

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 multilev 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 multilev 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
# No lag needed here - LastDay_Sleep_c is equivalent to Sleep_c
model_SleepPain <- lmer(Today_PainAve ~ LastDay_Sleep_c + (1|ID), data = df_new)
icc(model_SleepPain)
```

```
## # Intraclass Correlation Coefficient
##
##      Adjusted ICC: 0.774
##      Unadjusted ICC: 0.729
```

```
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
# Today_Sleep is computed using Next Day's Sleep reportings,
# LastDay_PainAve_c is computed using Last Day's PainAve_c reportings
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
```

```
## Both are within cluster/within individual centered
```

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 multilev 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), data = df_new)
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 multlev 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

confinf(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

confinf(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_PCsimprove)
```

```
##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_PCSimprove_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_PCSimprove_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_
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 = da,
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 = da
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_
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
```

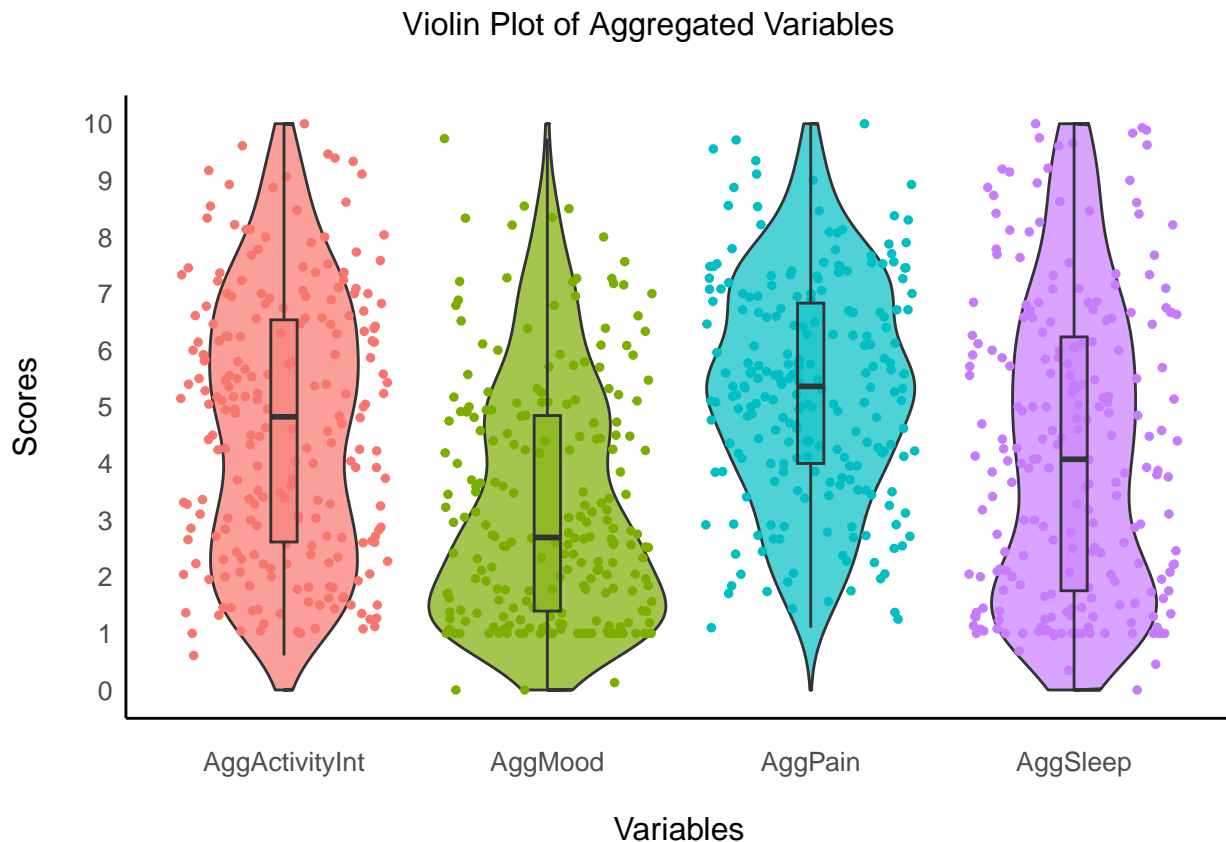
```
confint(model_HADSimprove_ActivityInt)
```

```
## 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
```

Graphs

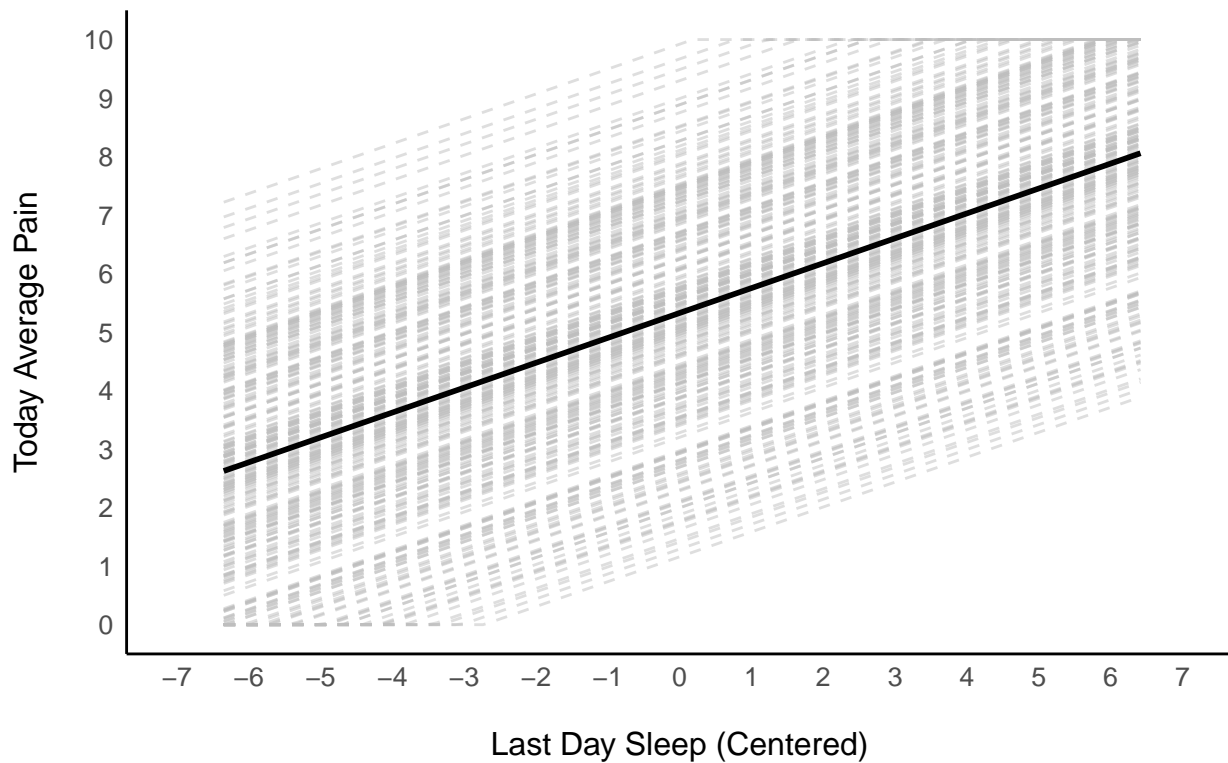
```
# Graphs; Objective 1
# Obj1: Graph; Descriptive; Violon plots for 30-day aggregates; Sleep; Mood; Pain; ActivityInt;
# All on the same 0-10 scale; follow the order listed here.
```



```
# Obj1: Graph; Multilevel linear reg slopes; Lagged effects; (1) Sleep/IV & Pain
```

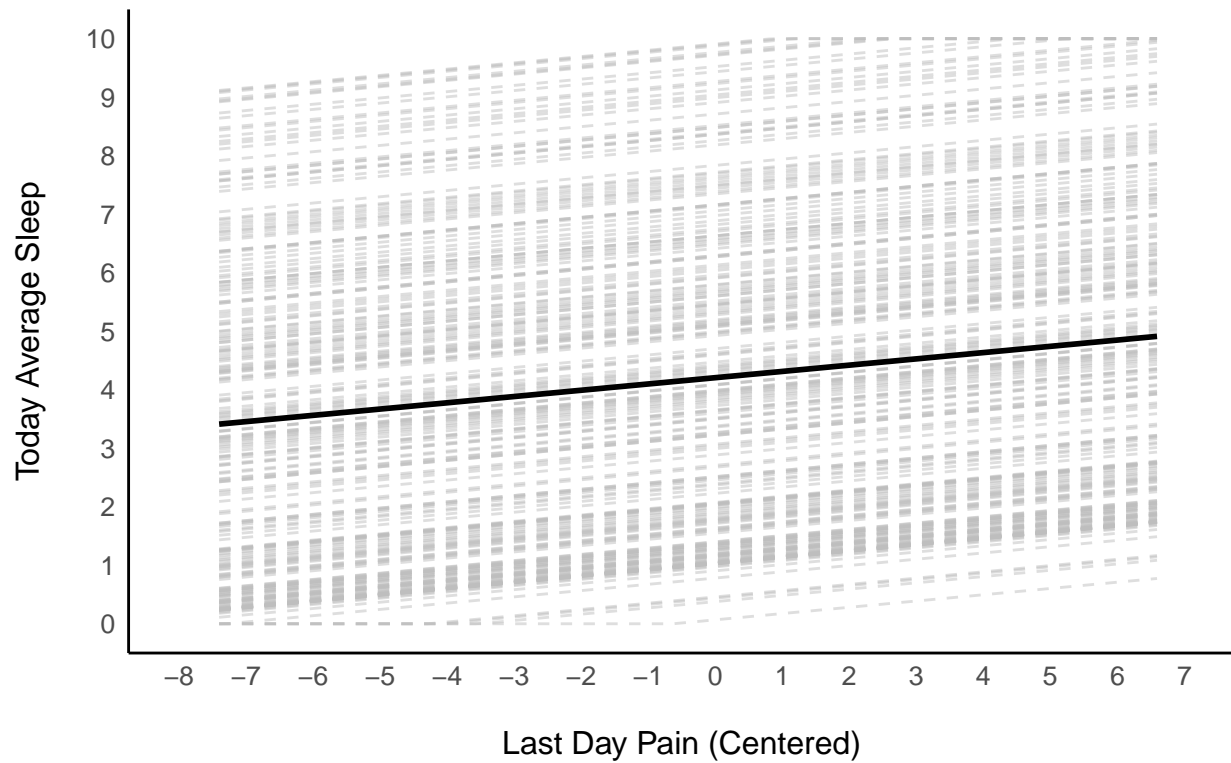
```
## Warning: Using 'size' aesthetic for lines was deprecated in ggplot2 3.4.0.  
## i Please use 'linewidth' instead.  
## This warning is displayed once every 8 hours.  
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was  
## generated.
```

Random Intercept Plot: Sleep vs. Pain



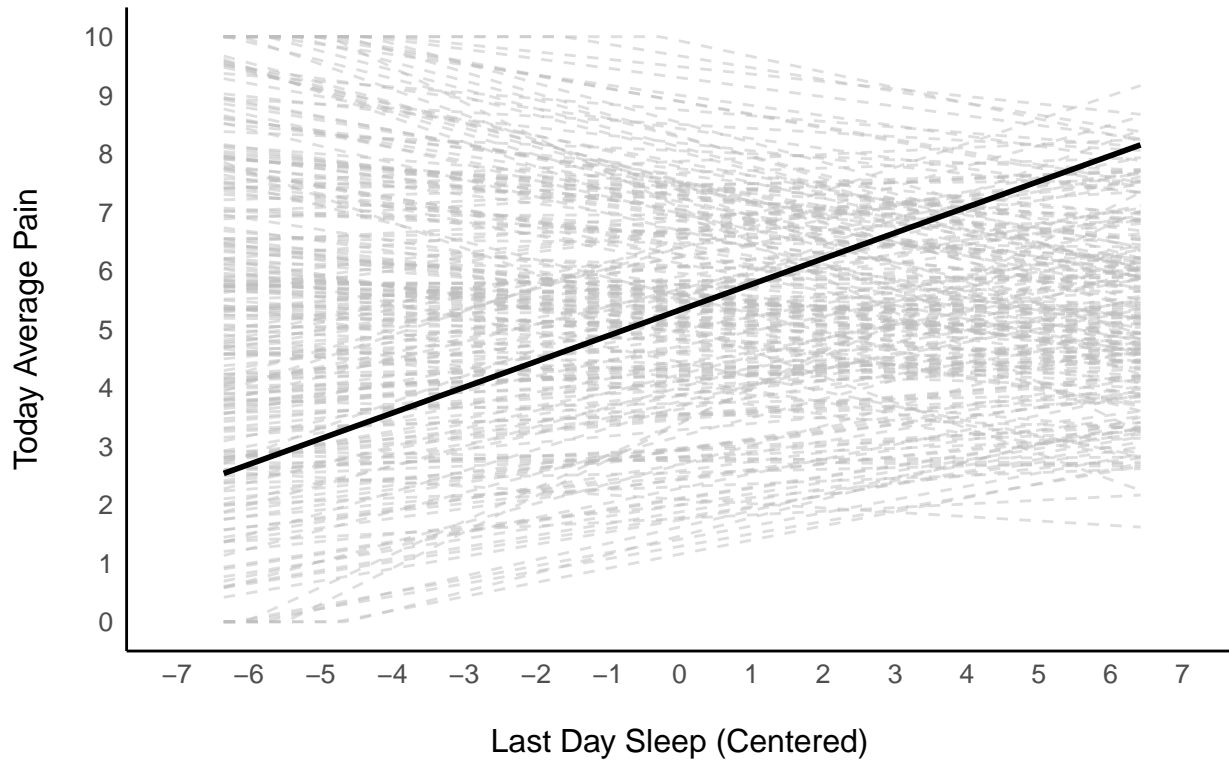
```
# Obj1: Graph; Multilevel linear reg slopes; Lagged effects; (2) Pain/IV & Sleep model_PainSleep
```

Random Intercept Plot: Pain vs. Sleep



Obj1: Not a graph; but test/analysis of random slopes effects (for both graphs above)
to make sure that we have random slope effects that would justify the use of a figure showing not only

Random Slope Plot: Sleep vs. Pain



Random Slope Plot: Pain vs. Sleep

