Linear relationships with ratings

Contents


```
library(data.table); library(nlme); library(multcomp); library(ggplot2)
```

```
load("../PilotData/IndividualData.RData")
load("../PilotData/ExcludedSubjectList.RData")
```

```
outside.hit.rate.per.room <- outside.hit.rate.per.room[! SubjectNo %in% excluded.ps]
```

Relationships with curiosity rating

```
baseline <- lme(SAcc ~ 1, random = ~ 1|SubjectNo, data = outside.hit.rate.per.room, method = "ML", cont
```

```
cur.model <- update(baseline, .~. + Curiosity, random = ~ 1 + Curiosity|SubjectNo)
```

```
anova(baseline, cur.model)
```

```
##           Model df       AIC       BIC   logLik   Test  L.Ratio p-value
## baseline      1  3 -55.12418 -43.03935 30.56209
## cur.model     2  6 -50.59085 -26.42118 31.29543 1 vs 2 1.466669    0.69
```

```
summary(cur.model)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##         AIC       BIC   logLik
##   -50.59085 -26.42118 31.29543
##
## Random effects:
##  Formula: ~1 + Curiosity | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev      Corr
## (Intercept) 0.133096407 (Intr)
## Curiosity   0.007108892 -0.205
## Residual    0.210428643
##
```

```
## Fixed effects: SAcc ~ Curiosity
##                   Value  Std.Error  DF   t-value p-value
## (Intercept)  0.28097739 0.03744609 388  7.503518  0.0000
## Curiosity   -0.00539461 0.00493083 388 -1.094056  0.2746
##  Correlation:
##           (Intr)
## Curiosity -0.673
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -2.18378449 -0.66095390 -0.04601702  0.71927972  2.70572198
##
## Number of Observations: 415
## Number of Groups: 26
```

Relationships with interestingness rating

```
int.model <- update(baseline, .~. + Interest, random = ~ 1 + Interest|SubjectNo)
```

```
anova(baseline, int.model)
```

```
##           Model df       AIC       BIC   logLik   Test   L.Ratio p-value
## baseline      1  3 -55.12418 -43.03935 30.56209
## int.model     2  6 -49.45835 -25.28867 30.72917 1 vs 2 0.3341621  0.9535
```

```
summary(int.model)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##         AIC       BIC   logLik
##   -49.45835 -25.28867 30.72917
##
## Random effects:
##  Formula: ~1 + Interest | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev      Corr
## (Intercept) 0.131452199 (Intr)
## Interest    0.001666875 -0.061
## Residual    0.211231048
##
## Fixed effects: SAcc ~ Interest
##                  Value  Std.Error  DF  t-value p-value
## (Intercept) 0.23840479 0.03718929 388 6.410577  0.0000
## Interest    0.00266813 0.00459212 388 0.581023  0.5616
##  Correlation:
##          (Intr)
## Interest -0.664
##
## Standardized Within-Group Residuals:
##        Min         Q1        Med         Q3        Max
## -2.2785816 -0.6548906 -0.0489853  0.7263272  2.8249948
##
## Number of Observations: 415
## Number of Groups: 26
```

Relationships with surprise score

```
sur.model <- update(baseline, .~. + Surprise, random = ~ 1 + Surprise|SubjectNo)
```

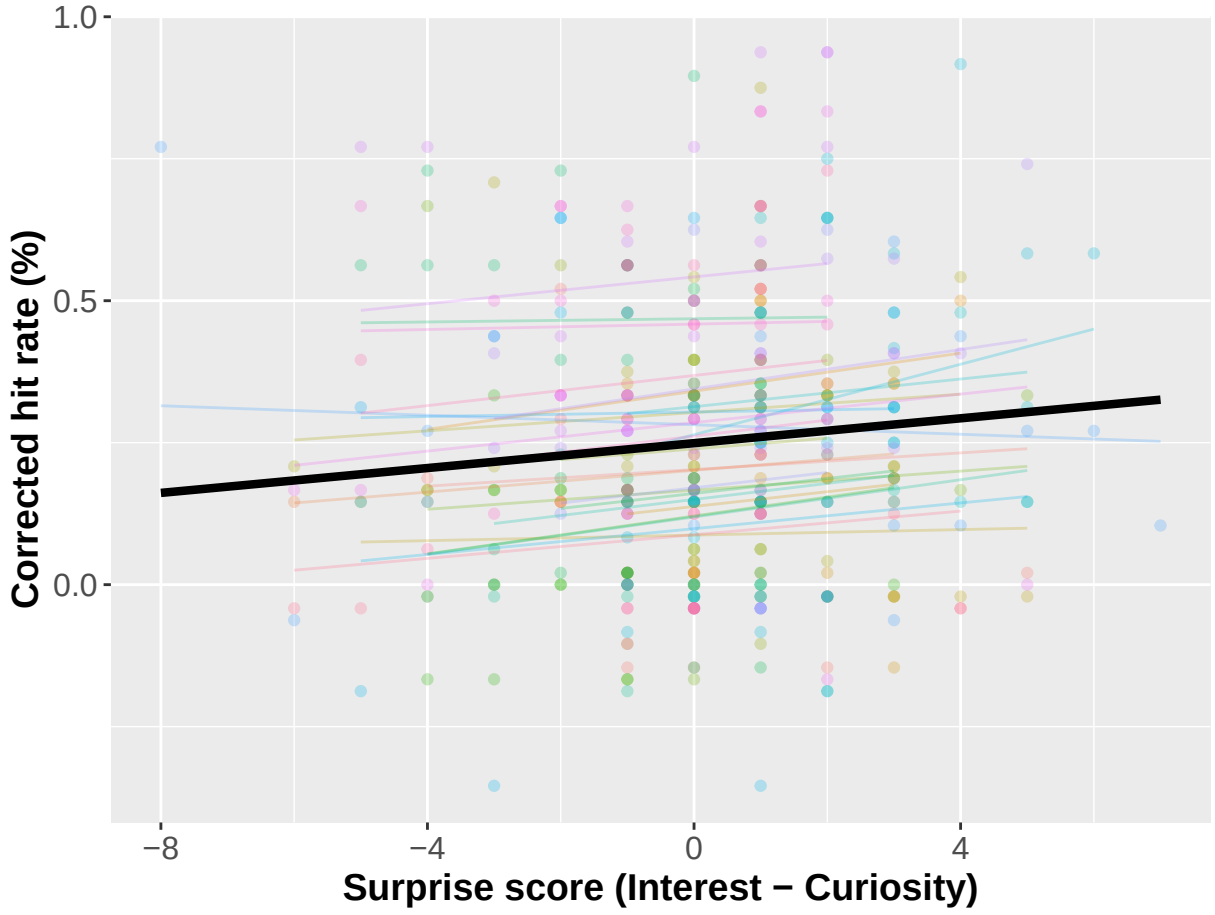
```
anova(baseline, sur.model)
```

```
##           Model df       AIC       BIC   logLik   Test  L.Ratio p-value
## baseline      1  3 -55.12418 -43.03935 30.56209
## sur.model     2  6 -53.89548 -29.72581 32.94774 1 vs 2 4.771301  0.1893
```

```
summary(sur.model)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##         AIC       BIC   logLik
##   -53.89548 -29.72581 32.94774
##
## Random effects:
##  Formula: ~1 + Surprise | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev     Corr
## (Intercept) 0.13026395 (Intr)
## Surprise    0.01387512 -0.095
## Residual    0.20830359
##
## Fixed effects: SAcc ~ Surprise
##                  Value   Std.Error  DF  t-value p-value
## (Intercept) 0.24915265 0.027670470 388 9.004279  0.0000
## Surprise    0.01094423 0.005694313 388 1.921957  0.0553
##  Correlation:
##          (Intr)
## Surprise -0.068
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -2.29061078 -0.65390709 -0.03490819  0.69007796  2.70633586
##
## Number of Observations: 415
## Number of Groups: 26
```

Plot the linear relationships



Relationships with pre-interestingness rating

```
pre.int.model   <- update(baseline, .~. + PreInt, random = ~ 1 + PreInt|SubjectNo)
```

```
summary(pre.int.model)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##         AIC       BIC   logLik
##   -41.90344 -18.12196 26.95172
##
## Random effects:
##  Formula: ~1 + PreInt | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev      Corr
## (Intercept) 0.164604666 (Intr)
## PreInt      0.008195384 -0.882
## Residual    0.211817558
##
## Fixed effects: SAcc ~ PreInt
##                   Value  Std.Error  DF   t-value p-value
## (Intercept)  0.26264163 0.04268382 362  6.153189  0.0000
```

```
## PreInt      -0.00230589 0.00499170 362 -0.461945  0.6444
##  Correlation:
##        (Intr)
## PreInt -0.784
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -2.21469168 -0.69778164 -0.04884127  0.77023498  2.77893187
##
## Number of Observations: 389
## Number of Groups: 26
```

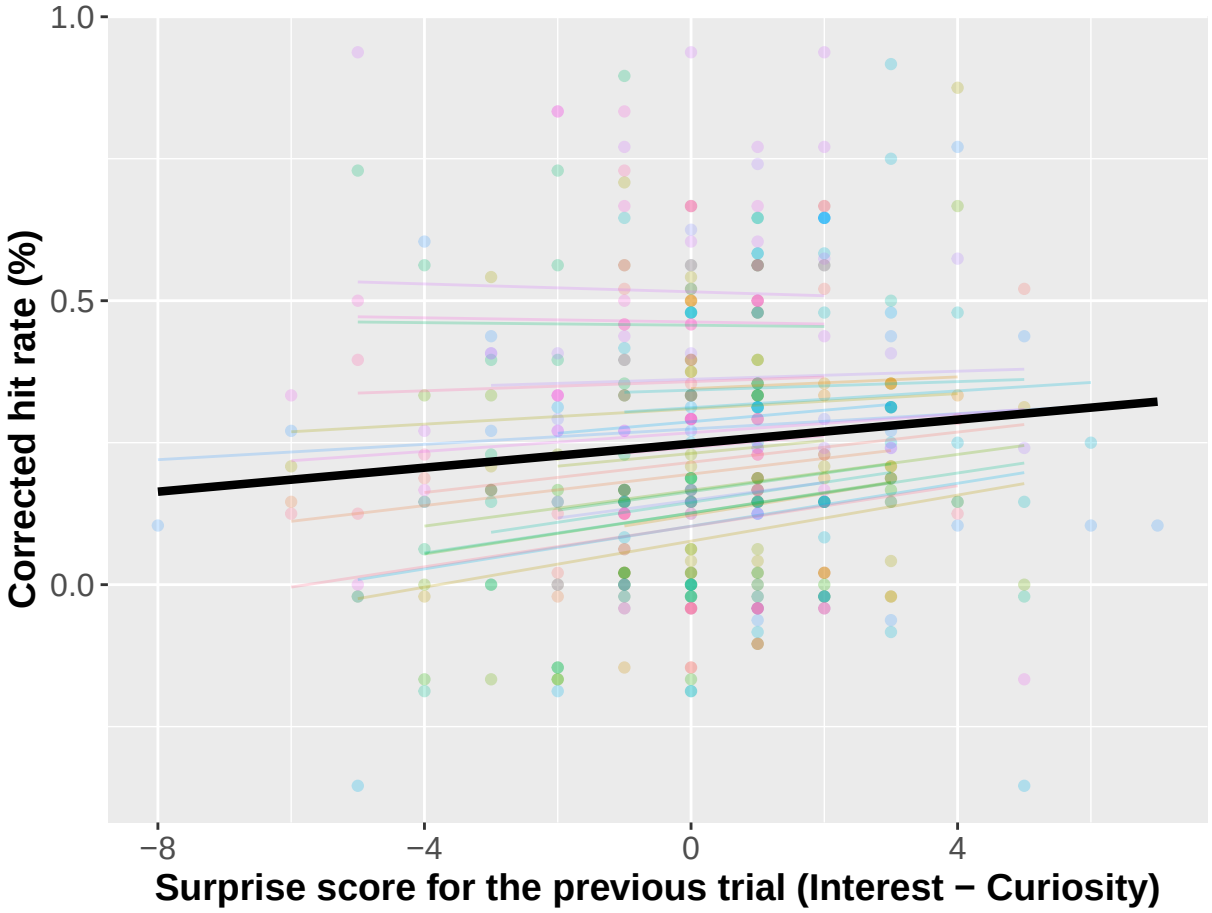
Relationships with pre-surprise rating

```
pre.sur.model   <- update(baseline, .~. + PreSur, random = ~ 1 + PreSur|SubjectNo)
```

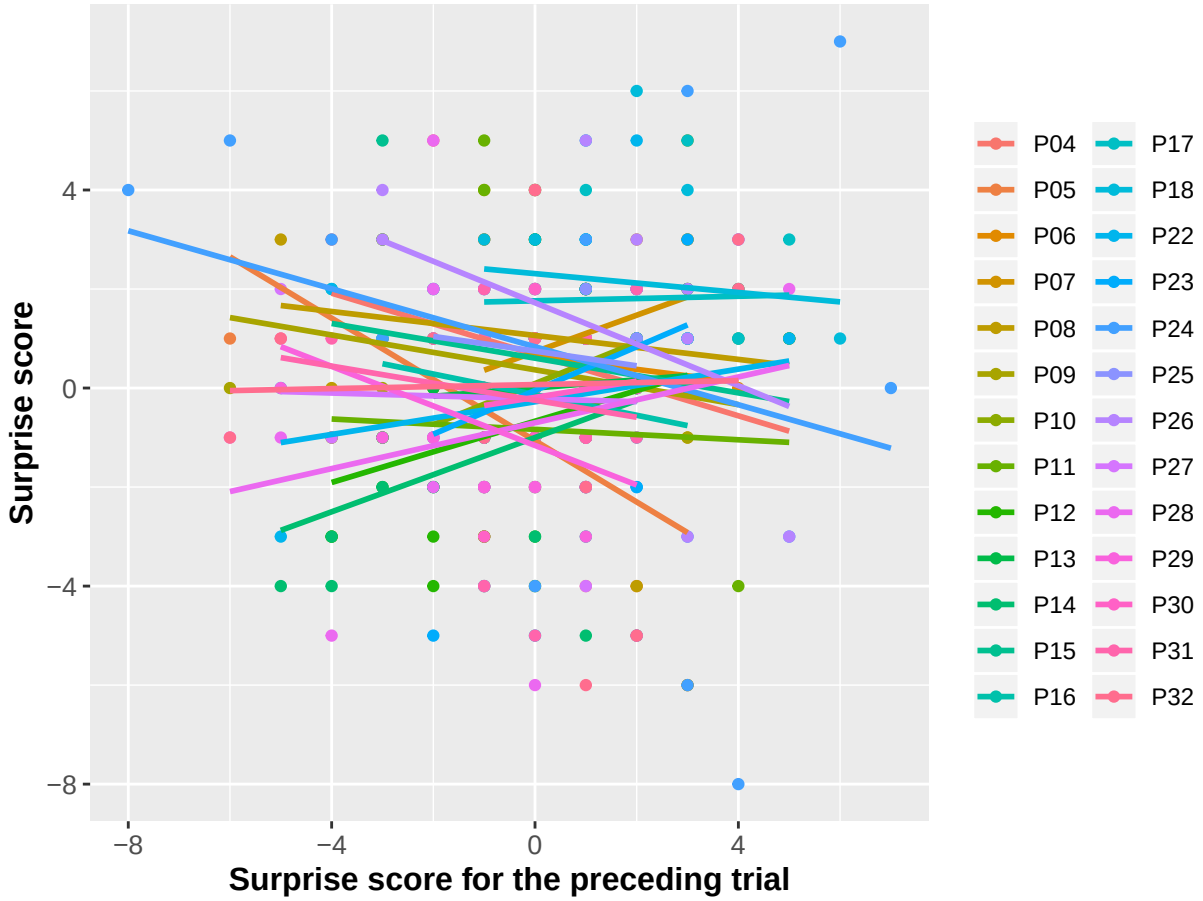
```
summary(pre.sur.model)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##         AIC       BIC   logLik
##   -45.53501 -21.75354 28.76751
##
## Random effects:
##  Formula: ~1 + PreSur | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev      Corr
## (Intercept) 0.131545746 (Intr)
## PreSur      0.009333342 -0.809
## Residual    0.210454338
##
## Fixed effects: SAcc ~ PreSur
##                  Value   Std.Error  DF  t-value p-value
## (Intercept) 0.24829020 0.028031020 362 8.857694  0.0000
## PreSur      0.01057281 0.005356764 362 1.973731  0.0492
##  Correlation:
##        (Intr)
## PreSur -0.293
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -2.62024183 -0.68637095 -0.07278589  0.71109934  2.76935848
##
## Number of Observations: 389
## Number of Groups: 26
```

Plot the linear relationships



Check the relationship between *Surprise* and *Pre-surprise*




```
base.sur <- lme(PreSur ~ 1, random = ~ 1|SubjectNo, data = outside.hit.rate.per.room, method = "ML", na
base.pre.sur.sur <- update(base.sur, .~. + Surprise, random = ~ Surprise|SubjectNo)
```

```
anova(base.sur, base.pre.sur.sur)
```

```
##                  Model df      AIC      BIC    logLik   Test L.Ratio p-value
## base.sur             1  3 1748.373 1760.263 -871.1863
## base.pre.sur.sur     2  6 1751.737 1775.518 -869.8683 1 vs 2 2.63604  0.4512
```

```
summary(base.pre.sur.sur)
```

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: outside.hit.rate.per.room
##        AIC      BIC    logLik
##   1751.737 1775.518 -869.8683
##
## Random effects:
##  Formula: ~Surprise | SubjectNo
##  Structure: General positive-definite, Log-Cholesky parametrization
##             StdDev    Corr
## (Intercept) 0.6114518 (Intr)
## Surprise    0.1370594 -0.432
## Residual    2.1911887
##
## Fixed effects: PreSur ~ Surprise
##                  Value  Std.Error  DF   t-value p-value
```

```
## (Intercept) 0.21686073 0.16542660 362 1.3109182  0.1907
## Surprise    0.00436696 0.05887281 362 0.0741762  0.9409
##  Correlation:
##          (Intr)
## Surprise -0.197
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -3.67738383 -0.46961839 -0.02414864  0.57805795  2.93712824
##
## Number of Observations: 389
## Number of Groups: 26
```

So there is no coorelation between Surprise score and pre-Surprise score.