Surprise study pilot 20

Marjan Biria

2024-03-19

Study description

This study is the same as pilot 19, except we have now moved the second prediction after the feedback to see how they take the feedback into account, and allows us to re-calculate the PE differently for the two subjective predictions.

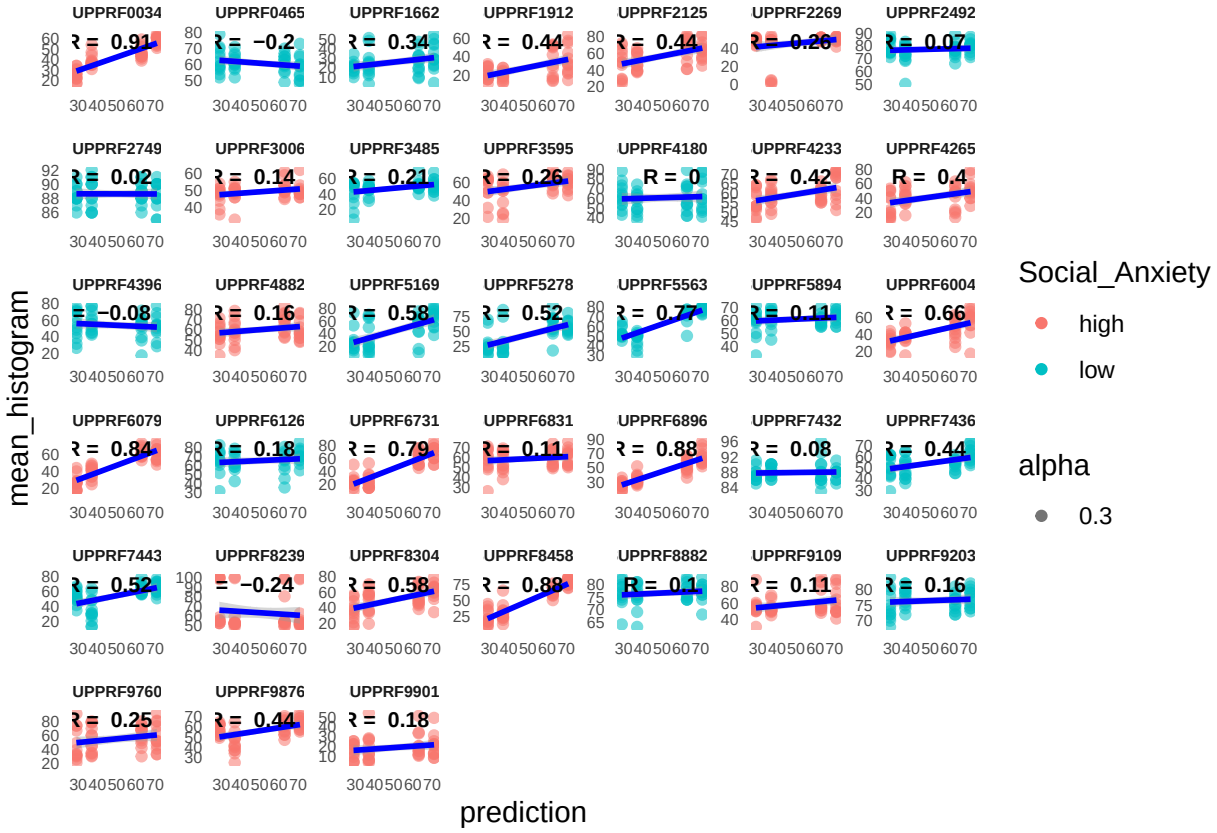
The Gorilla experiment is the following: https://app.gorilla.sc/admin/project/129240 The task is the following: https://app.gorilla.sc/admin/task/793630/editor

```
## # A tibble: 38 x 2
##    Random_ID   Trial.Number
##    <chr>              <int>
##  1 SUPPRF00347           48
##  2 SUPPRF04651           48
##  3 SUPPRF16624           48
##  4 SUPPRF19125           48
##  5 SUPPRF21256           48
##  6 SUPPRF22695           48
##  7 SUPPRF24929           48
##  8 SUPPRF27495           48
##  9 SUPPRF30067           48
## 10 SUPPRF34851           48
## # i 28 more rows
```

Relationship between prediction and mean histogram

Reminder: we now have only 4 judges/histograms and people will see the histograms only once in the very beginning. We have an average correlation of 0.33 between mean of histogram and prediction (as opposed to 0.80 in previous 3 pilots when prediction was before performance; and 0.60 when prediction was after performance).

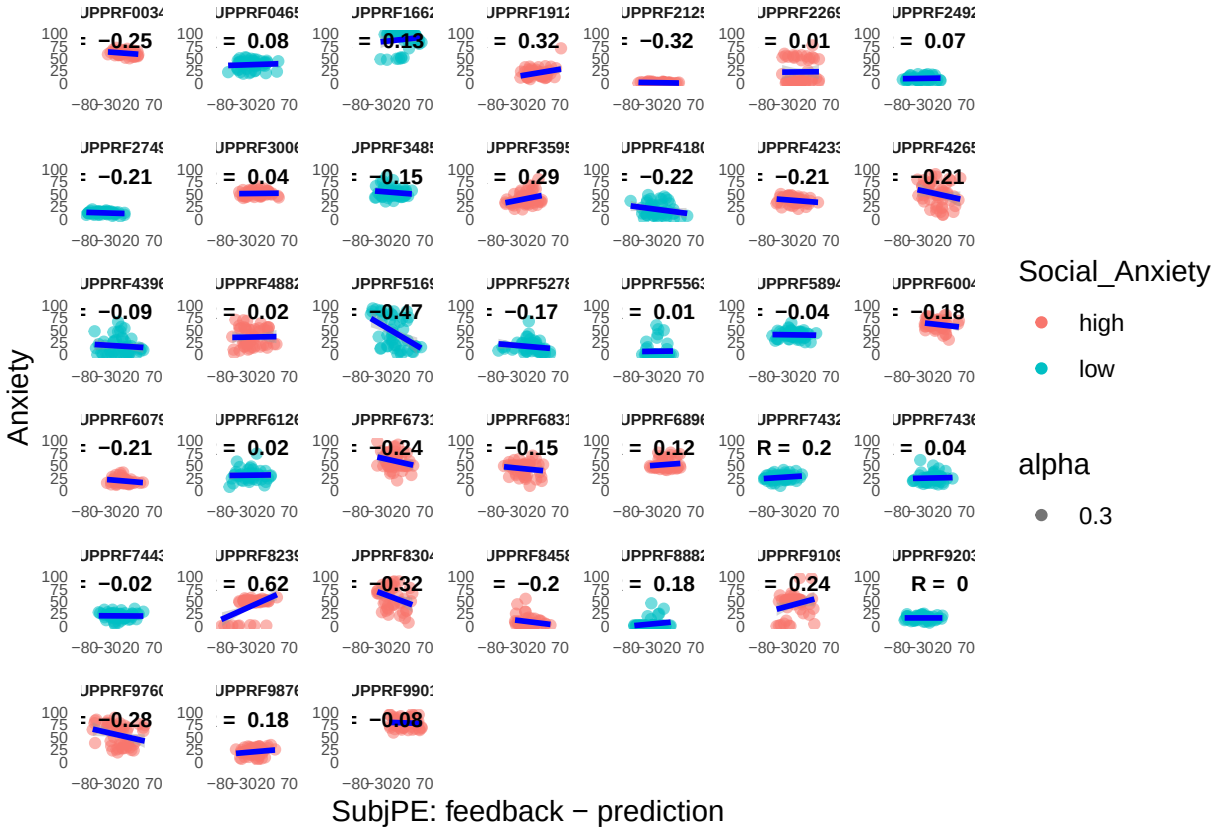
```
## [1] "average correlation between mean_hist and prediction: 0.335558007559963"
```



Relationship between Anxiety and SubjPE

SubjPE = feedback - pre-prediction (before performance) The correlation with anxiety has always been weaker than mood, but now it is closer to 0 (-0.037) as opposed to ~-0.10 we used to get!

```
## [1] "average correlation between anxiety and SubjPE: -0.0372721780000788"
```

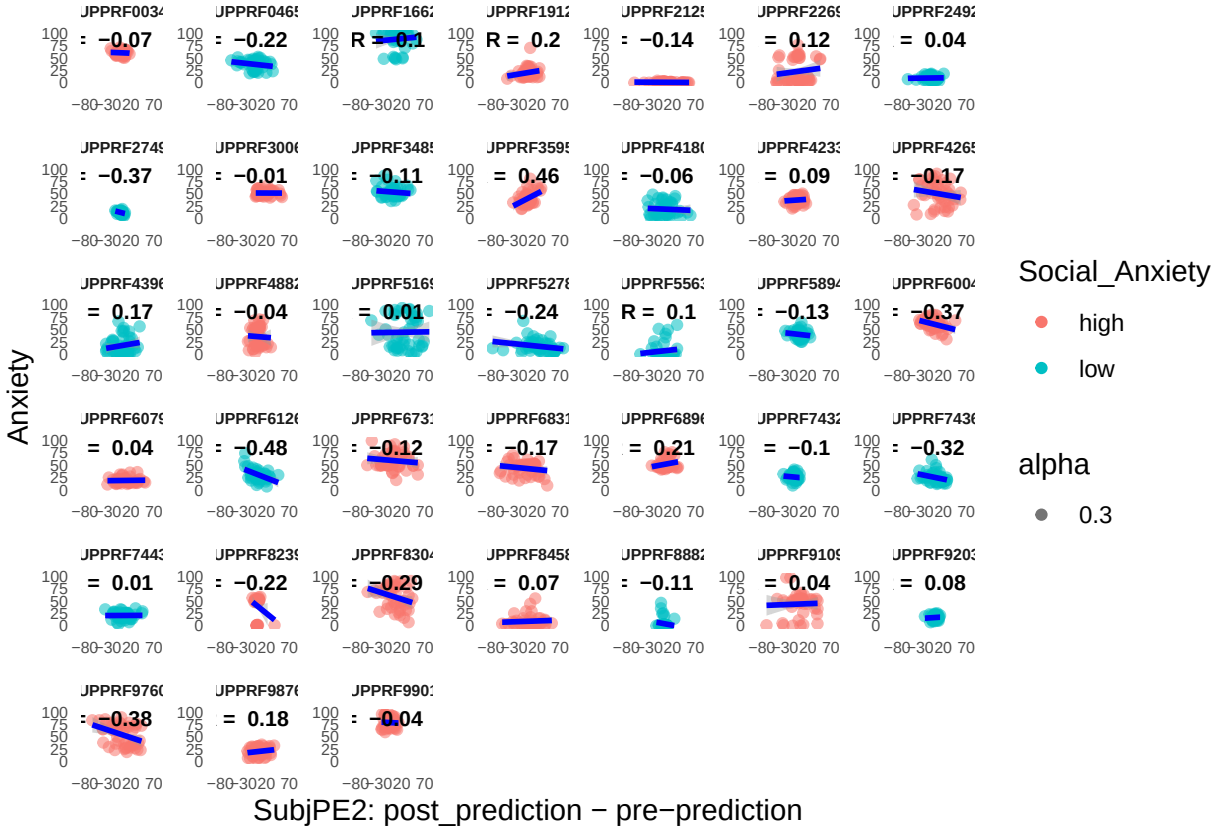


Relationship Anxiety and SubjPE_2 (pred2 - pred1)

SubjPE_2 was calculated by looking at the difference between the ratings on questions before and after the performance: "how well you performed?" minus "how well do you think you will performe?" or [post - pre] ratings.

In this pilot the second rating was asked AFTER they received feedback about their performance. The correlation with anxiety is slightly higher here: ~-0.06 but still lower than the old SubjPE x axiety correlations we've had.

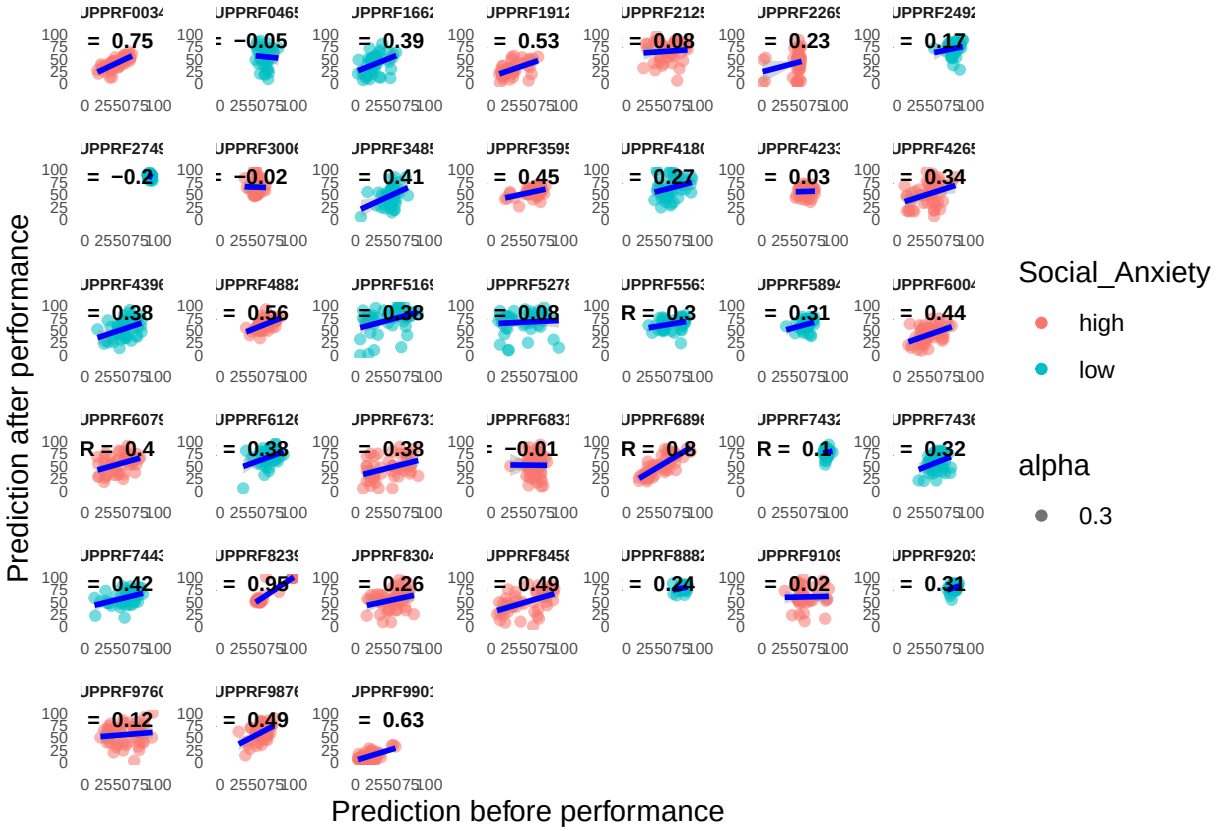
```
## [1] "average correlation between anxiety and SubjPE_2: -0.0589515140528669"
```



Relationship between predictions before and after performance

We will see in the following pages that the relationship between SubjPE and SubjPE3 with mood and anxiety is very similar. If the predictions before and after performance would be very similar (highly correlated), it would make sense as SubjPE is calculated as[feedback - prediction_before_performance] and SubjPE_3 is calcylated as[feedback - prediction_after_performance]. So they don't seem to be highly correlated r = 0.33. We were worried about the fact that feedback might influence people's predictions and I will next look at the correlation between post-prediction and feedback.

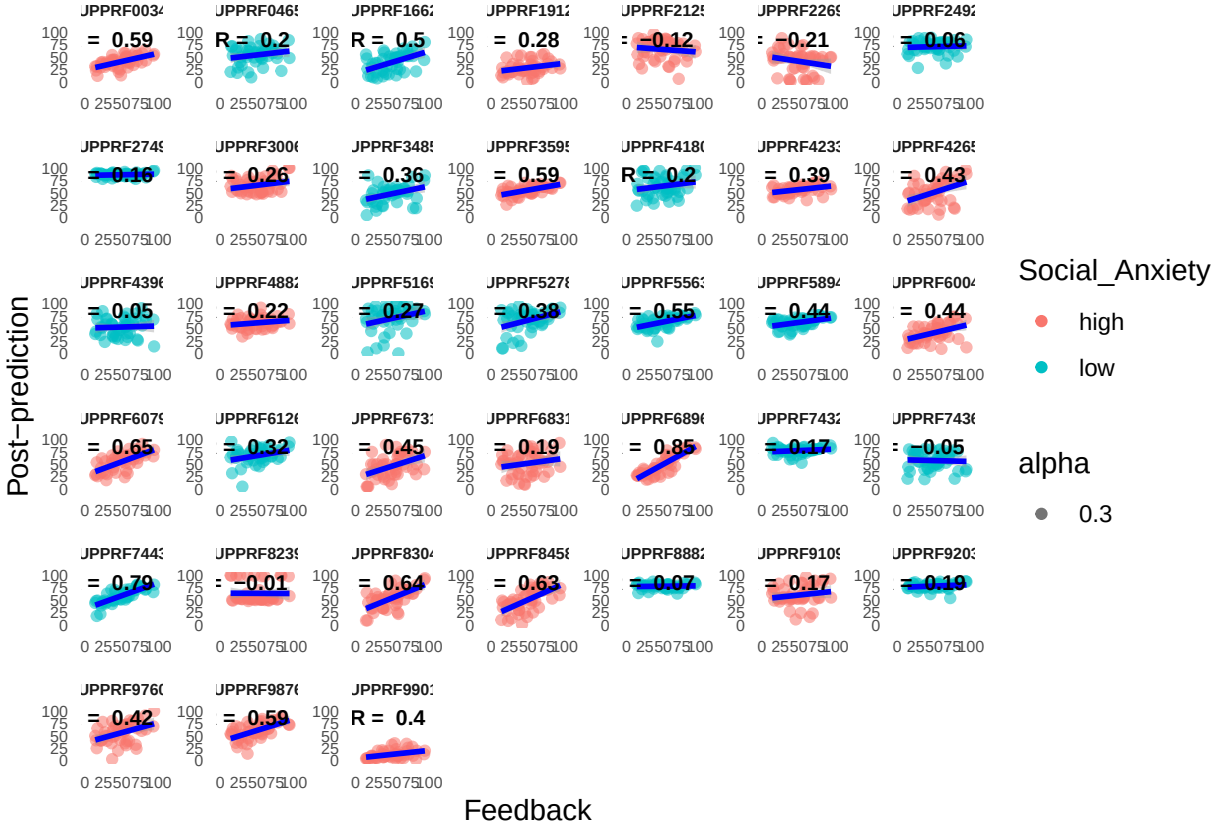
```
## [1] "average correlation between predictions before and after performance: 0.319566313186415"
```



Relationship between post-prediction and feedback

They are not very highly correlated (r = 0.33) which could mean: 1) either they don't take the feedback too much into account which is against what we thought and not necessarily a bad thing, it would allow us to dissociate the impact of the reward from feedback and their own prediction on emotions; or 2) their predictions are not meaningful/random. Are there any other possibilities/interpretations?

```
## [1] "average correlation between post-prediction and feedback: 0.329604992667881"
```

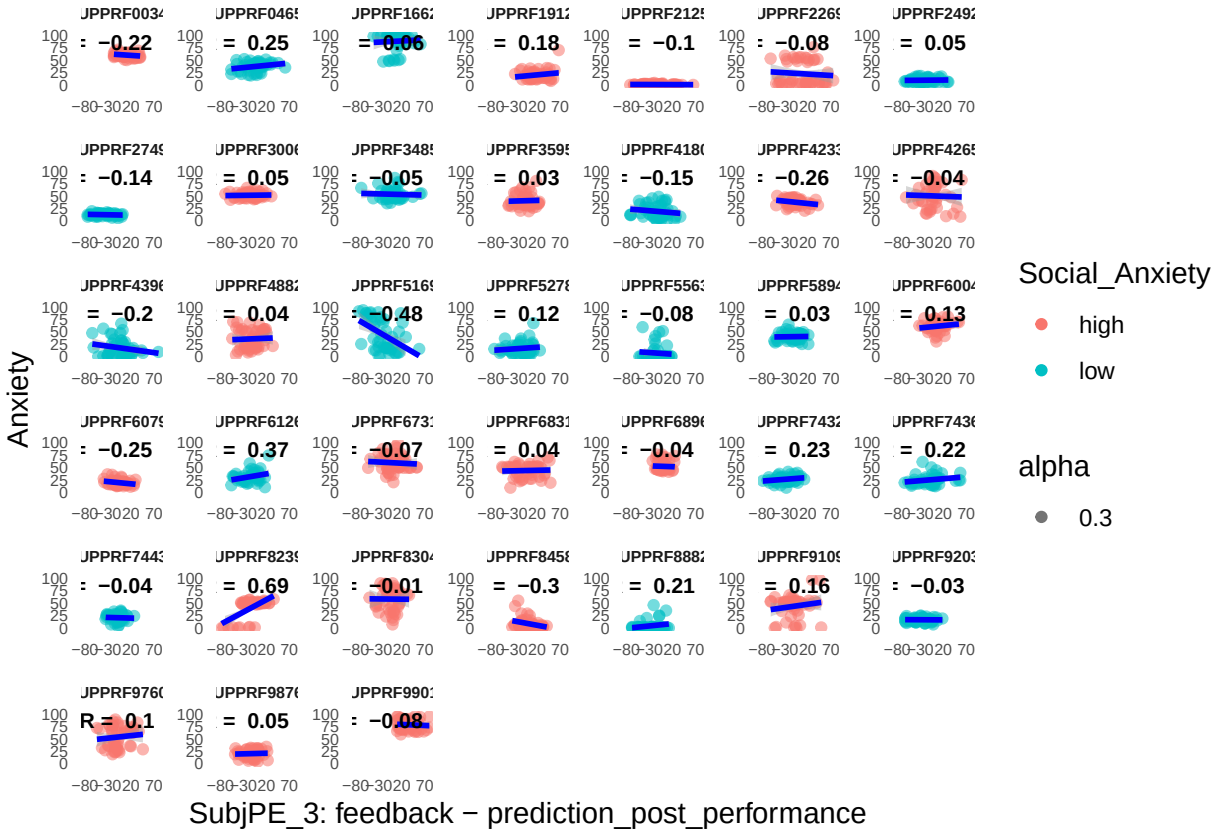


Relationship between Anxiety and SubjPE_3

SubjPE_3 = feedback - prediction after performance

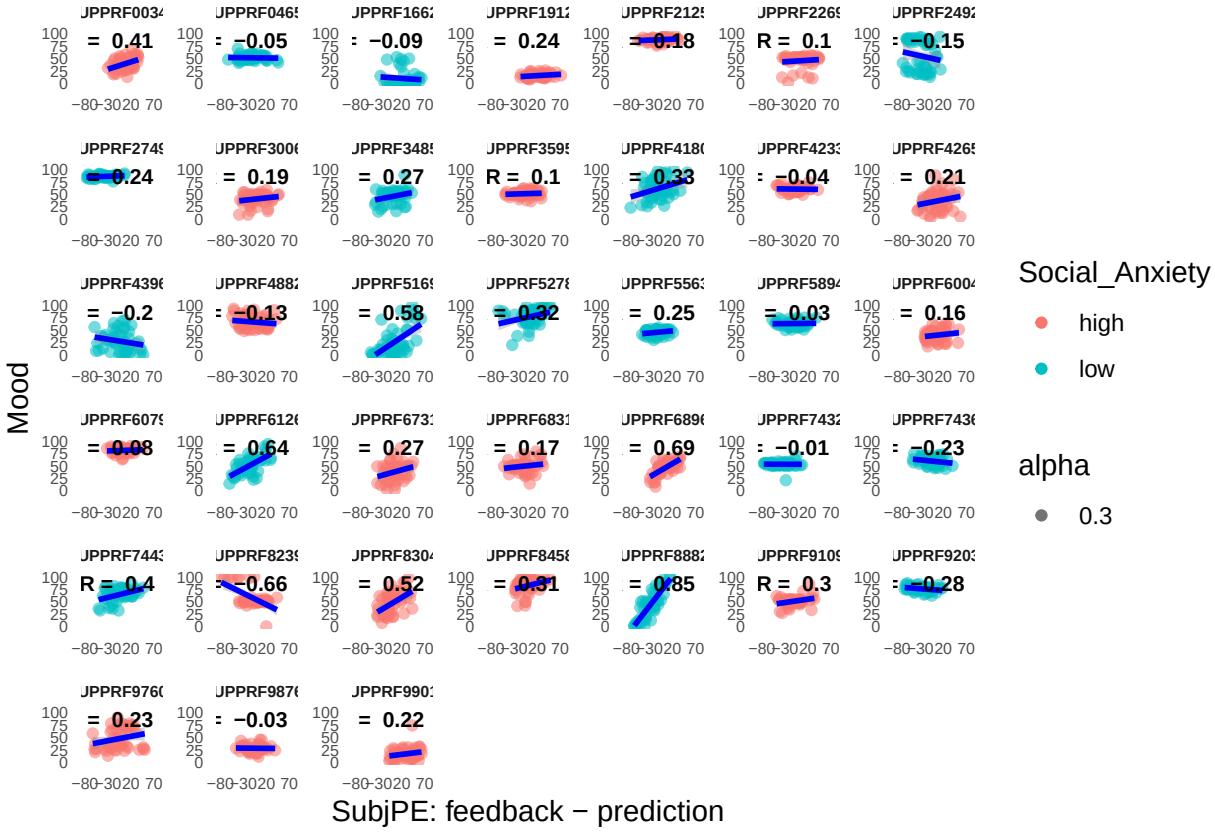
This one is literally almost 0: r = 0.01, but maybe it does make sense if the feedback and post-prediction would be in the same direction with the same size?

```
## [1] "average correlation between anxiety and SubjPE_3: 0.010961180000383"
```



Relationship between Mood and SubjPE

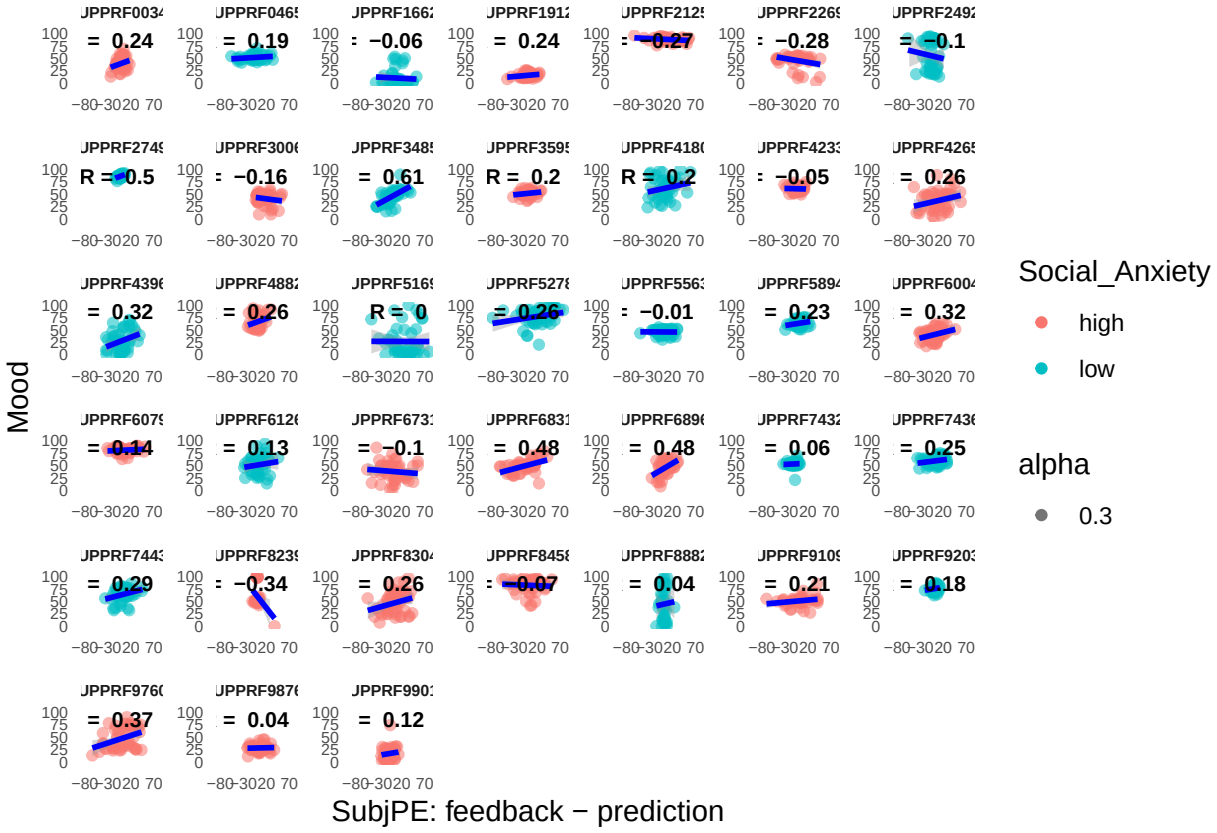
```
## [1] "average correlation between mood and SubjPE: 0.168023580858433"
```



Relationship between Mood and SubjPE_2

Again, here SubjPE_2 = prediction_2 - prediction_1; [post - pre] ratings (question about how they think they **DID** perform - **WILL** perform). Again, this relationship has dropped from ~0.25 to r = 0.14.

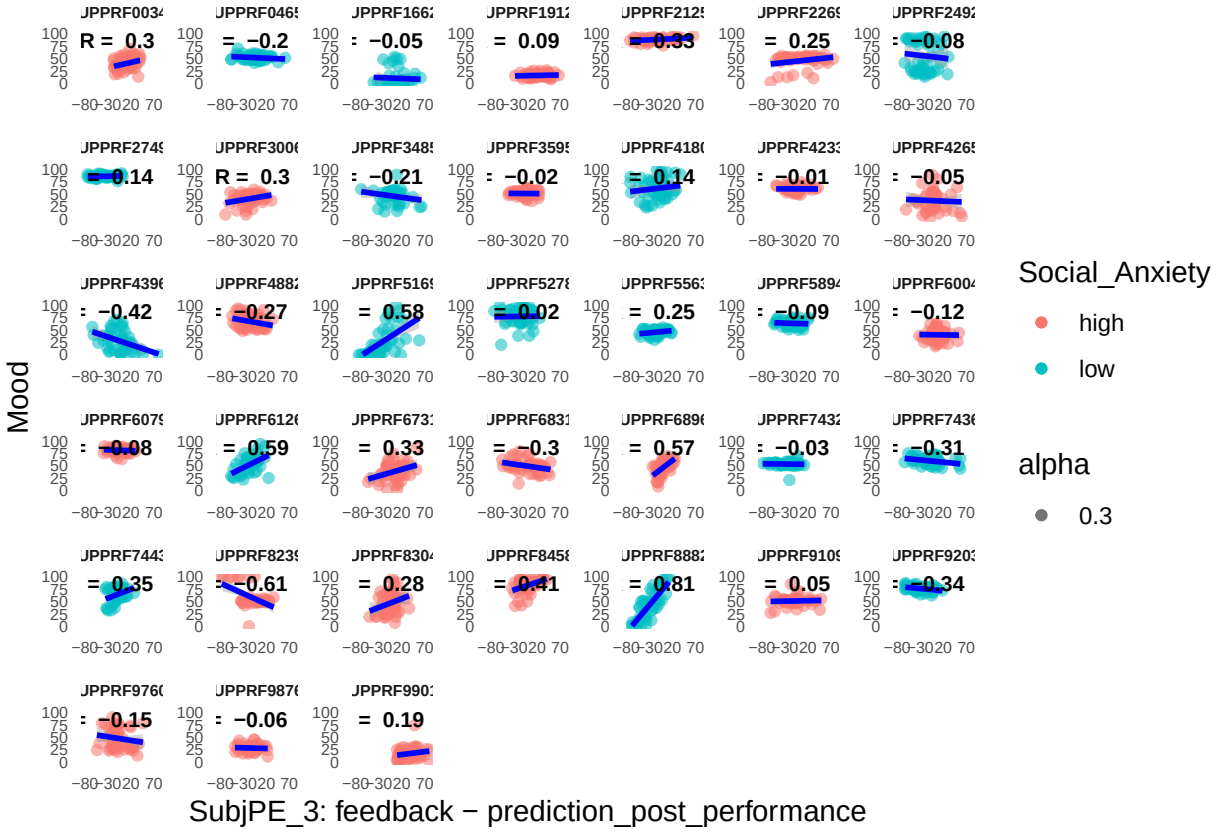
```
## [1] "average correlation between mood and SubjPE_2: 0.142953719533822"
```



Relationship between Mood and SubjPE_3

SubjPE_3 = feedback - post_prediction (question about how they think they performed).

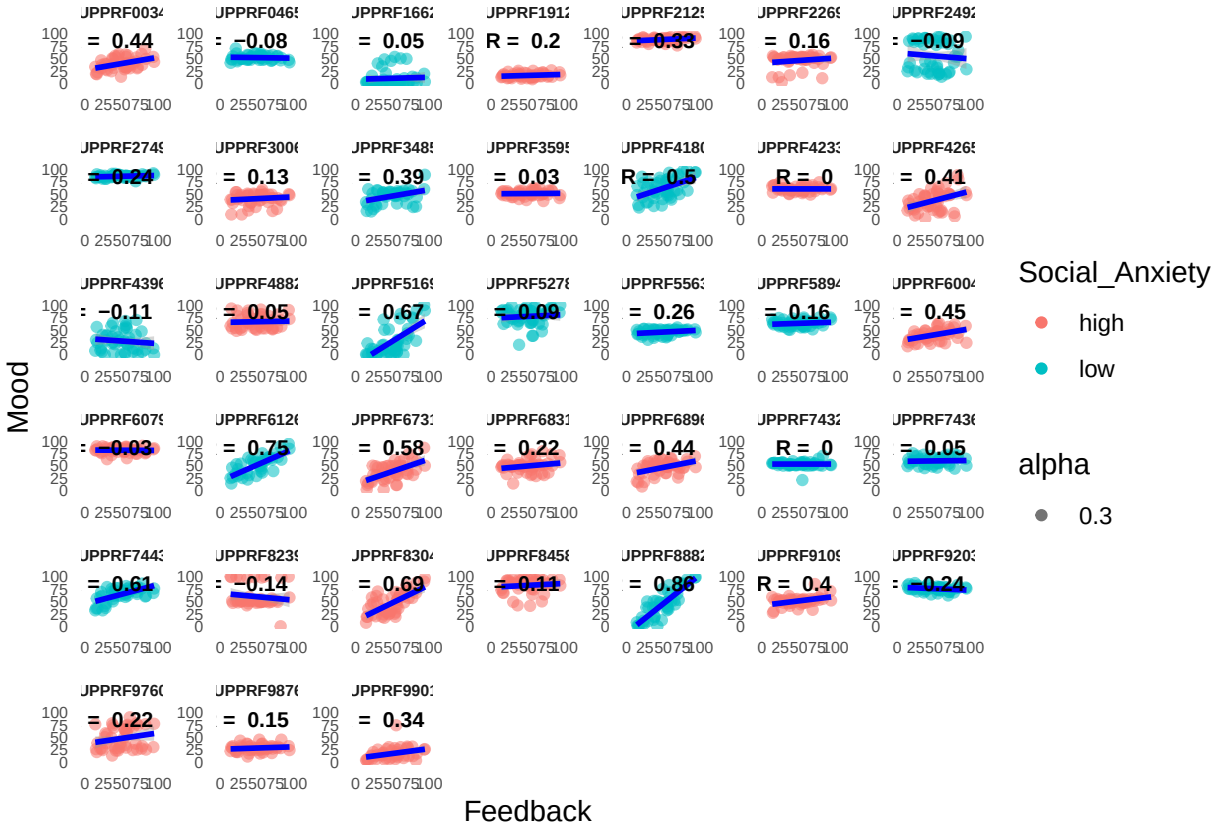
```
## [1] "average correlation between mood and SubjPE_3: 0.0671325769669322"
```



Relationship between Mood and feedback

This one is also slightly reduced from an average correlation of 0.30 to average r = 0.24.

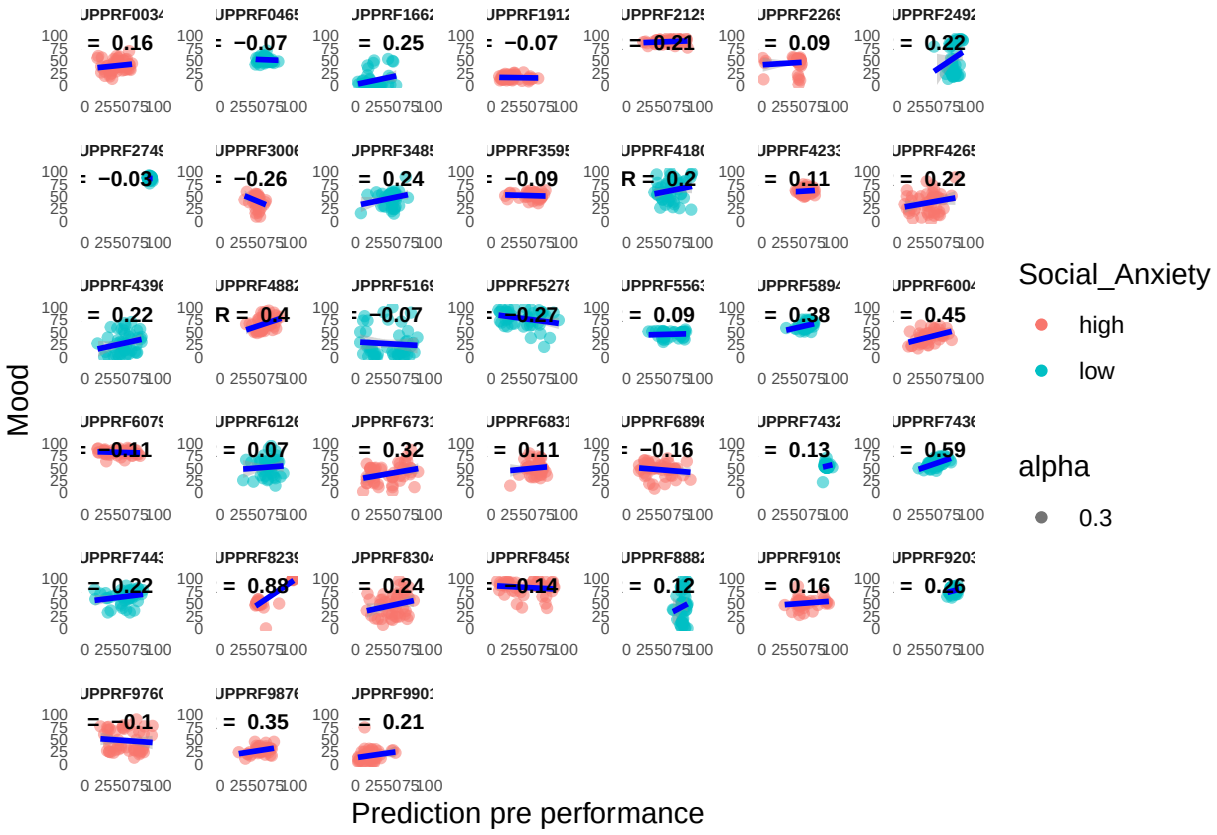
```
## [1] "average correlation between mood and feedback: 0.244366972199394"
```



Relationship between Mood and prediction (pre-performance)

Pre-performance prediction is related to mood only slightly ~ 0.14 which is similar to previous pilot.

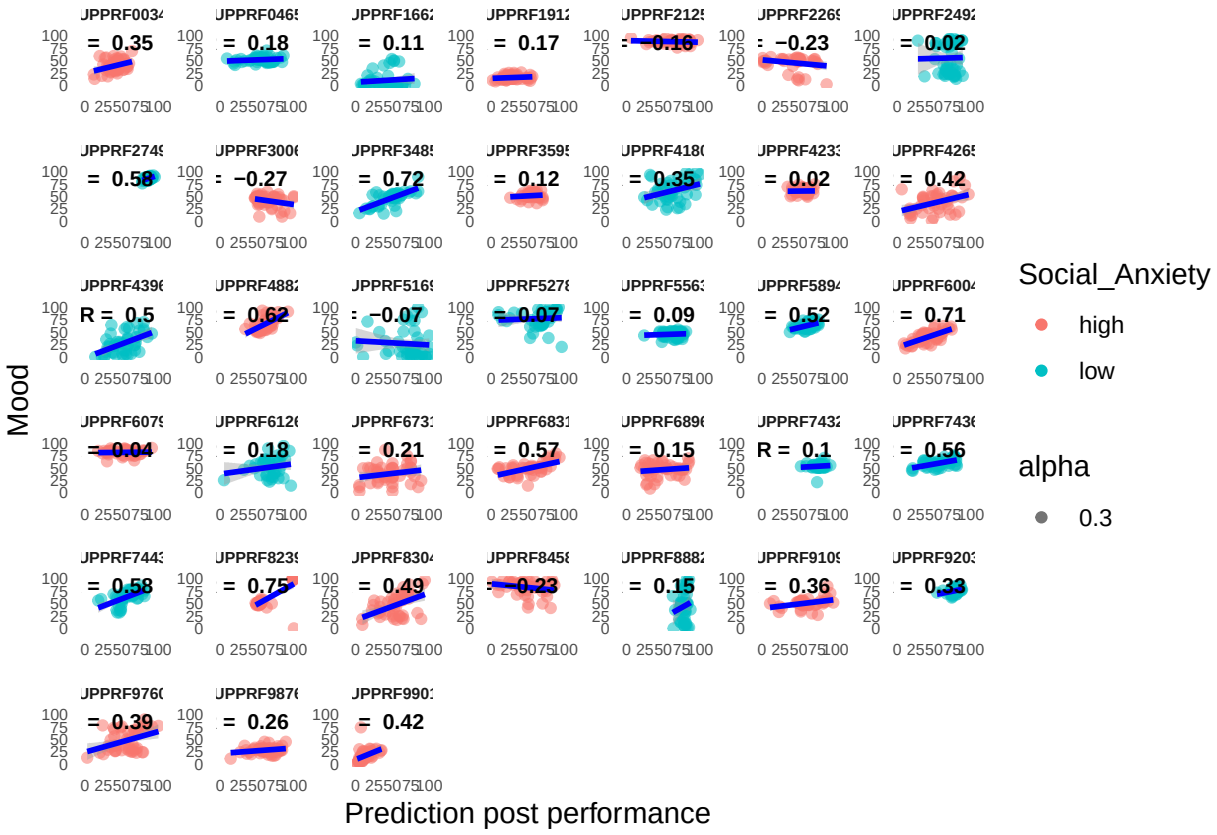
```
## [1] "average correlation between mood and prediction before performance: 0.144647315555219"
```



Relationship between Mood and prediction (post-performance)

Post-performance prediction is related to mood slightly higher than feedback r = 0.266

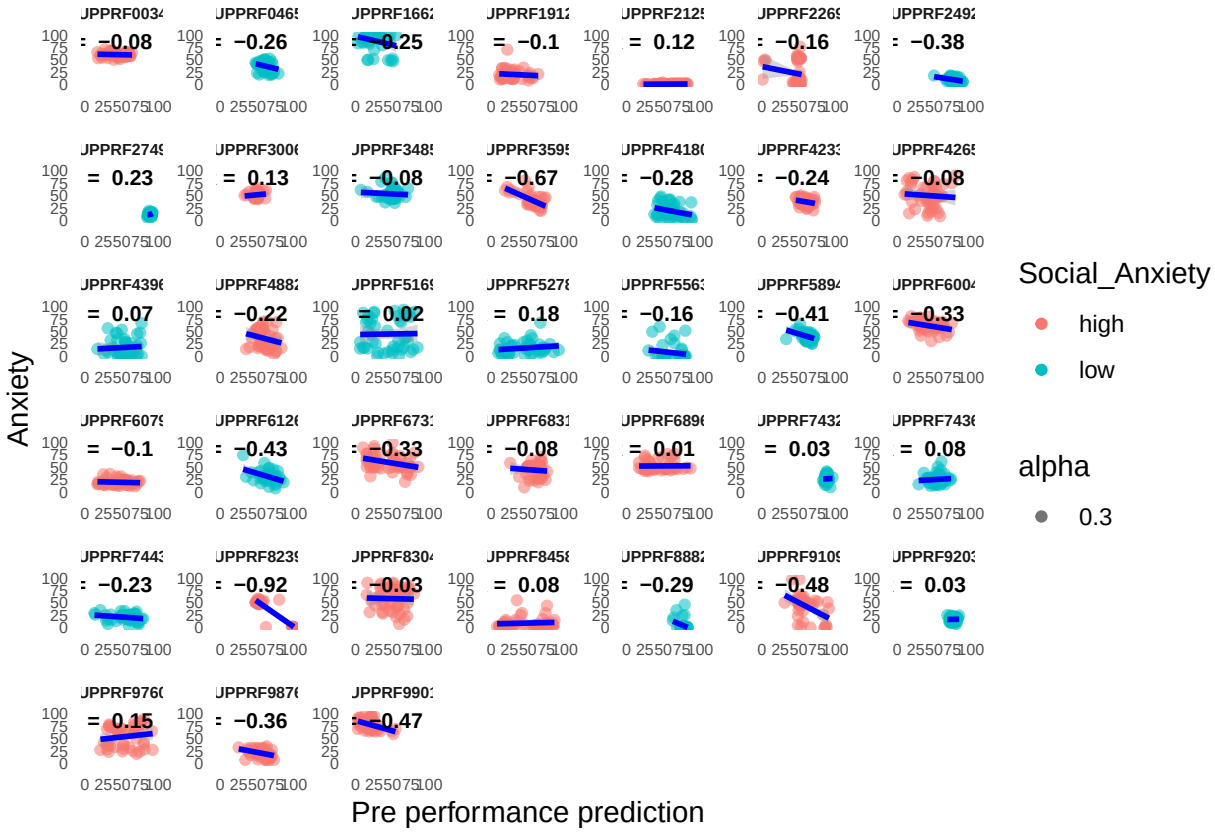
```
## [1] "average correlation between mood and prediction after performance: 0.266445409622252"
```



Relationship between Anxiety and prediction

What is interesting now, is that the pre-performance prediction is showing a correlation of -0.16 which is much higher than previous pilots and as high as the correlation with feedback and anxiety! I wonder whether there is a learning going on, for example, if we look at predictions in the beginning they would not show a big impact on anxiety, but as they progress this relationship becomes bigger. One way we could look at this could be to look at this correlation on a trial by trial basis across all subjects, but we will have different scores/judges across subjects, wouldn't that influence the results? How can we look at this by doing a more complicated/more sophisticated modelling?

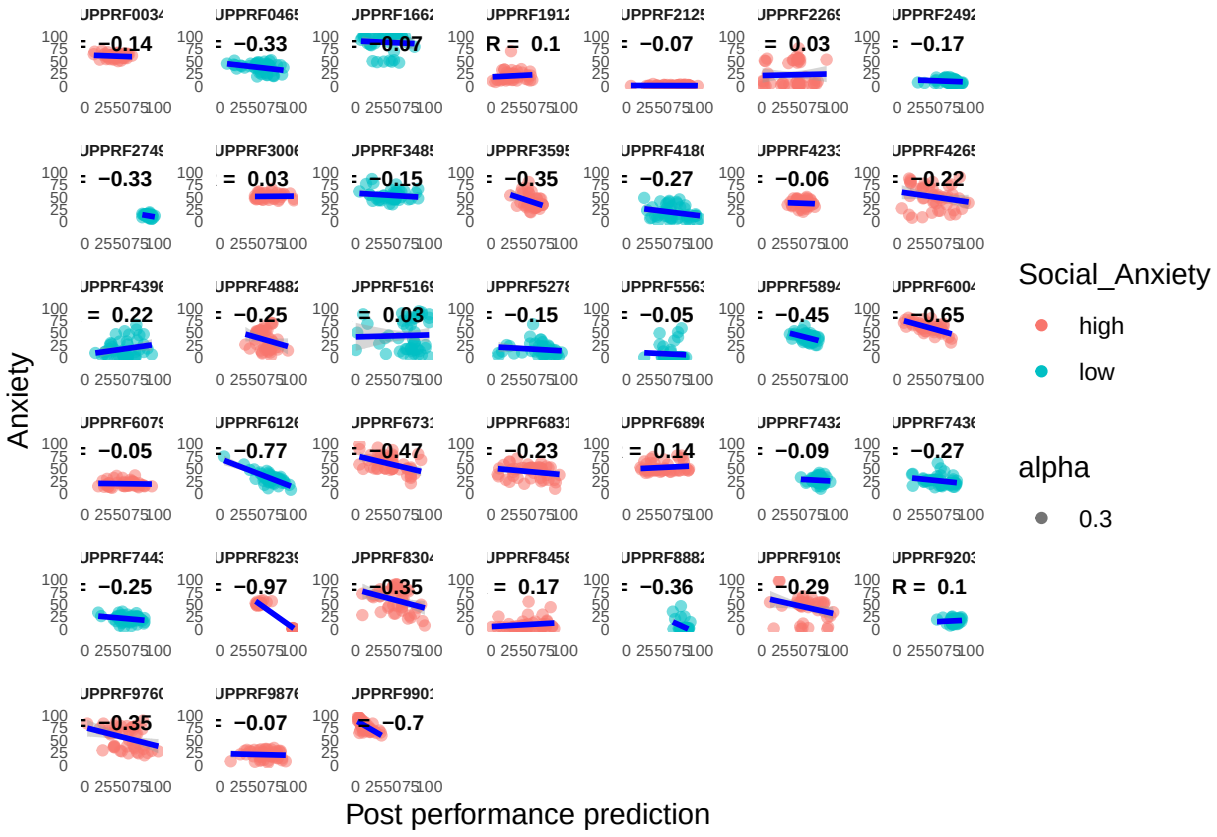
```
## [1] "average correlation between anxiety and prediction: -0.16501652203785"
```



Relationship between Anxiety and prediction2

Now this has been the strongest correlation with anxiety we have every had (r = -0.21), almost as big as the effect size for mood! I even excluded one subject who showed a very high correlation which could have been caused by only a few data points and the correlation still remains around -0.19!

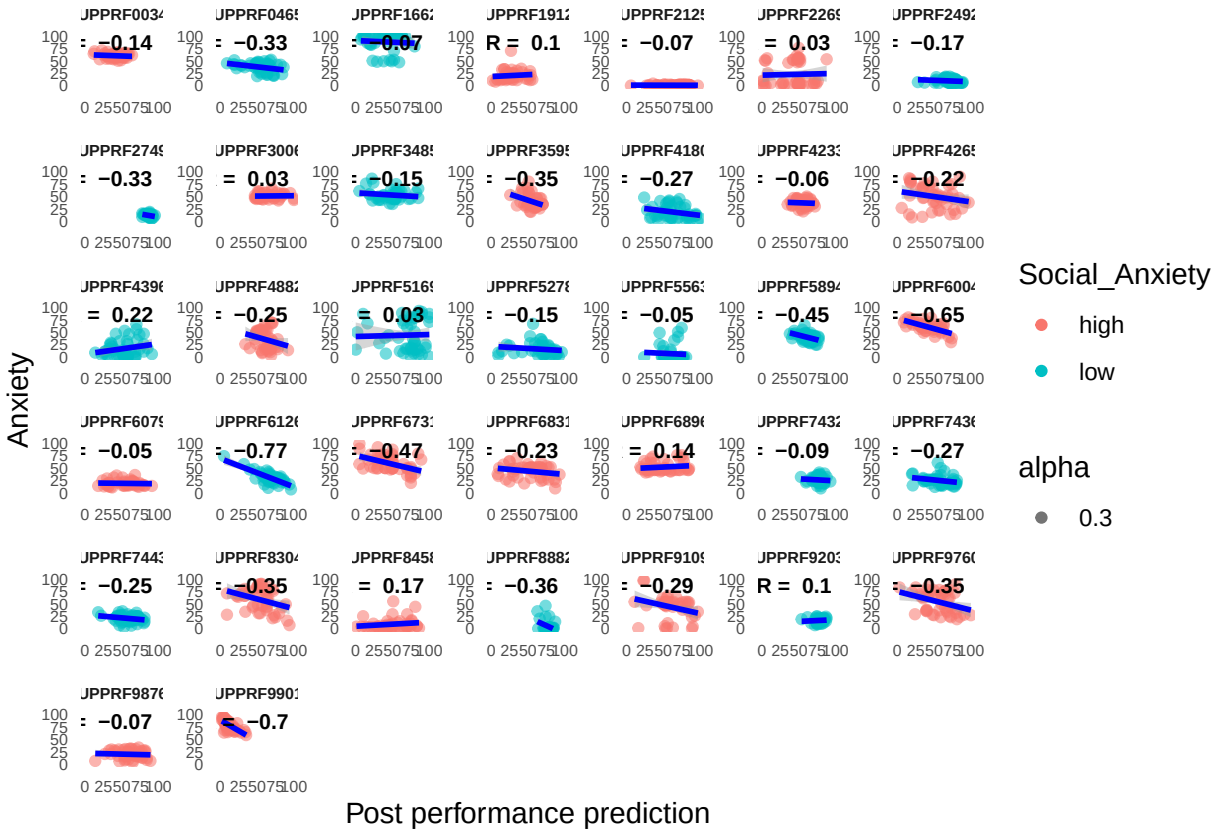
```
## [1] "average correlation between anxiety and prediction: -0.213826441295648"
```



Relationship Anxiety & predic_2 (excluding 1 subject)

Here I exclude one subject who has a correlation of -0.97, most likely caused by a few data points to see how the results change (subject SUPPRF82392). Even after excluding this subject the correlation is -0.19 which has been the strongest correlation with anxiety we have had so far.

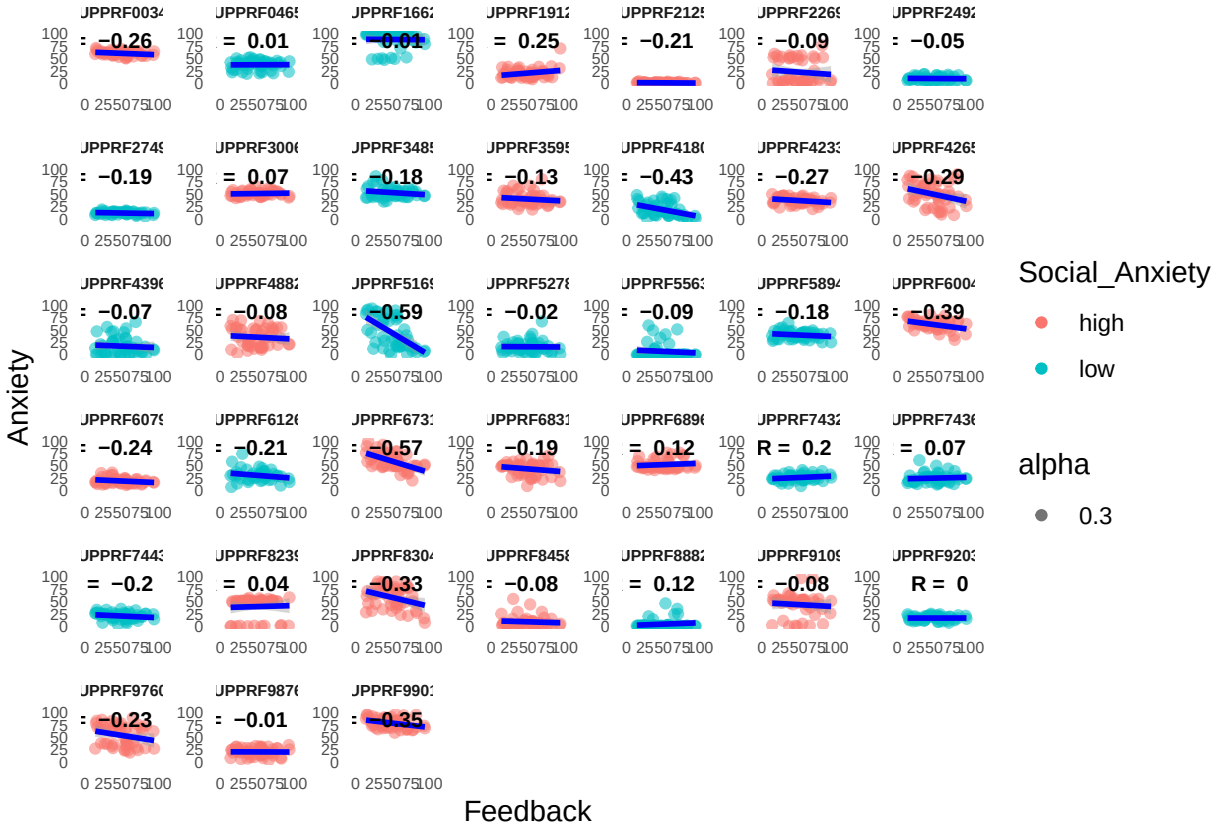
```
## [1] "average correlation between anxiety and prediction: -0.193395633180553"
```



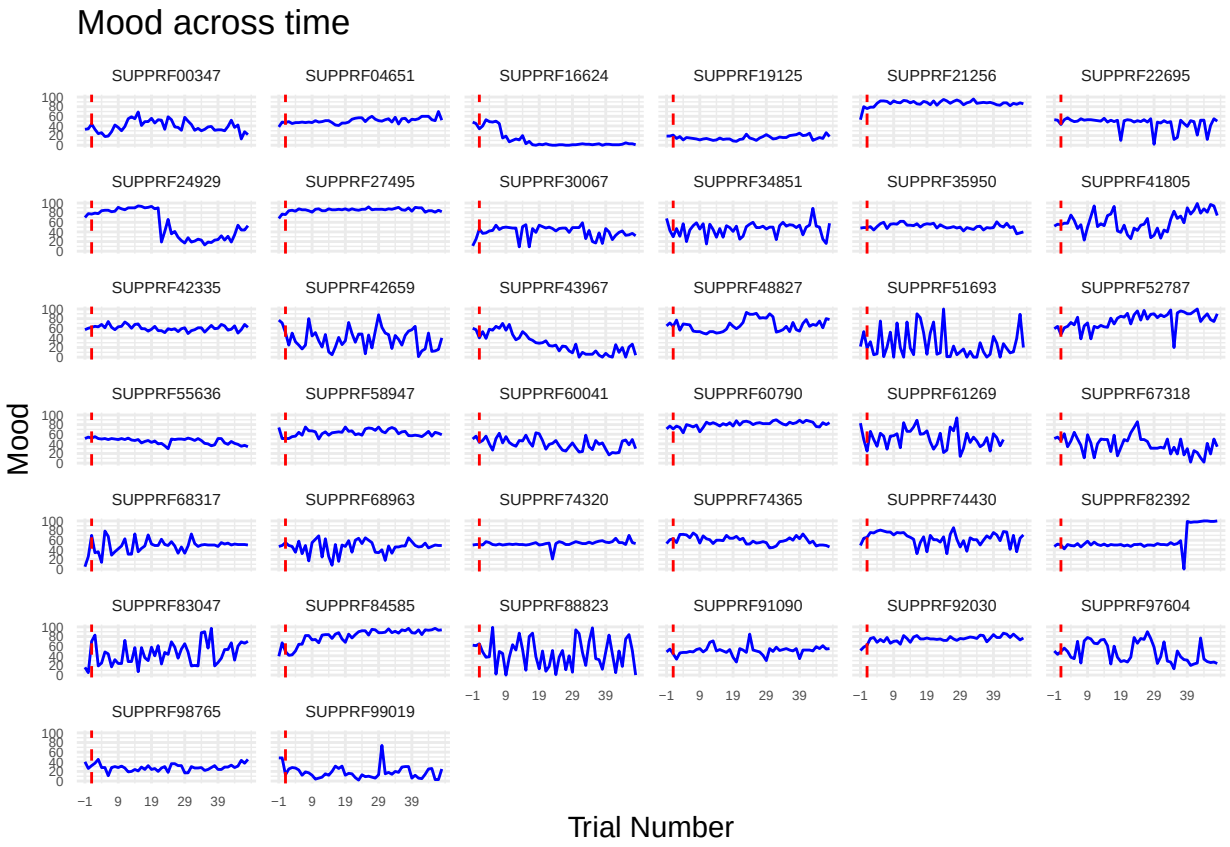
Relationship between Anxiety and feedback

The correlation between feedback and anxiety is quite similar to previous pilots.

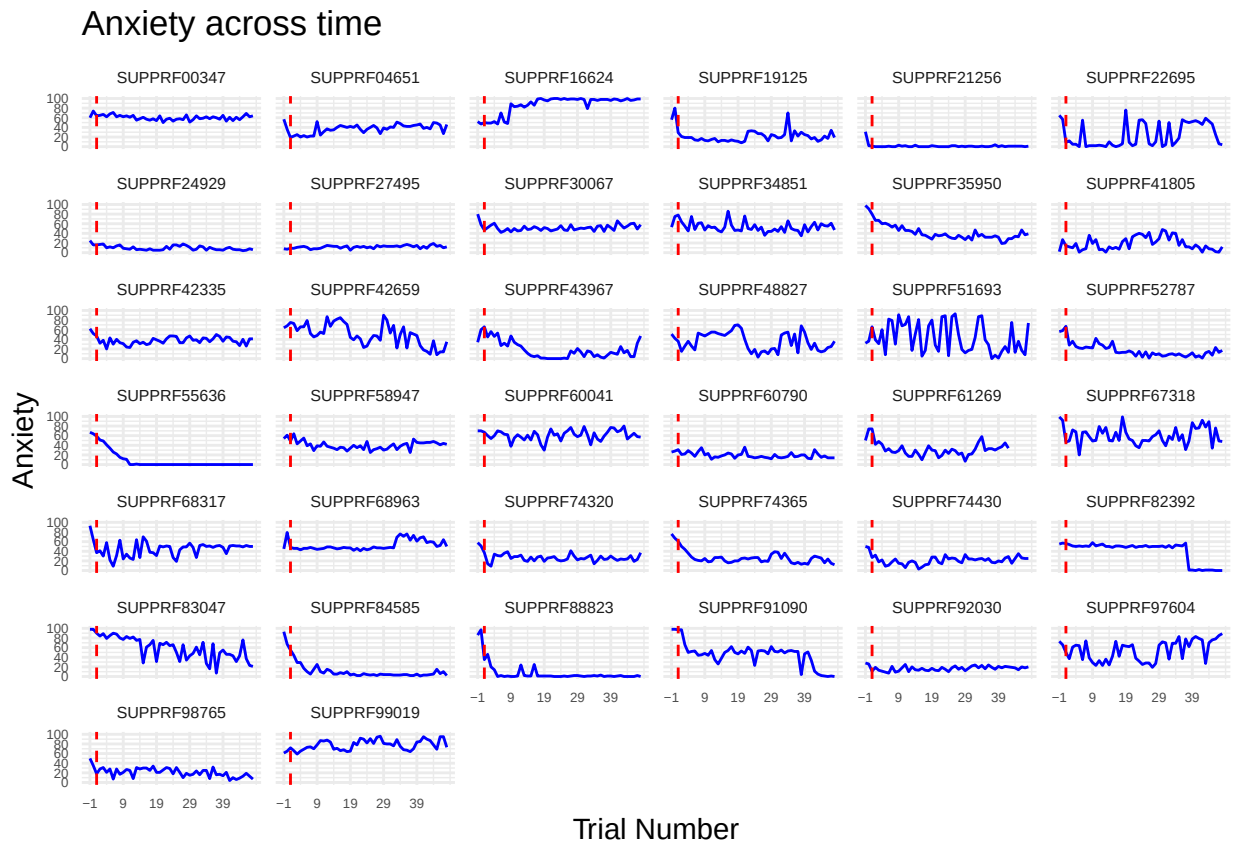
```
## [1] "average correlation between anxiety and feedback: -0.135129081241716"
```



Mood over time



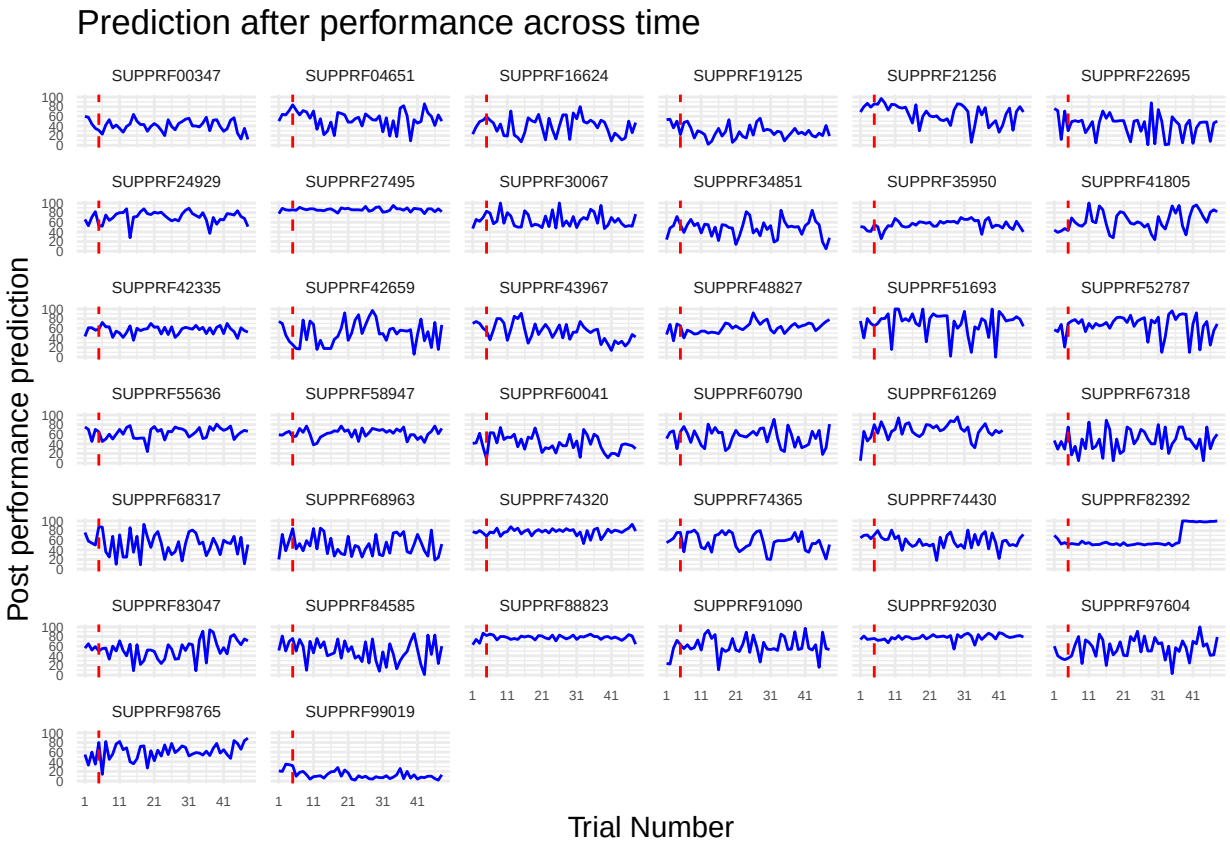
Anxiety over time



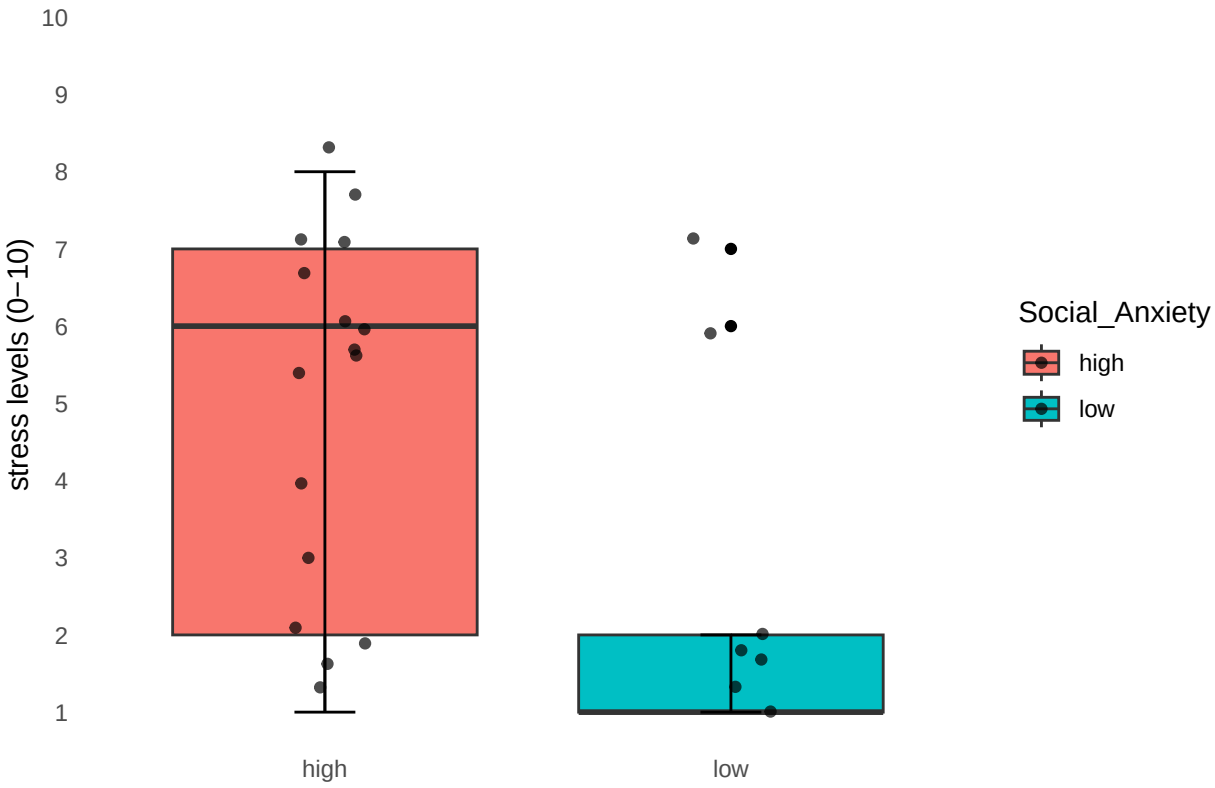
Prediction before performance over time

Red line presents until what points histograms were presented (4 first trials only).

Prediction after feedback over time



Stress levels and social anxiety



LME models for Mood and SubjPE

When looking at subjective PE, the best model is Mood ~ SubjPE + (SubjPE | Random_ID).

```
## [1] 15191.28
```

```
## [1] 14969.58
```

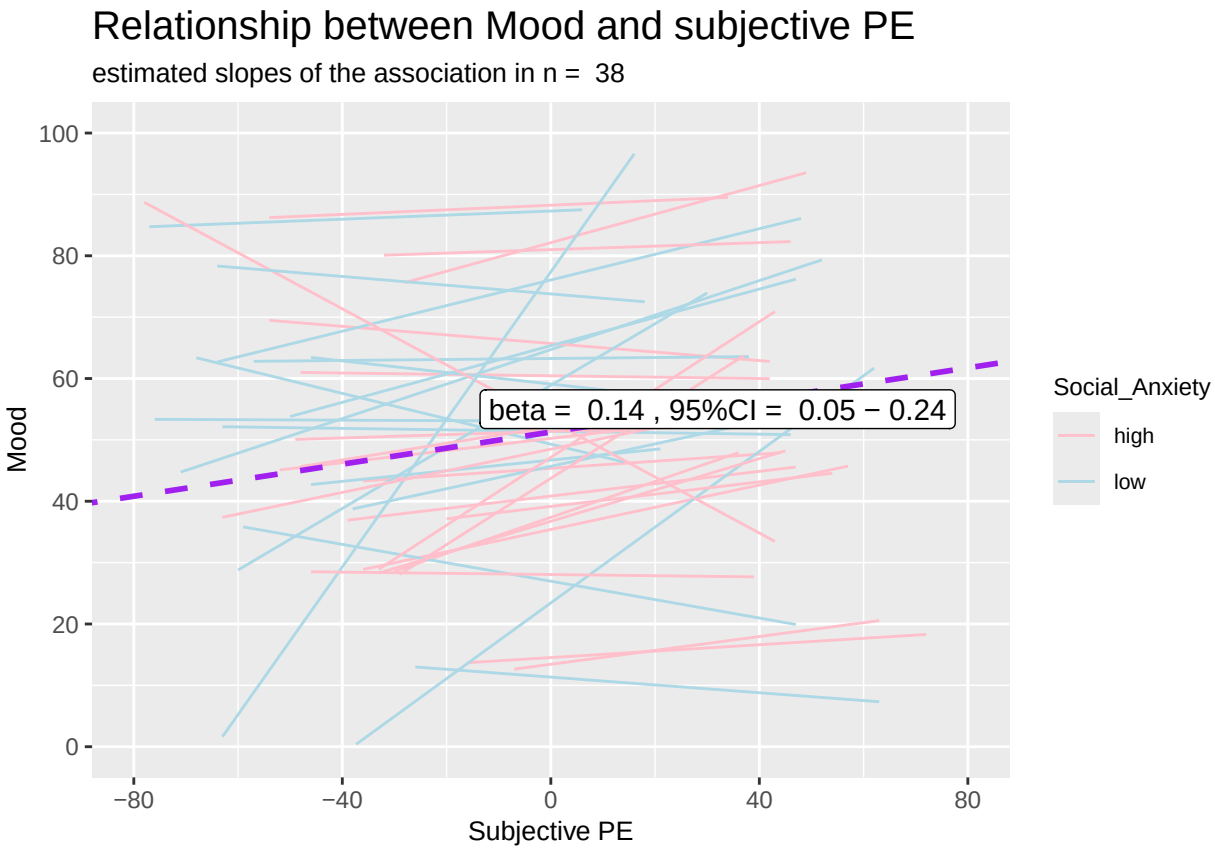
```
## [1] 14969.95
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + (1 | Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 15183.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.2225 -0.5057  0.0153  0.4570  4.5756
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 397.1    19.93
##  Residual              226.1    15.04
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     51.36415    3.25299  15.790
## Response_SubjPE  0.11673    0.01619   7.209
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE 0.026
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + (Response_SubjPE | Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 14957.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5378 -0.4849  0.0118  0.4738  4.4159
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     384.51196 19.6090
##            Response_SubjPE   0.06931  0.2633  0.07
##  Residual                  190.38895 13.7982
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     51.27541    3.20515  15.998
```

```
## Response_SubjPE  0.13077    0.04539   2.881
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE 0.069
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_H ~ Response_SubjPE + mini_SPIN_total + (Response_SubjPE |
##     Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 14956
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5390 -0.4857  0.0113  0.4738  4.4158
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     394.7764 19.8690
##            Response_SubjPE   0.0693  0.2632  0.06
##  Residual                  190.3879 13.7981
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     52.47161    6.33611   8.281
## Response_SubjPE  0.13096    0.04539   2.886
## mini_SPIN_total -0.19407    0.88217  -0.220
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE
## Rspns_SbjPE  0.041
## mn_SPIN_ttl -0.859 -0.009
```


Relationship between Mood and subjective PE
estimated slopes of the association in n = 38
beta = 0.14 , 95%CI = 0.05 − 0.24
Mood
Subjective PE
100
80
60
40
20
0
−80
−40
0
40
80
Social_Anxiety
high
low

LME models for Anxiety and SubjPE

When looking at subjective PE, the best model is Anxiety ~ SubjPE + mini_SPIN_total + (SubjPE | Random_ID).

```
## [1] 14990.26
```

```
## [1] 14923.03
```

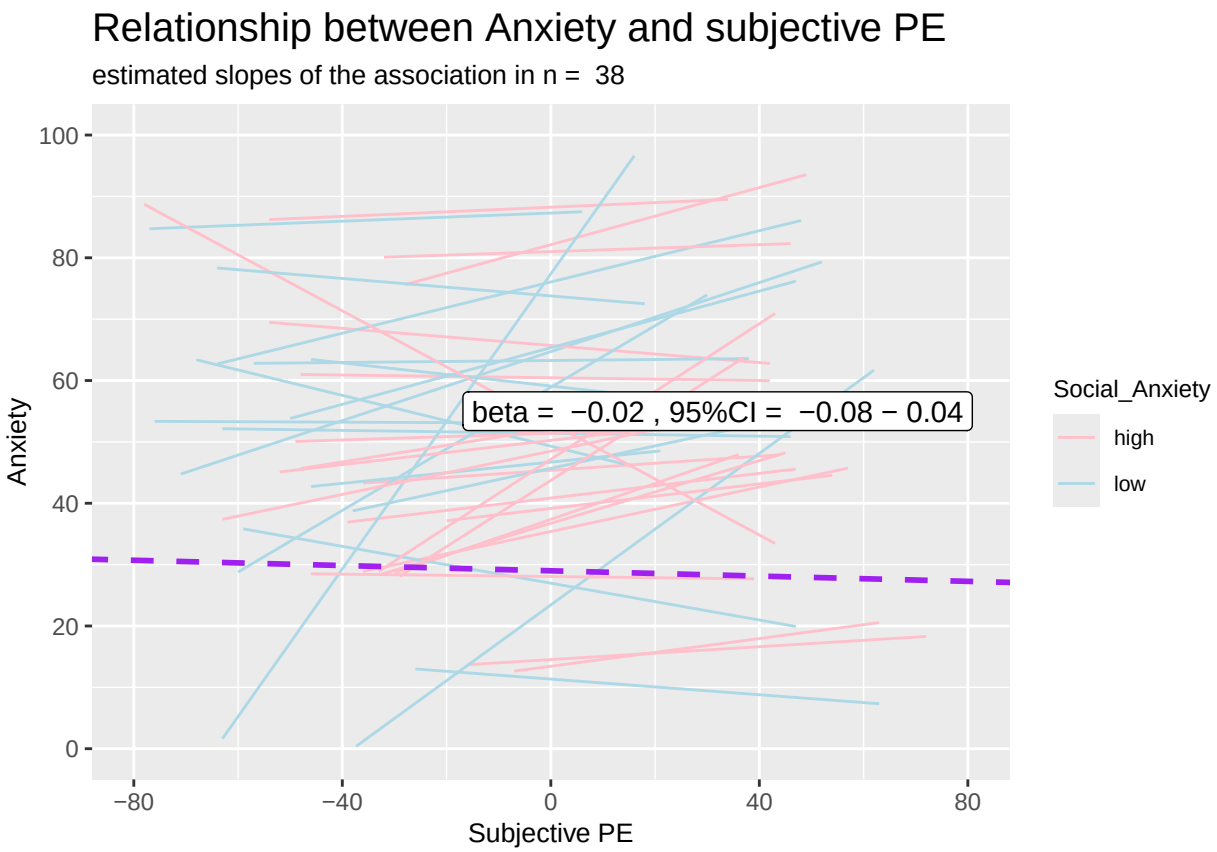
```
## [1] 14922.29
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE + (1 | Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 14982.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5352 -0.4769 -0.0670  0.5111  3.8229
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 441.7    21.02
##  Residual              201.5    14.19
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     34.62174    3.42654  10.104
## Response_SubjPE -0.02139    0.01529  -1.398
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE 0.023
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE + (Response_SubjPE | Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 14911
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6860 -0.4835 -0.0725  0.4635  3.9547
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     435.8039 20.876
##            Response_SubjPE   0.0216  0.147   -0.14
##  Residual                  188.6520 13.735
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
```

```
## (Intercept)     35.02081    3.40769  10.277
## Response_SubjPE -0.02116    0.02828  -0.749
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.103
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: Response_Ax ~ Response_SubjPE + mini_SPIN_total + (Response_SubjPE |
##     Random_ID)
##    Data: final_df20
## Control: lmerControl(optimizer = "bobyqa")
##
## REML criterion at convergence: 14908.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6867 -0.4828 -0.0756  0.4630  3.9587
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     440.31622 20.9837
##            Response_SubjPE   0.02158  0.1469  -0.18
##  Residual                  188.64386 13.7348
## Number of obs: 1818, groups:  Random_ID, 38
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     28.99172    6.65319   4.358
## Response_SubjPE -0.02149    0.02826  -0.760
## mini_SPIN_total  0.97885    0.92389   1.059
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE
## Rspns_SbjPE -0.063
## mn_SPIN_ttl -0.857 -0.010
```


Relationship between Anxiety and subjective PE
estimated slopes of the association in n = 38
beta = −0.02 , 95%CI = −0.08 − 0.04
Anxiety
Subjective PE
100
80
60
40
20
0
−80
−40
0
40
80
Social_Anxiety
high
low

ICC for Mood with chocking

```
## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.599
##   Unadjusted ICC: 0.599
```

ICC for Anxiety with chocking

```
## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.677
##   Unadjusted ICC: 0.677
```