

Pain Research - Dr. Jamison Data

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Objective 1.1 Day-to-day (Concurrent) associations

```
#Analyses; Day-to-day; Univariate multilevel linear regressions
#- Outcome: Lev1 daily pain intensity
#- Examine Lev1 association; between daily mood and pain (Same-day Lev1 units)
#- Examine Lev1 association; between daily sleep and pain (Same-day Lev1 units)
#- All these multlev must be done with Lev1 centered data
model_Pain1 <- lmer(Today_PainAve ~ Today_Mood_c + (1|ID), data = df_new)
summary(model_Pain1)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_PainAve ~ Today_Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15011.6
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -5.7045 -0.5554 -0.0477 0.5334 5.7811
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 3.680 1.918
## Residual 1.302 1.141
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 5.327e+00 1.300e-01 2.213e+02 40.97 <2e-16 ***
## Today_Mood_c 2.530e-01 1.481e-02 4.327e+03 17.09 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## Today_Mod_c 0.000
```

```
confint(model_Pain1)
```

```
## Computing profile confidence intervals ...
```

```
##           2.5 %    97.5 %
## .sig01      1.7454201 2.1101539
## .sigma      1.1172842 1.1653647
## (Intercept) 5.0717382 5.5824304
## Today_Mood_c 0.2239451 0.2819929
```

```
model_Pain2 <- lmer(Today_PainAve ~ Today_Sleep_c + (1|ID), data = df_new)
summary(model_Pain2)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_PainAve ~ Today_Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 10933.3
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -6.5284 -0.5819 -0.0394  0.5142  5.9042
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 3.657  1.912
## Residual 1.258  1.122
## Number of obs: 3303, groups: ID, 221
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 5.323e+00 1.311e-01 2.222e+02 40.59 <2e-16 ***
## Today_Sleep_c 1.845e-01 1.646e-02 3.101e+03 11.21 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## Today_Slp_c 0.006
```

```
confint(model_Pain2)
```

```
##Computing profile confidence intervals ...
```

```
##           2.5 %    97.5 %
## .sig01      1.7374495 2.1066502
## .sigma      1.0939984 1.1499834
## (Intercept) 5.0649905 5.5800950
## Today_Sleep_c 0.1521968 0.2167286
```

```

# Analyses; Multivariable models
#- Outcome: Lev1 daily pain intensity
#- Ivs entered simulatenously: daily (Lev1) mood, sleep
#- All these multilev must be done with Lev1 centered data
#- Same-day Lev1 units
model_Pain3 <- lmer(Today_PainAve ~ Today_Sleep_c + Today_Mood_c + (1|ID), data = df_new)
summary(model_Pain3)

```

```

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_PainAve ~ Today_Sleep_c + Today_Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 10777.6
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -5.8858 -0.5809 -0.0514 0.5217 6.2497
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 3.659 1.913
## Residual 1.195 1.093
## Number of obs: 3302, groups: ID, 221
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 5.321e+00 1.310e-01 2.221e+02 40.603 <2e-16 ***
## Today_Sleep_c 1.548e-01 1.621e-02 3.098e+03 9.547 <2e-16 ***
## Today_Mood_c 2.227e-01 1.751e-02 3.091e+03 12.716 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) Tdy_S_
## Today_Slp_c 0.006
## Today_Mod_c -0.001 -0.141

```

```

confint(model_Pain3)

```

```

## Computing profile confidence intervals ...

```

```

## 2.5 % 97.5 %
## .sig01 1.7382149 2.1069537
## .sigma 1.0662030 1.1207757
## (Intercept) 5.0638525 5.5786317
## Today_Sleep_c 0.1230106 0.1865591
## Today_Mood_c 0.1883642 0.2570086

```

```

# Analyses; Day-to-day; Univariate multilevel linear regressions
#-Outcome: Lev1 Sleep
#-Examine Lev1 association; between daily mood and sleep (Same-day Lev1 units)

```

```

#-Examine Lev1 association; between daily pain and sleep (Same-day Lev1 units)
#-All these multlev must be done with Lev1 centered data
model_Pain4 <- lmer(Today_Sleep ~ Today_Mood_c + (1|ID), data = df_new)
summary(model_Pain4)

```

```

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_Sleep ~ Today_Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 11558
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -5.0222 -0.4542 -0.0430 0.3844 4.7405
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 7.051 2.655
## Residual 1.472 1.213
## Number of obs: 3303, groups: ID, 221
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 4.198e+00 1.808e-01 2.201e+02 23.223 < 2e-16 ***
## Today_Mood_c 1.530e-01 1.924e-02 3.088e+03 7.952 2.54e-15 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## Today_Mod_c 0.000

```

```

confint(model_Pain4)

```

```

## Computing profile confidence intervals ...

```

```

## 2.5 % 97.5 %
## .sig01 2.4146433 2.9228138
## .sigma 1.1833356 1.2439177
## (Intercept) 3.8429193 4.5529965
## Today_Mood_c 0.1152788 0.1907008

```

```

model_Pain5 <- lmer(Today_Sleep ~ Today_PainAve_c + (1|ID), data = df_new)
summary(model_Pain5)

```

```

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_Sleep ~ Today_PainAve_c + (1 | ID)
## Data: df_new
##

```

```
## REML criterion at convergence: 11499.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.0919 -0.4400 -0.0457  0.3781  4.8290
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##    ID      (Intercept) 7.037    2.653
## Residual              1.444    1.202
## Number of obs: 3303, groups: ID, 221
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   4.200e+00  1.805e-01 2.202e+02  23.26   <2e-16 ***
## Today_PainAve_c 2.117e-01  1.891e-02 3.086e+03  11.19   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## Tody_PnAv_c 0.001
```

```
confint(model_Pain5)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %
## .sig01        2.4123271 2.9196923
## .sigma        1.1721656 1.2321750
## (Intercept)    3.8457760 4.5549940
## Today_PainAve_c 0.1745975 0.2487484
```

```
# Analyses; Multivariable models
```

```
#- Outcome: Lev1 sleep
```

```
#- Ivs entered simulatenously: daily (Lev1) mood, pain
```

```
#- All these multlev must be done with Lev1 centered data
```

```
#- Same-day Lev1 units
```

```
model_Pain6 <- lmer(Today_Sleep ~ Today_PainAve_c + Today_Mood_c + (1|ID), data = df_new)
summary(model_Pain6)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
```

```
## lmerModLmerTest]
```

```
## Formula: Today_Sleep ~ Today_PainAve_c + Today_Mood_c + (1 | ID)
```

```
##   Data: df_new
```

```
##
```

```
## REML criterion at convergence: 11472.2
```

```
##
```

```
## Scaled residuals:
```

```
##      Min       1Q   Median       3Q      Max
## -5.0471 -0.4440 -0.0444  0.3613  4.9110
```

```
##
```

```
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 7.031 2.652
## Residual 1.431 1.196
## Number of obs: 3302, groups: ID, 221
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 4.200e+00 1.805e-01 2.202e+02 23.274 < 2e-16 ***
## Today_PainAve_c 1.852e-01 1.942e-02 3.084e+03 9.532 < 2e-16 ***
## Today_Mood_c 1.073e-01 1.957e-02 3.086e+03 5.482 4.54e-08 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) Td_PA_
## Tody_PnAv_c 0.001
## Today_Mod_c -0.001 -0.245
```

```
confint(model_Pain6)
```

```
## Computing profile confidence intervals ...
```

```
##          2.5 %    97.5 %
## .sig01      2.4114685 2.9185218
## .sigma      1.1665697 1.2263023
## (Intercept) 3.8456850 4.5545636
## Today_PainAve_c 0.1470809 0.2232211
## Today_Mood_c 0.0689274 0.1456310
```

Objective 1.2: Time-lag effects

```
# Yesterday sleep -> Today Pain
model_SleepPain <- lmer(Today_PainAve ~ LastDay_Sleep_c + (1|ID), data = df_new)
model_SleepPain2 <- lmer(Today_PainAve ~ Today_Sleep + (1|ID), data = df_new)
AIC(model_SleepPain, model_SleepPain2)
```

```
## Warning in AIC.default(model_SleepPain, model_SleepPain2): models are not all
## fitted to the same number of observations
```

```
##          df      AIC
## model_SleepPain  4 14191.20
## model_SleepPain2  4 10840.18
```

```
icc(model_SleepPain2)
```

```
## # Intraclass Correlation Coefficient
##
## Adjusted ICC: 0.627
## Unadjusted ICC: 0.544
```

```
summary(model_SleepPain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_PainAve ~ LastDay_Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 14183.2
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -6.7956 -0.5835 -0.0156  0.5409  5.6682
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 3.694  1.922
## Residual      1.076  1.037
## Number of obs: 4549, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   5.327e+00  1.300e-01 2.213e+02  40.96  <2e-16 ***
## LastDay_Sleep_c 4.255e-01  1.196e-02 4.326e+03  35.59  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## LstDy_Slp_c 0.000
```

```
confint(model_SleepPain)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %
## .sig01        1.7495327 2.1138023
## .sigma        1.0156199 1.0593308
## (Intercept)    5.0718626 5.5827192
## LastDay_Sleep_c 0.4020557 0.4489307
```

```
# Yesterday pain -> Today sleep
```

```
model_PainSleep <- lmer(Today_Sleep ~ LastDay_PainAve_c + (1|ID), data = df_new)
summary(model_PainSleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: Today_Sleep ~ LastDay_PainAve_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 11418.6
##
```

```
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.9873 -0.4373 -0.0525  0.3856  5.3624
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 7.177    2.679
##   Residual              1.488    1.220
## Number of obs: 3249, groups: ID, 220
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      4.2056     0.1827  218.5013  23.021 < 2e-16 ***
## LastDay_PainAve_c  0.1072     0.0191 3033.6008   5.616 2.14e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## LstDy_PnAv_  0.002
```

```
confint(model_PainSleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %
## .sig01        2.43545667 2.9494551
## .sigma        1.18959773 1.2510508
## (Intercept)    3.84678260 4.5644047
## LastDay_PainAve_c 0.06981079 0.1446839
```

Objective 2: Analyses: Perceived Improvement

```
# Analyses; Univariate multilevel linear regressions
# Outcome: Lev1 perceived improvement
# Examine Lev1 association; between daily pain and perceived improvement (Same-day Lev1 units)
model_painimprove <- lmer(GlobalImprovement ~ AvePain_c + (1|ID), data = df_new)
summary(model_painimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ AvePain_c + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 15753.6
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8904 -0.5018 -0.0428  0.4359  5.8656
##
## Random effects:
```



```
## Groups Name Variance Std.Dev.
## ID (Intercept) 1.157 1.076
## Residual 1.634 1.278
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 6.02260 0.07497 219.50479 80.33 <2e-16 ***
## AvePain_c -0.56930 0.01648 4326.95685 -34.55 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## AvePain_c 0.000
```

```
confint(model_painimprove)
```

```
## Computing profile confidence intervals ...
```

```
## 2.5 % 97.5 %
## .sig01 0.9727485 1.1897264
## .sigma 1.2515144 1.3053738
## (Intercept) 5.8753590 6.1698673
## AvePain_c -0.6016027 -0.5370068
```

```
# Examine Lev1 association; between daily mood and perceived improvement (Same-day Lev1 units)
model_moodimprove <- lmer(GlobalImprovement ~ Mood_c + (1|ID), data = df_new)
summary(model_moodimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16284.1
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -4.7165 -0.4527 -0.0031 0.4594 4.7921
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 1.148 1.071
## Residual 1.846 1.359
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 6.02342 0.07503 219.43605 80.28 <2e-16 ***
## Mood_c -0.41725 0.01763 4327.04478 -23.67 <2e-16 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## Mood_c 0.000
```

```
confint(model_moodimprove)
```

```
## Computing profile confidence intervals ...
```

```
##           2.5 %    97.5 %
## .sig01      0.9676451  1.1858657
## .sigma      1.3305648  1.3878259
## (Intercept)  5.8760587  6.1708057
## Mood_c      -0.4518087 -0.3826932
```

```
# Examine Lev1 association; between daily sleep and perceived improvement (Same-day Lev1 unit)
model_sleepimprove <- lmer(GlobalImprovement ~ Sleep_c + (1|ID), data = df_new)
summary(model_sleepimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16176.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1334 -0.4733 -0.0108  0.4473  5.4262
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.151  1.073
## Residual          1.803  1.343
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   6.02181    0.07507 219.56667  80.21  <2e-16 ***
## Sleep_c      -0.40231    0.01548 4326.12350 -25.99  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## Sleep_c 0.000
```

```
confint(model_sleepimprove)
```

```
##Computing profile confidence intervals ...
```

```
##           2.5 %    97.5 %
## .sig01      0.9693305  1.1873852
## .sigma      1.3146478  1.3712297
## (Intercept) 5.8743714  6.1692689
## Sleep_c     -0.4326473 -0.3719721
```

```
# Examine Lev1 association; between daily ActivityInt and perceived improvement (Same-day Lev1 unit)
model_actimprove <- lmer(GlobalImprovement ~ ActivityInt_c + (1|ID), data = df_new)
summary(model_actimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ ActivityInt_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15895.9
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7369 -0.4823 -0.0091  0.4385  6.0088
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.156  1.075
## Residual          1.688  1.299
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.02303    0.07502 219.50622   80.29 <2e-16 ***
## ActivityInt_c  -0.49764    0.01560 4327.00419  -31.90 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## ActvtyInt_c 0.000
```

```
confint(model_actimprove)
```

```
## Computing profile confidence intervals ...
```

```
##           2.5 %    97.5 %
## .sig01      0.9718338  1.1891921
## .sigma      1.2722037  1.3269534
## (Intercept) 5.8756991  6.1703749
## ActivityInt_c -0.5282147 -0.4670559
```

```
# All these multlev must be done with Lev1 centered data
```

```

# Analysis; Multivariable/multilevel linear regression
# Outcome: Perceived improvement
# Ivs entered simulatenously: daily (Lev1) pain, mood, sleep, ActivityInt
model_compimprove <- lmer(GlobalImprovement ~ Sleep_c + AvePain_c + Mood_c + ActivityInt_c + (1|ID), da
summary(model_compimprove)

```

```

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ Sleep_c + AvePain_c + Mood_c + ActivityInt_c +
##      (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 15264.6
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.9588 -0.4953 -0.0213  0.4476  5.4574
##
## Random effects:
##  Groups   Name                Variance Std.Dev.
##  ID       (Intercept)  1.167      1.081
##  Residual                    1.458      1.208
## Number of obs: 4547, groups:  ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.02109    0.07500 219.63353  80.286 < 2e-16 ***
## Sleep_c       -0.13345    0.01637 4319.99960  -8.153 4.61e-16 ***
## AvePain_c     -0.31707    0.02058 4319.99960 -15.406 < 2e-16 ***
## Mood_c        -0.23456    0.01669 4319.99960 -14.055 < 2e-16 ***
## ActivityInt_c -0.18611    0.01913 4319.99960  -9.728 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) Slep_c AvPn_c Mood_c
## Sleep_c      0.000
## AvePain_c    0.000 -0.279
## Mood_c       0.000 -0.123 -0.041
## ActvtyInt_c 0.000 -0.195 -0.492 -0.178

```

```

confint(model_compimprove)

```

```

## Computing profile confidence intervals ...

```

```

##              2.5 %      97.5 %
## .sig01        0.9778873  1.1940124
## .sigma        1.1819700  1.2328602
## (Intercept)   5.8738056  6.1683978
## Sleep_c      -0.1655270 -0.1013790
## AvePain_c    -0.3573965 -0.2767410
## Mood_c       -0.2672611 -0.2018564
## ActivityInt_c -0.2235920 -0.1486184

```

```
# All these multilevel must be done with Lev1 centered data
# Perhaps get some colinearity indicator to know to what extent colinearity is an issue
collinear_test <- check_collinearity(model_compimprove)
print(collinear_test)
```

```
## # Check for Multicollinearity
##
## Low Correlation
##
##          Term  VIF   VIF 95% CI Increased SE Tolerance Tolerance 95% CI
##      Sleep_c 1.38 [1.33, 1.44]         1.18      0.72      [0.70, 0.75]
##      AvePain_c 1.75 [1.68, 1.82]         1.32      0.57      [0.55, 0.60]
##      Mood_c 1.13 [1.10, 1.18]         1.06      0.88      [0.85, 0.91]
##      ActivityInt_c 1.74 [1.67, 1.81]         1.32      0.58      [0.55, 0.60]
```

```
## Some comments on how to read this result: The VIF is around 1 => Low Multicollinearity
## The VIF is between 2 to 5, Moderate Multicollinearity
## The VIF >5 (or 10 sometimes), High Multicollinearity
## Low Tolerance (~ 0), High Multicollinearity
```

We have low multicollinearity in this case!

Objective 2.2 Analyses: Moderators of perceived improvement

```
# Test if any of the baseline (Lev2) socio-demog variables are linked to perceived improvements; Univar
# B_Demog_Gender
model_genderimprove <- lmer(GlobalImprovement ~ B_Demog_Gender + (1|ID), data = df_new)
summary(model_genderimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Gender + (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 16807
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4120 -0.4415 -0.0034  0.4388  4.9641
##
## Random effects:
##      Groups      Name              Variance Std.Dev.
##      ID          (Intercept)  1.129      1.063
##      Residual                2.084      1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    5.5544    0.3340 221.1166  16.630  <2e-16 ***
## B_Demog_Gender  0.2626    0.1823 220.5723   1.441    0.151
```

```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Demg_Gndr -0.975

confint(model_genderimprove)

## Computing profile confidence intervals ...

##           2.5 %    97.5 %
## .sig01      0.95610501 1.1745618
## .sigma      1.41389130 1.4747295
## (Intercept)  4.89983087 6.2088010
## B_Demog_Gender -0.09460566 0.6199379

# B_Demog_Ethnicity
model_ethnimprove <- lmer(GlobalImprovement ~ B_Demog_Ethnicity + (1|ID), data = df_new)
summary(model_ethnimprove)

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Ethnicity + (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 16810.8
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4097 -0.4419 -0.0007  0.4351  4.9691
##
## Random effects:
##      Groups      Name      Variance Std.Dev.
##      ID      (Intercept)  1.140     1.068
##      Residual              2.085     1.444
## Number of obs: 4552, groups:  ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.00103    0.12719 217.53061  47.180  <2e-16 ***
## B_Demog_Ethnicity  0.01584    0.07313 216.10493   0.217    0.829
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Dmg_Ethnc -0.807

confint(model_ethnimprove)

##Computing profile confidence intervals ...

```

```
##                2.5 %    97.5 %
## .sig01          0.9608634 1.1802628
## .sigma          1.4139012 1.4747407
## (Intercept)     5.7518051 6.2502987
## B_Demog_Ethnicity -0.1274734 0.1591333
```

```
# B_Demog_Age
model_ageimprove <- lmer(GlobalImprovement ~ B_Demog_Age + (1|ID), data = df_new)
summary(model_ageimprove) # Significant!
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Age + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16806.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4221 -0.4320  0.0060  0.4383  4.9723
##
## Random effects:
## Groups   Name            Variance Std.Dev.
## ID       (Intercept)  1.085      1.042
## Residual                2.084      1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  5.174e+00  2.756e-01 2.192e+02 18.771 < 2e-16 ***
## B_Demog_Age  1.643e-02  5.139e-03 2.185e+02  3.197  0.00159 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Demog_Age -0.964
```

```
confint(model_ageimprove)
```

```
## Computing profile confidence intervals ...
```

```
##                2.5 %    97.5 %
## .sig01          0.936999138 1.15191933
## .sigma          1.413883734 1.47472084
## (Intercept)     4.633722247 5.71393232
## B_Demog_Age     0.006362664 0.02650471
```

Age tends to be associated with the improvement, older patients have better improvements.

```
# Test if any of the baseline (Lev2) clinical variables are linked to perceived improvements; Univariate
# B_Clin_PainDur"
model_paindurimprove <- lmer(GlobalImprovement ~ B_Clin_PainDur + (1|ID), data = df_new)
summary(model_paindurimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Clin_PainDur + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15755.7
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -4.4949 -0.4460 0.0026 0.4333 5.0739
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 1.140 1.068
## Residual 2.009 1.417
## Number of obs: 4307, groups: ID, 208
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 5.853e+00 1.150e-01 2.023e+02 50.897 <2e-16 ***
## B_Clin_PainDur 1.054e-02 6.443e-03 2.008e+02 1.636 0.103
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## B_Clin_PnDr -0.739
```

```
confint(model_paindurimprove)
```

```
## Computing profile confidence intervals ...
```

```
## 2.5 % 97.5 %
## .sig01 0.957201880 1.18347983
## .sigma 1.387215156 1.44861026
## (Intercept) 5.627911643 6.07861770
## B_Clin_PainDur -0.002087504 0.02316534
```

```
# B_Clin_BMI"
model_BMIimprove <- lmer(GlobalImprovement ~ B_Clin_BMI + (1|ID), data = df_new)
summary(model_BMIimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Clin_BMI + (1 | ID)
## Data: df_new
```



```
##
## REML criterion at convergence: 16744.6
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.3929 -0.4468 -0.0041  0.4384  4.9859
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##    ID      (Intercept) 1.127    1.062
##   Residual             2.091    1.446
## Number of obs: 4530, groups: ID, 221
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   6.549705   0.307229 217.553450  21.319   <2e-16 ***
## B_Clin_BMI   -0.017618   0.009996 218.596599  -1.762   0.0794 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Clin_BMI -0.970
```

```
confint(model_BMIimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01         0.95483504 1.173896041
## .sigma         1.41600771 1.477091251
## (Intercept)    5.94756133 7.151656409
## B_Clin_BMI    -0.03720348 0.001974141
```

```
# All the medications below;
# separately/independently; association with perceived improvement; Univariate
# B_Med_Tramadol
model_Tramadolimprove <- lmer(GlobalImprovement ~ B_Med_Tramadol + (1|ID), data = df_new)
summary(model_Tramadolimprove) # Significant!
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Tramadol + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16803.3
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.3805 -0.4434 -0.0029  0.4466  4.9618
##
## Random effects:
```

```
## Groups      Name      Variance Std.Dev.
## ID          (Intercept) 1.113    1.055
## Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06720    0.07706 218.39971  78.738  <2e-16 ***
## B_Med_Tramadol -0.64456    0.29501 214.59198  -2.185    0.03 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Med_Trmdl -0.261
```

```
confint(model_Tramadolimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01        0.9490154  1.16639513
## .sigma        1.4139247  1.47476718
## (Intercept)    5.9162106  6.21819605
## B_Med_Tramadol -1.2226186 -0.06639294
```

```
# B_Med_Suboxone
```

```
model_Suboxoneimprove <- lmer(GlobalImprovement ~ B_Med_Suboxone + (1|ID), data = df_new)
summary(model_Suboxoneimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Suboxone + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16806.8
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4100 -0.4422 -0.0010  0.4347  4.9697
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## ID          (Intercept) 1.141    1.068
## Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.02424    0.07589 218.40722  79.378  <2e-16 ***
## B_Med_Suboxone -0.05481    0.56592 219.61262  -0.097    0.923
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Med_Subxn -0.134
```

```
confint(model_Suboxoneimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %   97.5 %
## .sig01         0.9609876 1.180399
## .sigma         1.4138995 1.474739
## (Intercept)    5.8755257 6.172964
## B_Med_Suboxone -1.1638748 1.054071
```

```
# B_Med_Marijuana
```

```
model_Marijuanaimprove <- lmer(GlobalImprovement ~ B_Med_Marijuana + (1|ID), data = df_new)
summary(model_Marijuanaimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Marijuana + (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 16806
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4099 -0.4421 -0.0009  0.4349  4.9698
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.140    1.068
##   Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.02149   0.07553 218.34053  79.724   <2e-16 ***
## B_Med_Marijuana  0.19885   0.80349 227.64451   0.247   0.805
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Med_Marjn -0.094
```

```
confint(model_Marijuanaimprove)
```

```
##Computing profile confidence intervals ...
```

```
##              2.5 %   97.5 %
## .sig01        0.9608479 1.180237
## .sigma        1.4139001 1.474740
## (Intercept)   5.8734877 6.169513
## B_Med_Marijuana -1.3756156 1.773272
```

```
# B_Med_NSAIDS
```

```
model_NSAIDSimprove <- lmer(GlobalImprovement ~ B_Med_NSAIDS + (1|ID), data = df_new)
summary(model_NSAIDSimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_NSAIDS + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16807.8
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4105 -0.4427 -0.0016  0.4340  4.9685
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.138 1.067
## Residual 2.085 1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  6.03765  0.07839 218.53613  77.018 <2e-16 ***
## B_Med_NSAIDS -0.17721  0.27499 217.56200  -0.644 0.52
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Md_NSAIDS -0.285
```

```
confint(model_NSAIDSimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %   97.5 %
## .sig01        0.9600212 1.179243
## .sigma        1.4138980 1.474737
## (Intercept)   5.8840426 6.191277
## B_Med_NSAIDS -0.7161135 0.361628
```

```
# B_Med_Anticonvulsant
```

```
model_Anticonimprove <- lmer(GlobalImprovement ~ B_Med_Anticonvulsant + (1|ID), data = df_new)
summary(model_Anticonimprove) # Significant!
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Anticonvulsant + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16805.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.3967 -0.4454 -0.0048  0.4421  4.9595
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.117  1.057
## Residual                2.085  1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.11123    0.08635 217.49113  70.775 <2e-16 ***
## B_Med_Anticonvulsant -0.34396    0.17071 219.00087  -2.015  0.0451 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Md_Antcnv -0.506
```

```
confint(model_Anticonimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9505424  1.168264279
## .sigma          1.4139343  1.474778015
## (Intercept)      5.9420200  6.280433914
## B_Med_Anticonvulsant -0.6784171 -0.009370955
```

```
# B_Med_MuscleRelaxer
model_MuscleRelimprove <- lmer(GlobalImprovement ~ B_Med_MuscleRelaxer + (1|ID), data = df_new)
summary(model_MuscleRelimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_MuscleRelaxer + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16807.5
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4115 -0.4391 -0.0029  0.4405  4.9801
```

```
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.132    1.064
##   Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##               Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06699   0.08328 218.74597  72.848   <2e-16 ***
## B_Med_MuscleRelaxer -0.22996   0.19094 216.50016  -1.204    0.23
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Md_MsclRl -0.436
```

```
confint(model_MuscleRelimprove)
```

```
## Computing profile confidence intervals ...
```

```
##               2.5 %    97.5 %
## .sig01          0.9571279 1.1759473
## .sigma          1.4139180 1.4747596
## (Intercept)      5.9037877 6.2301813
## B_Med_MuscleRelaxer -0.6040729 0.1442792
```

```
# B_Med_Antidepressants
```

```
model_Antidepimprove <- lmer(GlobalImprovement ~ B_Med_Antidepressants + (1|ID), data = df_new)
summary(model_Antidepimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Antidepressants + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16808.5
##
## Scaled residuals:
##   Min       1Q   Median       3Q      Max
## -4.4058 -0.4428 -0.0016  0.4339  4.9685
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.139    1.067
##   Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##               Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.03880   0.08141 217.81422  74.182   <2e-16 ***
```

```
## B_Med_Antidepressants -0.10539    0.21191 220.93126 -0.497    0.619
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr)
## B_Md_Antdpr -0.384
```

```
confint(model_Antidepimprove)
```

```
## Computing profile confidence intervals ...
```

```
##                2.5 %    97.5 %
## .sig01          0.9602830 1.1796099
## .sigma          1.4139059 1.4747460
## (Intercept)      5.8792776 6.1983259
## B_Med_Antidepressants -0.5205751 0.3099154
```

```
# B_Med-Benzodiazepine
```

```
model_Benzoimprove <- lmer(GlobalImprovement ~ B_Med-Benzodiazepine + (1|ID), data = df_new)
summary(model_Benzoimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med-Benzodiazepine + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16808.2
##
## Scaled residuals:
##    Min       1Q   Median       3Q      Max
## -4.4100 -0.4422 -0.0010  0.4348  4.9693
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.141    1.068
##   Residual                2.085    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.02259    0.07847 218.53625   76.75  <2e-16 ***
## B_Med-Benzodiazepine  0.00818    0.27512 217.28816    0.03   0.976
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr)
## B_Md_Bnzdzp -0.285
```

```
confint(model_Benzoimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %  
## .sig01          0.9610017 1.1804179  
## .sigma          1.4138998 1.4747392  
## (Intercept)      5.8688229 6.1763525  
## B_Med-Benzodiazepine -0.5308821 0.5473554
```

```
# B_Med_Stimulants
```

```
model_Stimuimprove <- lmer(GlobalImprovement ~ B_Med_Stimulants + (1|ID), data = df_new)  
summary(model_Stimuimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
```

```
## lmerModLmerTest]
```

```
## Formula: GlobalImprovement ~ B_Med_Stimulants + (1 | ID)
```

```
## Data: df_new
```

```
##
```

```
## REML criterion at convergence: 16804.8
```

```
##
```

```
## Scaled residuals:
```

```
##      Min       1Q   Median       3Q      Max  
## -4.4087 -0.4413 -0.0004  0.4352  4.9687
```

```
##
```

```
## Random effects:
```

```
## Groups   Name      Variance Std.Dev.  
## ID      (Intercept) 1.130    1.063  
## Residual                2.085    1.444
```

```
## Number of obs: 4552, groups: ID, 222
```

```
##
```

```
## Fixed effects:
```

```
##              Estimate Std. Error      df t value Pr(>|t|)  
## (Intercept)      6.00902    0.07556 218.44470  79.524   <2e-16 ***  
## B_Med_Stimulants  0.78498    0.56133 216.51366   1.398    0.163
```

```
## ---
```

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

```
##
```

```
## Correlation of Fixed Effects:
```

```
##              (Intr)
```

```
## B_Md_Stmlnt -0.135
```

```
confint(model_Stimuimprove)
```

```
##Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %  
## .sig01          0.9562009 1.174741  
## .sigma          1.4139019 1.474741  
## (Intercept)      5.8609556 6.157096  
## B_Med_Stimulants -0.3149942 1.884988
```



```
# B_Med_OtherMed
model_OtherMedimprove <- lmer(GlobalImprovement ~ B_Med_OtherMed + (1|ID), data = df_new)
summary(model_OtherMedimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OtherMed + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16738.4
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -4.4002 -0.4395 -0.0022 0.4316 4.9531
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 1.131 1.063
## Residual 2.094 1.447
## Number of obs: 4528, groups: ID, 221
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 6.05563 0.07744 218.03753 78.20 <2e-16 ***
## B_Med_OtherMed -0.53378 0.31773 213.76851 -1.68 0.0944 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr)
## B_Md_OthrMd -0.244
```

```
confint(model_OtherMedimprove)
```

```
## Computing profile confidence intervals ...
```

```
## 2.5 % 97.5 %
## .sig01 0.956518 1.17558861
## .sigma 1.417199 1.47834351
## (Intercept) 5.903905 6.20738424
## B_Med_OtherMed -1.156587 0.08870723
```

```
# B_Med_OTC
model_OTCimprove <- lmer(GlobalImprovement ~ B_Med_OTC + (1|ID), data = df_new)
summary(model_OTCimprove)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OTC + (1 | ID)
## Data: df_new
##
```

```
## REML criterion at convergence: 16808.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4053 -0.4394  0.0028  0.4369  4.9746
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.134    1.065
##   Residual                2.084    1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   5.9290     0.1113 219.0857  53.284   <2e-16 ***
## B_Med_OTC     0.1726     0.1506 218.5990   1.146    0.253
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Med_OTC -0.739
```

```
confint(model_OTCimprove)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %    97.5 %
## .sig01        0.9579311 1.1767401
## .sigma        1.4138921 1.4747306
## (Intercept)   5.7109624 6.1470576
## B_Med_OTC    -0.1224755 0.4678271
```

```
# B_Med_OpioidsYN
model_Opioid_improve <- lmer(GlobalImprovement ~ B_Med_OpioidsYN + (1|ID), data = df_new)
summary(model_Opioid_improve) # Significant!
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OpioidsYN + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16796.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.3877 -0.4486 -0.0084  0.4470  4.9455
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.074    1.036
##   Residual                2.084    1.444
```

```
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.20058    0.08827 217.86764  70.247 < 2e-16 ***
## B_Med_OpioidsYN -0.56716    0.15783 221.19294  -3.593 0.000402 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## B_Md_OpdsYN -0.559
```

```
confint(model_Opioid_improve)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9320611  1.1456483
## .sigma          1.4138145  1.4746427
## (Intercept)      6.0276537  6.3736066
## B_Med_OpioidsYN -0.8765529 -0.2579604
```

B_Med_Tramadol, B_Med_Anticonvulsant, and B_Med_OpioidsYN are associated with the Global Improvement!

```
# Test if any of the baseline (Lev2) psych variables are linked to perceived improvements; Univariate
# B_Psych_PCS"
model_PCsimprove <- lmer(GlobalImprovement ~ B_Psych_PCS + (1|ID), data = df_new)
summary(model_PCsimprove) # Significant!
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_PCS + (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 16794.9
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4284 -0.4347 -0.0002  0.4339  4.9977
##
## Random effects:
##  Groups   Name                Variance Std.Dev.
##  ID       (Intercept)  1.027      1.013
##  Residual                    2.084      1.444
## Number of obs: 4552, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.522346    0.128253 219.069009  50.855 < 2e-16 ***
## B_Psych_PCS   -0.025840    0.005504 220.087865  -4.695 4.69e-06 ***
```

```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Psych_PCS -0.829

confint(model_PCImprove)

## Computing profile confidence intervals ...

##      2.5 %      97.5 %
## .sig01      0.91090586  1.12099293
## .sigma      1.41387693  1.47471229
## (Intercept)  6.27105135  6.77370231
## B_Psych_PCS -0.03662589 -0.01505529

# B_Psych_HADS"
model_HADSimprove <- lmer(GlobalImprovement ~ B_Psych_HADS + (1|ID), data = df_new)
summary(model_HADSimprove) # Significant!

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_HADS + (1 | ID)
##      Data: df_new
##
## REML criterion at convergence: 16799
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.4170 -0.4304 -0.0055  0.4386  4.9812
##
## Random effects:
##      Groups      Name      Variance Std.Dev.
##      ID      (Intercept)  1.055     1.027
##      Residual              2.084     1.444
## Number of obs: 4552, groups:  ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   6.587636   0.156523 219.009063   42.09 < 2e-16 ***
## B_Psych_HADS  -0.035892   0.008818 219.764835   -4.07 6.55e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr)
## B_Psyc_HADS -0.886

confint(model_HADSimprove)

##Computing profile confidence intervals ...

```

```
##              2.5 %      97.5 %
## .sig01      0.92341224  1.13559144
## .sigma      1.41384078  1.47467228
## (Intercept) 6.28098471  6.89443548
## B_Psych_HADS -0.05317654 -0.01861603
```

Both are significant!

```
# Then if any of the Lev2 variables above are significantly associated with the outcome (i.e., perceive
#1; Sleep on daily improvement
model_ageimprove_Sleep <- lmer(GlobalImprovement ~ B_Demog_Age*Sleep_c + (1|ID), data = df_new)
summary(model_ageimprove_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Age * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16187.4
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1331 -0.4759 -0.0228  0.4517  5.4294
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.103  1.050
## Residual      1.803  1.343
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    5.181e+00  2.759e-01 2.193e+02  18.781 < 2e-16 ***
## B_Demog_Age    1.627e-02  5.145e-03 2.188e+02   3.162  0.00179 **
## Sleep_c       -4.198e-01  5.419e-02 4.325e+03  -7.746 1.18e-14 ***
## B_Demog_Age:Sleep_c 3.440e-04  1.023e-03 4.325e+03   0.336  0.73680
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Dm_A Slep_c
## B_Demog_Age -0.964
## Sleep_c      0.000  0.000
## B_Dmg_Ag:S_  0.000  0.000 -0.958
```

```
confint(model_ageimprove_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01      0.945923497  1.159557837
## .sigma      1.314621677  1.371201502
```

```
## (Intercept)          4.640598503  5.721786315
## B_Demog_Age          0.006184892  0.026349702
## Sleep_c              -0.525980573 -0.313545633
## B_Demog_Age:Sleep_c -0.001661801  0.002349729
```

```
model_Tramadolimprove_Sleep <- lmer(GlobalImprovement ~ B_Med_Tramadol*Sleep_c + (1|ID), data = df_new)
summary(model_Tramadolimprove_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Tramadol * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16165
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1114 -0.4701 -0.0121  0.4550  5.4251
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.130  1.063
## Residual          1.798  1.341
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06567    0.07709 218.55392  78.684 < 2e-16 ***
## B_Med_Tramadol    -0.64456    0.29529 215.11746  -2.183 0.030134 *
## Sleep_c           -0.38950    0.01592 4324.87947 -24.460 < 2e-16 ***
## B_Med_Tramadol:Sleep_c -0.22287    0.06640 4324.96426  -3.357 0.000796 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_T Slep_c
## B_Med_Trmdl -0.261
## Sleep_c      0.000 0.000
## B_Md_Trm:S_  0.000 0.001 -0.240
```

```
confint(model_Tramadolimprove_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01        0.9575689  1.17352757
## .sigma        1.3129660  1.36947721
## (Intercept)    5.9146124  6.21673070
## B_Med_Tramadol -1.2231719 -0.06585173
## Sleep_c        -0.4207078 -0.35828858
## B_Med_Tramadol:Sleep_c -0.3530075 -0.09273616
```

```
model_Anticonimprove_Sleep <- lmer(GlobalImprovement ~ B_Med_Anticonvulsant*Sleep_c + (1|ID), data = df)
summary(model_Anticonimprove_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Anticonvulsant * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16174.3
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.0844 -0.4687 -0.0097  0.4387  5.4176
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.134  1.065
## Residual 1.801  1.342
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.10918    0.08641  217.77561  70.696 <2e-16
## B_Med_Anticonvulsant -0.34134    0.17078  219.01754  -1.999  0.0469
## Sleep_c          -0.37844    0.01873 4324.76067 -20.205 <2e-16
## B_Med_Anticonvulsant:Sleep_c -0.07510    0.03322 4324.76972  -2.261  0.0238
##
## (Intercept)      ***
## B_Med_Anticonvulsant      *
## Sleep_c            ***
## B_Med_Anticonvulsant:Sleep_c *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_A Slep_c
## B_Md_Antcnv -0.506
## Sleep_c      0.000  0.000
## B_Md_Ant:S_  0.000  0.000 -0.564
```

```
confint(model_Anticonimprove_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01        0.9592065  1.175551959
## .sigma        1.3139023  1.370454558
## (Intercept)    5.9398279  6.278504013
## B_Med_Anticonvulsant -0.6759366 -0.006603092
## Sleep_c        -0.4151524 -0.341730584
## B_Med_Anticonvulsant:Sleep_c -0.1402192 -0.009988142
```

```
model_Opioid_improve_Sleep <- lmer(GlobalImprovement ~ B_Med_OpioidsYN*Sleep_c + (1|ID), data = df_new)
summary(model_Opioid_improve_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OpioidsYN * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16170.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1194 -0.4697 -0.0148  0.4437  5.4027
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.088  1.043
## Residual      1.803  1.343
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.20152   0.08825  218.05756  70.274 < 2e-16 ***
## B_Med_OpioidsYN    -0.57441   0.15775  221.15594  -3.641 0.000338 ***
## Sleep_c           -0.39334   0.01939 4326.06831 -20.284 < 2e-16 ***
## B_Med_OpioidsYN:Sleep_c -0.02471   0.03219 4326.07543  -0.768 0.442643
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_OYN Slep_c
## B_Md_OpdsYN  -0.559
## Sleep_c       0.000  0.000
## B_Md_OYN:S_   0.000  0.000 -0.602
```

```
confint(model_Opioid_improve_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.93971806  1.15176837
## .sigma          1.31448586  1.37105433
## (Intercept)      6.02863129  6.37450149
## B_Med_OpioidsYN  -0.88364830 -0.26537132
## Sleep_c         -0.43135118 -0.35533800
## B_Med_OpioidsYN:Sleep_c -0.08779466  0.03836847
```

```
model_PCSimprove_Sleep <- lmer(GlobalImprovement ~ B_Psych_PCS*Sleep_c + (1|ID), data = df_new)
summary(model_PCSimprove_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
```



```
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_PCS * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16166.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1743 -0.4862 -0.0200  0.4523  5.4706
##
## Random effects:
## Groups   Name                Variance Std.Dev.
## ID      (Intercept)  1.044      1.022
## Residual                    1.799      1.341
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.518e+00  1.284e-01  2.192e+02  50.766 < 2e-16 ***
## B_Psych_PCS    -2.569e-02  5.509e-03  2.200e+02  -4.664 5.37e-06 ***
## Sleep_c        -3.215e-01  3.059e-02  4.325e+03 -10.510 < 2e-16 ***
## B_Psych_PCS:Sleep_c -3.762e-03  1.230e-03  4.325e+03  -3.059 0.00223 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Ps_PCS Slep_c
## B_Psych_PCS  -0.829
## Sleep_c      0.000  0.000
## B_Ps_PCS:S_  0.000  0.000  -0.863
```

```
confint(model_PCImprove_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01        0.920206340  1.12898300
## .sigma        1.313215100  1.36973352
## (Intercept)    6.266736819  6.76995983
## B_Psych_PCS    -0.036489874 -0.01490053
## Sleep_c        -0.381504709 -0.26157917
## B_Psych_PCS:Sleep_c -0.006171837 -0.00135171
```

```
model_HADSimprove_Sleep <- lmer(GlobalImprovement ~ B_Psych_HADS*Sleep_c + (1|ID), data = df_new)
summary(model_HADSimprove_Sleep)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_HADS * Sleep_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16178
```

```
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.1222 -0.4692 -0.0206  0.4503  5.4398
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.071    1.035
##   Residual             1.803    1.343
## Number of obs: 4550, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.586e+00  1.566e-01  2.191e+02  42.064 < 2e-16 ***
## B_Psych_HADS      -3.589e-02  8.820e-03  2.197e+02  -4.069 6.58e-05 ***
## Sleep_c           -3.693e-01  4.135e-02  4.326e+03  -8.932 < 2e-16 ***
## B_Psych_HADS:Sleep_c -1.894e-03  2.202e-03  4.326e+03  -0.860 0.39
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Ps_HADS Slep_c
## B_Psyc_HADS  -0.886
## Sleep_c       0.000  0.000
## B_P_HADS:S_   0.000  0.000  -0.927
```

```
confint(model_HADSimprove_Sleep)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.931923408  1.142704043
## .sigma          1.314488005  1.371058713
## (Intercept)      6.279530764  6.893198883
## B_Psych_HADS     -0.053178744 -0.018611697
## Sleep_c          -0.450364740 -0.288281854
## B_Psych_HADS:Sleep_c -0.006210707  0.002421813
```

```
#2; Mood on daily improvement
```

```
model_ageimprove_Mood <- lmer(GlobalImprovement ~ B_Demog_Age*Mood_c + (1|ID), data = df_new)
summary(model_ageimprove_Mood)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Age * Mood_c + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16294.3
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7217 -0.4500 -0.0126  0.4615  4.7915
```

```
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.098    1.048
##   Residual              1.847    1.359
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    5.172e+00  2.756e-01  2.192e+02  18.769 < 2e-16 ***
## B_Demog_Age    1.647e-02  5.138e-03  2.186e+02   3.206  0.00155 **
## Mood_c        -4.067e-01  6.431e-02  4.326e+03  -6.324  2.8e-10 ***
## B_Demog_Age:Mood_c -2.072e-04  1.214e-03  4.326e+03  -0.171  0.86452
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Dm_A Mood_c
## B_Demog_Age -0.964
## Mood_c      0.000  0.000
## B_Dmg_Ag:M_ 0.000  0.000 -0.962
```

```
confint(model_ageimprove_Mood)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.943663607  1.157335497
## .sigma          1.330546403  1.387805307
## (Intercept)     4.631968816  5.711903096
## B_Demog_Age      0.006406012  0.026544796
## Mood_c          -0.532756642 -0.280669265
## B_Demog_Age:Mood_c -0.002587233  0.002172804
```

```
model_Tramadolimprove_Mood <- lmer(GlobalImprovement ~ B_Med_Tramadol*Mood_c + (1|ID), data = df_new)
summary(model_Tramadolimprove_Mood)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Tramadol * Mood_c + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 16283.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7141 -0.4528 -0.0046  0.4563  4.7811
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.126    1.061
##   Residual              1.847    1.359
```

```
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06729    0.07705   218.42440   78.740   <2e-16 ***
## B_Med_Tramadol    -0.64396    0.29516   214.97661   -2.182    0.0302 *
## Mood_c            -0.41483    0.01823  4325.81378  -22.760   <2e-16 ***
## B_Med_Tramadol:Mood_c -0.03778    0.07195  4325.75449   -0.525    0.5995
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_T Mood_c
## B_Med_Trmdl  -0.261
## Mood_c        0.000  0.000
## B_Md_Trm:M_   0.000  0.000 -0.253
```

```
confint(model_Tramadolimprove_Mood)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9558230  1.17198854
## .sigma          1.3305434  1.38780527
## (Intercept)      5.9163007  6.21828646
## B_Med_Tramadol   -1.2223158 -0.06551047
## Mood_c           -0.4505504 -0.37910556
## B_Med_Tramadol:Mood_c -0.1787977  0.10323339
```

```
model_Anticonimprove_Mood <- lmer(GlobalImprovement ~ B_Med_Anticonvulsant*Mood_c + (1|ID), data = df_n
summary(model_Anticonimprove_Mood)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Anticonvulsant * Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16286.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7286 -0.4484 -0.0072  0.4614  4.8622
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.130  1.063
## Residual          1.847  1.359
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.11122    0.08636   217.61364   70.765   <2e-16
```

```
## B_Med_Anticonvulsant      -0.34309    0.17070  218.95411  -2.010    0.0457
## Mood_c                    -0.40901    0.02168  4325.72020 -18.869    <2e-16
## B_Med_Anticonvulsant:Mood_c -0.02436    0.03726  4325.66105  -0.654    0.5133
##
## (Intercept)                ***
## B_Med_Anticonvulsant        *
## Mood_c                      ***
## B_Med_Anticonvulsant:Mood_c
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) B_Md_A Mood_c
## B_Md_Antcnv -0.506
## Mood_c      0.000  0.000
## B_Md_Ant:M_  0.000  0.000 -0.582
```

```
confint(model_Anticonimprove_Mood)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.95738127  1.173890210
## .sigma          1.33052777  1.387789700
## (Intercept)      5.94198085  6.280442475
## B_Med_Anticonvulsant -0.67752289 -0.008519729
## Mood_c           -0.45149560 -0.366525783
## B_Med_Anticonvulsant:Mood_c -0.09739163  0.048675311
```

```
model_Opioid_improve_Mood <- lmer(GlobalImprovement ~ B_Med_OpioidsYN*Mood_c + (1|ID), data = df_new)
summary(model_Opioid_improve_Mood)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OpioidsYN * Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16271.5
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.6760 -0.4558 -0.0115  0.4506  4.6678
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.087  1.042
## Residual 1.844  1.358
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.20099    0.08827  217.94399  70.248  <2e-16 ***
```

```
## B_Med_OpioidsYN      -0.56725    0.15777  220.92818  -3.595    0.0004 ***
## Mood_c               -0.38217    0.02227  4326.91482  -17.162   <2e-16 ***
## B_Med_OpioidsYN:Mood_c -0.09372    0.03641  4326.98995   -2.574    0.0101 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) B_Md_OYN Mood_c
## B_Md_OpdsYN -0.559
## Mood_c      0.000  0.000
## B_Md_OYN:M_ 0.000  0.000  -0.612
```

```
confint(model_Opioid_improve_Mood)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01         0.9388311  1.15119859
## .sigma         1.3294728  1.38668063
## (Intercept)    6.0280566  6.37402680
## B_Med_OpioidsYN -0.8765148 -0.25816639
## Mood_c         -0.4258189 -0.33852742
## B_Med_OpioidsYN:Mood_c -0.1650728 -0.02235868
```

```
model_PCSimprove_Mood <- lmer(GlobalImprovement ~ B_Psych_PCS*Mood_c + (1|ID), data = df_new)
summary(model_PCSimprove_Mood)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_PCS * Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16272
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8271 -0.4637 -0.0099  0.4580  5.1125
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.040    1.020
## Residual          1.842    1.357
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.523e+00  1.282e-01  2.190e+02  50.877 < 2e-16 ***
## B_Psych_PCS    -2.588e-02  5.502e-03  2.199e+02  -4.703 4.52e-06 ***
## Mood_c        -3.100e-01  3.703e-02  4.327e+03  -8.371 < 2e-16 ***
## B_Psych_PCS:Mood_c -4.493e-03  1.364e-03  4.326e+03  -3.294 0.000996 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```

##
## Correlation of Fixed Effects:
##          (Intr) B_Ps_PCS Mood_c
## B_Psych_PCS -0.829
## Mood_c      -0.001  0.000
## B_Ps_PCS:M_  0.000  0.000  -0.880

confint(model_PCImprove_Mood)

## Computing profile confidence intervals ...

##          2.5 %      97.5 %
## .sig01      0.917794239  1.126580054
## .sigma      1.328880633  1.386066905
## (Intercept)  6.271999122  6.774499344
## B_Psych_PCS  -0.036657477 -0.015096233
## Mood_c      -0.382548809 -0.237397038
## B_Psych_PCS:Mood_c -0.007166646 -0.001819727

model_HADSimprove_Mood <- lmer(GlobalImprovement ~ B_Psych_HADS*Mood_c + (1|ID), data = df_new)
summary(model_HADSimprove_Mood)

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_HADS * Mood_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 16280
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7999 -0.4513 -0.0129  0.4510  5.0392
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.067  1.033
## Residual      1.844  1.358
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   6.589e+00  1.565e-01 2.190e+02  42.103 < 2e-16 ***
## B_Psych_HADS  -3.595e-02  8.815e-03 2.196e+02  -4.078 6.36e-05 ***
## Mood_c        -3.024e-01  5.137e-02 4.327e+03  -5.886 4.25e-09 ***
## B_Psych_HADS:Mood_c -6.136e-03  2.577e-03 4.327e+03  -2.381 0.0173 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr) B_Ps_HADS Mood_c
## B_Psyc_HADS -0.886
## Mood_c      0.000  0.000
## B_P_HADS:M_  0.000  0.000  -0.939

```

```
confint(model_HADSimprove_Mood)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.93017448  1.141091407
## .sigma          1.32964284  1.386859731
## (Intercept)      6.28212872  6.895449716
## B_Psych_HADS     -0.05322552 -0.018675790
## Mood_c          -0.40303347 -0.201686240
## B_Psych_HADS:Mood_c -0.01118578 -0.001085654
```

```
#3; Pain on daily improvement
```

```
model_ageimprove_AvePain <- lmer(GlobalImprovement ~ B_Demog_Age*AvePain_c + (1|ID), data = df_new)
summary(model_ageimprove_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Age * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15759.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8905 -0.5040 -0.0440  0.4439  5.8815
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.108 1.053
## Residual 1.632 1.278
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  5.174e+00  2.753e-01 2.192e+02  18.792 < 2e-16 ***
## B_Demog_Age  1.642e-02  5.135e-03 2.186e+02   3.197  0.00159 **
## AvePain_c    -6.940e-01  6.275e-02 4.326e+03 -11.060 < 2e-16 ***
## B_Demog_Age:AvePain_c  2.371e-03  1.151e-03 4.326e+03   2.060  0.03949 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Dm_A AvPn_c
## B_Demog_Age -0.964
## AvePain_c    0.000  0.000
## B_Dmg_A:AP_  0.000  0.000 -0.965
```

```
confint(model_ageimprove_AvePain)
```

```
##Computing profile confidence intervals ...
```



```
##              2.5 %      97.5 %
## .sig01      0.9490867333  1.161520739
## .sigma      1.2508893304  1.304720779
## (Intercept)  4.6346204678  5.713719104
## B_Demog_Age  0.0063558406  0.026480689
## AvePain_c    -0.8169998347 -0.571025382
## B_Demog_Age:AvePain_c  0.0001147977  0.004627032
```

```
model_Tramadolimprove_AvePain <- lmer(GlobalImprovement ~ B_Med_Tramadol*AvePain_c + (1|ID), data = df_
summary(model_Tramadolimprove_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Tramadol * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15737
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8971 -0.5018 -0.0275  0.4329  5.8643
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.136  1.066
## Residual 1.628  1.276
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06642    0.07699 218.49385  78.795 < 2e-16 ***
## B_Med_Tramadol    -0.64401    0.29505 215.39166  -2.183  0.0301 *
## AvePain_c         -0.55225    0.01699 4325.73918 -32.498 < 2e-16 ***
## B_Med_Tramadol:AvePain_c -0.27045    0.06767 4325.74630  -3.997 6.53e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_T AvPn_c
## B_Med_Trmdl -0.261
## AvePain_c    0.000  0.000
## B_Md_Tr:AP_  0.000  0.000 -0.251
```

```
confint(model_Tramadolimprove_AvePain)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01      0.9611832  1.17605308
## .sigma      1.2492308  1.30299346
## (Intercept)  5.9155537  6.21728639
## B_Med_Tramadol -1.2221549 -0.06577881
## AvePain_c     -0.5855591 -0.51894642
## B_Med_Tramadol:AvePain_c -0.4030813 -0.13782360
```

```
model_Anticonimprove_AvePain <- lmer(GlobalImprovement ~ B_Med_Anticonvulsant*AvePain_c + (1|ID), data =
summary(model_Anticonimprove_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Anticonvulsant * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15739.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8960 -0.5023 -0.0353  0.4344  5.8550
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.140 1.068
## Residual 1.628 1.276
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##
## Estimate Std. Error df t value
## (Intercept) 6.11003 0.08631 217.77168 70.794
## B_Med_Anticonvulsant -0.34145 0.17056 218.96174 -2.002
## AvePain_c -0.52895 0.01915 4325.63728 -27.620
## B_Med_Anticonvulsant:AvePain_c -0.15376 0.03738 4325.62738 -4.113
## Pr(>|t|)
## (Intercept) < 2e-16 ***
## B_Med_Anticonvulsant 0.0465 *
## AvePain_c < 2e-16 ***
## B_Med_Anticonvulsant:AvePain_c 3.98e-05 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) B_Md_A AvPn_c
## B_Md_Antcnv -0.506
## AvePain_c 0.000 0.000
## B_Md_An:AP_ 0.000 0.000 -0.512
```

```
confint(model_Anticonimprove_AvePain)
```

```
## Computing profile confidence intervals ...
```

```
##      2.5 %      97.5 %
## .sig01 0.9628815 1.178114922
## .sigma 1.2490982 1.302855773
## (Intercept) 5.9408933 6.279148261
## B_Med_Anticonvulsant -0.6756240 -0.007150329
## AvePain_c -0.5664871 -0.491416811
## B_Med_Anticonvulsant:AvePain_c -0.2270288 -0.080490479
```

```
model_Opioid_improve_AvePain <- lmer(GlobalImprovement ~ B_Med_OpioidsYN*AvePain_c + (1|ID), data = df_new)
summary(model_Opioid_improve_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OpioidsYN * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15743.2
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.8716 -0.5050 -0.0415  0.4269  5.8392
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.095  1.046
## Residual 1.632  1.278
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.20095    0.08818  218.07776  70.321 < 2e-16 ***
## B_Med_OpioidsYN    -0.56945    0.15755  220.76390  -3.614 0.000373 ***
## AvePain_c         -0.54684    0.01974 4326.79467 -27.699 < 2e-16 ***
## B_Med_OpioidsYN:AvePain_c -0.07391    0.03580 4326.79278  -2.064 0.039067 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_OYN AvPn_c
## B_Md_OpdsYN -0.560
## AvePain_c    0.000 0.000
## B_M_OYN:AP_  0.000 0.000 -0.551
```

```
confint(model_Opioid_improve_AvePain)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9436430  1.154702267
## .sigma          1.2508379  1.304662818
## (Intercept)      6.0281920  6.373798297
## B_Med_OpioidsYN  -0.8782698 -0.260808445
## AvePain_c        -0.5855354 -0.508147471
## B_Med_OpioidsYN:AvePain_c -0.1440806 -0.003729326
```

```
model_PCSimprove_AvePain <- lmer(GlobalImprovement ~ B_Psych_PCS*AvePain_c + (1|ID), data = df_new)
summary(model_PCSimprove_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
```

```
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_PCS * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15713.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.9054 -0.4972 -0.0454  0.4501  5.9961
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID (Intercept) 1.050 1.025
## Residual 1.619 1.273
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 6.522e+00 1.281e-01 2.190e+02 50.912 < 2e-16 ***
## B_Psych_PCS -2.585e-02 5.496e-03 2.198e+02 -4.703 4.52e-06 ***
## AvePain_c -4.187e-01 2.920e-02 4.326e+03 -14.340 < 2e-16 ***
## B_Psych_PCS:AvePain_c -7.938e-03 1.273e-03 4.326e+03 -6.237 4.89e-10 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) B_Ps_PCS AvPn_c
## B_Psych_PCS -0.829
## AvePain_c 0.000 0.000
## B_P_PCS:AP_ 0.000 0.000 -0.827
```

```
confint(model_PCsimprove_AvePain)
```

```
## Computing profile confidence intervals ...
```

```
##      2.5 %      97.5 %
## .sig01 0.92351662 1.130987214
## .sigma 1.24591270 1.299529381
## (Intercept) 6.27108211 6.773152071
## B_Psych_PCS -0.03662196 -0.015081687
## AvePain_c -0.47590033 -0.361456763
## B_Psych_PCS:AvePain_c -0.01043256 -0.005443471
```

```
model_HADSimprove_AvePain <- lmer(GlobalImprovement ~ B_Psych_HADS*AvePain_c + (1|ID), data = df_new)
summary(model_HADSimprove_AvePain)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_HADS * AvePain_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15723
```

```
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.9037 -0.5082 -0.0344  0.4550  5.9472
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.077    1.038
##   Residual              1.622    1.273
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.588e+00  1.563e-01  2.190e+02  42.138 < 2e-16 ***
## B_Psych_HADS      -3.595e-02  8.807e-03  2.196e+02  -4.083 6.24e-05 ***
## AvePain_c         -3.852e-01  3.618e-02  4.327e+03 -10.646 < 2e-16 ***
## B_Psych_HADS:AvePain_c -1.190e-02  2.083e-03  4.327e+03  -5.712 1.19e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Ps_HADS AvPn_c
## B_Psyc_HADS  -0.886
## AvePain_c     0.000  0.000
## B_P_HADS:AP   0.000  0.000  -0.891
```

```
confint(model_HADSimprove_AvePain)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.93567701  1.145272017
## .sigma          1.24677821  1.300430071
## (Intercept)      6.28180251  6.894556939
## B_Psych_HADS     -0.05321476 -0.018699926
## AvePain_c        -0.45605928 -0.314244053
## B_Psych_HADS:AvePain_c -0.01598284 -0.007816636
```

```
#4; ActivInterf on daily improvement
```

```
model_ageimprove_ActivityInt <- lmer(GlobalImprovement ~ B_Demog_Age*ActivityInt_c + (1|ID), data = df_new)
summary(model_ageimprove_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Demog_Age * ActivityInt_c + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 15903
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.6711 -0.4780 -0.0198  0.4337  6.0118
```

```
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.106    1.052
##   Residual              1.687    1.299
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##               Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      5.173e+00  2.755e-01  2.192e+02  18.779 < 2e-16 ***
## B_Demog_Age      1.644e-02  5.138e-03  2.187e+02   3.200  0.00158 **
## ActivityInt_c    -3.944e-01  5.905e-02  4.326e+03  -6.678  2.73e-11 ***
## B_Demog_Age:ActivityInt_c -2.034e-03  1.122e-03  4.326e+03  -1.813  0.06984 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##           (Intr) B_Dm_A ActvI_
## B_Demog_Age -0.964
## ActvtyInt_c  0.000  0.000
## B_Dmg_A:AI_  0.000  0.000 -0.964
```

```
confint(model_ageimprove_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##               2.5 %      97.5 %
## .sig01          0.948047995  1.1608486359
## .sigma          1.271709764  1.3264369217
## (Intercept)     4.633440753  5.7131086548
## B_Demog_Age      0.006375613  0.0265107139
## ActivityInt_c    -0.510094665 -0.2786086166
## B_Demog_Age:ActivityInt_c -0.004233233  0.0001643541
```

```
model_Tramadolimprove_ActivityInt <- lmer(GlobalImprovement ~ B_Med_Tramadol*ActivityInt_c + (1|ID), data = df_new)
summary(model_Tramadolimprove_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Tramadol * ActivityInt_c + (1 | ID)
##   Data: df_new
##
## REML criterion at convergence: 15893.8
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7344 -0.4855 -0.0067  0.4378  5.9825
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   ID       (Intercept) 1.134    1.065
##   Residual              1.688    1.299
```

```
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.06713    0.07703   218.47778   78.768   <2e-16
## B_Med_Tramadol    -0.64780    0.29517   215.34603   -2.195    0.0293
## ActivityInt_c     -0.49240    0.01614  4325.77405  -30.505   <2e-16
## B_Med_Tramadol:ActivityInt_c -0.07928    0.06280  4325.73965   -1.262    0.2069
##
## (Intercept)          ***
## B_Med_Tramadol        *
## ActivityInt_c          ***
## B_Med_Tramadol:ActivityInt_c
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_T ActvI_
## B_Med_Trmdl -0.261
## ActvtyInt_c  0.000  0.000
## B_Md_Tr:AI_  0.000  0.000 -0.257
```

```
confint(model_Tramadolimprove_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9599652  1.17523084
## .sigma          1.2719887  1.32673069
## (Intercept)      5.9161922  6.21806262
## B_Med_Tramadol   -1.2261723 -0.06933107
## ActivityInt_c    -0.5240361 -0.46076205
## B_Med_Tramadol:ActivityInt_c -0.2023731  0.04381226
```

```
model_Anticonimprove_ActivityInt <- lmer(GlobalImprovement ~ B_Med_Anticonvulsant*ActivityInt_c + (1|ID),
summary(model_Anticonimprove_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_Anticonvulsant * ActivityInt_c + (1 |
## ID)
## Data: df_new
##
## REML criterion at convergence: 15894.6
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7260 -0.4865 -0.0084  0.4386  6.2404
##
## Random effects:
## Groups   Name      Variance Std.Dev.
## ID       (Intercept) 1.138    1.067
```

```
## Residual          1.687    1.299
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##
##              Estimate Std. Error      df t value
## (Intercept)      6.11093    0.08634  217.73555  70.774
## B_Med_Anticonvulsant -0.34339    0.17065  218.98406  -2.012
## ActivityInt_c      -0.47738    0.01864 4325.68183 -25.606
## B_Med_Anticonvulsant:ActivityInt_c -0.06747    0.03402 4325.64755  -1.983
##
##              Pr(>|t|)
## (Intercept)      <2e-16 ***
## B_Med_Anticonvulsant 0.0454 *
## ActivityInt_c      <2e-16 ***
## B_Med_Anticonvulsant:ActivityInt_c 0.0474 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) B_Md_A ActvI_
## B_Md_Antcnv -0.506
## ActvtyInt_c 0.000 0.000
## B_Md_An:AI_ 0.000 0.000 -0.548
```

```
confint(model_Anticonimprove_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.9616863  1.1773120867
## .sigma          1.2716506  1.3263786728
## (Intercept)      5.9417244  6.2801254975
## B_Med_Anticonvulsant -0.6777355 -0.0089272928
## ActivityInt_c      -0.5139189 -0.4408390246
## B_Med_Anticonvulsant:ActivityInt_c -0.1341513 -0.0007813839
```

```
model_Opioid_improve_ActivityInt <- lmer(GlobalImprovement ~ B_Med_OpioidsYN*ActivityInt_c + (1|ID), data = data,
summary(model_Opioid_improve_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Med_OpioidsYN * ActivityInt_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15890
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7460 -0.4847 -0.0129  0.4444  6.0193
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.093    1.046
```



```
## Residual          1.688    1.299
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)      6.20136    0.08823  218.04218  70.288 < 2e-16
## B_Med_OpioidsYN   -0.56953    0.15765  220.82250  -3.613 0.000375
## ActivityInt_c     -0.50180    0.02029 4326.85734 -24.736 < 2e-16
## B_Med_OpioidsYN:ActivityInt_c  0.01021    0.03174 4326.84691   0.322 0.747742
##
## (Intercept)      ***
## B_Med_OpioidsYN   ***
## ActivityInt_c     ***
## B_Med_OpioidsYN:ActivityInt_c
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) B_Md_OYN ActvI_
## B_Md_OpdsYN  -0.560
## ActvtyInt_c   0.000   0.000
## B_M_OYN:AI_   0.000   0.000  -0.639
```

```
confint(model_Opioid_improve_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.94265061  1.15410450
## .sigma          1.27212643  1.32686715
## (Intercept)      6.02850649  6.37429936
## B_Med_OpioidsYN  -0.87855207 -0.26068517
## ActivityInt_c    -0.54155866 -0.46203936
## B_Med_OpioidsYN:ActivityInt_c -0.05199487  0.07241343
```

```
model_PCSimprove_ActivityInt <- lmer(GlobalImprovement ~ B_Psych_PCS*ActivityInt_c + (1|ID), data = df_new)
summary(model_PCSimprove_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_PCS * ActivityInt_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15886.9
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7461 -0.4870 -0.0197  0.4494  6.4615
##
## Random effects:
## Groups   Name                Variance Std.Dev.
## ID       (Intercept)  1.048      1.024
```

```
## Residual          1.685    1.298
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    6.522e+00  1.282e-01  2.191e+02  50.880 < 2e-16 ***
## B_Psych_PCS    -2.584e-02  5.500e-03  2.199e+02  -4.699 4.61e-06 ***
## ActivityInt_c  -4.273e-01  2.939e-02  4.326e+03 -14.538 < 2e-16 ***
## B_Psych_PCS:ActivityInt_c -3.417e-03  1.210e-03  4.326e+03  -2.824 0.00476 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) B_Ps_PCS ActvI_
## B_Psych_PCS -0.829
## ActvtyInt_c 0.000 0.000
## B_P_PCS:AI_ 0.000 0.000 -0.848
```

```
confint(model_PCSimprove_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##              2.5 %      97.5 %
## .sig01          0.92224019  1.130158977
## .sigma          1.27101720  1.325713788
## (Intercept)      6.27113160  6.773536674
## B_Psych_PCS      -0.03662293 -0.015067629
## ActivityInt_c     -0.48487778 -0.369671785
## B_Psych_PCS:ActivityInt_c -0.00578772 -0.001045784
```

```
model_HADSimprove_ActivityInt <- lmer(GlobalImprovement ~ B_Psych_HADS*ActivityInt_c + (1|ID), data = d,
summary(model_HADSimprove_ActivityInt)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: GlobalImprovement ~ B_Psych_HADS * ActivityInt_c + (1 | ID)
## Data: df_new
##
## REML criterion at convergence: 15885.4
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -4.7344 -0.4928 -0.0168  0.4479  6.0692
##
## Random effects:
## Groups Name Variance Std.Dev.
## ID      (Intercept) 1.075 1.037
## Residual 1.683 1.297
## Number of obs: 4551, groups: ID, 222
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
```

```
## (Intercept)          6.588e+00  1.564e-01  2.190e+02  42.114 < 2e-16
## B_Psych_HADS         -3.595e-02  8.812e-03  2.196e+02  -4.079 6.32e-05
## ActivityInt_c        -3.792e-01  3.685e-02  4.327e+03 -10.289 < 2e-16
## B_Psych_HADS:ActivityInt_c -7.187e-03  2.027e-03  4.327e+03  -3.546 0.000395
##
## (Intercept)          ***
## B_Psych_HADS          ***
## ActivityInt_c          ***
## B_Psych_HADS:ActivityInt_c ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr) B_Ps_HADS ActvI_
## B_Psyc_HADS -0.886
## ActvtyInt_c  0.000  0.000
## B_P_HADS:AI  0.000  0.000  -0.906
```

```
confint(model_HADSimprove_ActivityInt)
```

```
## Computing profile confidence intervals ...
```

```
##          2.5 %      97.5 %
## .sig01      0.93453848  1.14456008
## .sigma      1.27031289  1.32497715
## (Intercept)  6.28191744  6.89505793
## B_Psych_HADS -0.05322112 -0.01868377
## ActivityInt_c -0.45142259 -0.30695691
## B_Psych_HADS:ActivityInt_c -0.01115902 -0.00321500
```