3.933333 | 4.000000 | |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 4.000000 | 3.800000 | 3.933333 | 3.933333 | 3.933333 | 3.333333 | 3.733333 | 1.133333 | |
| | 17 | 18 | 19 | 20 | | | | |
| 1.133333 | 2.866667 | 1.133333 | 1.200000 | | | | | |

```

> (meanfillere2 <- with(e2datafiller, tapply(rating, IND = list(item),
+      mean)))

```

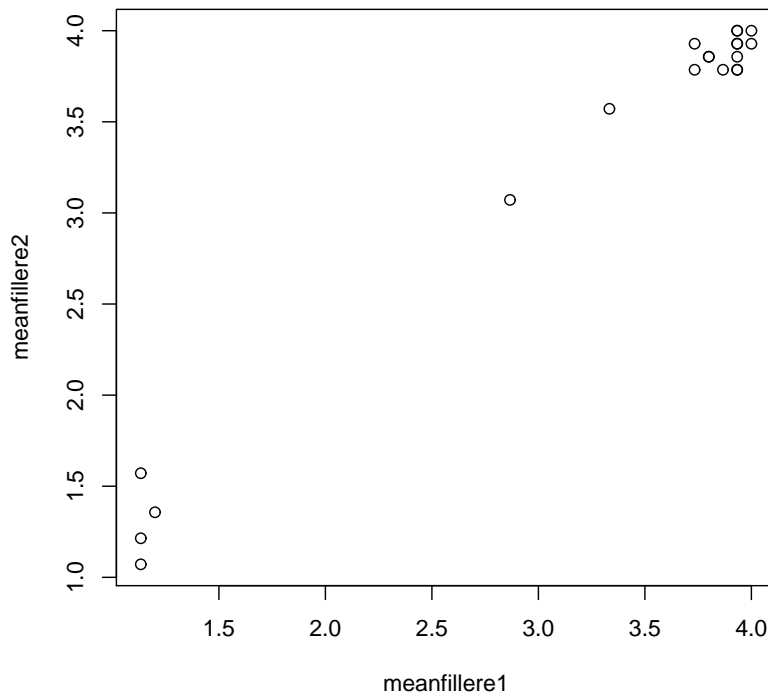
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------|----------|----------|----------|----------|----------|----------|----------|----|
| 4.000000 | 3.785714 | 3.857143 | 3.928571 | 3.785714 | 3.928571 | 4.000000 | 4.000000 | |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 3.928571 | 3.857143 | 3.785714 | 3.928571 | 3.857143 | 3.571429 | 3.785714 | 1.571429 | |
| | 17 | 18 | 19 | 20 | | | | |
| 1.071429 | 3.071429 | 1.214286 | 1.357143 | | | | | |

The participants' responses to the fillers (in the two sessions) are, as expected, very steady:

```

> plot(meanfillere1, meanfillere2)

```



2 Data analysis

2.1 Targets versus controls (overall)

First, the mixed-effects model's results:

```
> summary(model.cont <- lmer(rating ~ Expt + (1 | Subject) + (1 |
+ item), e1e2))
```

Linear mixed model fit by REML

Formula: rating ~ Expt + (1 | Subject) + (1 | item)

Data: e1e2

| | AIC | BIC | logLik | deviance | REMLdev |
|--|-------|-------|--------|----------|---------|
| | 690.7 | 708.5 | -340.3 | 676.2 | 680.7 |

Random effects:

| Groups | Name | Variance | Std.Dev. |
|----------|-------------|----------|----------|
| Subject | (Intercept) | 0.264243 | 0.51405 |
| item | (Intercept) | 0.064184 | 0.25334 |
| Residual | | 0.668305 | 0.81750 |

Number of obs: 261, groups: Subject, 16; item, 9

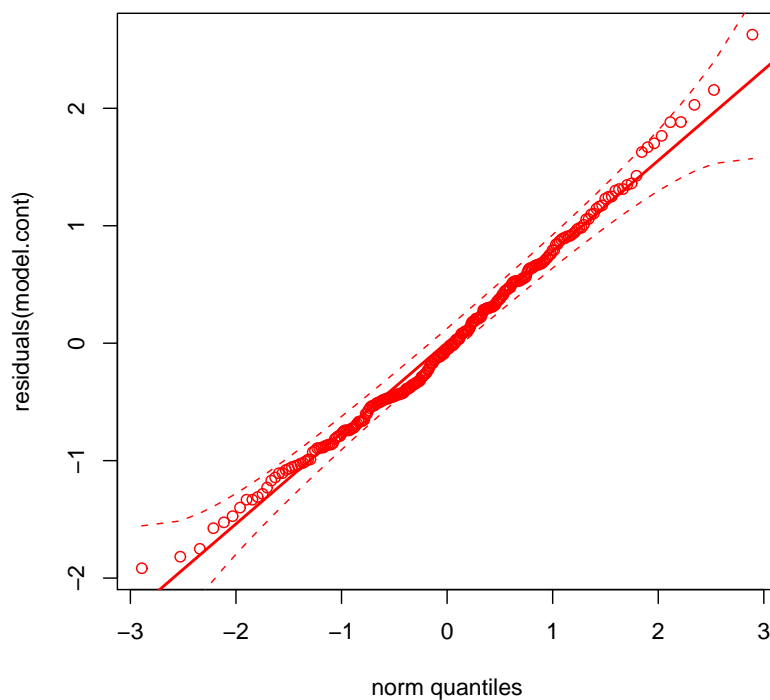
Fixed effects:

| | Estimate | Std. Error | t value |
|-------------|----------|------------|---------|
| (Intercept) | 1.9450 | 0.1698 | 11.452 |
| ExptE2 | 0.4183 | 0.1056 | 3.962 |

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.293
```

For each lme analysis we check whether the residuals are approximately normally distributed:

```
> qq.plot(residuals(model.cont))
```



Next, the ANOVA:

```
> e1e2.balanced <- subset(e1e2, (Subject != 109 & Subject != 108 &
+   Subject != 106))
> with(e1e2.balanced, tapply(rating, Expt, mean))
```

```
      E1      E2
1.931624 2.350427
```

```
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

```
      E1 E2
1      9  9
2      9  9
```

```

3    9    9
4    9    9
101  9    9
102  9    9
103  9    9
104  9    9
105  9    9
107  9    9
110  9    9
111  9    9
112  9    9

```

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

```
Error: Subject
```

```
      Df Sum Sq Mean Sq F value Pr(>F)
Residuals 12 76.179    6.348
```

```
Error: Subject:Expt
```

```
      Df  Sum Sq Mean Sq F value  Pr(>F)
Expt    1 10.2607 10.2607  9.1467 0.01058 *
Residuals 12 13.4615   1.1218
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Error: Within
```

```
      Df  Sum Sq Mean Sq F value Pr(>F)
Residuals 208 144.444    0.694
```

```
> summary(aov(rating ~ Expt + Error(factor(item)/Expt), e1e2.balanced))
```

```
Error: factor(item)
```

```
      Df  Sum Sq Mean Sq F value Pr(>F)
Residuals  8 18.4615   2.3077
```

```
Error: factor(item):Expt
```

```
      Df  Sum Sq Mean Sq F value Pr(>F)
Expt    1 10.2607 10.2607  3.4522 0.1002
Residuals  8 23.7778   2.9722
```

```
Error: Within
```

```
      Df  Sum Sq Mean Sq F value Pr(>F)
Residuals 216 191.846    0.888
```

2.2 Also vs only

```
> summary(model.cont.1 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 1)))
```

```
Linear mixed model fit by REML
```

```
Formula: rating ~ Expt + (1 | Subject)
```

```

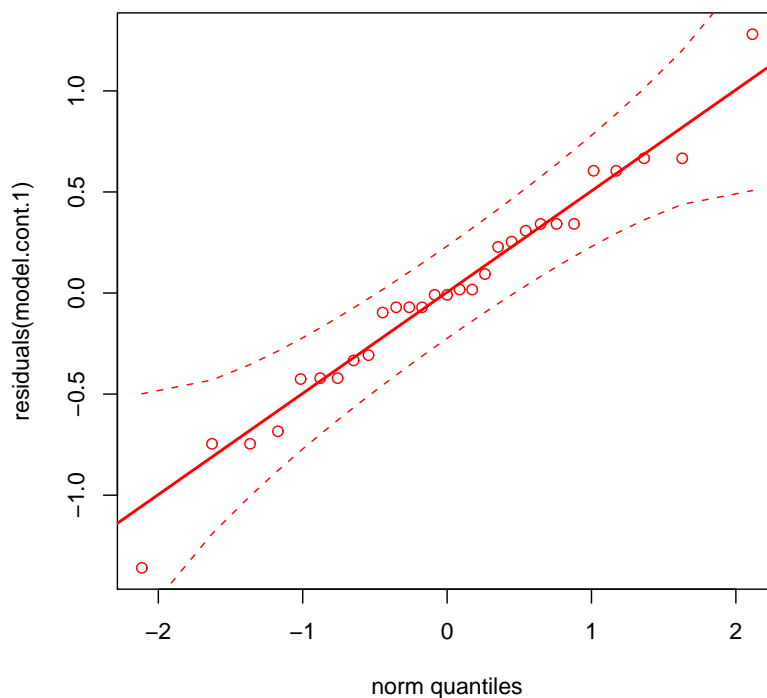
Data: subset(e1e2, item == 1)
   AIC   BIC logLik deviance REMLdev
83.05 88.52 -37.52   72.76   75.05
Random effects:
   Groups   Name      Variance Std.Dev.
Subject (Intercept) 0.41810  0.64661
Residual                0.45169  0.67208
Number of obs: 29, groups: Subject, 16

Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.8190     0.2391    7.609
ExptE2         1.5877     0.2562    6.198

Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.510

> qq.plot(residuals(model.cont.1))

```



```

> e1e2.balanced <- subset(e1e2, (item == 1 & Subject != 109 & Subject !=
+   108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)

```

```

      E1 E2
1      1  1

```

```

2    1    1
3    1    1
4    1    1
101  1    1
102  1    1
103  1    1
104  1    1
105  1    1
107  1    1
110  1    1
111  1    1
112  1    1

```

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

```
Error: Subject
```

```
      Df Sum Sq Mean Sq F value Pr(>F)
Residuals 12 17.1538  1.4295
```

```
Error: Subject:Expt
```

```
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1 15.3846 15.3846  32.877 9.4e-05 ***
Residuals 12  5.6154  0.4679
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

2.3 Also vs nobody

```
> summary(model.cont.4 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+ item == 4)))
```

```
Linear mixed model fit by REML
```

```
Formula: rating ~ Expt + (1 | Subject)
```

```
Data: subset(e1e2, item == 4)
```

```
AIC BIC logLik deviance REMLdev
```

```
83.39 88.86 -37.69 73.1 75.39
```

```
Random effects:
```

```
Groups Name Variance Std.Dev.
```

```
Subject (Intercept) 0.62837 0.7927
```

```
Residual 0.35892 0.5991
```

```
Number of obs: 29, groups: Subject, 16
```

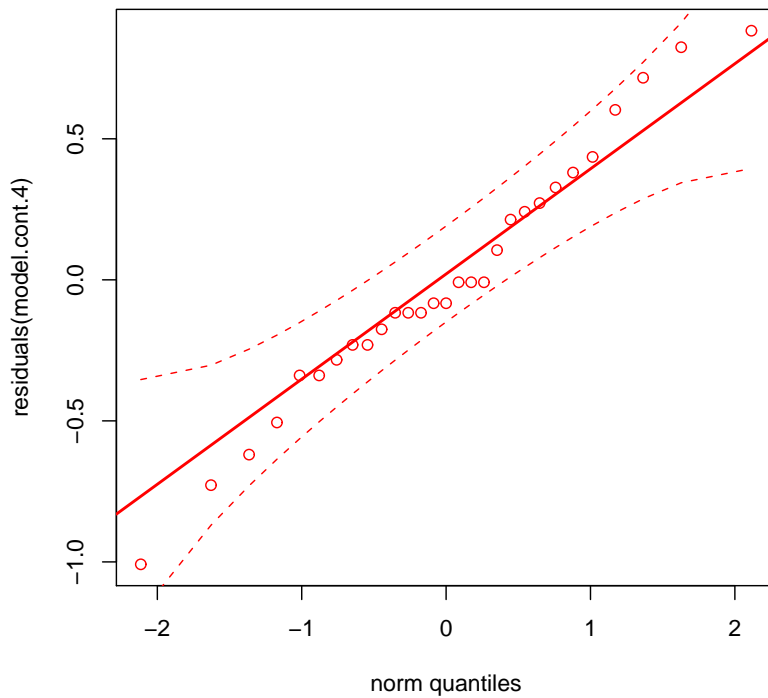
```
Fixed effects:
```

```
      Estimate Std. Error t value
(Intercept)  2.2282    0.2533  8.796
ExptE2       0.1082    0.2303  0.470
```

```
Correlation of Fixed Effects:
```

```
(Intr)
ExptE2 -0.431
```

```
> qq.plot(residuals(model.cont.4))
```



```
> e1e2.balanced <- subset(e1e2, (item == 4 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

```
Error: Subject
      Df Sum Sq Mean Sq F value Pr(>F)
Residuals 12 22.6154  1.8846
```



```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1 0.0385  0.0385  0.1034 0.7533
Residuals 12 4.4615  0.3718
```

2.4 Also vs even

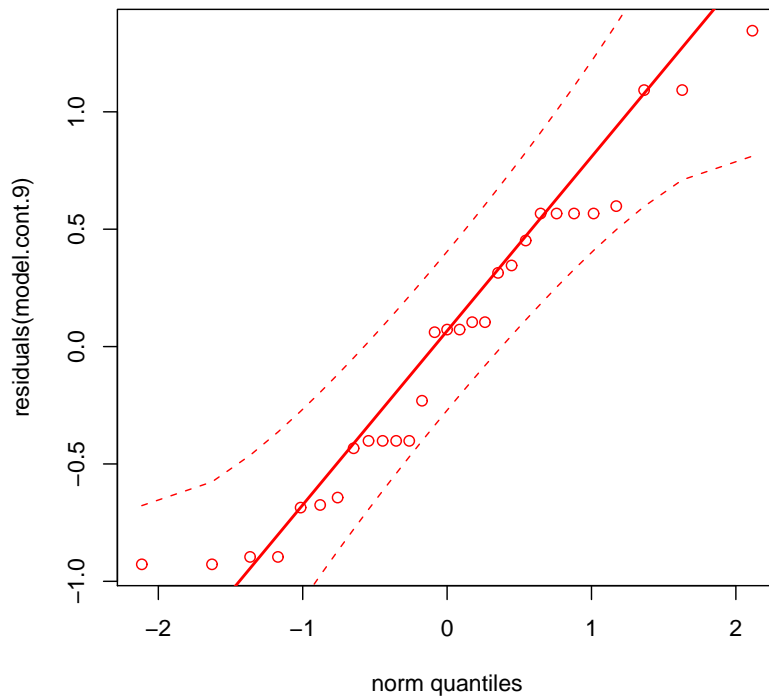
```
> summary(model.cont.9 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 9)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 9)
AIC   BIC logLik deviance REMLdev
85.64 91.11 -38.82   75.57   77.64
Random effects:
Groups   Name             Variance Std.Dev.
Subject (Intercept) 0.30426  0.55159
Residual                0.59500  0.77136
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)  2.34873    0.24398   9.627
ExptE2       -0.03154    0.29178  -0.108
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.571
```

```
> qq.plot(residuals(model.cont.9))
```



```
> e1e2.balanced <- subset(e1e2, (item == 9 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

```
Error: Subject
      Df Sum Sq Mean Sq F value Pr(>F)
Residuals 12 13.6154  1.1346
```

```
Error: Subject:Expt
      Df    Sum Sq   Mean Sq    F value Pr(>F)
Expt    1 1.233e-30 1.233e-30 2.113e-30    1
Residuals 12    7.0000    0.5833
```

2.5 Only vs also

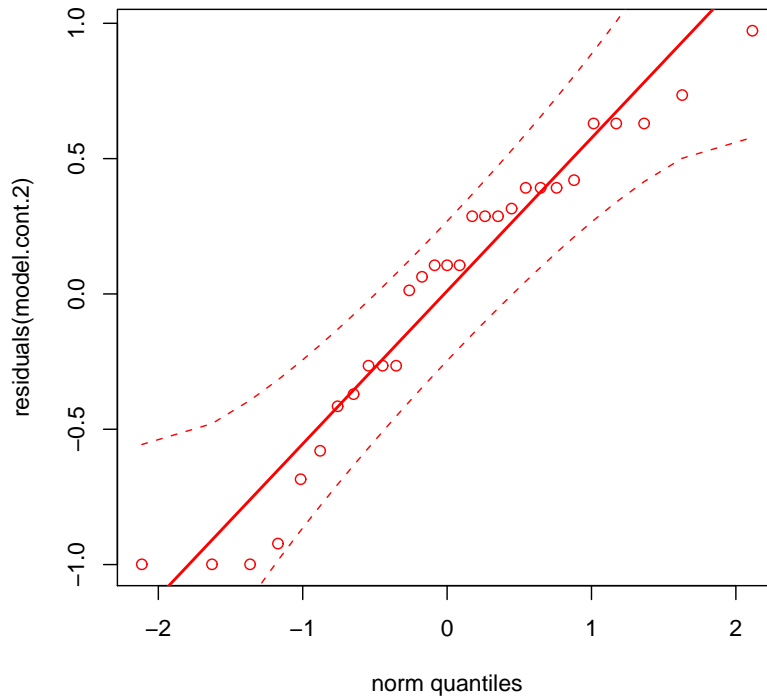
```
> summary(model.cont.2 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 2)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 2)
AIC   BIC logLik deviance REMLdev
88.16 93.63 -40.08    78.25   80.16
Random effects:
Groups   Name             Variance Std.Dev.
Subject (Intercept) 0.56170  0.74946
Residual              0.51528  0.71783
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.8676    0.2657    7.03
ExptE2         1.1050    0.2742    4.03
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.490
```

```
> qq.plot(residuals(model.cont.2))
```



```
> e1e2.balanced <- subset(e1e2, (item == 2 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

Error: Subject

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|---------|---------|---------|--------|
| Residuals | 12 | 22.4615 | 1.8718 | | |

```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value    Pr(>F)
Expt    1  7.5385   7.5385     14 0.002813 **
Residuals 12  6.4615   0.5385
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

2.6 Only vs nobody

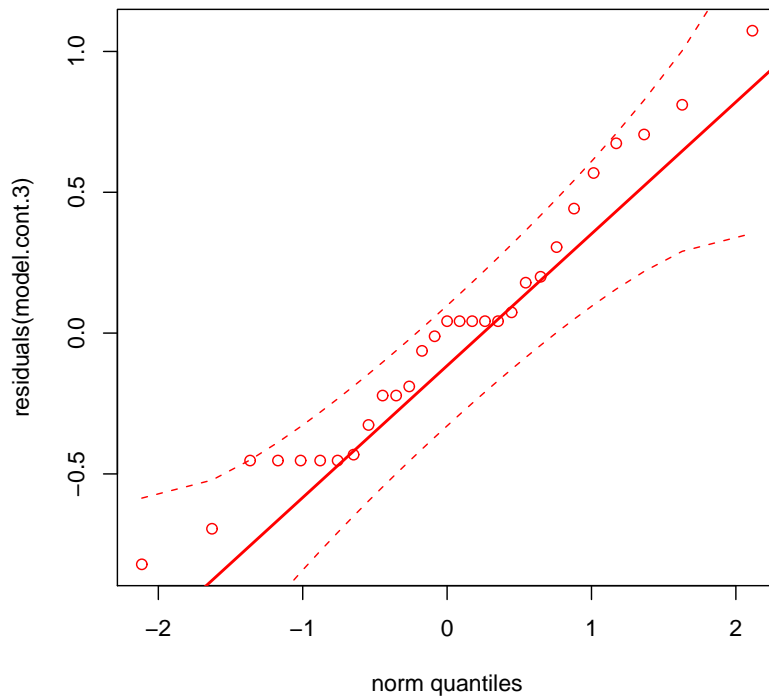
```
> summary(model.cont.3 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 3)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 3)
AIC      BIC logLik deviance REMLdev
81.77 87.24 -36.88    71.38    73.77
Random effects:
Groups   Name      Variance Std.Dev.
Subject (Intercept) 0.51817  0.71984
Residual              0.36995  0.60823
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.5323      0.2407    6.365
ExptE2         0.4948      0.2331    2.122
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.459
```

```
> qq.plot(residuals(model.cont.3))
```



```
> e1e2.balanced <- subset(e1e2, (item == 3 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

Error: Subject

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|---------|---------|---------|--------|
| Residuals | 12 | 19.3846 | 1.6154 | | |

```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1  1.3846   1.3846    3.6 0.0821 .
Residuals 12  4.6154   0.3846
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

2.7 Only vs even

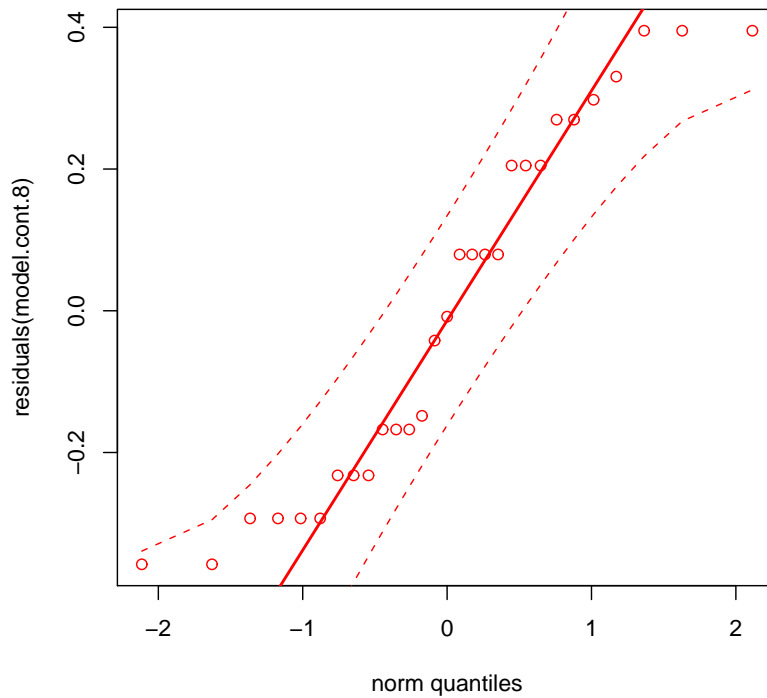
```
> summary(model.cont.8 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 8)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 8)
AIC   BIC logLik deviance REMLdev
64.13 69.6 -28.07   52.38   56.13
Random effects:
Groups   Name      Variance Std.Dev.
Subject (Intercept) 0.45034  0.67107
Residual              0.12927  0.35954
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.6647      0.1928   8.633
ExptE2         0.3725      0.1393   2.674
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.341
```

```
> qq.plot(residuals(model.cont.8))
```



```
> e1e2.balanced <- subset(e1e2, (item == 8 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

Error: Subject

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|---------|---------|---------|--------|
| Residuals | 12 | 11.5385 | 0.9615 | | |


```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1 0.96154 0.96154    7.5 0.01798 *
Residuals 12 1.53846 0.12821
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

2.8 Even vs only

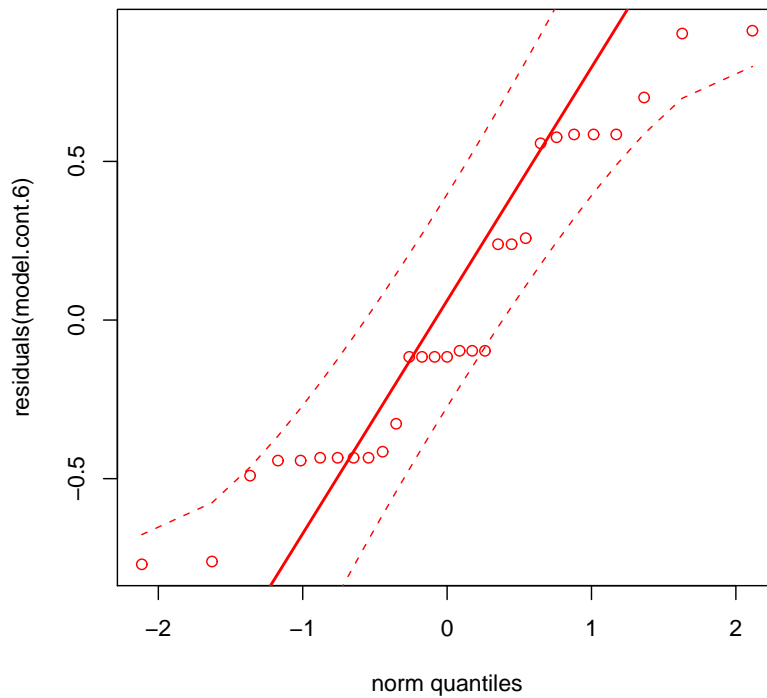
```
> summary(model.cont.6 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 6)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 6)
AIC   BIC logLik deviance REMLdev
79.3 84.77 -35.65   68.74   71.3
Random effects:
Groups   Name      Variance Std.Dev.
Subject (Intercept) 0.36885  0.60733
Residual              0.39039  0.62481
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.6358     0.2233    7.325
ExptE2         0.3181     0.2382    1.335
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.507
```

```
> qq.plot(residuals(model.cont.6))
```



```
> e1e2.balanced <- subset(e1e2, (item == 6 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

Error: Subject

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|---------|---------|---------|--------|
| Residuals | 12 | 12.5385 | 1.0449 | | |

```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1 0.9615  0.9615  2.5424 0.1368
Residuals 12 4.5385  0.3782
```

2.9 Even vs nobody

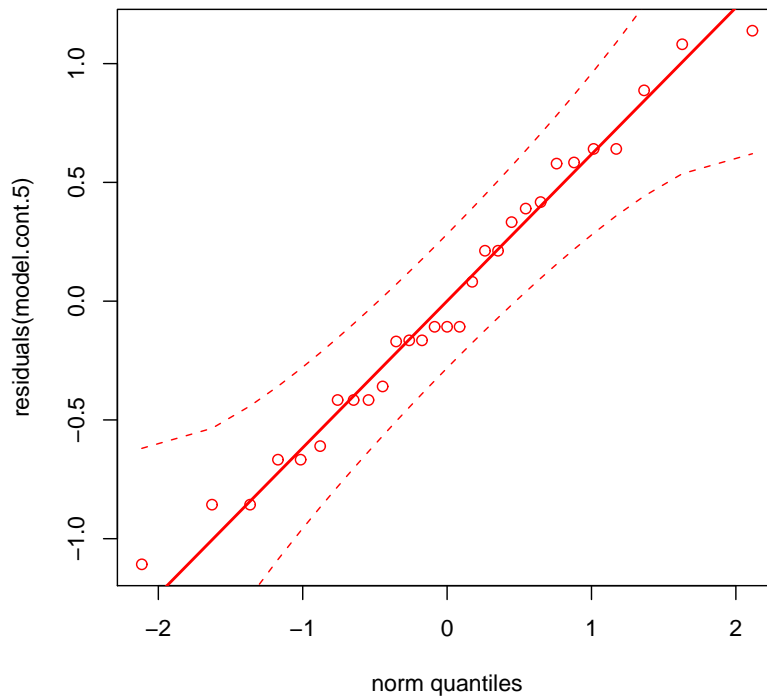
```
> summary(model.cont.5 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 5)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 5)
AIC   BIC logLik deviance REMLdev
80.93 86.4 -36.46    70.5    72.93
Random effects:
Groups   Name             Variance Std.Dev.
Subject (Intercept) 0.25305  0.50304
Residual                0.50131  0.70803
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   1.6807     0.2235   7.521
ExptE2         0.6917     0.2678   2.583
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.572
```

```
> qq.plot(residuals(model.cont.5))
```



```
> e1e2.balanced <- subset(e1e2, (item == 5 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

Error: Subject

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|---------|---------|---------|--------|
| Residuals | 12 | 13.4615 | 1.1218 | | |

```
Error: Subject:Expt
      Df Sum Sq Mean Sq F value Pr(>F)
Expt    1 3.1154   3.1154   5.8554 0.03233 *
Residuals 12 6.3846   0.5321
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

2.10 Even vs also

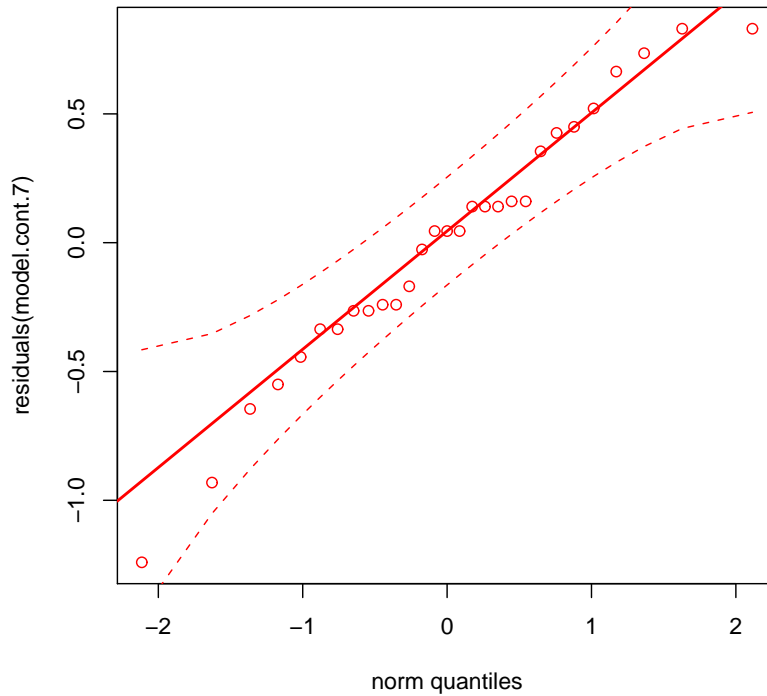
```
> summary(model.cont.7 <- lmer(rating ~ Expt + (1 | Subject), subset(e1e2,
+   item == 7)))
```

```
Linear mixed model fit by REML
Formula: rating ~ Expt + (1 | Subject)
Data: subset(e1e2, item == 7)
AIC      BIC logLik deviance REMLdev
77.85 83.32 -34.93    67.19    69.85
Random effects:
Groups   Name      Variance Std.Dev.
Subject (Intercept) 0.31622  0.56233
Residual              0.38914  0.62381
Number of obs: 29, groups: Subject, 16
```

```
Fixed effects:
              Estimate Std. Error t value
(Intercept)   2.7093     0.2155  12.573
ExptE2        -0.9050     0.2374  -3.813
```

```
Correlation of Fixed Effects:
      (Intr)
ExptE2 -0.524
```

```
> qq.plot(residuals(model.cont.7))
```



```
> e1e2.balanced <- subset(e1e2, (item == 7 & Subject != 109 & Subject !=
+ 108 & Subject != 106))
> e1e2.balanced$Subject <- factor(e1e2.balanced$Subject)
> table(e1e2.balanced$Subject, e1e2.balanced$Expt)
```

| | E1 | E2 |
|-----|----|----|
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 101 | 1 | 1 |
| 102 | 1 | 1 |
| 103 | 1 | 1 |
| 104 | 1 | 1 |
| 105 | 1 | 1 |
| 107 | 1 | 1 |
| 110 | 1 | 1 |
| 111 | 1 | 1 |
| 112 | 1 | 1 |

```
> summary(aov(rating ~ Expt + Error(Subject/Expt), e1e2.balanced))
```

```
Error: Subject
      Df Sum Sq Mean Sq F value Pr(>F)
Residuals 12 13.6154  1.1346
```

Error: Subject:Expt

| | Df | Sum Sq | Mean Sq | F value | Pr(>F) |
|-----------|----|--------|---------|---------|-------------|
| Expt | 1 | 4.6538 | 4.6538 | 11.524 | 0.005322 ** |
| Residuals | 12 | 4.8462 | 0.4038 | | |

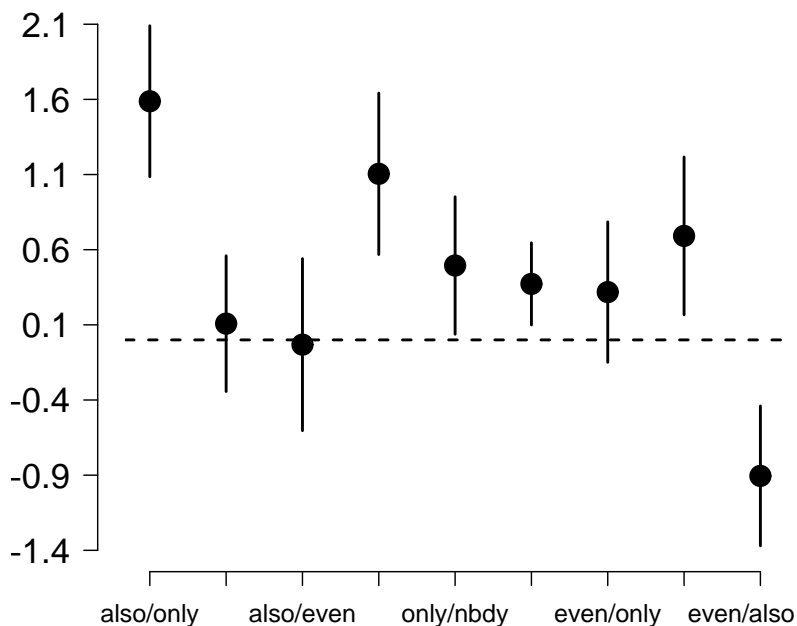
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

3 Graphical visualization of the results

First we load a file containing the fixed effects coefficients and standard errors corresponding to all the above analyses.

```
> fix <- read.table("fixef.txt")
> colnames(fix) <- c("item", "coef", "se")
> xlab <- c("also/only", "also/nbdy", "also/even", "only/also",
+          "only/nbdy", "only/even", "even/only", "even/nbdy", "even/also")

> y <- fix$coef
> lower <- y - qnorm(0.975) * fix$se
> upper <- y + qnorm(0.975) * fix$se
> min_y <- as.numeric(formatC(min(lower), digits = 2))
> max_y <- as.numeric(formatC(max(upper), digits = 2))
> p <- 9
> z <- c(0, 0, 0, 0, 0, 0, 0, 0, 0.25)
> plot(1:p, y, axes = F, xlab = "", ylab = "", pch = 19, cex = 2,
+      col = "black", ylim = c(min_y, max_y + 0.05), cex.main = 2)
> segments(c(1:p), lower, c(1:p), upper, lwd = 2, "black")
> axis(1, c(1:p), labels = rep("", 9), las = 1, cex.axis = 1.3)
> axis(1, c(1:p) - z, labels = xlab, tick = FALSE, las = 1, cex.axis = 1.1)
> axis(2, seq(min_y, max_y, by = 0.5), line = 1, las = 1, cex.axis = 1.5)
> abline(a = 0, b = 0, lty = 2, lwd = 2, col = gray(0))
```



```

> xlab1 <- c("also/only", "also/even", "only/nbdy", "even/only",
+           "even/also")
> xlab2 <- c("also/nbdy", "only/also", "only/even", "even/nbdy")
> newitem <- ifelse(e1e2$item == 1, 1, ifelse(e1e2$item == 4, 2,
+     ifelse(e1e2$item == 9, 3, ifelse(e1e2$item == 2, 4, ifelse(e1e2$item ==
+     3, 5, ifelse(e1e2$item == 8, 6, ifelse(e1e2$item == 6,
+     7, ifelse(e1e2$item == 5, 8, ifelse(e1e2$item == 7, 9,
+     NA)))))))))
> e1e2$newitem <- newitem
> means <- with(e1e2, tapply(rating, IND = list(Expt, newitem),
+   mean))
> CI.E1 <- c()
> CI.E2 <- c()
> for (i in 1:9) {
+   cis <- ci(subset(e1e2, newitem == i & Expt == "E1")$rating)
+   CI.E1 <- rbind(CI.E1, cis)
+   cis <- ci(subset(e1e2, newitem == i & Expt == "E2")$rating)
+   CI.E2 <- rbind(CI.E2, cis)
+ }
> mygray <- gray(0.4)
> barplot(with(e1e2, tapply(rating, IND = list(Expt, newitem),
+   mean)), axes = F, axisnames = F, ylim = c(1, 4), col = c(mygray,
+   "white"), beside = TRUE, xpd = F, xlab = "", ylab = "", cex.lab = 2,
+   cex.main = 1.5)
> sequence <- seq(from = 1.5, to = 27, by = 3)
> arrows(sequence, CI.E1$lower, sequence, CI.E1$upper, angle = 90,
+   length = 0.05, code = 3, lwd = 2)
> sequence <- seq(from = 2.5, to = 29, by = 3)

```



```

> arrows(sequence, CI.E2$lower, sequence, CI.E2$upper, angle = 90,
+        length = 0.05, code = 3, lwd = 2)
> mtext("Ratings", side = 2, line = 2.7, cex = 1.8)
> axis(1, seq(2, 26, by = 6), labels = xlab1, line = -0.5, tick = FALSE,
+      las = 3, cex.axis = 1.1)
> axis(1, seq(5, 26, by = 6), labels = xlab2, line = -0.5, tick = FALSE,
+      las = 3, cex.axis = 1.1)
> min_y <- min(e1e2$rating)
> max_y <- max(e1e2$rating)
> axis(2, seq(min_y, max_y, by = 1), line = 1, las = 1, cex.axis = 1.9)
> legend(19, 3.5, c("Target", "Control"), fill = c(mygray, "white",
+            cex = 2))

```

