# Surprise study pilot 16

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2024-02-19

## 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.

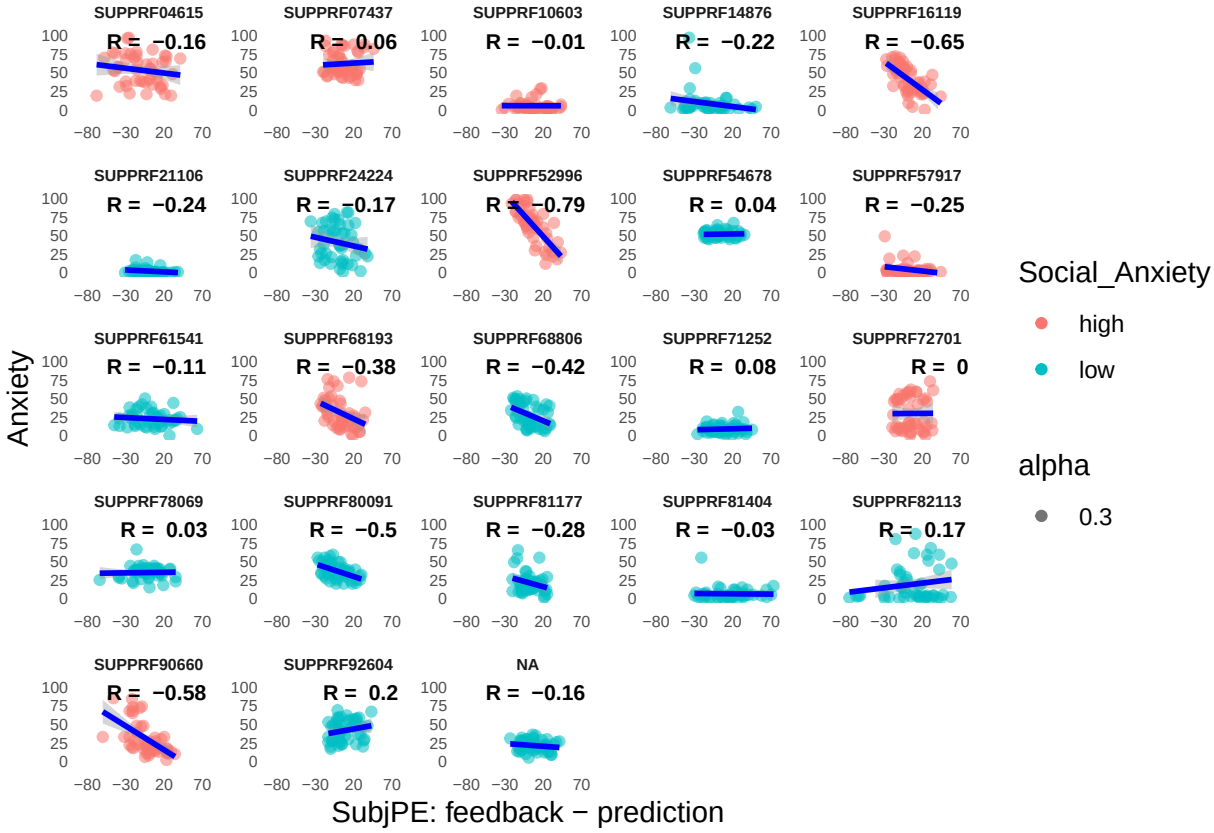
The Gorilla experiment is the following: https://app.gorilla.sc/admin/project/125827 The task is the following: https://app.gorilla.sc/admin/task/772053/editor

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

```
## # A tibble: 23 x 2
##    Random_ID   Trial.Number
##    <chr>              <int>
##  1 SUPPRF04615           48
##  2 SUPPRF07437           48
##  3 SUPPRF10603           48
##  4 SUPPRF14876           48
##  5 SUPPRF16119           48
##  6 SUPPRF21106           48
##  7 SUPPRF24224           48
##  8 SUPPRF52996           48
##  9 SUPPRF54678           48
## 10 SUPPRF57917           48
## # i 13 more rows
```

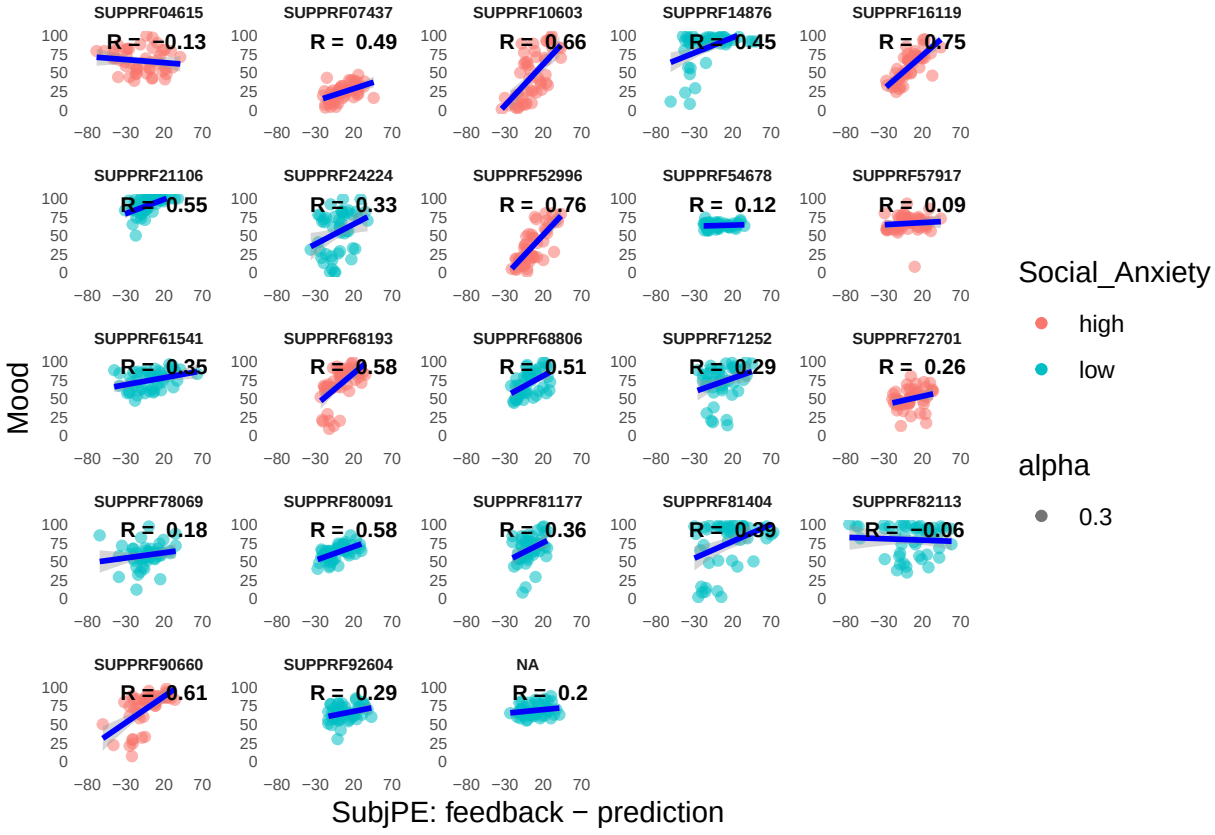
# Relationship between Anxiety and SubjPE

```
## [1] "average correlation between anxiety and SubjPE: -0.188598549499634"
```



# Relationship between Mood and SubjPE

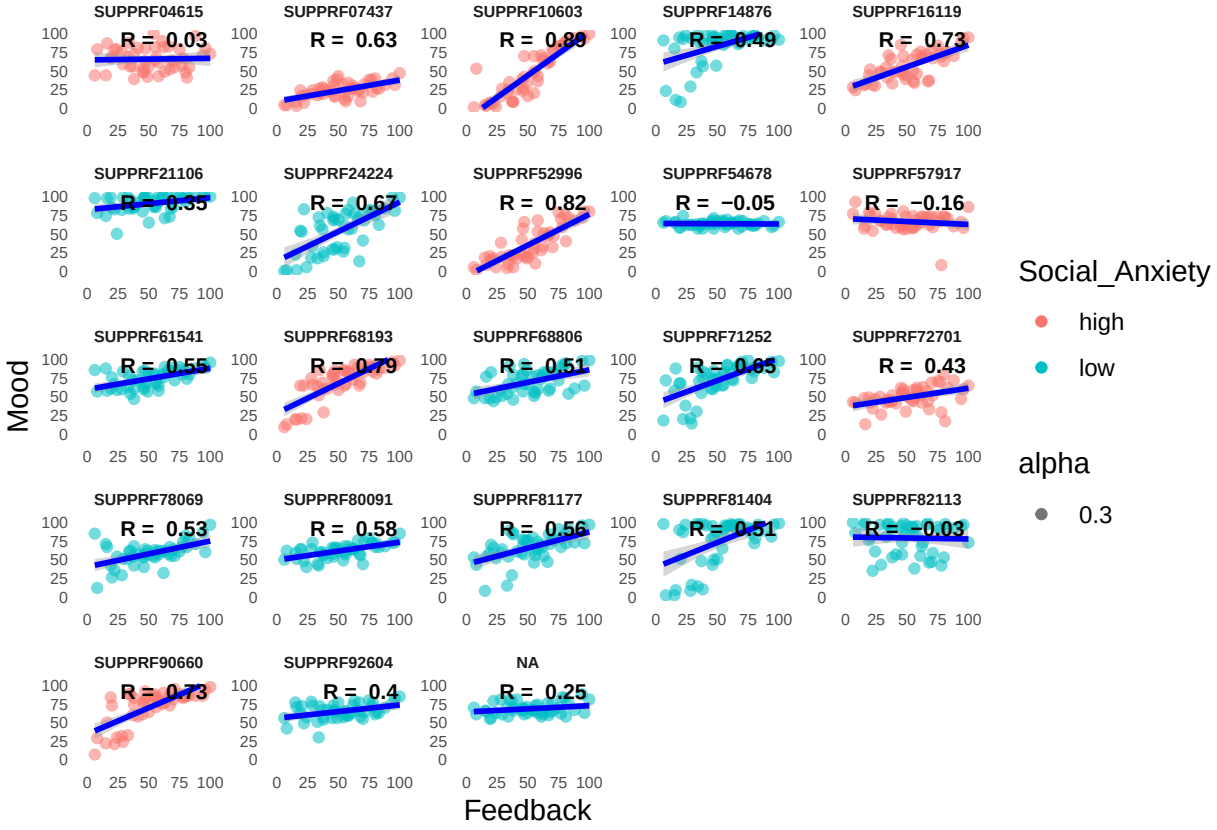
```
## [1] "average correlation between mood and SubjPE: 0.374402588235143"
```



# Relationship between Mood and feedback

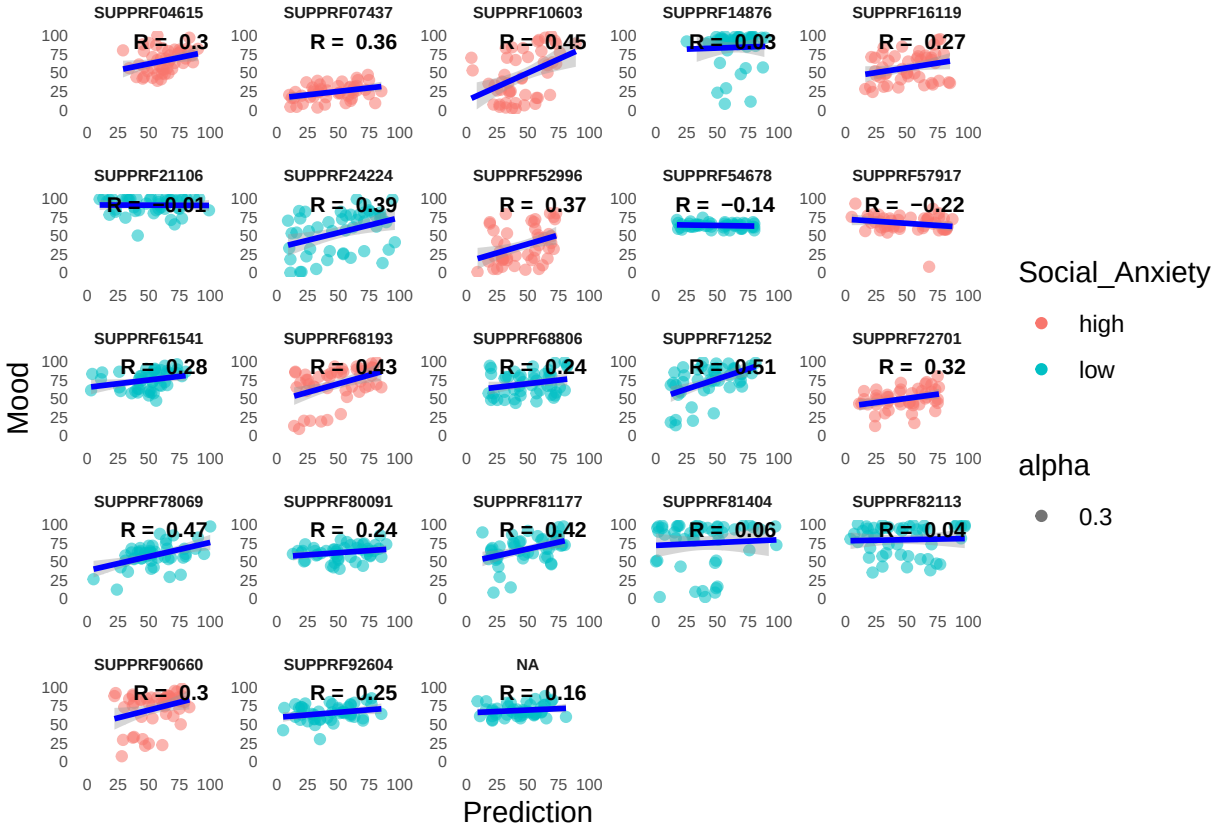
The relationship between mood and feedback still seems to be stronger than mood and subjective PE. Is this a problem? How do we even differentiate social reward, from social PE?

```
## [1] "average correlation between mood and feedback: 0.473387453802557"
```



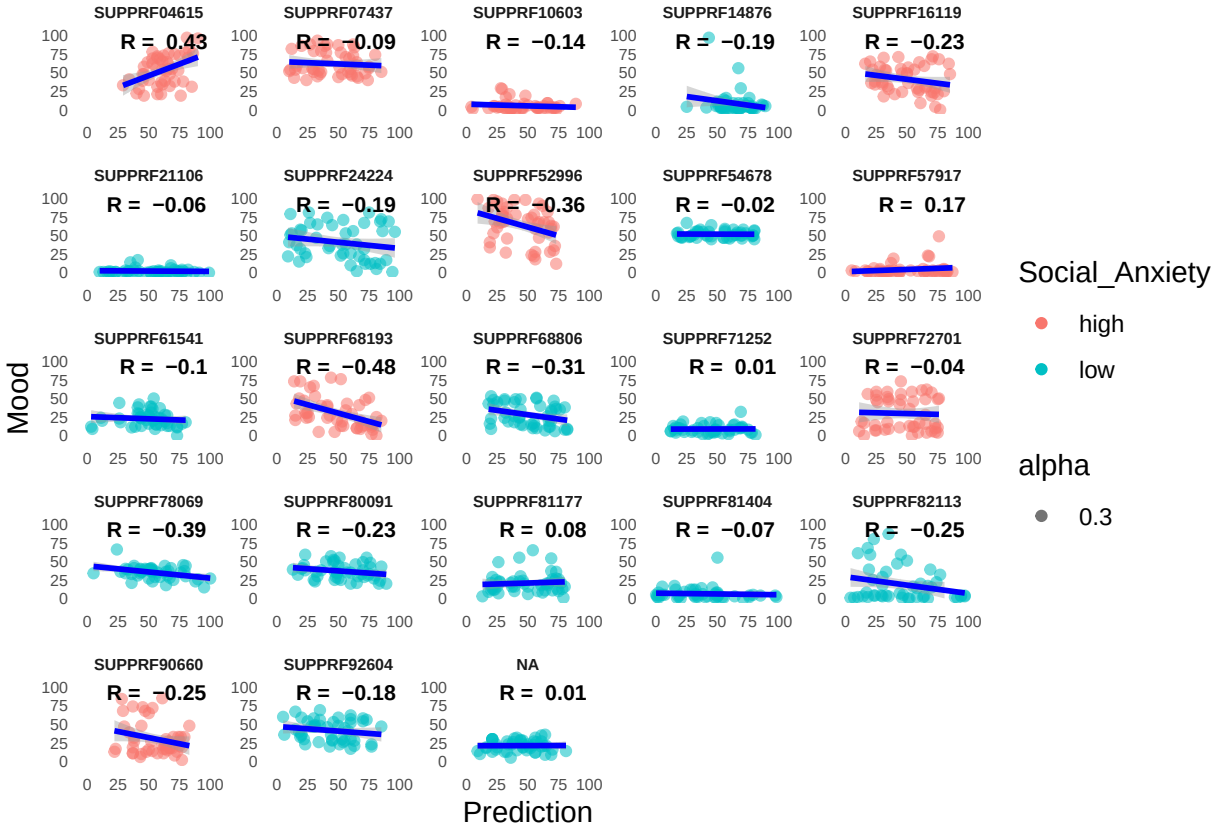
# Relationship between Mood and prediction

```
## [1] "average correlation between mood and prediction: 0.240187813450925"
```



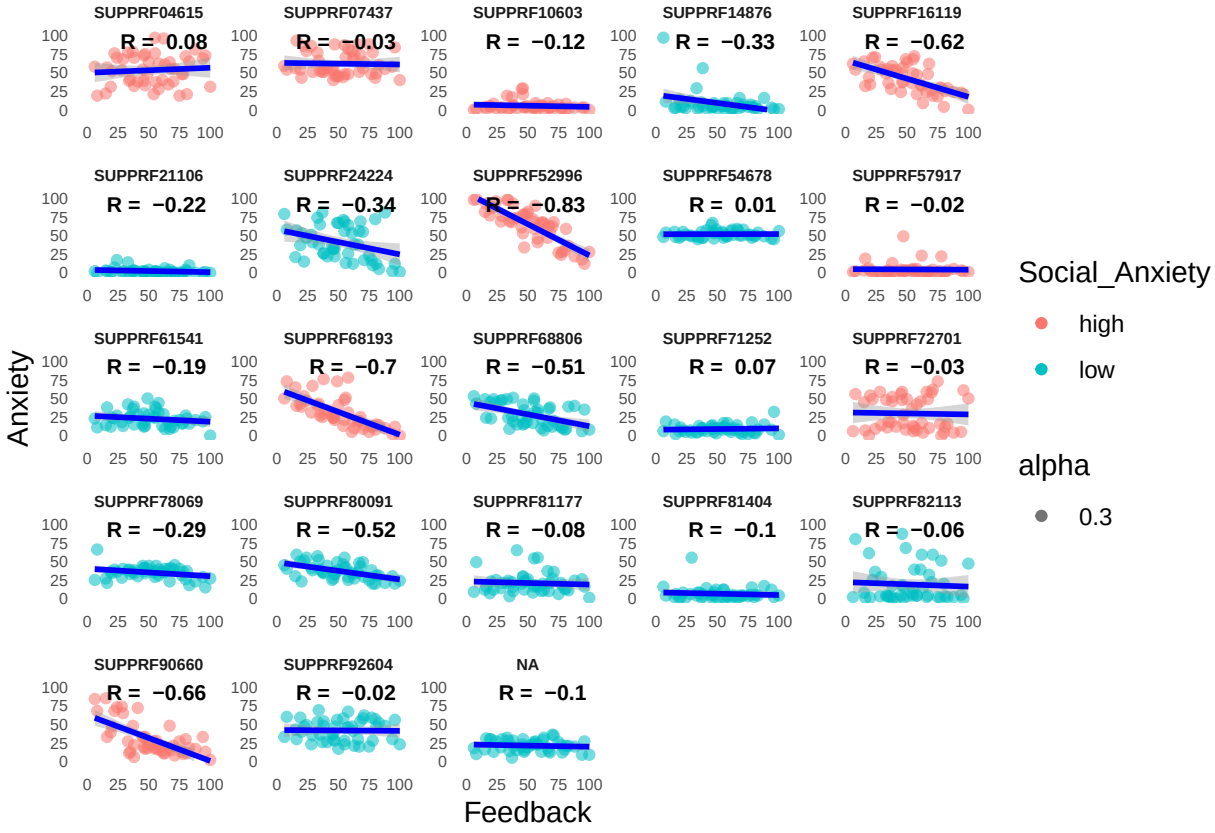
# Relationship between Anxiety and prediction

```
## [1] "average correlation between anxiety and prediction: -0.124333242732399"
```

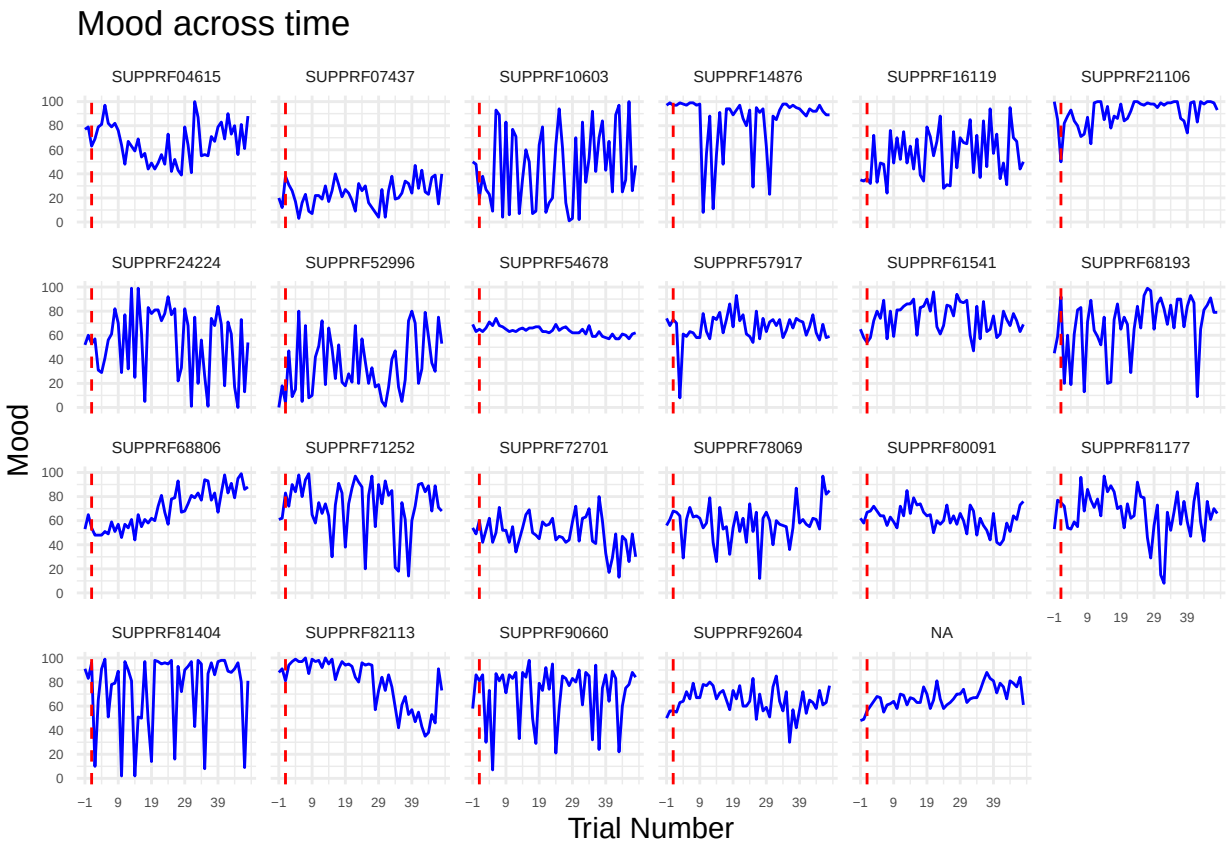


# Relationship between Anxiety and feedback

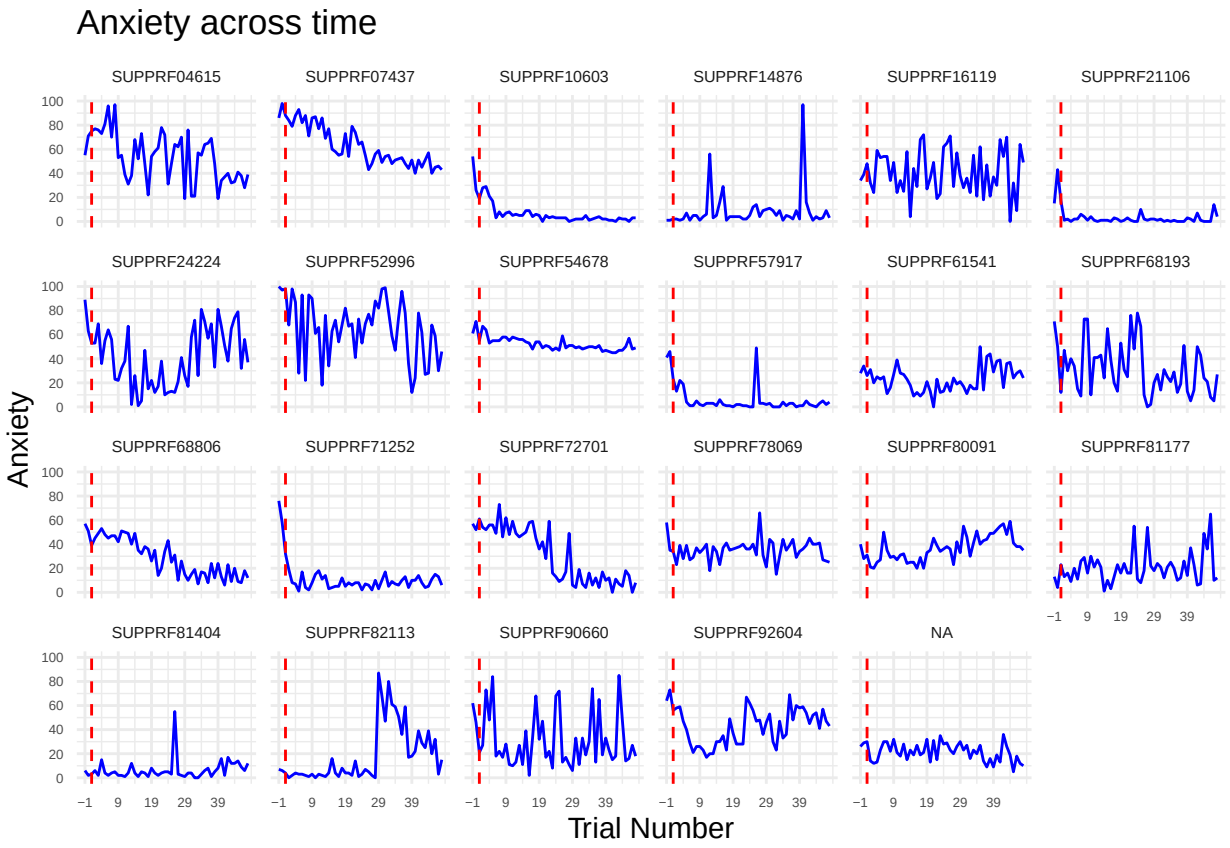
```
## [1] "average correlation between anxiety and feedback: -0.243743880842419"
```



# Mood over time



# Anxiety over time



## LME models for Mood and SubjPE

When looking at subjective PE, the best model is Mood ~ SubjPE * mini_SPIN_total + (SubjPE | Random_ID) with an AIC of 9123.999 When including feedback the best model is Mood ~ feedback + (feedback | Random_ID) with an AIC of 8879.897

```
## [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: 9201.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.7893 -0.4884  0.0806  0.6023  2.7692
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 247.3    15.72
##  Residual              330.7    18.19
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     62.92412    3.39952   18.51
## Response_SubjPE  0.35954    0.02915   12.33
##
## 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: 9113.1
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.9801 -0.4506  0.0879  0.6167  3.3449
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     273.3041 16.532
##            Response_SubjPE   0.1005  0.317   -0.41
##  Residual                  292.7437 17.110
## Number of obs: 1056, groups:  Random_ID, 22
```

```
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     62.42278    3.56684  17.501
## Response_SubjPE  0.41921    0.07395   5.669
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.383
```

```
## [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: 9108
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.9991 -0.4423  0.0829  0.6239  3.3552
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     206.09465 14.3560
##            Response_SubjPE   0.08221  0.2867  -0.21
##  Residual                  292.66348 17.1074
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                                 Estimate Std. Error t value
## (Intercept)                     76.63929    5.99751  12.779
## Response_SubjPE                  0.16600    0.13111   1.266
## mini_SPIN_total                 -2.84091    1.02570  -2.770
## Response_SubjPE:mini_SPIN_total  0.05047    0.02253   2.240
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE m_SPIN
## Rspns_SbjPE -0.193
## mn_SPIN_ttl -0.855  0.165
## R_SPE:_SPIN  0.165 -0.855 -0.194
```

```
## [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: 9036.6
##
```

```
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.1105 -0.5268  0.0899  0.6438  2.6980
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 225.3    15.01
##  Residual              282.4    16.81
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)    42.3284     3.4332   12.33
## Response_fdbk   0.4120     0.0218   18.90
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.329
```

```
## [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: 8867.9
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.0194 -0.4834  0.0459  0.6035  3.6981
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   636.65770 25.2321
##            Response_fdbk   0.09884  0.3144  -0.82
##  Residual                228.16358 15.1051
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   42.32836    5.49434   7.704
## Response_fdbk  0.41200    0.06983   5.900
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.824
```

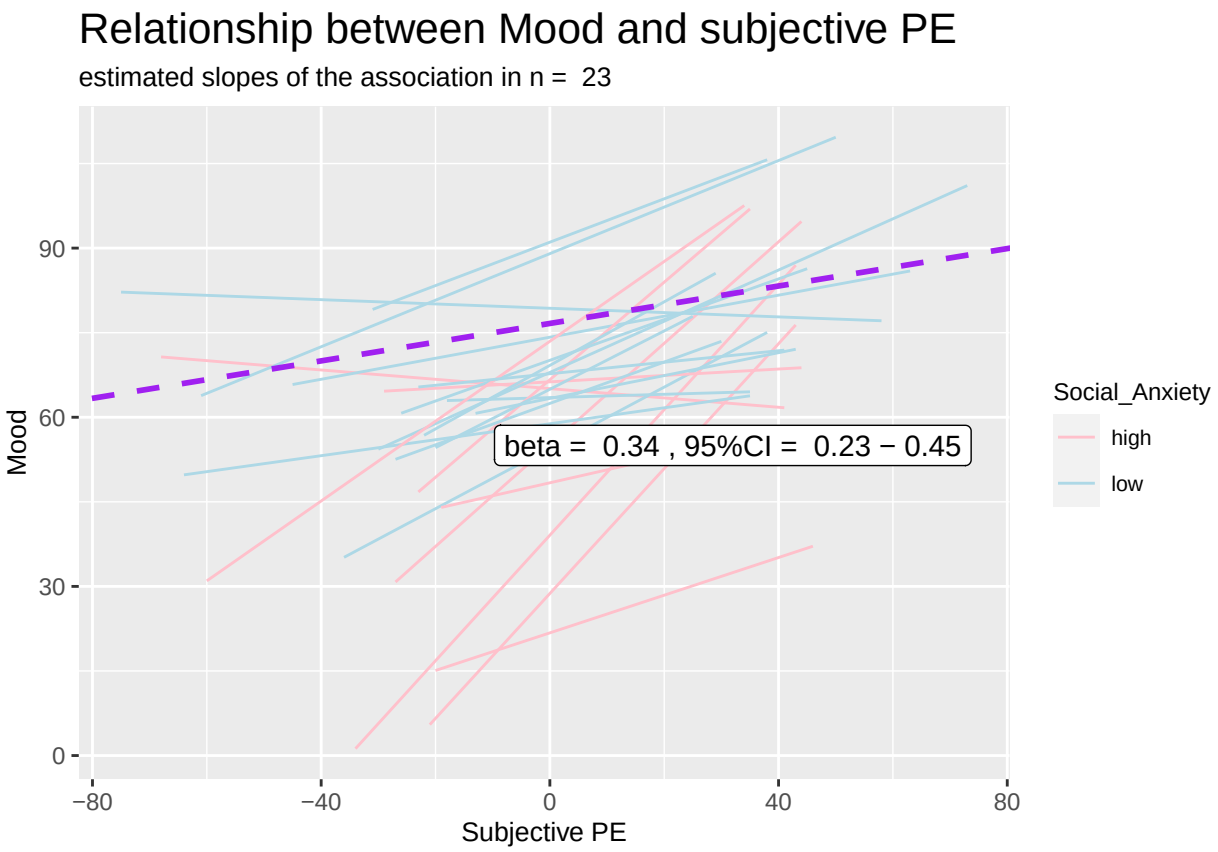
```
## [1] "Model 6 summary: Response_H ~ Response_fdbk * mini_SPIN_total + (Response_fdbk | Random_ID)"
```

```
## 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: 8864.1
##
## Scaled residuals:
##    Min     1Q Median     3Q    Max
## -4.011 -0.478  0.051  0.606  3.717
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   480.06161 21.9103
##            Response_fdbk   0.09317  0.3052  -0.81
##  Residual                228.16352 15.1051
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                               Estimate Std. Error t value
## (Intercept)                   64.00389    9.26733   6.906
## Response_fdbk                  0.24672    0.13113   1.881
## mini_SPIN_total               -4.33511    1.58510  -2.735
## Response_fdbk:mini_SPIN_total  0.03306    0.02243   1.474
##
## Correlation of Fixed Effects:
##             (Intr) Rspns_ m_SPIN
## Respns_fdbk -0.816
## mn_SPIN_ttl -0.855  0.697
## Rsp_:_SPIN_  0.697 -0.855 -0.816

## [1] "AIC model1:"

## [1] 9209.337

## [1] "AIC model2:"

## [1] 9125.099

## [1] "AIC model3:"

## [1] 9123.999

## [1] "AIC model4:"

## [1] 9044.628

## [1] "AIC model5:"

## [1] 8879.897

## [1] "AIC model6:"

## [1] 8880.099
```

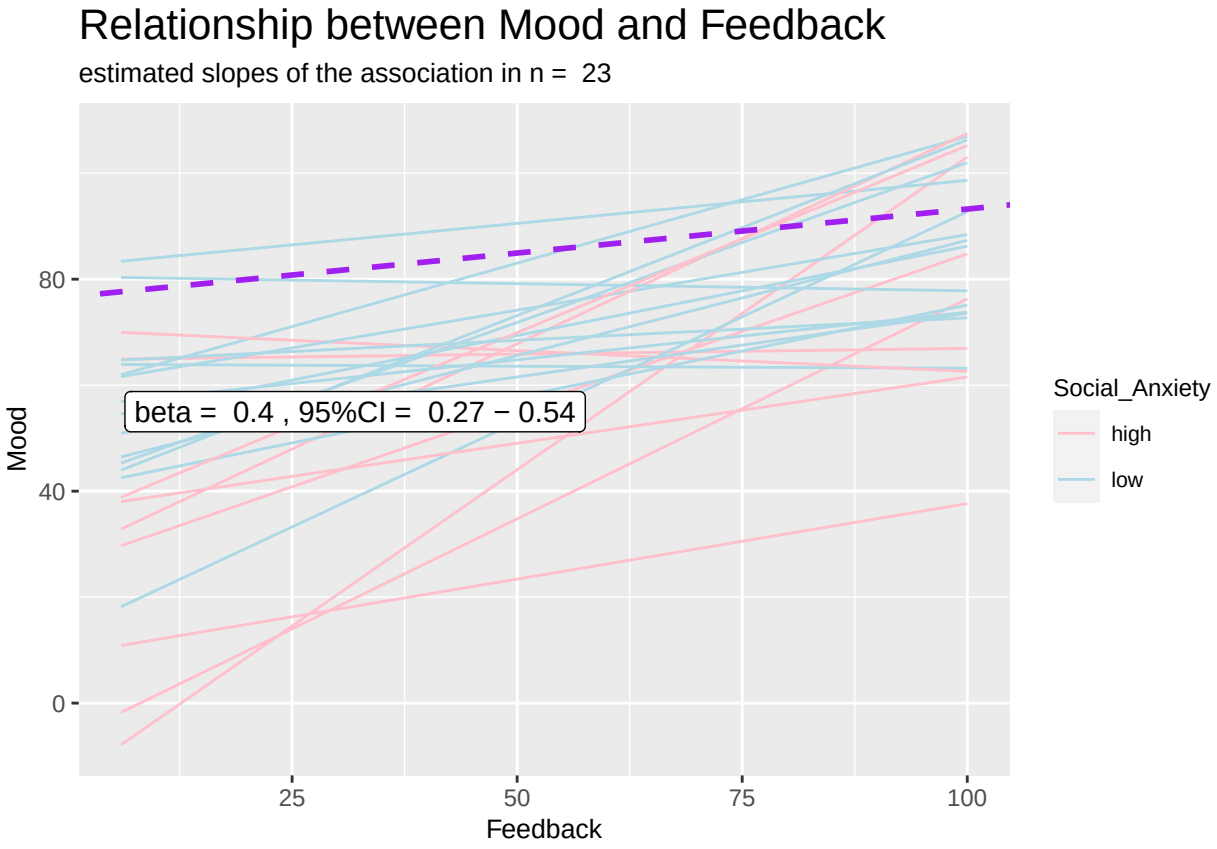
## Individual plots with LME for Mood with SubjPE

When looking at subjective PE, the best model is Mood ~ SubjPE * mini_SPIN_total + (SubjPE | Random_ID) with an AIC of 9123.999



## 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 8879.897.



## LME models for Anxiety and SubjPE

When looking at subjective PE, the best model is Anxiety ~ SubjPE + (SubjPE | Random_ID) with an AIC of 8823.219 When including feedback the best model is Anxiety ~ feedback + (Random_ID) with an AIC of 8761.136

```
## [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: 8895.4
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1183 -0.5765 -0.1094  0.4716  5.3865
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 344.2    18.55
##  Residual              244.4    15.63
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)     29.57649    3.98521   7.422
## Response_SubjPE -0.15150    0.02507  -6.042
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.013

## [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: 8811.2
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.9076 -0.5342 -0.1150  0.4258  5.7725
##
## Random effects:
##  Groups    Name            Variance  Std.Dev. Corr
##  Random_ID (Intercept)     370.99356 19.261
##            Response_SubjPE   0.08762  0.296   -0.44
##  Residual                  216.74228 14.722
## Number of obs: 1056, groups:  Random_ID, 22
```

```
##
## Fixed effects:
##                 Estimate Std. Error t value
## (Intercept)      29.4687     4.1334   7.129
## Response_SubjPE  -0.1961     0.0682  -2.876
##
## Correlation of Fixed Effects:
##             (Intr)
## Rspns_SbjPE -0.407
```

```
## [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: 8810.9
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.9207 -0.5327 -0.1158  0.4245  5.7763
##
## Random effects:
##  Groups    Name            Variance Std.Dev. Corr
##  Random_ID (Intercept)     375.0125 19.3652
##            Response_SubjPE   0.0746  0.2731  -0.39
##  Residual                  216.7394 14.7221
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                                 Estimate Std. Error t value
## (Intercept)                     23.46020    8.01688   2.926
## Response_SubjPE                  0.01591    0.12271   0.130
## mini_SPIN_total                  1.20522    1.37115   0.879
## Response_SubjPE:mini_SPIN_total -0.04246    0.02107  -2.015
##
## Correlation of Fixed Effects:
##             (Intr) Rs_SPE m_SPIN
## Rspns_SbjPE -0.363
## mn_SPIN_ttl -0.855  0.311
## R_SPE:_SPIN  0.310 -0.855 -0.364
```

```
## [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: 8849.8
##
```

```
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8223 -0.6286 -0.1124  0.4856  5.2061
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  Random_ID (Intercept) 345.6    18.59
##  Residual              233.7    15.29
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   38.74687    4.12186   9.400
## Response_fdbk -0.18309    0.01983  -9.231
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.250
```

```
## [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: 8749.1
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4597 -0.5366 -0.1277  0.4207  5.5145
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   656.22388 25.6169
##            Response_fdbk   0.05488  0.2343  -0.74
##  Residual                203.58882 14.2685
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)   38.74687    5.56261   6.966
## Response_fdbk -0.18309    0.05326  -3.437
##
## Correlation of Fixed Effects:
##             (Intr)
## Respns_fdbk -0.737
```

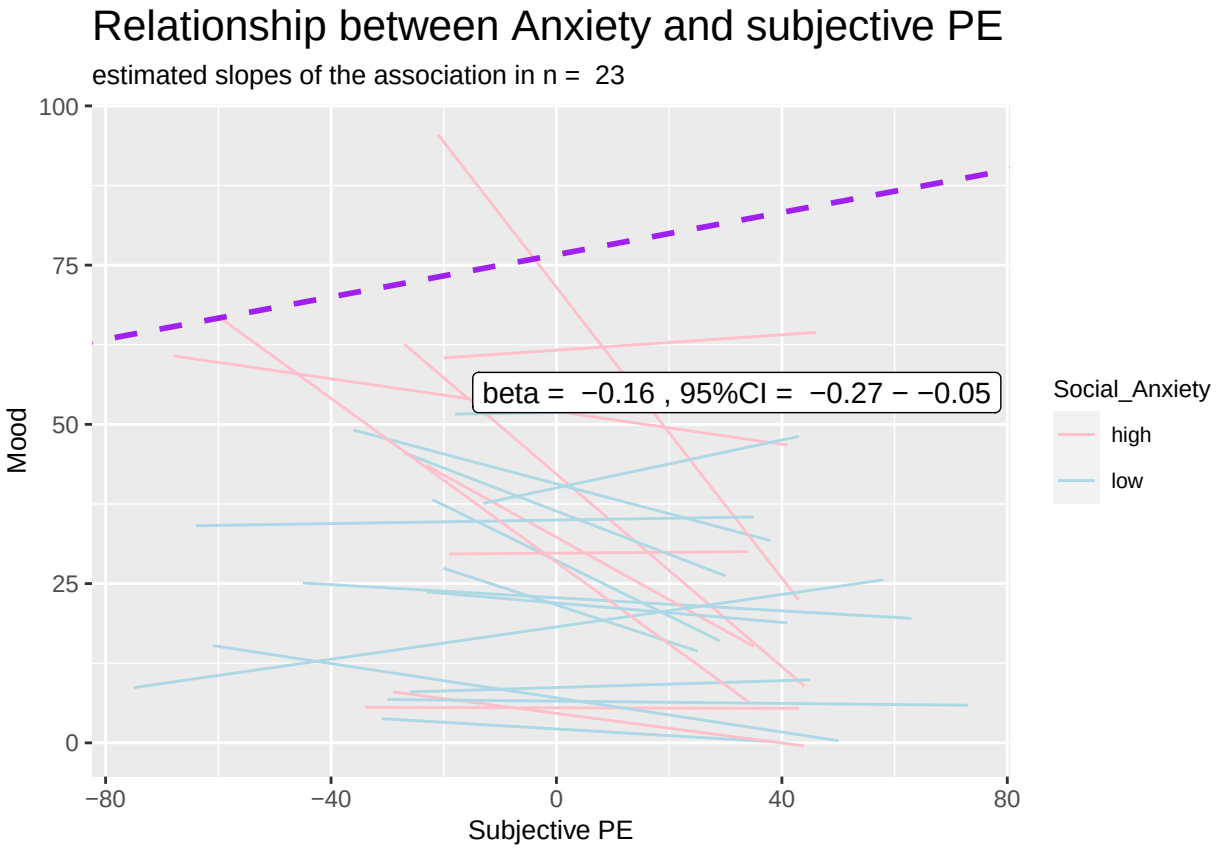
```
## [1] "Model 6 summary: Response_Ax ~ Response_fdbk * mini_SPIN_total + (Response_fdbk | Random_ID)"
```

```
## 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: 8750.5
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4560 -0.5498 -0.1287  0.4106  5.5227
##
## Random effects:
##  Groups    Name          Variance  Std.Dev. Corr
##  Random_ID (Intercept)   627.27690 25.0455
##            Response_fdbk   0.05043  0.2246  -0.70
##  Residual                203.58748 14.2684
## Number of obs: 1056, groups:  Random_ID, 22
##
## Fixed effects:
##                               Estimate Std. Error t value
## (Intercept)                   26.23780   10.50209   2.498
## Response_fdbk                 -0.04615    0.09904  -0.466
## mini_SPIN_total                2.50181    1.79630   1.393
## Response_fdbk:mini_SPIN_total -0.02739    0.01694  -1.617
##
## Correlation of Fixed Effects:
##             (Intr) Rspns_ m_SPIN
## Respns_fdbk -0.708
## mn_SPIN_ttl -0.855  0.606
## Rsp_:_SPIN_  0.606 -0.855 -0.708

## [1] "AIC model1:"

## [1] 8903.407

## [1] "AIC model2:"

## [1] 8823.219

## [1] "AIC model3:"

## [1] 8826.92

## [1] "AIC model4:"

## [1] 8857.829

## [1] "AIC model5:"

## [1] 8761.136

## [1] "AIC model6:"

## [1] 8766.497
```

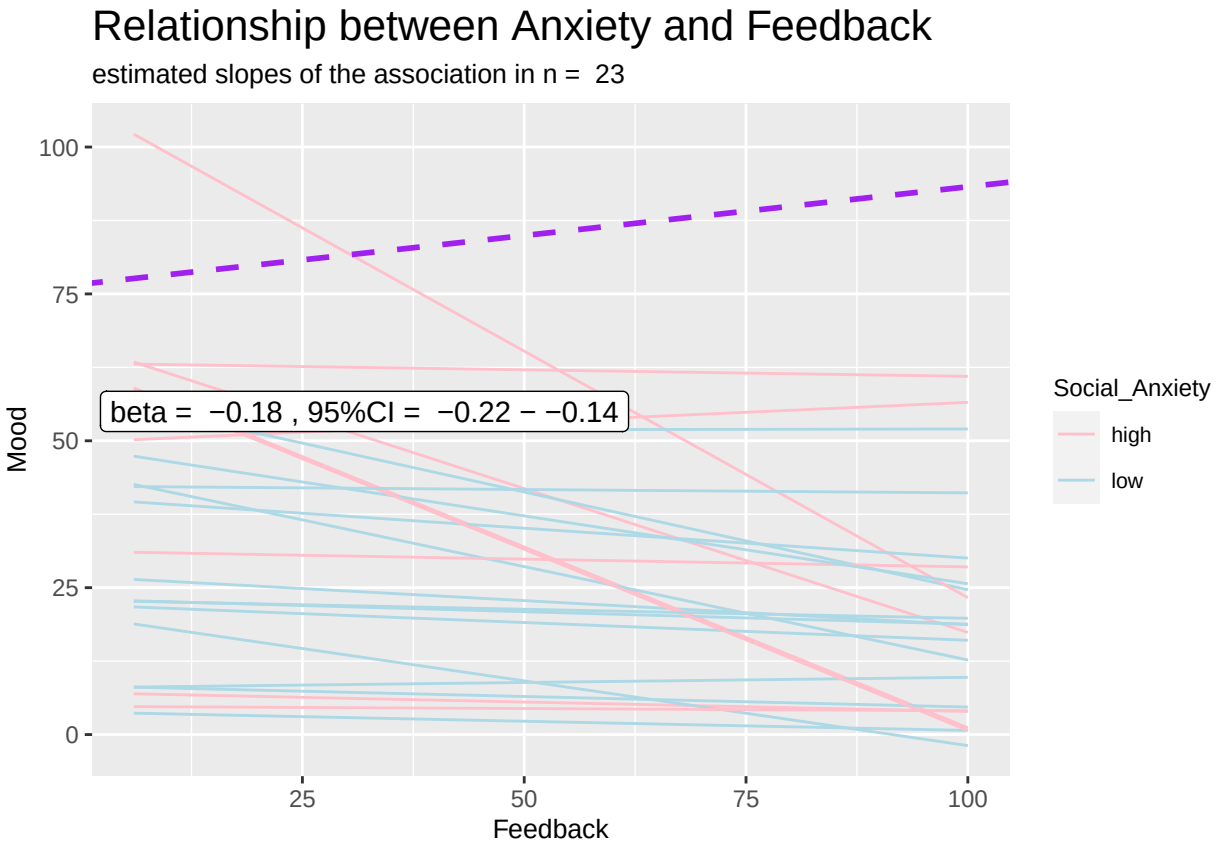
## Individual plots with LME for Anxiety with SubjPE

When looking at subjective PE, the best model is Anxiety ~ SubjPE + (SubjPE | Random_ID) with an AIC of 8823.219



## 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



## Bayesian LME