Surprise study pilot 16

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Study description

This study is the same as pilot 15, but we have moved the prediction before participant's performance to see whether it would make a difference in the relationship between subjective PE and emotion ratings. Although participants won't take their performance into account, this would be closer to what happens during therapy.

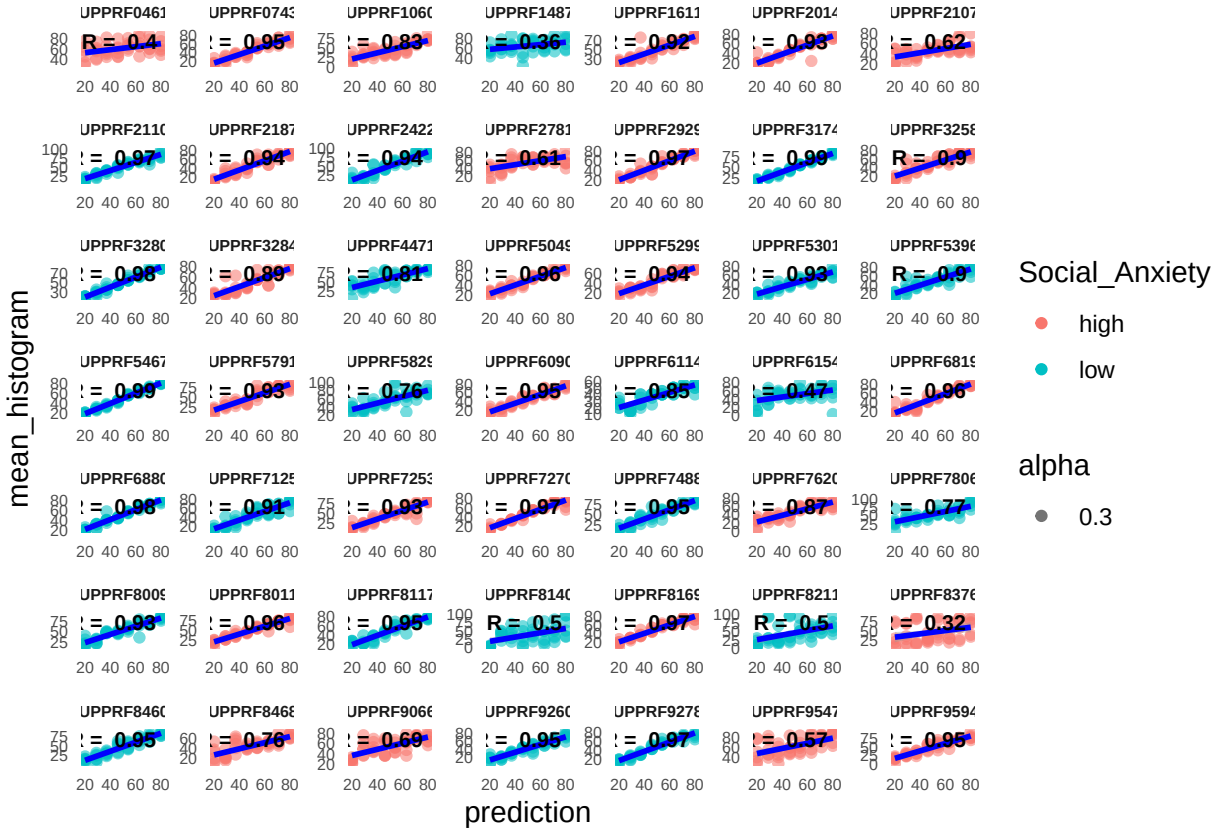
The Gorilla experiment is the following: https://app.gorilla.sc/admin/project/125827 The task is the following: https://app.gorilla.sc/admin/task/772053/editor

```
## [1] "It seems everyone has done all the 48 trials, Elena managed to fix the issue some people were e
```

```
## # A tibble: 49 x 2
##    Random_ID   Trial.Number
##    <chr>              <int>
##  1 SUPPRF04615           48
##  2 SUPPRF07437           48
##  3 SUPPRF10603           48
##  4 SUPPRF14876           48
##  5 SUPPRF16119           48
##  6 SUPPRF20143           48
##  7 SUPPRF21072           48
##  8 SUPPRF21106           48
##  9 SUPPRF21877           48
## 10 SUPPRF24224           48
## # i 39 more rows
```

Relationship between prediction and mean histogram

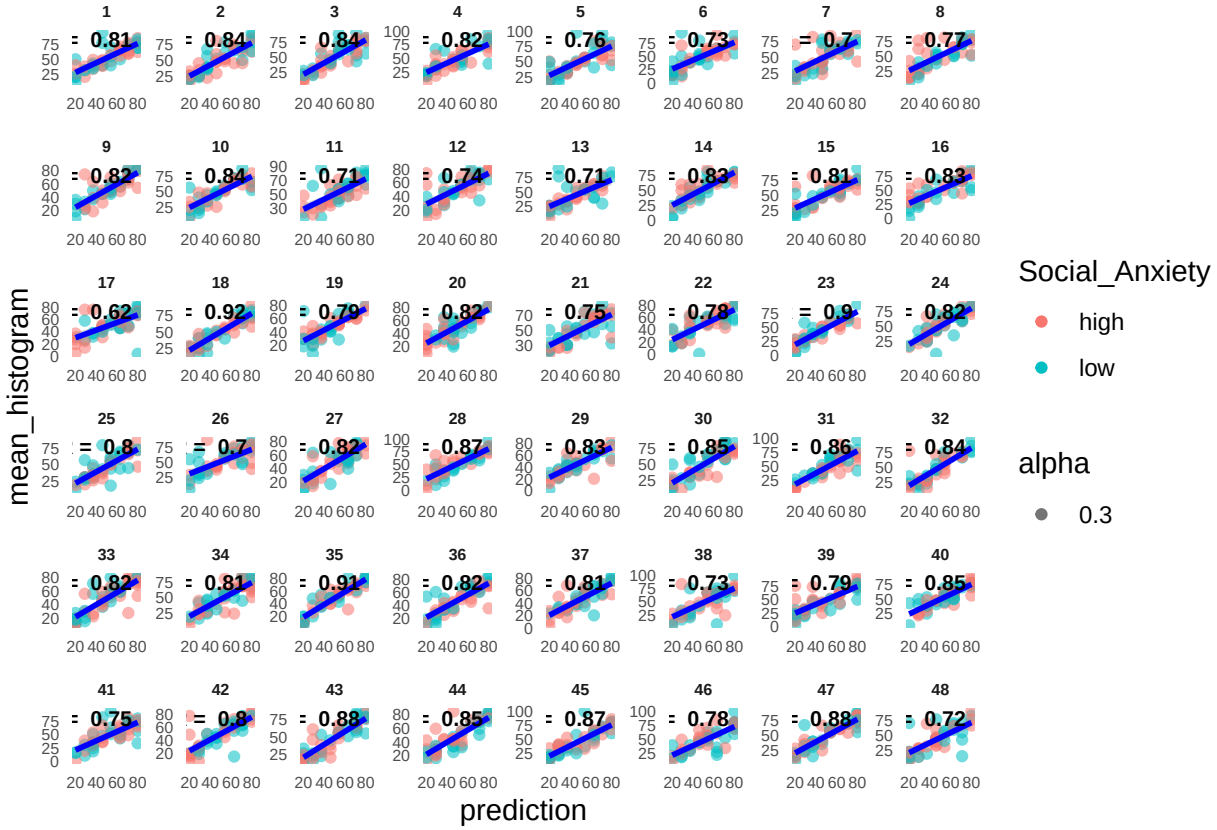
```
## [1] "average correlation between mean_hist and prediction: 0.837135503217472"
```



Relationship between prediction and mean histogram across trials

I suspect to see a weaker correlation between prediction and mean of the histogram from first to last trial.

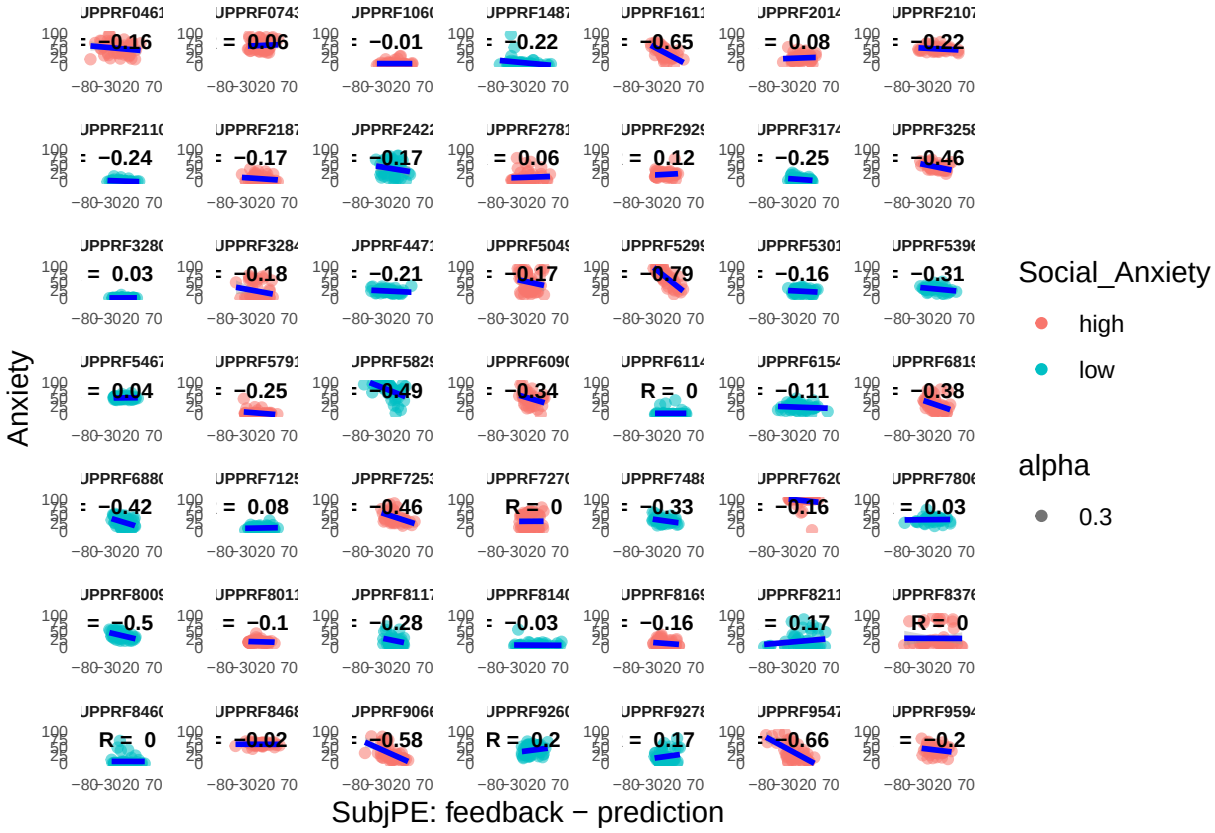
```
## [1] "average correlation between mean_hist and prediction per trial: 0.804829794914563"
```




```
## # A tibble: 2 x 2
##   Trial_Group average_correlation
##   <chr>                     <dbl>
## 1 1-24                      0.791
## 2 25-48                     0.820
```

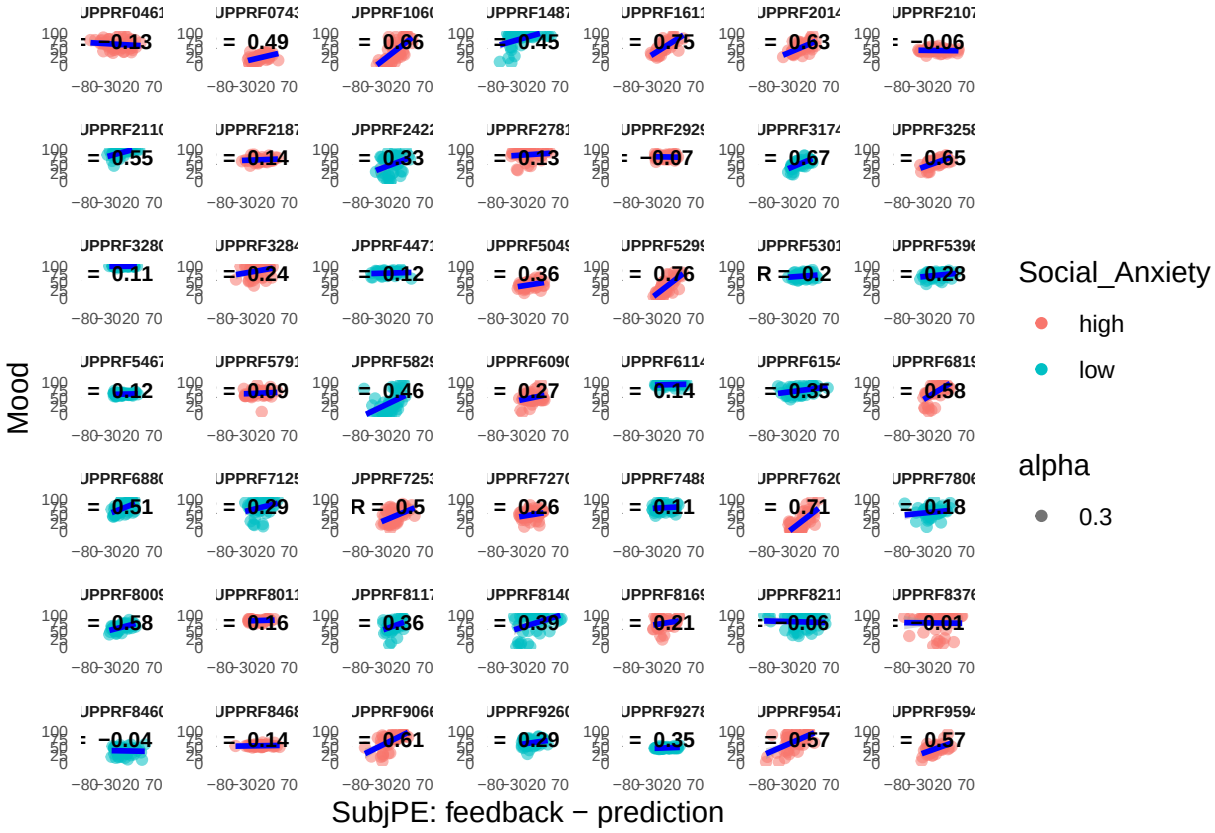
Relationship between Anxiety and SubjPE

```
## [1] "average correlation between anxiety and SubjPE: -0.178596386576519"
```



Relationship between Mood and SubjPE

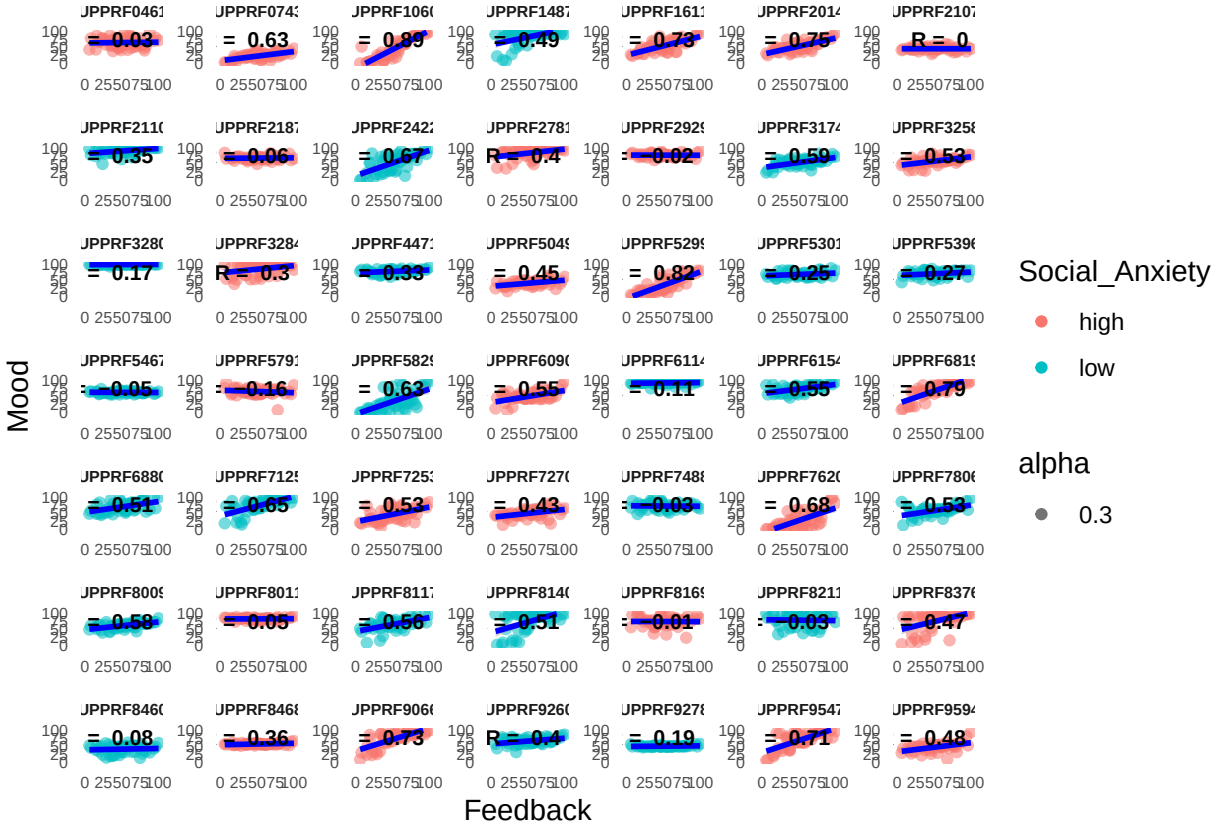
```
## [1] "average correlation between mood and SubjPE: 0.325520728259234"
```



Relationship between Mood and feedback

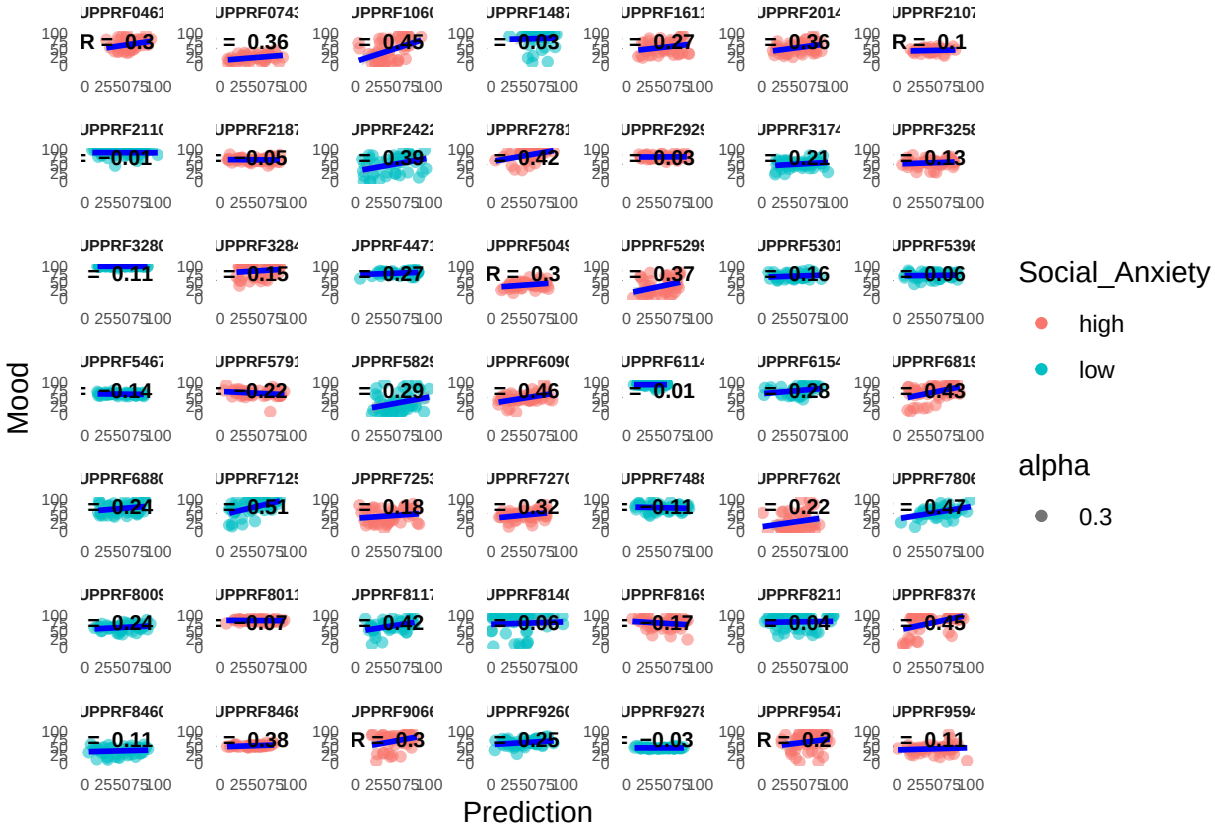
The relationship between mood and feedback still seems to be stronger than mood and subjective PE. Is this a problem? How do we even differentiate social reward, from social PE?

```
## [1] "average correlation between mood and feedback: 0.398495868220696"
```



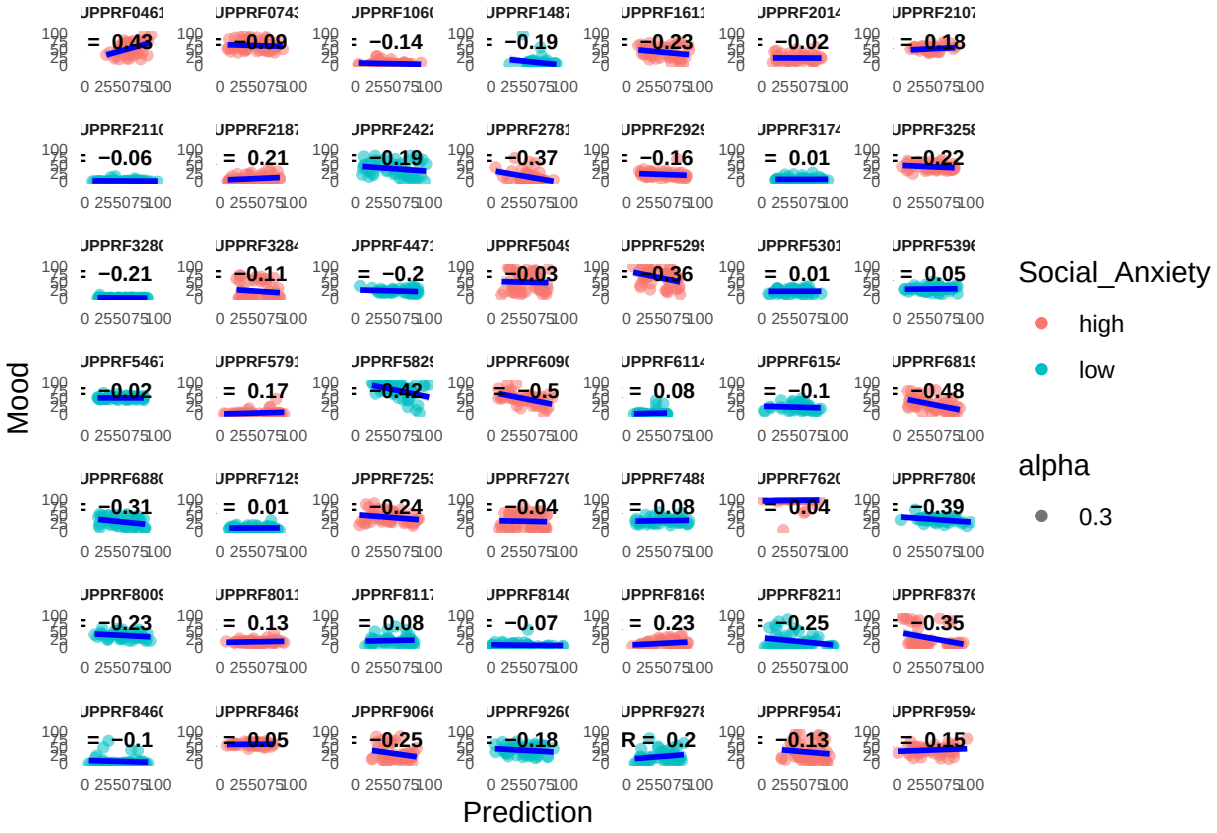
Relationship between Mood and prediction

```
## [1] "average correlation between mood and prediction: 0.196583244817707"
```



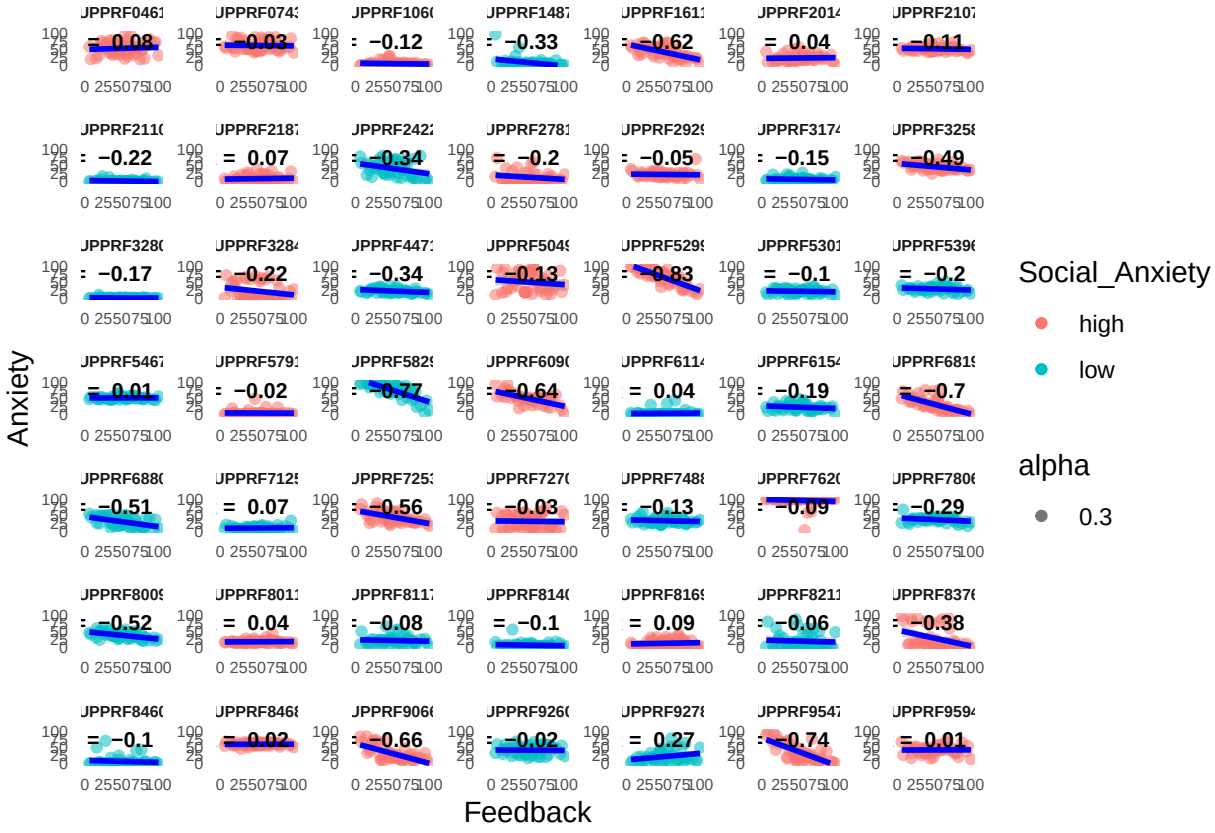
Relationship between Anxiety and prediction

```
## [1] "average correlation between anxiety and prediction: -0.091867831859706"
```

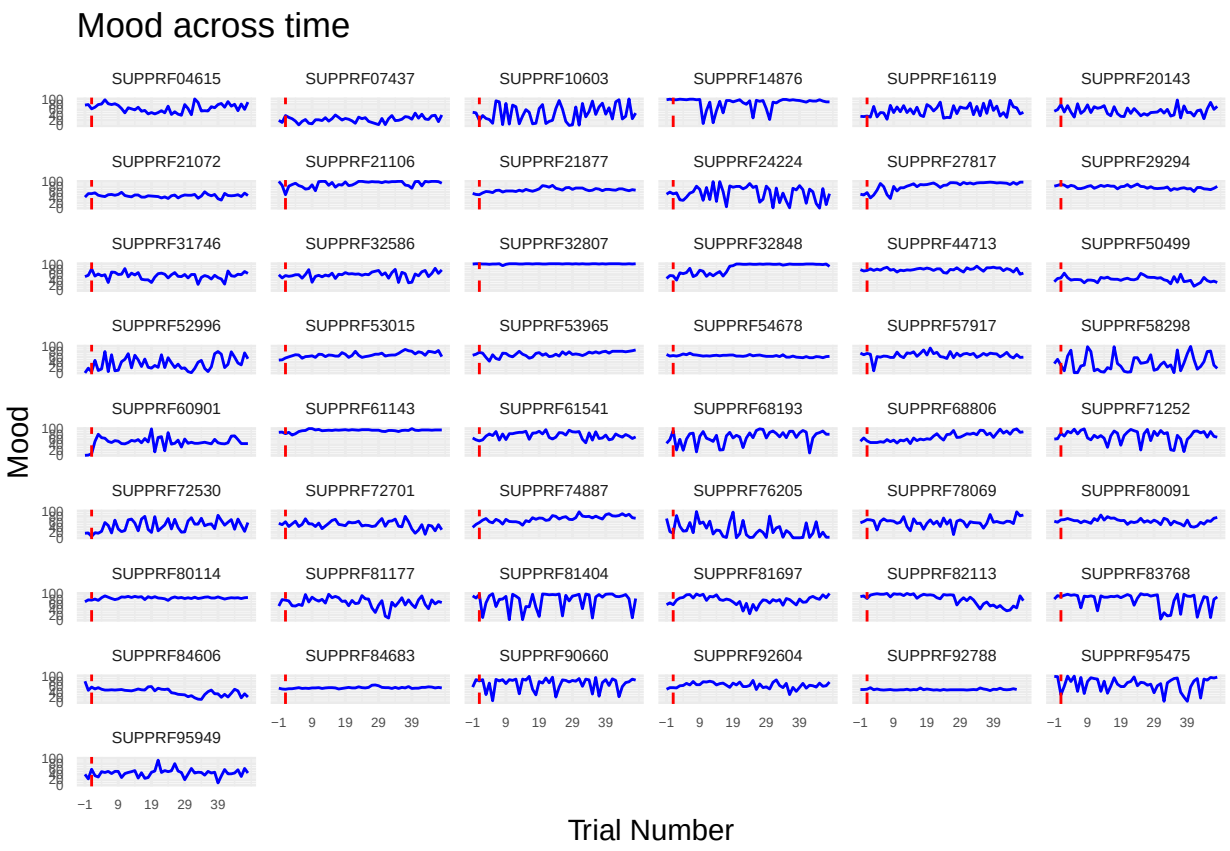


Relationship between Anxiety and feedback

```
## [1] "average correlation between anxiety and feedback: -0.213654726385626"
```



Mood over time



Anxiety over time

LME models for Mood and SubjPE

When looking at subjective PE, the best model is Mood ~ SubjPE + (SubjPE | Random_ID) with an AIC of 19784.67 When including feedback the best model is Mood ~ feedback + (feedback | Random_ID) with an AIC of 19380.41

```
## [1] 19784.67
```

```
## [1] 19512.53
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + (Response_SubjPE | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19772.7
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.6896 -0.4242  0.0623  0.5415  5.3003
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     314.7330 17.7407
##            Response_SubjPE   0.0921  0.3035  -0.49
##  Residual                  233.5934 15.2838
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     62.67782    2.55556   24.53
## Response_SubjPE  0.32723    0.04701    6.96
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.460
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + Response_fdbk + (Response_SubjPE |
##     Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19498.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.5200 -0.4751  0.0476  0.5741  5.1787
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     306.71458 17.5133
##            Response_SubjPE   0.09464  0.3076  -0.49
```

```
##  Residual                  206.40186 14.3667
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     49.40343    2.63536  18.746
## Response_SubjPE  0.12529    0.04859   2.578
## Response_fdbk    0.26614    0.01540  17.282
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE
## Rspns_SbjPE -0.355
## Respns_fdbk -0.292 -0.241

## Data: final_df16
## Models:
## model2: Response_H ~ Response_SubjPE + (Response_SubjPE | Random_ID)
## model2a: Response_H ~ Response_SubjPE + Response_fdbk + (Response_SubjPE | Random_ID)
##         npar   AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
## model2     6 19784 19818 -9885.9    19772
## model2a    7 19505 19546 -9745.6    19491 280.67  1  < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## [1] "Model 1 summary: Response_H ~ Response_SubjPE + (1 | Random_ID)"

## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + (1 | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19984.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.3328 -0.4649  0.0681  0.5582  3.6861
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 291.1    17.06
##  Residual              265.9    16.31
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)      62.7790     2.4607   25.51
## Response_SubjPE   0.2949     0.0181   16.29
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.018

## [1] "Model 2 summary: Response_H ~ Response_SubjPE + (Response_SubjPE | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + (Response_SubjPE | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19772.7
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.6896 -0.4242  0.0623  0.5415  5.3003
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     314.7330 17.7407
##            Response_SubjPE   0.0921  0.3035  -0.49
##  Residual                  233.5934 15.2838
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     62.67782    2.55556   24.53
## Response_SubjPE  0.32723    0.04701    6.96
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.460

## [1] "Model 3 summary: Response_H ~ Response_SubjPE * mini_SPIN_total + (Response_SubjPE | Random_ID)

## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE * mini_SPIN_total + (Response_SubjPE |
##     Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19774.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.6800 -0.4232  0.0625  0.5438  5.2801
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     297.68644 17.2536
##            Response_SubjPE   0.09127  0.3021  -0.47
##  Residual                  233.58683 15.2835
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                                 Estimate Std. Error t value
## (Intercept)                     70.87842    4.91912  14.409
## Response_SubjPE                  0.23099    0.09256   2.496
## mini_SPIN_total                 -1.47194    0.76174  -1.932
## Response_SubjPE:mini_SPIN_total  0.01729    0.01433   1.207
```

```
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE m_SPIN
## Rspns_SbjPE -0.434
## mn_SPIN_ttl -0.863  0.375
## R_SPE:_SPIN  0.375 -0.863 -0.436
```

```
## [1] "Model 4 summary: Response_H ~ Response_fdbk + (1 | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_fdbk + (1 | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19758.1
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.2803 -0.4966  0.0507  0.6075  3.8259
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 280.0    16.73
##  Residual              241.1    15.53
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)    47.3764     2.5112   18.87
## Response_fdbk   0.3111     0.0135   23.05
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.279
```

```
## [1] "Model 5 summary: Response_H ~ Response_fdbk + (Response_fdbk | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_fdbk + (Response_fdbk | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19368.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.9988 -0.4352  0.0479  0.5360  3.9930
##
## Random effects:
##  Groups    Name          Variance Std.Dev. Corr
##  Random_ID (Intercept)   689.1663 26.2520
##            Response_fdbk   0.0845  0.2907  -0.80
##  Residual                193.4635 13.9091
```

```
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   47.37695    3.81314  12.425
## Response_fdbk  0.31105    0.04325   7.192
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.804
## optimizer (bobyqa) convergence code: 0 (OK)
## Model is nearly unidentifiable: very large eigenvalue
##  - Rescale variables?
```

```
## [1] "Model 6 summary: Response_H ~ Response_fdbk * mini_SPIN_total + (Response_fdbk | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_fdbk * mini_SPIN_total + (Response_fdbk |
##     Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19370.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.9992 -0.4357  0.0482  0.5358  4.0037
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   653.53976 25.5644
##            Response_fdbk   0.08355  0.2891  -0.80
##  Residual                193.46391 13.9091
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                                Estimate Std. Error t value
## (Intercept)                    59.28230    7.35262   8.063
## Response_fdbk                   0.22108    0.08512   2.597
## mini_SPIN_total                -2.13686    1.13869  -1.877
## Response_fdbk:mini_SPIN_total  0.01615    0.01318   1.225
##
## Correlation of Fixed Effects:
##             (Intr) Rspns_ m_SPIN
## Respns_fdbk -0.798
## mn_SPIN_ttl -0.863  0.688
## Rsp_:_SPIN_  0.688 -0.863 -0.798
## optimizer (bobyqa) convergence code: 0 (OK)
## Model is nearly unidentifiable: very large eigenvalue
##  - Rescale variables?
```

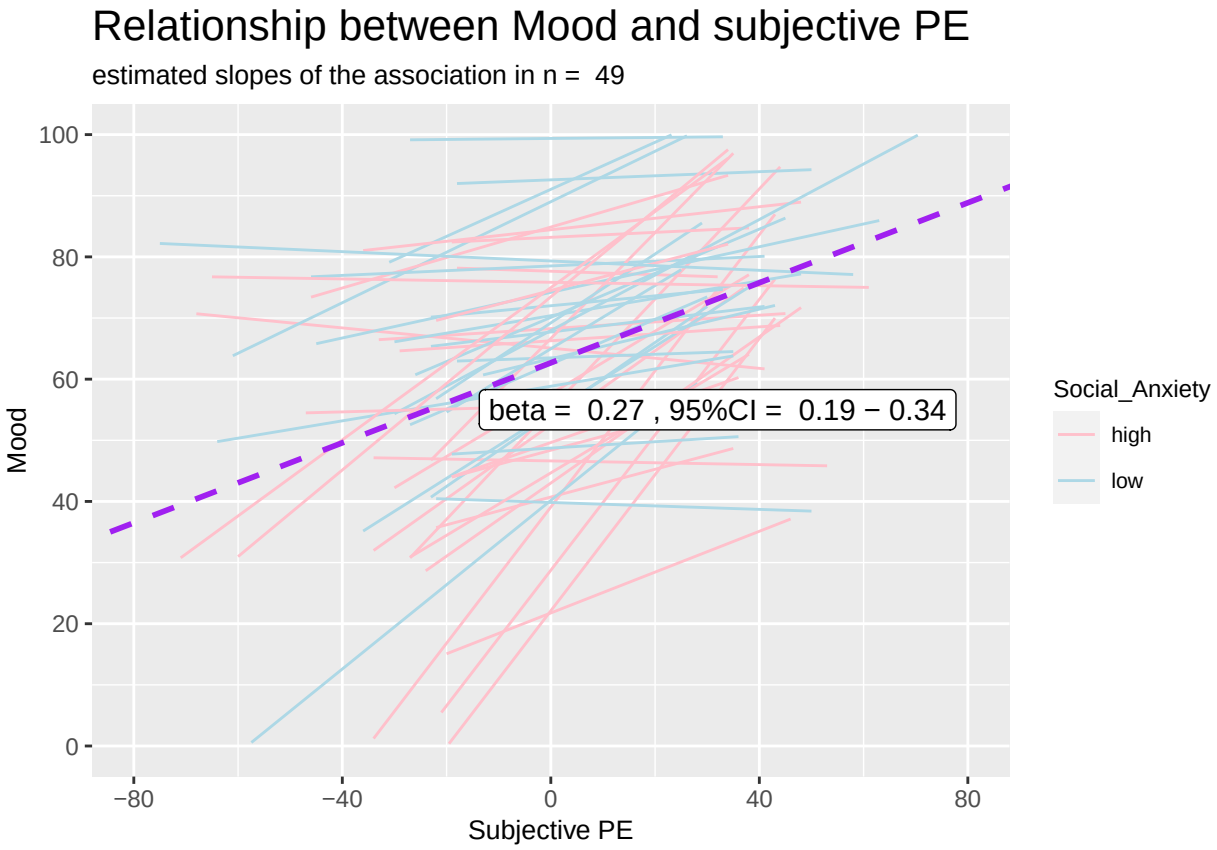
```
## [1] "AIC model1:"
```

```
## [1] 19992.5
```

```
## [1] "AIC model2:"

## [1] 19784.67

## [1] "AIC model3:"

## [1] 19790.43

## [1] "AIC model4:"

## [1] 19766.07

## [1] "AIC model5:"

## [1] 19380.41

## [1] "AIC model6:"

## [1] 19386.5
```

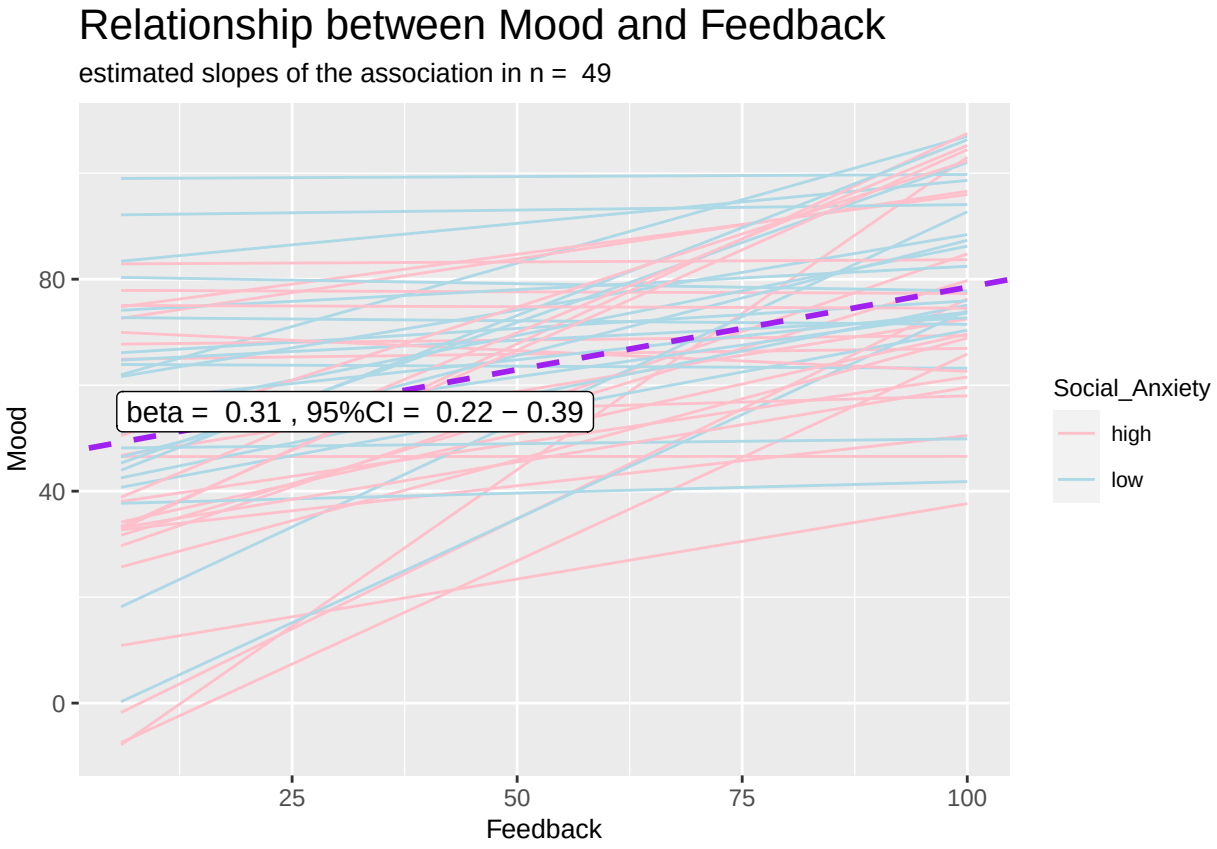
Individual plots with LME for Mood with SubjPE

When looking at subjective PE, the best model is Mood ~ SubjPE + (SubjPE | Random_ID) with an AIC of 19784.67



Individual plots with LME for Mood with feedback instead of SubjPE

When including feedback the best model is Mood ~ feedback + (feedback | Random_ID) with an AIC of 19380.41



LME models for Anxiety and SubjPE

When looking at subjective PE, the best model is Anxiety ~ SubjPE + (SubjPE | Random_ID) with an AIC of 19691.4 When including feedback the best model is Anxiety ~ feedback + (Random_ID) with an AIC of 19530.9

```
## [1] "Model 1 summary: Response_Ax ~ Response_SubjPE + (1 | Random_ID)"

## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE + (1 | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19801.8
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.6842 -0.5253 -0.1021  0.3999  5.3958
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 421.5    20.53
##  Residual              243.7    15.61
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     30.63287    2.95086  10.381
## Response_SubjPE -0.15240    0.01733  -8.791
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.014

## [1] "Model 2 summary: Response_Ax ~ Response_SubjPE + (Response_SubjPE | Random_ID)"

## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE + (Response_SubjPE | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19679.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.8117 -0.4855 -0.1017  0.3878  5.6814
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     435.49841 20.8686
##            Response_SubjPE   0.05674  0.2382  -0.43
##  Residual                  224.15641 14.9719
## Number of obs: 2350, groups:  Random_ID, 49
```

```
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     30.37102    2.99845  10.129
## Response_SubjPE -0.16858    0.03838  -4.393
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.386
```

```
## [1] "Model 3 summary: Response_Ax ~ Response_SubjPE * mini_SPIN_total + (Response_SubjPE | Random_ID)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE * mini_SPIN_total + (Response_SubjPE |
##     Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19681.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.8151 -0.4828 -0.1020  0.3863  5.6828
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     414.97541 20.3709
##            Response_SubjPE   0.05643  0.2375  -0.40
##  Residual                  224.14379 14.9714
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                                 Estimate Std. Error t value
## (Intercept)                     21.19643    5.79200   3.660
## Response_SubjPE                 -0.09275    0.07566  -1.226
## mini_SPIN_total                  1.64705    0.89694   1.836
## Response_SubjPE:mini_SPIN_total -0.01363    0.01171  -1.165
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE m_SPIN
## Rspns_SbjPE -0.358
## mn_SPIN_ttl -0.863  0.310
## R_SPE:_SPIN  0.310 -0.862 -0.361
```

```
## [1] "Model 4 summary: Response_Ax ~ Response_fdbk + (1 | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_fdbk + (1 | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19737.3
##
```

```
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.9347 -0.5697 -0.0924  0.4113  5.2382
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 422.6    20.56
##  Residual              236.9    15.39
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   38.62255    3.03428   12.73
## Response_fdbk -0.16135    0.01338  -12.06
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.229
```

```
## [1] "Model 5 summary: Response_Ax ~ Response_fdbk + (Response_fdbk | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_fdbk + (Response_fdbk | Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19518.9
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.3684 -0.5103 -0.1091  0.4041  5.4843
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   751.78109 27.4186
##            Response_fdbk   0.05329  0.2308  -0.72
##  Residual                206.87699 14.3832
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   38.62183    3.98131   9.701
## Response_fdbk -0.16128    0.03527  -4.573
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.719
## optimizer (bobyqa) convergence code: 0 (OK)
## Model is nearly unidentifiable: very large eigenvalue
##  - Rescale variables?
```

```
## [1] "Model 6 summary: Response_Ax ~ Response_fdbk * mini_SPIN_total + (Response_fdbk | Random_ID)"
```

```
## Linear mixed model fit by REML ['lmerMod']
```

```
## Formula: Response_Ax ~ Response_fdbk * mini_SPIN_total + (Response_fdbk |
##     Random_ID)
##    Data: final_df16
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 19521.1
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.3702 -0.5073 -0.1078  0.3979  5.4877
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   712.14249 26.686
##            Response_fdbk   0.05243  0.229   -0.70
##  Residual                206.87656 14.383
## Number of obs: 2350, groups:  Random_ID, 49
##
## Fixed effects:
##                               Estimate Std. Error t value
## (Intercept)                   26.08468    7.67273   3.400
## Response_fdbk                 -0.08360    0.06928  -1.207
## mini_SPIN_total                2.25026    1.18827   1.894
## Response_fdbk:mini_SPIN_total -0.01394    0.01073  -1.299
##
## Correlation of Fixed Effects:
##             (Intr) Rspns_ m_SPIN
## Respns_fdbk -0.707
## mn_SPIN_ttl -0.863  0.610
## Rsp_:_SPIN_  0.610 -0.863 -0.707
## optimizer (bobyqa) convergence code: 0 (OK)
## Model is nearly unidentifiable: very large eigenvalue
##  - Rescale variables?

## [1] "AIC model1:"

## [1] 19809.76

## [1] "AIC model2:"

## [1] 19691.4

## [1] "AIC model3:"

## [1] 19697.39

## [1] "AIC model4:"

## [1] 19745.3

## [1] "AIC model5:"
```

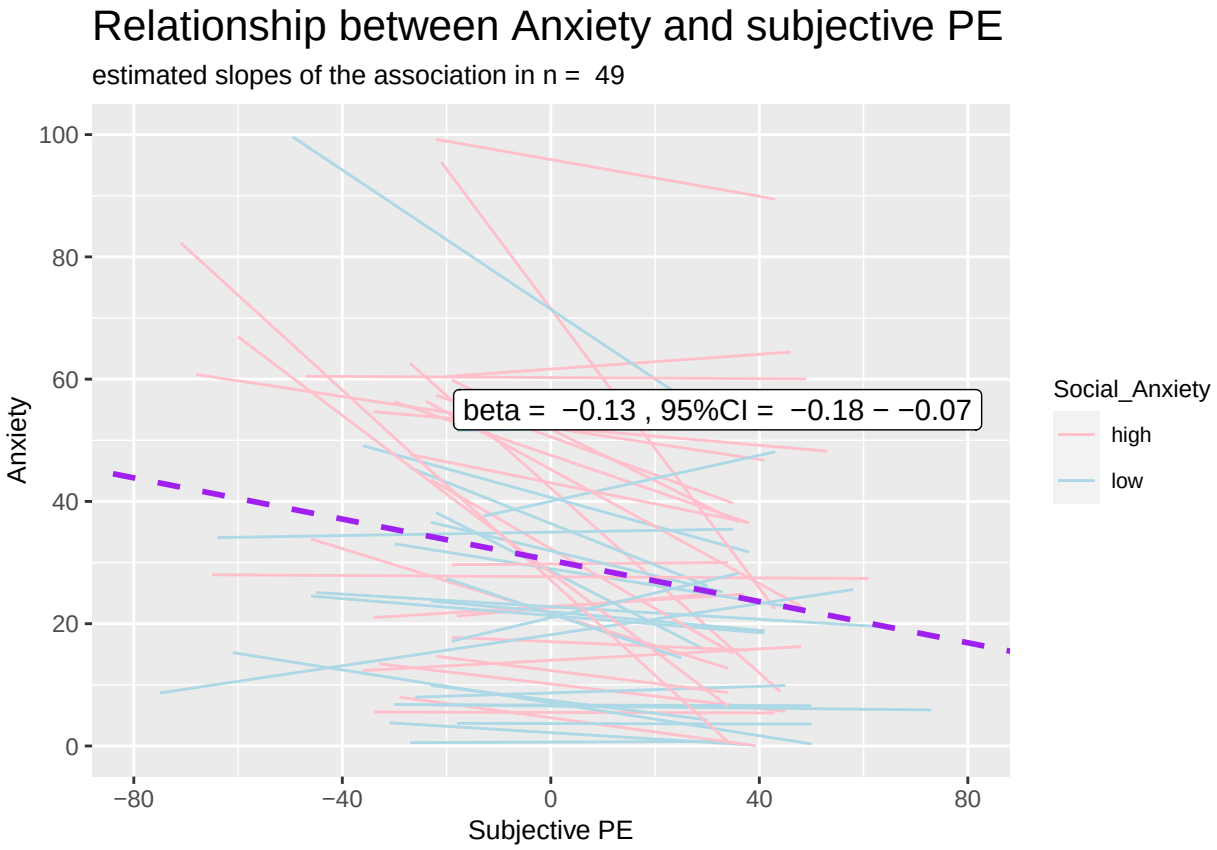
```
## [1] 19530.9
```

```
## [1] "AIC model6:"
```

```
## [1] 19537.13
```

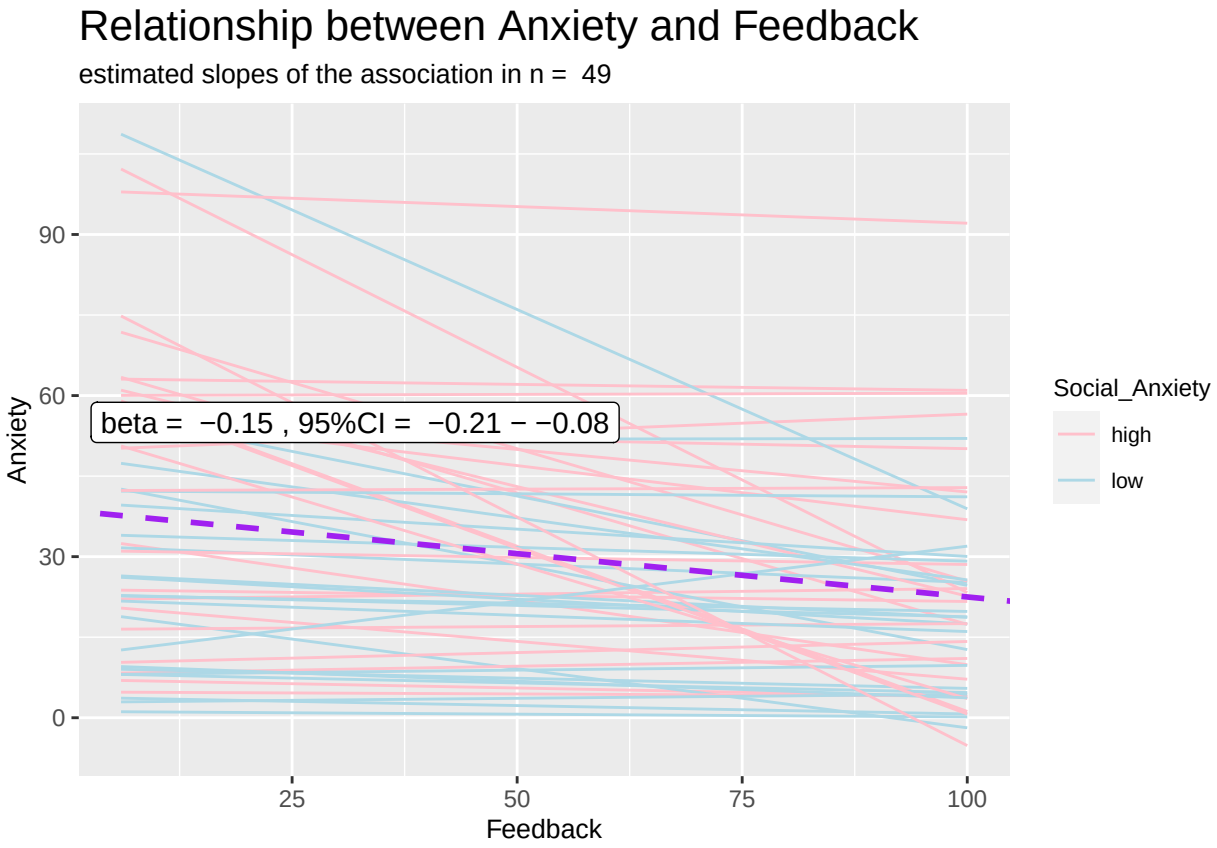
Individual plots with LME for Anxiety with SubjPE

When looking at subjective PE, the best model is Anxiety ~ SubjPE + (SubjPE | Random_ID) with an AIC of 19691.4



Individual plots with LME for Anxiety with feedback instead of SubjPE

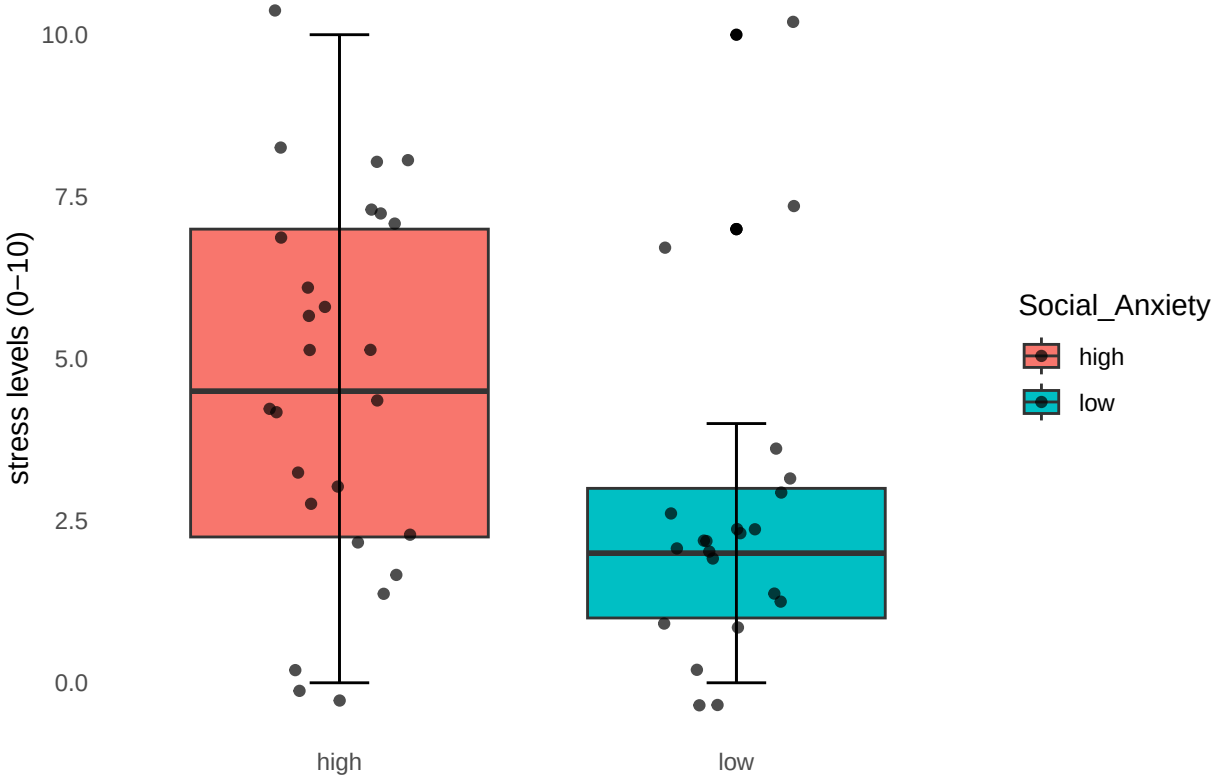
When including feedback the best model is Anxiety ~ feedback + (Random_ID) with an AIC of 8761.136



Relationship average anxiety on the task and how stressful they rated the task

We have only one scale at the end when asking feedback, and we ask them "How stressful was this as a social situation?" on a scale of 0-100. Let's look at the relationshio between this score and anxiety on the task, but also the average score in people with high and low social anxiety.

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  high and low
## W = 407, p-value = 0.01179
## alternative hypothesis: true location shift is not equal to 0
```



Bayesian LME

ICC for anxiety

we will now look at the ICC outcome for anxiety The ICC for anxiety is 0.62, which is moderate according to guidelines by Koo and Li (2016): below 0.50: poor between 0.50 and 0.75: moderate between 0.75 and 0.90: good above 0.90: excellent

```
## [1] "lmer for anxiety with just the intercept"
```

```
## [1] 0.6264877
```

```
##                 2.5 %   97.5 %
## .sig01      16.84056 25.19238
## .sigma      15.41940 16.33672
## (Intercept) 24.41311 36.10145
```

ICC for mood

The ICC for mood is 0.48, which is lower than anxiety and is actually just within the poor catrgoery, according to guidelines by Koo and Li (2016): below 0.50: poor between 0.50 and 0.75: moderate between 0.75 and 0.90: good above 0.90: excellent

```
## [1] "lmer for mood with just the intercept"
```

```
## [1] 0.4846121
```

```
##                 2.5 %   97.5 %
## .sig01      13.65402 20.50677
## .sigma      16.73674 17.73243
## (Intercept) 58.73342 68.27812
```