

# Ovsanna

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2023-05-05

## Introduction

Our client, Ovsanna Leyfer, who is from Psychological and Brain Sciences Department, want to develop an intensive (delivered over a course of one week) intervention to deliver CBT for youth aged 11-17 with ANY anxiety disorder to reduce the disability and impairment associated with anxiety disorders. Therefore, She created a multiple baseline study looking at treatment outcomes where eight participants were randomized to 2, 3, or 4 week baseline before starting a one-week treatment, and were asked to answer self-assessment questions every day during the pre-treatment and post-treatment. Our team's goal is to examine the potential indicators of treatment efficacy, as well as to give some statistical insights.

## Previous steps

Before making the EDAs, I first changed the variable's names of the .xlsx file to make it easier to import, so the new .xlsx file is different from the original one.

## EDAs

According to the data, there are 2 “two-week” patients, 4 “three-week” patients and 2 “four-week” patients. I make plots for each patient's each question and the black line separates the pre-treatment and treatment time.

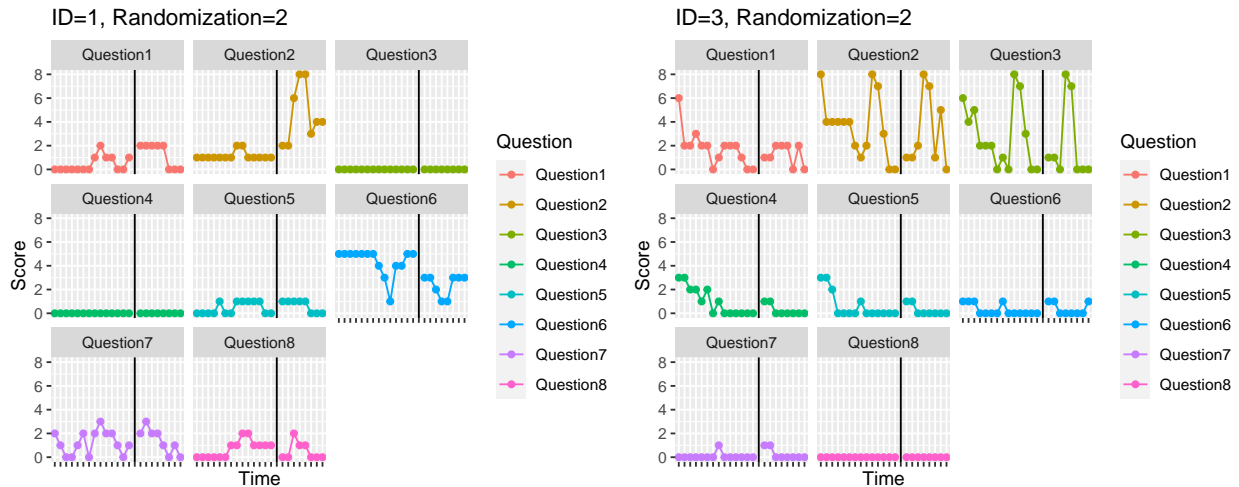


Figure 1: 2-week pre-treatment patients

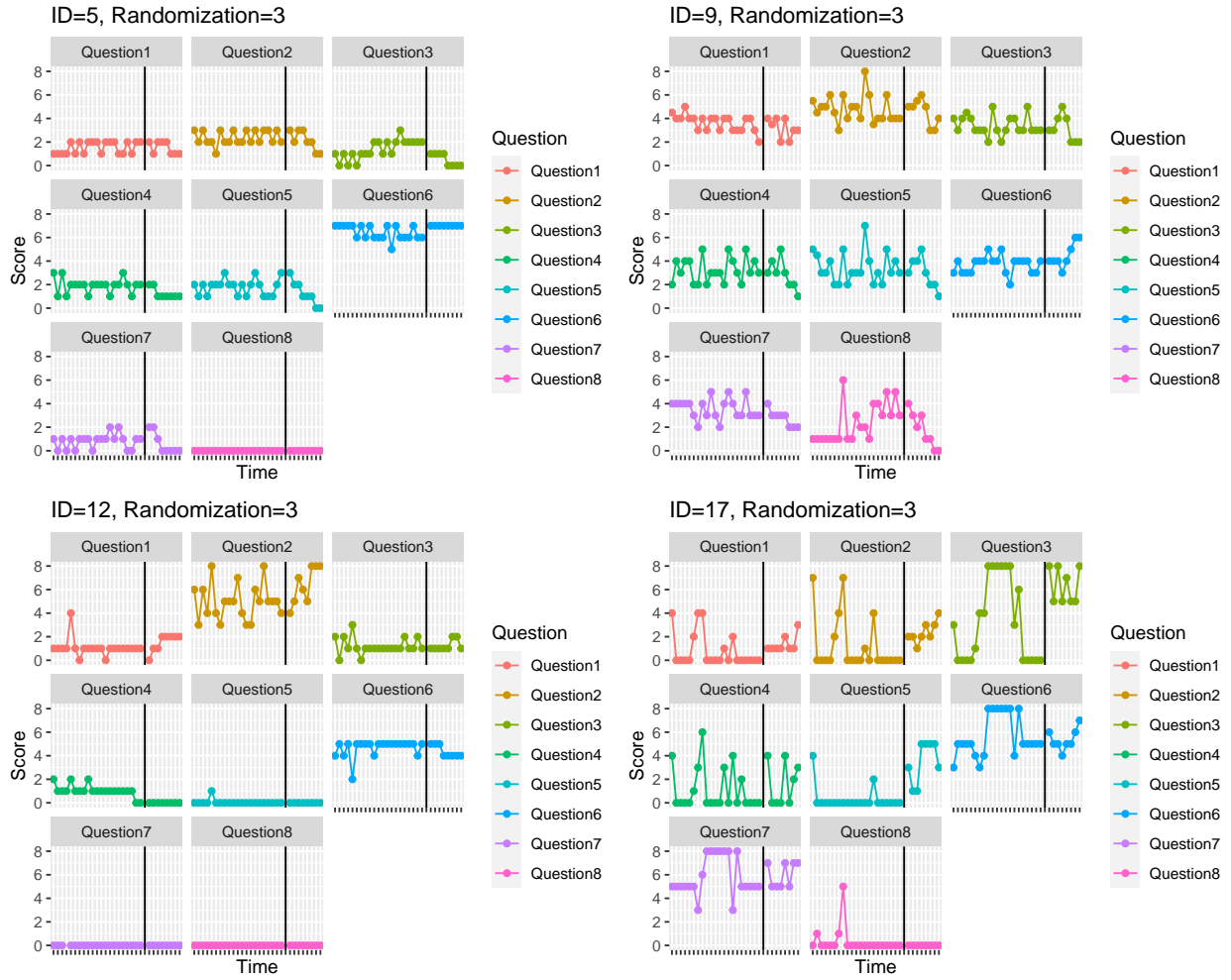


Figure 2: 3-week pre-treatment patients

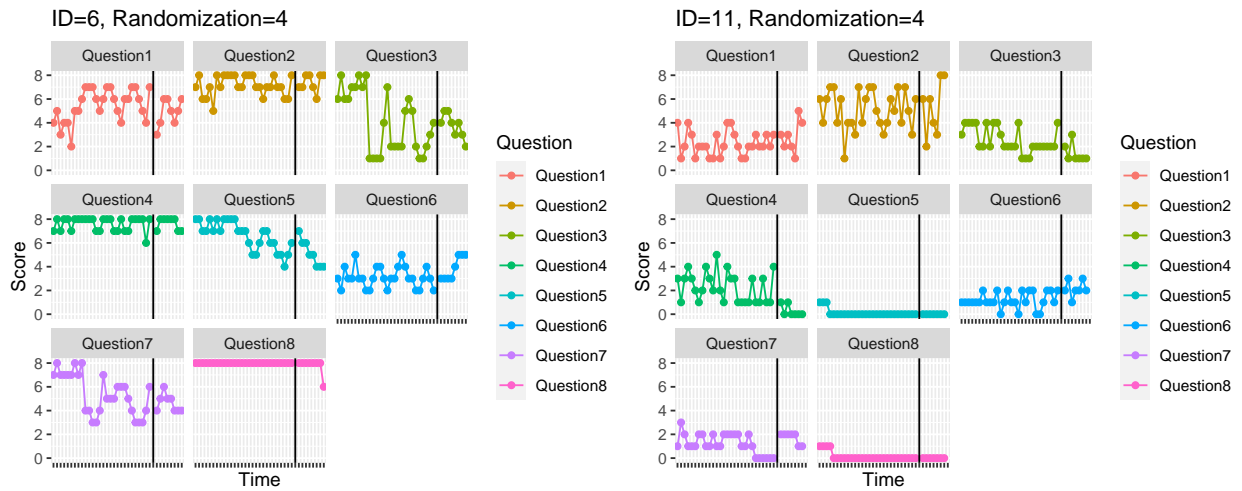


Figure 3: 4-week pre-treatment patients

## Comment on these EDAs

After analyzing the plots, several noteworthy observations can be made:

1. The score of Q6, which is "Confident in My Ability to Handle Situations" differs from the other questions. While the scores of other questions increase, the score of Q6 decreases.
2. The treatment appears to be ineffective for many questions. For instance, Q8, which is "Physical Feelings in My Body Scare Me" shows no change in trend for six patients. Moreover, the treatment may even worsen the condition, as seen in the first patient's score of Q2, which is "Max Anxiety Today" increased after treatment.
3. Due to the limited dataset consisting of only eight patients with a scoring scale ranging from 0-8, it is challenging to create effective models and it may not be possible to develop highly accurate models. Nevertheless, efforts can be made to create models despite these limitations.

## Methods

By the previous EDA part, we can see the data has some traits.

First, as there are repeated measurements taken for the same individual, there is likely correlation between these measurements. One way to account for this is using a mixed effects model."

Second, there are measurements collected over time. Auto-regressive models may be appropriate to account for correlation over time.

Third, the question score  $y$  is actually ordinal in nature, ranging from 0 to 8. Thus, we can use ordinal regression to account for this.

We expect that, after fitting these models, there are patterns of increasing scores in Question "Max Anxiety Today", "Confident in My Ability to Handle Situations", "Push Away Thoughts and Feelings I Do Not Like", and decreasing scores in Question "Average Anxiety Today", "Scares Me when I am Nervous", "Jump to Negative Conclusions", "Avg Avoidance of Thoughts, Situations, Sensations". For Question "Physical Feelings in My Body Scare Me", the daily scores are all stable among all patients so we consider not to analyze this question.

## Result

We fitted separated model for each problems because different problems may have different effect. Although the data is actually ordinal but 9 points is enough to do linear model, and it is more easier to diagnose linear model. The result of most model is same with what we found in EDA, the score of patient is same after making treatment. For instance, in most problem, only the intercept is significant.

Table 1: Linear Mixed Model for Average Anxiety Today

Row	Estimate	Std. Error	df	t value	Pr(> t )
(Intercept)	2.136820	0.575868	7.9303	-28.200	0.006 **
T	0.197230	0.747232	222.2000	0.264	0.79206
t	-0.001098	0.012335	221.0800	-0.089	0.92916
T:t	-0.003483	0.029450	221.4100	-0.118	0.90596

After fitting model, we did the auto-correlation analysis. From acf plot, there could be temporal effect. Therefore we try to use time series model (AR model). After fitting with AR model, the acf plot almost did not change for each problem. Temporal effect may be too small.

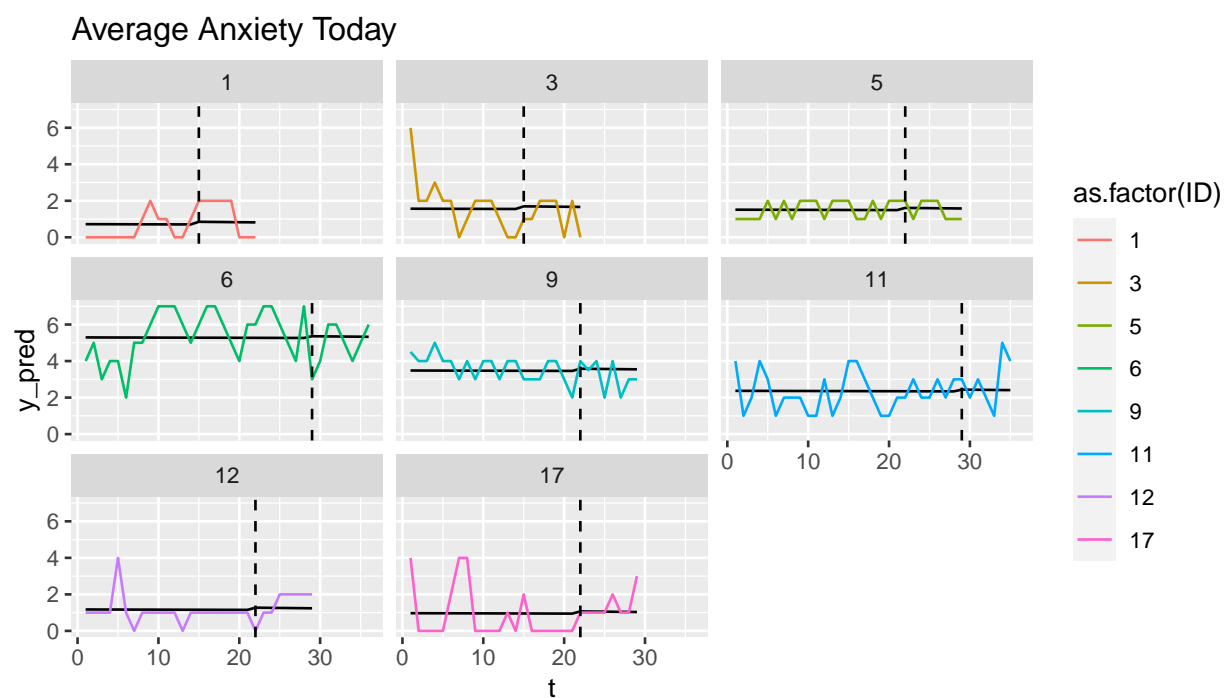


Figure 4: Linear Mixed Model for Average Anxiety Today

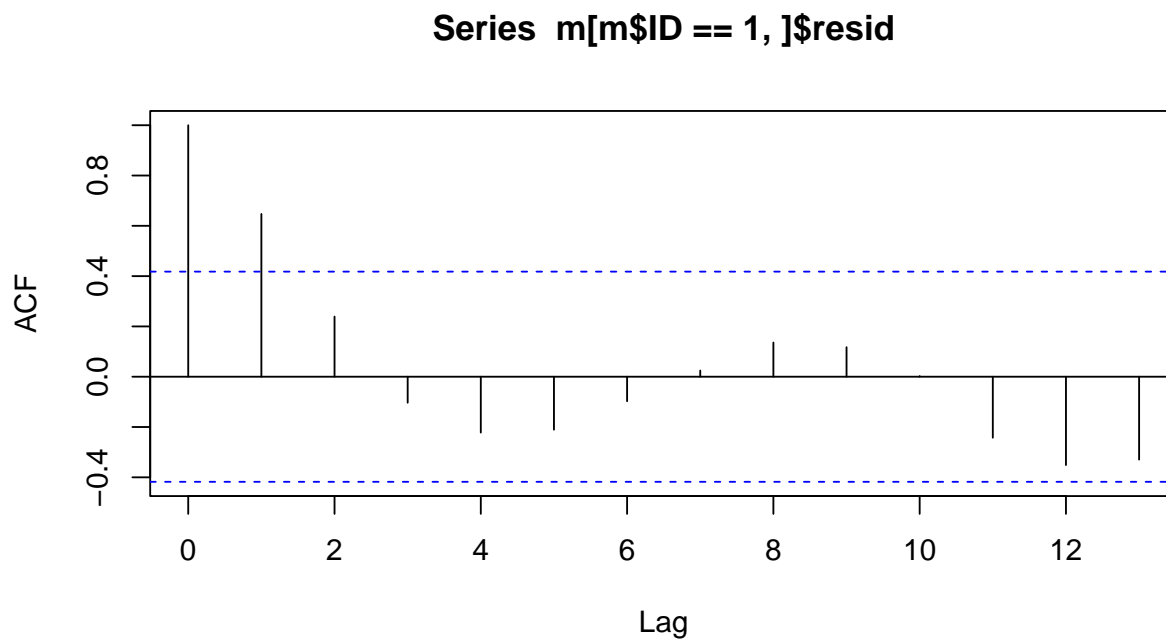


Figure 5: ACF Plot of Linear Mixed Model

After fitting with AR model, the acf plot almost did not change for each problem. temporal effect may be too small.

There are only two question the treatment seem to effects to patients, Scares Me when I am Nervous and Confident in My Ability to Handle Situations. However,for Scares Me when I am Nervous and Confident, after using AR models, this effect disappeared. From plot of this question, we could not find significant decreasing of score after taking treatment, which are correspond the result of AR model

Table 2: Linear Mixed Model for Scares Me when I am Nervous

Row	Estimate	Std. Error	df	t value	Pr(> t )
(Intercept)	2.16590	0.81736	7.42557	2.650	0.031243 *
T	2.04479	0.72973	221.06774	2.802	0.005527 **
t	-0.04548	0.01204	220.51531	-3.778	0.000203 ***
T:t	-0.05264	0.02874	220.67366	-1.831	0.068379

Table 3: Time Series Model for Scares Me when I am Nervous

Row	Estimate	Std. Error	df	t value	p-value
(Intercept)	2.3685784	0.8454966	220	2.801405	0.005541444**
T	1.8656768	1.0657592	220	1.750561	0.081415428
t	-0.0566064	0.0214366	220	-2.640642	0.008867989**
T:t	-0.0463229	0.0451578	220	-1.025802	0.306111548

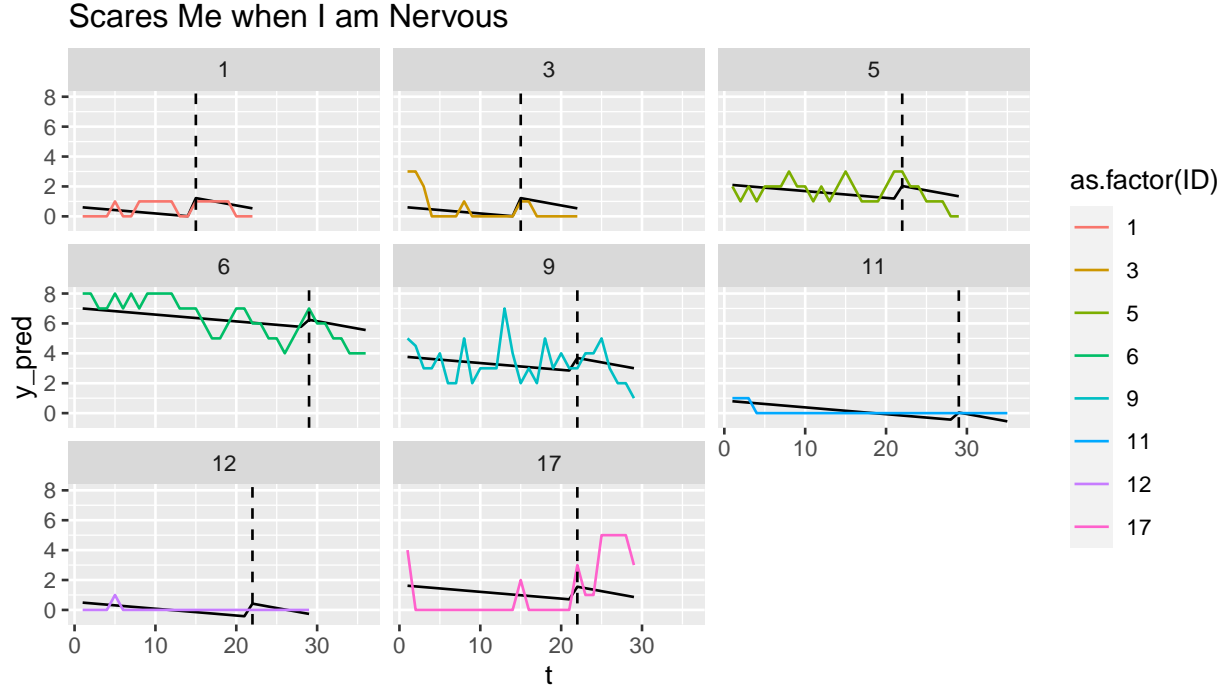


Figure 6: Linear Mixed Model for Scares Me when I am Nervous

The result of Confident in My Ability to Handle Situations is much better than result of Scares Me when I am Nervous. The plot also correspond to result of model. Both T and T:t are significant. Form plot and

fitted line, we could find some patient increase after treatment. Finally, we also checked with mixed ordinal model because data is ordinal, but compared with mixed ordinal model is hard to visualize. We put the all result in appendix.

Table 4: Linear Mixed Model for Confident in My Ability to Handle Situations

Row	Estimate	Std. Error	df	t value	Pr(> t )
(Intercept)	3.631392	0.728410	7.451728	4.985	0.00132 **
T	-2.978075	0.669260	221.129847	-4.450	1.36e-05 ***
t	0.003036	0.011040	220.545842	0.275	0.78354
T:t	0.118754	0.026362	220.713363	4.505	1.08e-05 ***

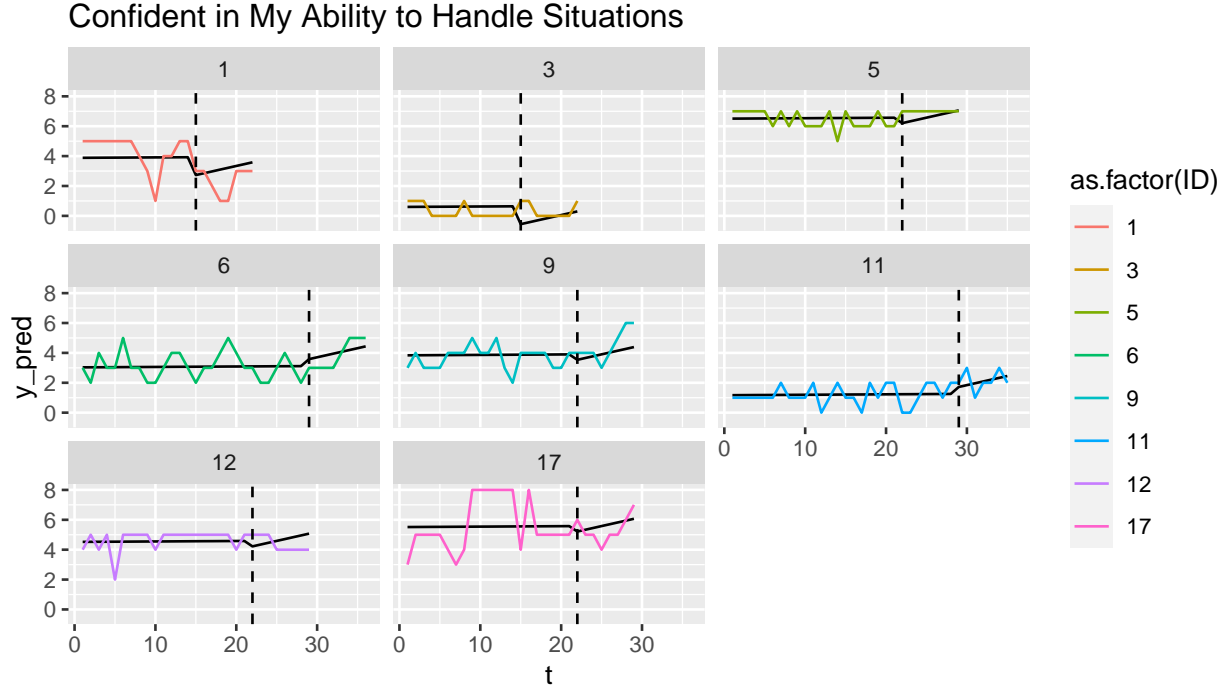


Figure 7: Linear Mixed Model for Confident in My Ability to Handle Situations

## Discussion

The results of the ordinal regression model developed to assess the effectiveness of the treatment in improving anxiety among adolescents based on the survey questions scored on an ordinal scale from 0 to 8 should be interpreted with caution due to several limitations.

First and foremost, the sample size of the dataset is extremely small, consisting of only 8 people's data. This small sample size may limit the statistical power of the model and affect the accuracy of its predictions. Additionally, the small sample size may not be representative of the entire population of adolescents experiencing anxiety issues, which may limit the generalizability of the model's findings.

Second, The key assumption in ordinal regression is that the effects of any explanatory variables are consistent or proportional across the different thresholds, which may not hold true in this case here for our survey responses.

Third, the model assumes a linear relationship between the independent and dependent variables. While ordinal regression models can capture nonlinear relationships between variables, the linear model may not accurately represent the relationship between the survey questions and anxiety symptoms.

Additionally, the survey questions are self-reported and may not accurately reflect the severity or frequency of anxiety symptoms. Furthermore, there may be other factors that contribute to anxiety symptoms that are not captured by the survey questions, such as genetic or environmental factors.

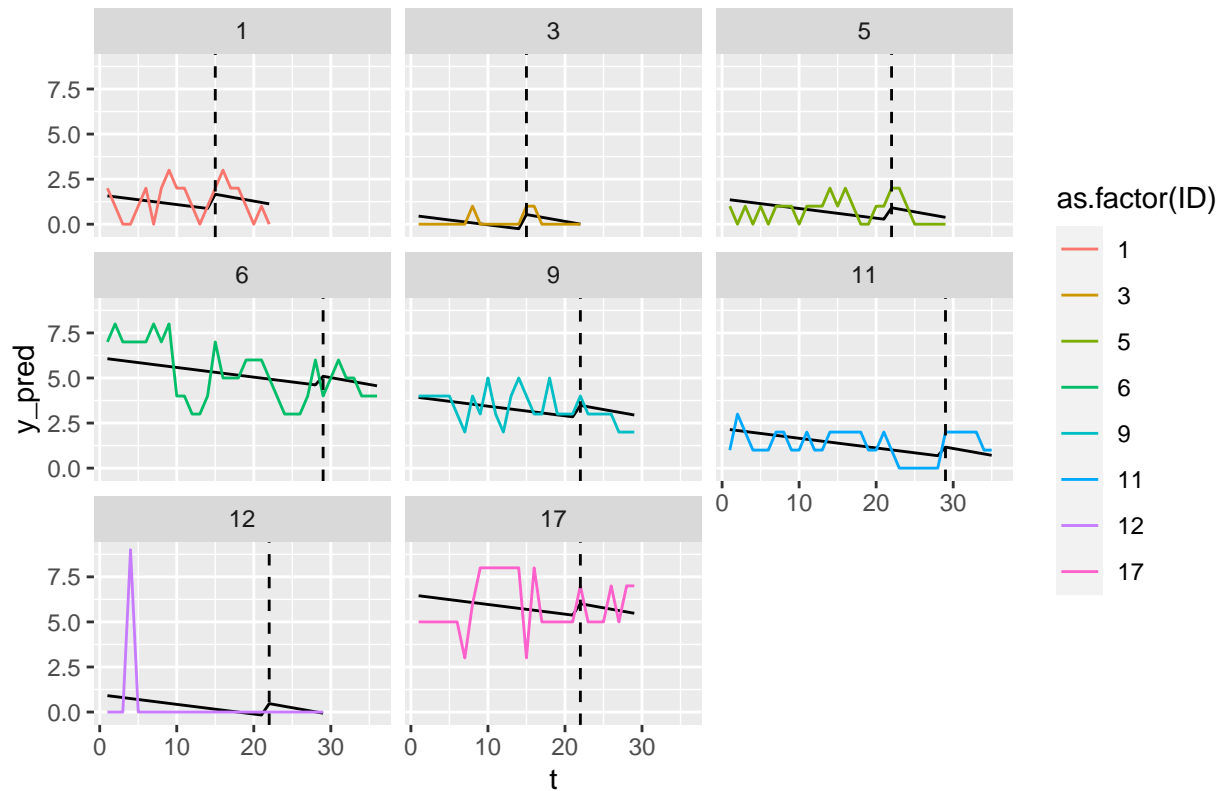
Overall, while the ordinal regression model developed in this project provides some initial insights into the effectiveness of the treatment in improving anxiety among adolescents based on the survey questions scored on an ordinal scale from 0 to 8, the above limitations should be taken into consideration when interpreting the results. Future research with a larger sample size and more comprehensive measures of anxiety symptoms may be necessary to provide more reliable and generalizable findings.

## Appendix

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: y ~ T + t * T + (1 | as.factor(ID))
## Data: m6
##
## REML criterion at convergence: 760.2
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.7610 -0.5608 -0.1045  0.4846  7.2786
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 5.532    2.352
## Residual                1.285    1.134
## Number of obs: 231, groups: as.factor(ID), 8
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   2.91240    0.84920   7.47426   3.430  0.00994 **
## T              1.17029    0.80633  221.19792   1.451  0.14809
## t             -0.05375    0.01330  220.57485  -4.041 7.37e-05 ***
## T:t           -0.02202    0.03176  220.75374  -0.693  0.48878
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) T      t
## T    -0.027
## t    -0.173  0.021
## T:t   0.056 -0.950 -0.258
```



## Push Away Thoughts and Feelings I Do Not Like



```
## Linear mixed-effects model fit by REML
## Data: m6
##      AIC      BIC    logLik
## 750.9272 774.9019 -368.4636
##
## Random effects:
## Formula: ~1 | as.factor(ID)
##      (Intercept) Residual
## StdDev:    2.351128 1.155872
##
## Correlation Structure: AR(1)
## Formula: ~1 | as.factor(ID)
## Parameter estimate(s):
##      Phi
## 0.3271351
## Fixed effects: y ~ T + t * T
##
##              Value Std.Error   DF   t-value p-value
## (Intercept)  2.8771326 0.8633003  220   3.332713  0.0010
## T            1.3259463 1.0232815  220   1.295779  0.1964
## t           -0.0516173 0.0175745  220  -2.937062  0.0037
## T:t          -0.0288226 0.0410666  220  -0.701851  0.4835
## Correlation:
##      (Intr) T      t
## T   -0.044
## t   -0.228  0.083
## T:t  0.079 -0.951 -0.308
```

```

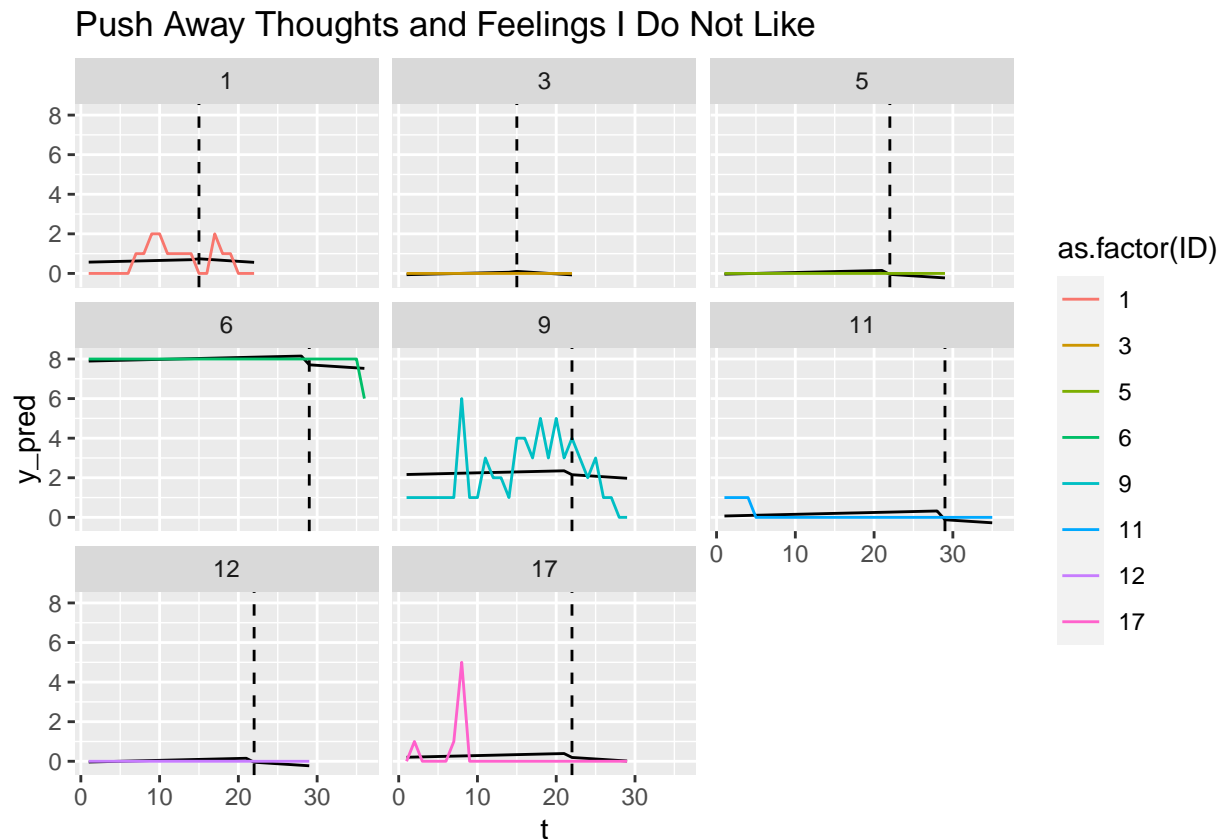
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.6735718 -0.5284025 -0.1054118  0.4539406  7.1520062
##
## Number of Observations: 231
## Number of Groups: 8

## Cumulative Link Mixed Model fitted with the Laplace approximation
##
## formula: y ~ T + t * T + (1 | as.factor(ID))
## data:    m6
##
## link threshold nobs logLik AIC      niter      max.grad cond.H
## logit flexible  231  -289.61 605.22 1085(7898) 1.29e-03 2.9e+05
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 21.71    4.66
## Number of groups:  as.factor(ID) 8
##
## Coefficients:
##      Estimate Std. Error z value Pr(>|z|)
## T      2.84198    1.42529   1.994  0.04615 *
## t     -0.08166    0.02327  -3.509  0.00045 ***
## T:t   -0.06905    0.05422  -1.273  0.20285
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Threshold coefficients:
##      Estimate Std. Error z value
## 0|1   -3.6579    1.6718  -2.188
## 1|2   -1.8403    1.6657  -1.105
## 2|3    0.7256    1.6768   0.433
## 3|4    2.8651    1.6913   1.694
## 4|5    4.1530    1.6984   2.445
## 5|6    5.7648    1.7102   3.371
## 6|7    6.1799    1.7132   3.607
## 7|8    7.1735    1.7265   4.155
## 8|9    9.7671    1.9727   4.951

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: y ~ T + t * T + (1 | as.factor(ID))
## Data: m7
##
## REML criterion at convergence: 556.6
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -2.8165 -0.2910 -0.0668  0.1268  6.6611
##
## Random effects:
## Groups      Name      Variance Std.Dev.

```

```
## as.factor(ID) (Intercept) 7.5792 2.7530
## Residual 0.5043 0.7102
## Number of obs: 231, groups: as.factor(ID), 8
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) 1.336496 0.979308 7.140944 1.365 0.2138
## T 0.561208 0.505673 220.362513 1.110 0.2683
## t 0.009391 0.008337 220.174137 1.126 0.2613
## T:t -0.034975 0.019912 220.227741 -1.757 0.0804 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) T t
## T -0.015
## t -0.094 0.020
## T:t 0.030 -0.950 -0.257
```



```
## Linear mixed-effects model fit by REML
## Data: m7
## AIC BIC logLik
## 543.8212 567.7959 -264.9106
##
## Random effects:
## Formula: ~1 | as.factor(ID)
```

```

##          (Intercept) Residual
## StdDev:    2.745514 0.7291276
##
## Correlation Structure: AR(1)
## Formula: ~1 | as.factor(ID)
## Parameter estimate(s):
##      Phi
## 0.3603219
## Fixed effects: y ~ T + t * T
##              Value Std.Error   DF   t-value p-value
## (Intercept)  1.3543270 0.9824060  220   1.378582  0.1694
## T            0.6377633 0.6572827  220   0.970303  0.3330
## t            0.0068061 0.0113633  220   0.598956  0.5498
## T:t          -0.0364790 0.0264524  220  -1.379041  0.1693
## Correlation:
##      (Intr) T      t
## T   -0.026
## t   -0.130  0.092
## T:t  0.045 -0.951 -0.313
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.64643410 -0.30198290 -0.05895287  0.11544185  6.47916091
##
## Number of Observations: 231
## Number of Groups: 8

## Cumulative Link Mixed Model fitted with the Laplace approximation
##
## formula: y ~ T + t * T + (1 | as.factor(ID))
## data:    m7
##
## link threshold nobs logLik AIC    niter      max.grad cond.H
## logit flexible  231  -117.22 256.43 1128(12026) 1.12e+02 1.2e+07
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 65.07    8.067
## Number of groups: as.factor(ID) 8
##
## Coefficients:
##      Estimate Std. Error z value Pr(>|z|)
## T      5.3052169  0.0006685 7935.49  <2e-16 ***
## t      0.0080511  0.0006694  12.03  <2e-16 ***
## T:t    -0.2772134  0.0006686 -414.61  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Threshold coefficients:
##      Estimate Std. Error z value
## 0|1 2.863e+00 6.686e-04 4282.21
## 1|2 5.151e+00 4.280e-01 12.04
## 2|3 5.811e+00 4.794e-01 12.12
## 3|4 6.704e+00 5.624e-01 11.92

```

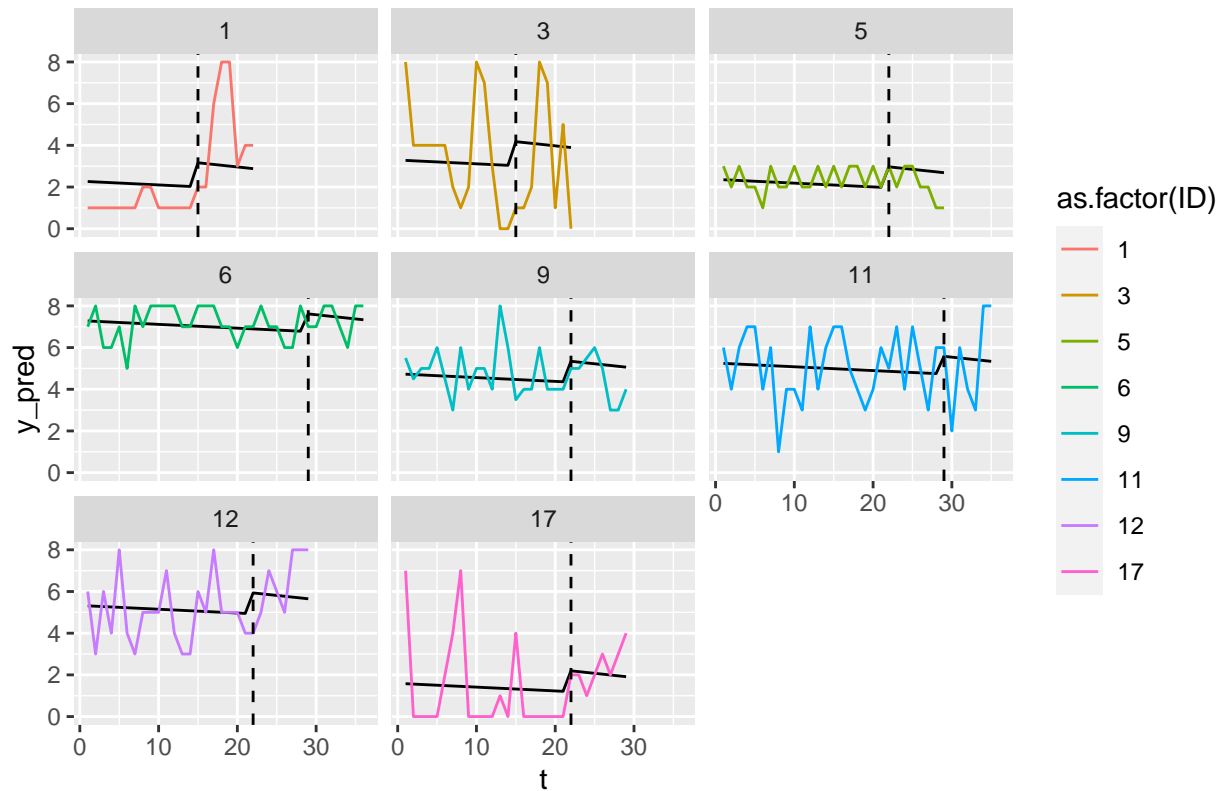
```

## 4|5 7.363e+00 6.512e-01 11.31
## 5|6 8.637e+00 9.682e-01 8.92
## 6|8 1.113e+01 2.213e+00 5.03

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: y ~ T + t * T + (1 | as.factor(ID))
## Data: m1
##
## REML criterion at convergence: 925.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.4789 -0.6876 -0.0800  0.5115  3.3440
##
## Random effects:
## Groups           Name          Variance Std.Dev.
## as.factor(ID) (Intercept) 3.912     1.978
## Residual                2.756     1.660
## Number of obs: 231, groups: as.factor(ID), 8
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  4.02130    0.74339   8.44541   5.409 0.000532 ***
## T             1.48380    1.17753  223.22366   1.260 0.208951
## t            -0.01821    0.01945  221.62260  -0.936 0.350308
## T:t          -0.02194    0.04643  222.09728  -0.473 0.636988
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) T      t
## T    -0.046
## t    -0.289  0.025
## T:t   0.095 -0.950 -0.262

```

## Max Anxiety Today



```
## Linear mixed-effects model fit by REML
## Data: m1
##      AIC      BIC    logLik
##  920.3059 944.2806 -453.153
##
## Random effects:
## Formula: ~1 | as.factor(ID)
##      (Intercept) Residual
## StdDev:      1.9288 1.705292
##
## Correlation Structure: AR(1)
## Formula: ~1 | as.factor(ID)
## Parameter estimate(s):
##      Phi
## 0.3228426
## Fixed effects: y ~ T + t * T
##              Value Std.Error DF   t-value p-value
## (Intercept)  4.096115 0.7630646 220   5.367980  0.0000
## T             0.931428 1.4995962 220   0.621119  0.5352
## t            -0.020236 0.0257955 220  -0.784460  0.4336
## T:t          -0.001454 0.0602599 220  -0.024126  0.9808
## Correlation:
##      (Intr) T      t
## T    -0.075
## t    -0.379  0.088
## T:t   0.133 -0.951 -0.313
```

```

##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.42294175 -0.69885558 -0.09197737  0.49122749  3.13779198
##
## Number of Observations: 231
## Number of Groups: 8

## Warning in update.uC(rho): Non finite negative log-likelihood
##   at iteration 350

## Warning in update.uC(rho): Non finite negative log-likelihood
##   at iteration 618

## Warning in update.uC(rho): Non finite negative log-likelihood
##   at iteration 758

## Warning in update.uC(rho): Non finite negative log-likelihood
##   at iteration 1471

## Cumulative Link Mixed Model fitted with the Laplace approximation
##
## formula: ordered(y) ~ T + t * T + (1 | as.factor(ID))
## data:    m1
##
## link threshold nobs logLik AIC      niter      max.grad cond.H
## logit flexible 231  -439.51 909.03 1588(9505) 1.79e-04 9.1e+04
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 4.534    2.129
## Number of groups: as.factor(ID) 8
##
## Coefficients:
##      Estimate Std. Error z value Pr(>|z|)
## T      1.230838  1.457687  0.844  0.398
## t     -0.017650  0.020088 -0.879  0.380
## T:t   -0.004956  0.057092 -0.087  0.931
##
## Threshold coefficients:
##      Estimate Std. Error z value
## 0|1      -3.6952    0.8575 -4.309
## 1|2      -2.3857    0.8302 -2.874
## 2|3      -1.2853    0.8216 -1.564
## 3|3.5    -0.2761    0.8175 -0.338
## 3.5|4    -0.2409    0.8174 -0.295
## 4|4.5     0.8387    0.8180  1.025
## 4.5|5     0.9052    0.8182  1.106
## 5|5.5     1.5909    0.8213  1.937
## 5.5|6     1.6572    0.8216  2.017
## 6|7       2.4975    0.8293  3.011
## 7|8       3.6631    0.8485  4.317

```

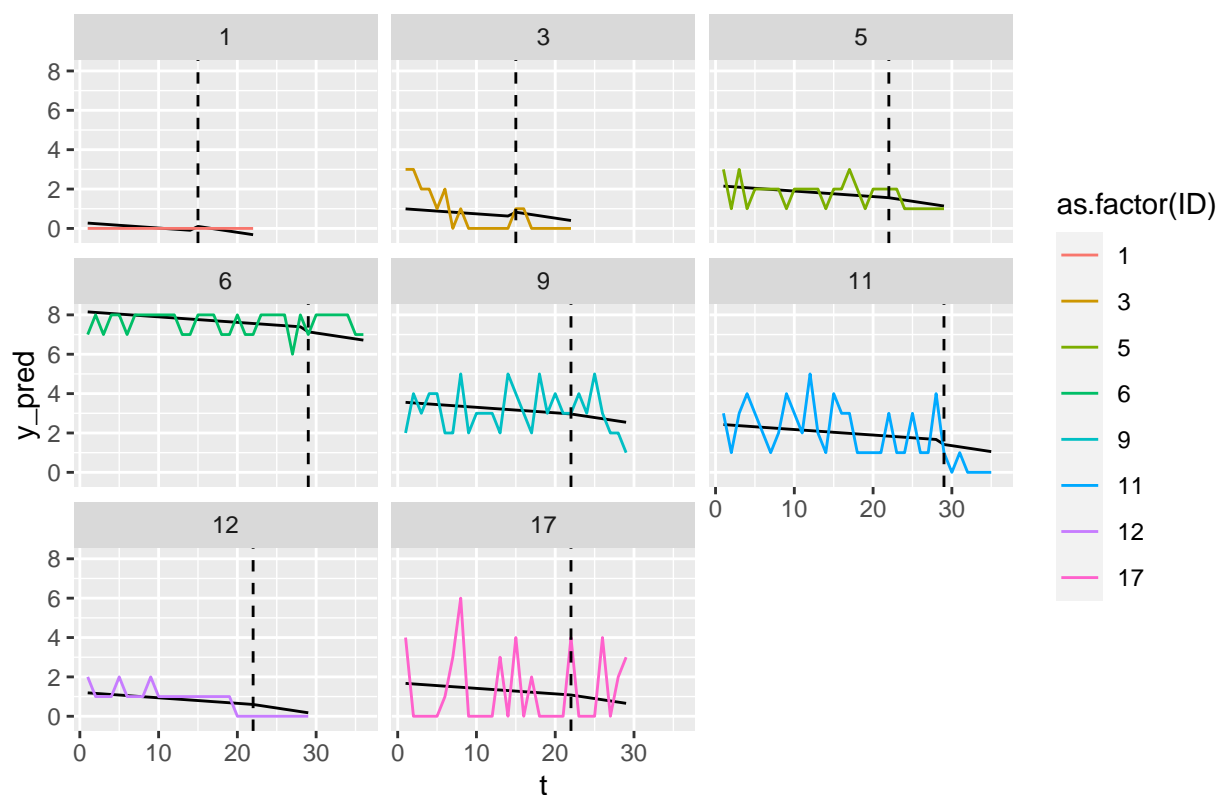
```

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: y ~ T + t * T + (1 | as.factor(ID))
## Data: m3
##
## REML criterion at convergence: 709.9
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.6271 -0.6634 -0.0498  0.3780  4.4834
##
## Random effects:
## Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 6.153    2.481
## Residual                1.019    1.009
## Number of obs: 231, groups: as.factor(ID), 8
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  2.57940    0.89034   7.33575  2.897    0.0219 *
## T             0.70662    0.71833  220.86647  0.984    0.3263
## t            -0.02803    0.01185  220.41221 -2.366    0.0189 *
## T:t          -0.03221    0.02829  220.54215 -1.139    0.2561
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) T      t
## T    -0.023
## t    -0.147  0.020
## T:t   0.048 -0.950 -0.258

```



## Jump to Negative Conclusions



```
##               Value Std.Error DF   t-value    p-value
## (Intercept)  2.58344986 0.89225260 220   2.8954243 0.004168142
## T            0.76273737 0.77339309 220   0.9862221 0.325107520
## t           -0.02825279 0.01284489 220  -2.1995349 0.028881183
## T:t         -0.03430151 0.03055475 220  -1.1226242 0.262820803
```

```
## Cumulative Link Mixed Model fitted with the Laplace approximation
```

```
##
```

```
## formula: ordered(y) ~ T + t * T + (1 | as.factor(ID))
```

```
## data:    m3
```

```
##
```

```
## link threshold nobs logLik AIC   niter    max.grad cond.H
```

```
## logit flexible  231  -288.62 601.23 1089(11331) 1.06e-04 3.0e+05
```

```
##
```

```
## Random effects:
```

```
## Groups      Name      Variance Std.Dev.
```

```
## as.factor(ID) (Intercept) 25.07    5.007
```

```
## Number of groups: as.factor(ID) 8
```

```
##
```

```
## Coefficients:
```

```
##      Estimate Std. Error z value Pr(>|z|)
```

```
## T      0.98291    1.63590   0.601   0.5479
```

```
## t     -0.05472    0.02322  -2.357   0.0184 *
```

```
## T:t   -0.05465    0.06253  -0.874   0.3821
```

```
## ---
```

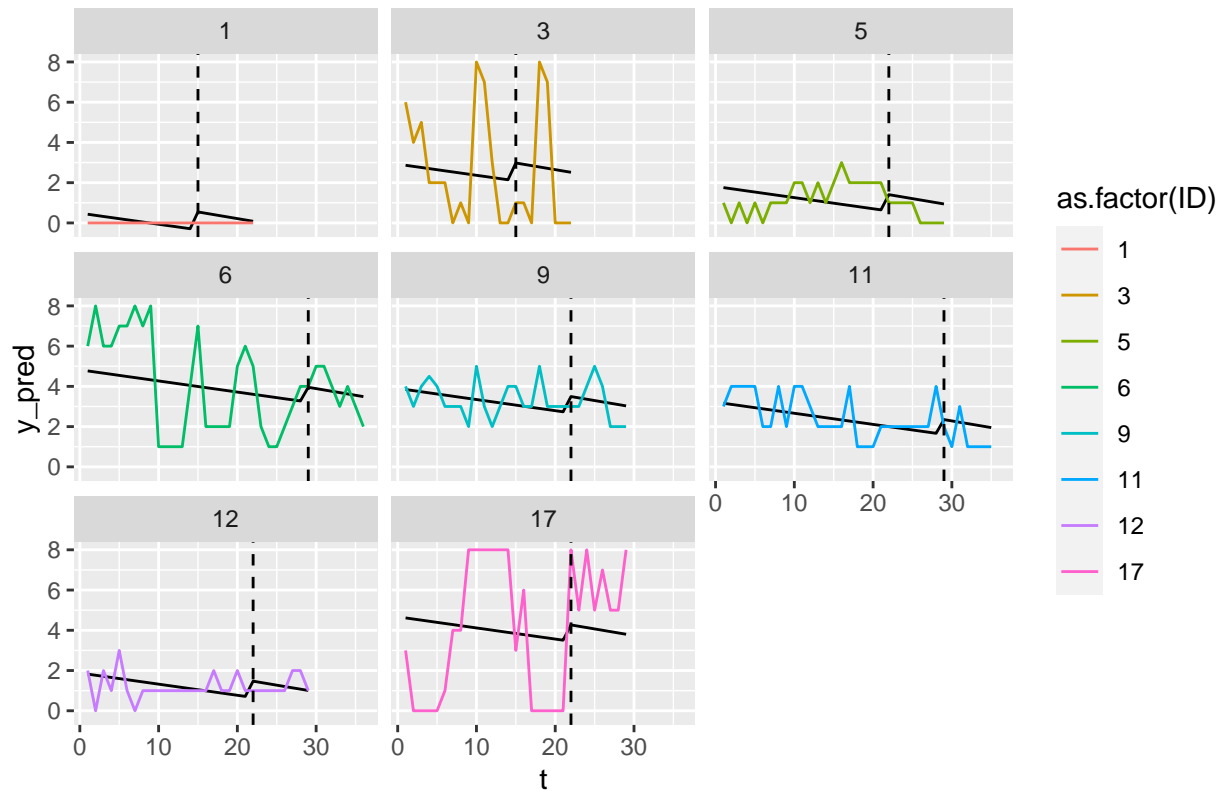
```

## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Threshold coefficients:
##      Estimate Std. Error z value
## 0|1  -2.7378      1.8524  -1.478
## 1|2  -1.0018      1.8465  -0.543
## 2|3   0.3107      1.8461   0.168
## 3|4   1.6044      1.8525   0.866
## 4|5   3.0195      1.8769   1.609
## 5|6   4.5991      1.9919   2.309
## 6|7   6.3342      2.3704   2.672
## 7|8   9.1337      2.5087   3.641

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: y ~ T + t * T + (1 | as.factor(ID))
##      Data: m2
##
## REML criterion at convergence: 969.5
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.46862 -0.46695 -0.08721  0.50280  3.04935
##
## Random effects:
##  Groups      Name      Variance Std.Dev.
## as.factor(ID) (Intercept) 2.403    1.550
## Residual          3.412    1.847
## Number of obs: 231, groups:  as.factor(ID), 8
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   2.96285    0.61566   9.86430   4.812 0.000738 ***
## T              1.05237    1.30502  225.35824   0.806 0.420863
## t             -0.05534    0.02161  222.91949  -2.561 0.011094 *
## T:t           -0.01090    0.05154  223.69761  -0.211 0.832764
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) T      t
## T    -0.063
## t    -0.389  0.030
## T:t   0.128 -0.950 -0.267

```

## Avg Avoidance of Thoughts, Situations, Sensations



```
## Warning in update.uC(rho): Non finite negative log-likelihood
## at iteration 822
```

```
## Cumulative Link Mixed Model fitted with the Laplace approximation
##
## formula: ordered(y) ~ T + t * T + (1 | as.factor(ID))
## data:    m2
##
## link threshold nobs logLik AIC niter max.grad cond.H
## logit flexible 231 -404.26 834.53 1189(5966) 7.16e-05 7.4e+04
##
## Random effects:
## Groups Name Variance Std.Dev.
## as.factor(ID) (Intercept) 5.559 2.358
## Number of groups: as.factor(ID) 8
##
## Coefficients:
## Estimate Std. Error z value Pr(>|z|)
## T 0.585447 1.488199 0.393 0.6940
## t -0.043191 0.020933 -2.063 0.0391 *
## T:t -0.007855 0.055678 -0.141 0.8878
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Threshold coefficients:
```

##		Estimate	Std. Error	z value
##	0 1	-2.1710	0.7514	-2.889
##	1 2	-0.5730	0.7539	-0.760
##	2 3	0.6361	0.7566	0.841
##	3 4	1.3162	0.7586	1.735
##	4 4.5	2.0933	0.7650	2.736
##	4.5 5	2.1310	0.7655	2.784
##	5 6	2.6462	0.7735	3.421
##	6 7	2.9689	0.7804	3.804
##	7 8	3.4512	0.7962	4.334