

R Code Outputs - Appendix

Han Chenyue

BASMI Score analysis

lme4 code for treatment and diagnosis: BASMI score

```
model_treatment_diagnosis_basmi_full <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_basmi_reduced <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_basmi_full, corr = FALSE))
```

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

```
Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified * diagnosis + time_in_years + (time_in_years |
      ttas_id)
```

```
Data: dataframe_sorted_and_reclassified_basmi
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 39038

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6710	-0.5707	0.0007	0.5707	6.0474

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.162783	1.77842	
	time_in_years	0.003905	0.06249	-0.12
Residual		0.483340	0.69523	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate
(Intercept)	2.903e+00
genderMale	5.455e-01
hlab27statusNegative	8.744e-02
hlab27statusPositive	-2.387e-01
age_at_onset	8.558e-03
diagnosisAxial SpA- nr-axSpA	-1.200e+00
treatment_order2	-1.681e-01
treatment_order3	-1.039e-01
treatment_order4	-3.378e-01
treatment_order5	-2.729e-01
treatment_order6	-4.604e-01
treatment_order7	-5.685e-01
treatment_order8	-9.840e-01
treatment_order9	-1.351e-01
treatment_order11	1.355e+00
last_known_smoking_statussex-smoker	3.232e-01
last_known_smoking_statusnever	1.151e-01
last_known_smoking_statussmoker	4.901e-01
last_known_vaping_statussex-vaper	-2.207e+00
last_known_vaping_statusnever	-6.818e-01
last_known_vaping_statusvaper	-7.571e-01

treatment_reclassifiedAnti-IL17	1.059e-01
treatment_reclassifiedAnti-TNF	-8.243e-02
treatment_reclassifiedJAK Inhibitor	2.201e-01
time_in_years	5.331e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-7.325e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-2.487e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-1.774e-01
	Std. Error
(Intercept)	2.207e-01
genderMale	1.359e-01
hlab27statusNegative	2.380e-01
hlab27statusPositive	1.608e-01
age_at_onset	6.723e-03
diagnosisAxial SpA- nr-axSpA	2.033e-01
treatment_order2	7.845e-02
treatment_order3	6.348e-02
treatment_order4	9.434e-02
treatment_order5	1.032e-01
treatment_order6	1.419e-01
treatment_order7	1.991e-01
treatment_order8	2.845e-01
treatment_order9	3.355e-01
treatment_order11	5.080e-01
last_known_smoking_statussex-smoker	3.208e-01
last_known_smoking_statusnever	3.241e-01
last_known_smoking_statussmoker	3.966e-01
last_known_vaping_statussex-vaper	7.069e-01
last_known_vaping_statusnever	3.107e-01
last_known_vaping_statusvaper	4.361e-01
treatment_reclassifiedAnti-IL17	1.216e-01
treatment_reclassifiedAnti-TNF	7.515e-02
treatment_reclassifiedJAK Inhibitor	3.913e-01
time_in_years	2.879e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.406e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.496e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	6.915e-01
	df
(Intercept)	8.652e+02
genderMale	8.625e+02
hlab27statusNegative	8.658e+02
hlab27statusPositive	8.622e+02
age_at_onset	8.596e+02
diagnosisAxial SpA- nr-axSpA	8.815e+02

treatment_order2	1.371e+04
treatment_order3	1.290e+04
treatment_order4	1.346e+04
treatment_order5	1.194e+04
treatment_order6	1.350e+04
treatment_order7	8.360e+03
treatment_order8	1.478e+04
treatment_order9	1.474e+04
treatment_order11	1.288e+04
last_known_smoking_statussex-smoker	8.594e+02
last_known_smoking_statusnever	8.598e+02
last_known_smoking_statussmoker	8.570e+02
last_known_vaping_statussex-vaper	8.470e+02
last_known_vaping_statusnever	8.592e+02
last_known_vaping_statusvaper	8.562e+02
treatment_reclassifiedAnti-IL17	1.216e+04
treatment_reclassifiedAnti-TNF	1.378e+04
treatment_reclassifiedJAK Inhibitor	4.125e+03
time_in_years	6.492e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.144e+04
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	8.896e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.175e+04
	t value
(Intercept)	13.155
genderMale	4.013
hlab27statusNegative	0.367
hlab27statusPositive	-1.484
age_at_onset	1.273
diagnosisAxial SpA- nr-axSpA	-5.903
treatment_order2	-2.142
treatment_order3	-1.637
treatment_order4	-3.581
treatment_order5	-2.644
treatment_order6	-3.245
treatment_order7	-2.855
treatment_order8	-3.458
treatment_order9	-0.403
treatment_order11	2.667
last_known_smoking_statussex-smoker	1.008
last_known_smoking_statusnever	0.355
last_known_smoking_statussmoker	1.236
last_known_vaping_statussex-vaper	-3.122
last_known_vaping_statusnever	-2.194

last_known_vaping_statusvaper	-1.736	
treatment_reclassifiedAnti-IL17	0.871	
treatment_reclassifiedAnti-TNF	-1.097	
treatment_reclassifiedJAK Inhibitor	0.562	
time_in_years	18.515	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-2.151	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-1.663	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-0.256	
	Pr(> t)	
(Intercept)	< 2e-16	***
genderMale	6.51e-05	***
hlab27statusNegative	0.713387	
hlab27statusPositive	0.138106	
age_at_onset	0.203359	
diagnosisAxial SpA- nr-axSpA	5.10e-09	***
treatment_order2	0.032197	*
treatment_order3	0.101737	
treatment_order4	0.000343	***
treatment_order5	0.008198	**
treatment_order6	0.001176	**
treatment_order7	0.004318	**
treatment_order8	0.000545	***
treatment_order9	0.687267	
treatment_order11	0.007664	**
last_known_smoking_statussex-smoker	0.313930	
last_known_smoking_statusnever	0.722629	
last_known_smoking_statussmoker	0.216909	
last_known_vaping_statussex-vaper	0.001856	**
last_known_vaping_statusnever	0.028491	*
last_known_vaping_statusvaper	0.082929	.
treatment_reclassifiedAnti-IL17	0.383691	
treatment_reclassifiedAnti-TNF	0.272743	
treatment_reclassifiedJAK Inhibitor	0.573854	
time_in_years	< 2e-16	***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.031514	*
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.096415	.
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.797598	

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

```
print(summary(model_treatment_diagnosis_basmi_reduced, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_basmi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 39042.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6692	-0.5717	0.0010	0.5701	6.0465

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.158152	1.77712	
	time_in_years	0.003911	0.06254	-0.12
Residual		0.483466	0.69532	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.904e+00	2.205e-01	8.656e+02	13.168
genderMale	5.466e-01	1.358e-01	8.628e+02	4.025
hlab27statusNegative	8.003e-02	2.377e-01	8.657e+02	0.337
hlab27statusPositive	-2.364e-01	1.607e-01	8.625e+02	-1.471
age_at_onset	8.555e-03	6.717e-03	8.599e+02	1.274
diagnosisAxial SpA- nr-axSpA	-1.231e+00	2.024e-01	8.724e+02	-6.081
treatment_order2	-1.643e-01	7.843e-02	1.370e+04	-2.095
treatment_order3	-1.091e-01	6.332e-02	1.292e+04	-1.724
treatment_order4	-3.353e-01	9.408e-02	1.349e+04	-3.564
treatment_order5	-3.044e-01	1.019e-01	1.193e+04	-2.986
treatment_order6	-4.331e-01	1.403e-01	1.372e+04	-3.086
treatment_order7	-5.529e-01	1.951e-01	8.306e+03	-2.834
treatment_order8	-1.010e+00	2.836e-01	1.470e+04	-3.562
treatment_order9	-1.415e-01	3.354e-01	1.475e+04	-0.422
treatment_order11	1.338e+00	5.078e-01	1.291e+04	2.634
last_known_smoking_statussex-smoker	3.235e-01	3.205e-01	8.596e+02	1.009
last_known_smoking_statusnever	1.149e-01	3.237e-01	8.599e+02	0.355

last_known_smoking_statussmoker	4.919e-01	3.963e-01	8.573e+02	1.241
last_known_vaping_statussex-vaper	-2.209e+00	7.063e-01	8.474e+02	-3.127
last_known_vaping_statusnever	-6.835e-01	3.104e-01	8.594e+02	-2.202
last_known_vaping_statusvaper	-7.590e-01	4.357e-01	8.566e+02	-1.742
treatment_reclassifiedAnti-IL17	4.056e-02	1.161e-01	1.257e+04	0.349
treatment_reclassifiedAnti-TNF	-9.808e-02	7.475e-02	1.363e+04	-1.312
treatment_reclassifiedJAK Inhibitor	1.629e-01	3.278e-01	6.679e+03	0.497
time_in_years	5.329e-02	2.881e-03	6.501e+02	18.501

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	6.19e-05 ***
hlab27statusNegative	0.736451
hlab27statusPositive	0.141679
age_at_onset	0.203155
diagnosisAxial SpA- nr-axSpA	1.78e-09 ***
treatment_order2	0.036192 *
treatment_order3	0.084808 .
treatment_order4	0.000366 ***
treatment_order5	0.002834 **
treatment_order6	0.002035 **
treatment_order7	0.004604 **
treatment_order8	0.000369 ***
treatment_order9	0.673067
treatment_order11	0.008444 **
last_known_smoking_statussex-smoker	0.313087
last_known_smoking_statusnever	0.722757
last_known_smoking_statussmoker	0.214862
last_known_vaping_statussex-vaper	0.001823 **
last_known_vaping_statusnever	0.027947 *
last_known_vaping_statusvaper	0.081882 .
treatment_reclassifiedAnti-IL17	0.726803
treatment_reclassifiedAnti-TNF	0.189490
treatment_reclassifiedJAK Inhibitor	0.619224
time_in_years	< 2e-16 ***

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

```
anova(model_treatment_diagnosis_basmi_full, model_treatment_diagnosis_basmi_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basmi

Models:

model_treatment_diagnosis_basmi_reduced: basmi_score ~ gender + hlab27status + age_at_onset +

model_treatment_diagnosis_basmi_full: basmi_score ~ gender + hlab27status + age_at_onset + d

	npar	AIC	BIC	logLik	deviance	Chisq
model_treatment_diagnosis_basmi_reduced	29	39040	39263	-19491	38982	
model_treatment_diagnosis_basmi_full	32	39040	39286	-19488	38976	5.9932

Df Pr(>Chisq)

model_treatment_diagnosis_basmi_reduced		
model_treatment_diagnosis_basmi_full	3	0.1119

```
anova(model_treatment_diagnosis_basmi_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value
gender	7.784	7.784	1	862.5	16.1048
hlab27status	2.007	1.003	2	864.3	2.0759
age_at_onset	0.783	0.783	1	859.6	1.6206
diagnosis	13.382	13.382	1	2766.1	27.6861
treatment_order	19.948	2.216	9	13283.1	4.5858
last_known_smoking_status	1.338	0.446	3	860.0	0.9229
last_known_vaping_status	5.246	1.749	3	853.4	3.6176
treatment_reclassified	2.660	0.887	3	11768.3	1.8344
time_in_years	165.689	165.689	1	649.2	342.8008
diagnosis:treatment_reclassified	2.902	0.967	3	11051.2	2.0016

Pr(>F)

gender	6.514e-05 ***
hlab27status	0.12606
age_at_onset	0.20336
diagnosis	1.536e-07 ***
treatment_order	4.564e-06 ***
last_known_smoking_status	0.42915
last_known_vaping_status	0.01291 *
treatment_reclassified	0.13852
time_in_years	< 2.2e-16 ***
diagnosis:treatment_reclassified	0.11144

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

For BASMI only: Plot predicted lmer() geom_line

lme4 code for treatment and gender: BASMI score

```
model_treatment_gender_basmi_full <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_gender_basmi_reduced <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_gender_basmi_full, corr = FALSE))
```

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

Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * gender + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_basmi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 39044.7

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-5.6702	-0.5711	-0.0002	0.5710	6.0464

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.159748	1.77757	
	time_in_years	0.003915	0.06257	-0.12
Residual		0.483469	0.69532	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.908e+00	2.207e-01	8.667e+02
genderMale	5.432e-01	1.360e-01	8.674e+02
hlab27statusNegative	8.197e-02	2.378e-01	8.659e+02
hlab27statusPositive	-2.369e-01	1.607e-01	8.624e+02
age_at_onset	8.517e-03	6.719e-03	8.599e+02
diagnosisAxial SpA- nr-axSpA	-1.230e+00	2.025e-01	8.723e+02
treatment_order2	-1.598e-01	7.872e-02	1.368e+04
treatment_order3	-1.068e-01	6.350e-02	1.285e+04
treatment_order4	-3.317e-01	9.416e-02	1.343e+04
treatment_order5	-3.085e-01	1.021e-01	1.190e+04
treatment_order6	-4.344e-01	1.421e-01	1.342e+04
treatment_order7	-5.191e-01	1.978e-01	8.529e+03
treatment_order8	-1.009e+00	2.838e-01	1.469e+04
treatment_order9	-1.187e-01	3.365e-01	1.474e+04
treatment_order11	1.350e+00	5.080e-01	1.290e+04
last_known_smoking_statussex-smoker	3.227e-01	3.206e-01	8.595e+02
last_known_smoking_statusnever	1.141e-01	3.238e-01	8.598e+02
last_known_smoking_statussmoker	4.919e-01	3.964e-01	8.572e+02
last_known_vaping_statussex-vaper	-2.208e+00	7.065e-01	8.472e+02
last_known_vaping_statusnever	-6.828e-01	3.105e-01	8.593e+02
last_known_vaping_statusvaper	-7.584e-01	4.359e-01	8.565e+02
treatment_reclassifiedAnti-IL17	1.101e-01	1.629e-01	1.055e+04
treatment_reclassifiedAnti-TNF	-1.308e-01	9.352e-02	1.305e+04
treatment_reclassifiedJAK Inhibitor	-9.499e-02	4.021e-01	7.566e+03
time_in_years	5.327e-02	2.882e-03	6.481e+02
genderMale:treatment_reclassifiedAnti-IL17	-1.251e-01	1.979e-01	9.890e+03
genderMale:treatment_reclassifiedAnti-TNF	3.775e-02	7.515e-02	1.191e+04
genderMale:treatment_reclassifiedJAK Inhibitor	6.470e-01	6.342e-01	4.711e+03
t value Pr(> t)			
(Intercept)	13.176	< 2e-16	***
genderMale	3.993	7.09e-05	***
hlab27statusNegative	0.345	0.730426	
hlab27statusPositive	-1.474	0.140823	

```

age_at_onset                1.267 0.205324
diagnosisAxial SpA- nr-axSpA -6.073 1.87e-09 ***
treatment_order2            -2.030 0.042335 *
treatment_order3            -1.682 0.092664 .
treatment_order4            -3.522 0.000429 ***
treatment_order5            -3.022 0.002515 **
treatment_order6            -3.057 0.002238 **
treatment_order7            -2.625 0.008688 **
treatment_order8            -3.555 0.000379 ***
treatment_order9            -0.353 0.724282
treatment_order11           2.657 0.007898 **
last_known_smoking_statussex-smoker 1.007 0.314446
last_known_smoking_statusnever 0.352 0.724700
last_known_smoking_statussmoker 1.241 0.214931
last_known_vaping_statussex-vaper -3.125 0.001839 **
last_known_vaping_statusnever -2.199 0.028144 *
last_known_vaping_statusvaper -1.740 0.082199 .
treatment_reclassifiedAnti-IL17 0.676 0.499020
treatment_reclassifiedAnti-TNF -1.399 0.161880
treatment_reclassifiedJAK Inhibitor -0.236 0.813269
time_in_years                18.482 < 2e-16 ***
genderMale:treatment_reclassifiedAnti-IL17 -0.632 0.527252
genderMale:treatment_reclassifiedAnti-TNF 0.502 0.615405
genderMale:treatment_reclassifiedJAK Inhibitor 1.020 0.307685
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_basmi_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_basmi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 39042.7

```

```

Scaled residuals:
    Min       1Q   Median       3Q      Max
-5.6692 -0.5717  0.0010  0.5701  6.0465

```

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.158152	1.77712	
	time_in_years	0.003911	0.06254	-0.12
Residual		0.483466	0.69532	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.904e+00	2.205e-01	8.656e+02	13.168
genderMale	5.466e-01	1.358e-01	8.628e+02	4.025
hlab27statusNegative	8.003e-02	2.377e-01	8.657e+02	0.337
hlab27statusPositive	-2.364e-01	1.607e-01	8.625e+02	-1.471
age_at_onset	8.555e-03	6.717e-03	8.599e+02	1.274
diagnosisAxial SpA- nr-axSpA	-1.231e+00	2.024e-01	8.724e+02	-6.081
treatment_order2	-1.643e-01	7.843e-02	1.370e+04	-2.095
treatment_order3	-1.091e-01	6.332e-02	1.292e+04	-1.724
treatment_order4	-3.353e-01	9.408e-02	1.349e+04	-3.564
treatment_order5	-3.044e-01	1.019e-01	1.193e+04	-2.986
treatment_order6	-4.331e-01	1.403e-01	1.372e+04	-3.086
treatment_order7	-5.529e-01	1.951e-01	8.306e+03	-2.834
treatment_order8	-1.010e+00	2.836e-01	1.470e+04	-3.562
treatment_order9	-1.415e-01	3.354e-01	1.475e+04	-0.422
treatment_order11	1.338e+00	5.078e-01	1.291e+04	2.634
last_known_smoking_statussex-smoker	3.235e-01	3.205e-01	8.596e+02	1.009
last_known_smoking_statusnever	1.149e-01	3.237e-01	8.599e+02	0.355
last_known_smoking_statussmoker	4.919e-01	3.963e-01	8.573e+02	1.241
last_known_vaping_statussex-vaper	-2.209e+00	7.063e-01	8.474e+02	-3.127
last_known_vaping_statusnever	-6.835e-01	3.104e-01	8.594e+02	-2.202
last_known_vaping_statusvaper	-7.590e-01	4.357e-01	8.566e+02	-1.742
treatment_reclassifiedAnti-IL17	4.056e-02	1.161e-01	1.257e+04	0.349
treatment_reclassifiedAnti-TNF	-9.808e-02	7.475e-02	1.363e+04	-1.312
treatment_reclassifiedJAK Inhibitor	1.629e-01	3.278e-01	6.679e+03	0.497
time_in_years	5.329e-02	2.881e-03	6.501e+02	18.501

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	6.19e-05 ***
hlab27statusNegative	0.736451
hlab27statusPositive	0.141679
age_at_onset	0.203155
diagnosisAxial SpA- nr-axSpA	1.78e-09 ***
treatment_order2	0.036192 *

```

treatment_order3          0.084808 .
treatment_order4          0.000366 ***
treatment_order5          0.002834 **
treatment_order6          0.002035 **
treatment_order7          0.004604 **
treatment_order8          0.000369 ***
treatment_order9          0.673067
treatment_order11         0.008444 **
last_known_smoking_statussex-smoker 0.313087
last_known_smoking_statusnever 0.722757
last_known_smoking_statussmoker 0.214862
last_known_vaping_statussex-vaper 0.001823 **
last_known_vaping_statusnever 0.027947 *
last_known_vaping_statusvaper 0.081882 .
treatment_reclassifiedAnti-IL17 0.726803
treatment_reclassifiedAnti-TNF 0.189490
treatment_reclassifiedJAK Inhibitor 0.619224
time_in_years              < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_basmi_full,
       model_treatment_gender_basmi_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basmi

Models:

model_treatment_gender_basmi_reduced: basmi_score ~ gender + hlab27status + age_at_onset + d

model_treatment_gender_basmi_full: basmi_score ~ gender + hlab27status + age_at_onset + diag

	np	AIC	BIC	logLik	deviance	Chisq	Df
model_treatment_gender_basmi_reduced	29	39040	39263	-19491	38982		
model_treatment_gender_basmi_full	32	39044	39290	-19490	38980	1.8893	3

Pr(>Chisq)

model_treatment_gender_basmi_reduced

model_treatment_gender_basmi_full 0.5957

```

anova(model_treatment_gender_basmi_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
--	--------	---------	-------	-------	---------	--------

gender	4.725	4.725	1	3624.2	9.7735	0.001784
hlab27status	1.949	0.974	2	864.2	2.0155	0.133885
age_at_onset	0.777	0.777	1	859.9	1.6065	0.205324
diagnosis	17.830	17.830	1	872.3	36.8795	1.874e-09
treatment_order	20.260	2.251	9	13270.3	4.6561	3.501e-06
last_known_smoking_status	1.348	0.449	3	860.2	0.9297	0.425787
last_known_vaping_status	5.260	1.753	3	853.7	3.6263	0.012761
treatment_reclassified	2.069	0.690	3	9044.9	1.4262	0.232993
time_in_years	165.145	165.145	1	648.1	341.5837	< 2.2e-16
gender:treatment_reclassified	0.915	0.305	3	7680.6	0.6309	0.594972

gender	**
hlab27status	
age_at_onset	
diagnosis	***
treatment_order	***
last_known_smoking_status	
last_known_vaping_status	*
treatment_reclassified	
time_in_years	***
gender:treatment_reclassified	

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

BASDAI Score analysis

lme4 code for treatment and diagnosis: BASDAI score

```
# Define the full and reduced models
model_treatment_diagnosis_bas dai_full <- lmer(
  bas dai ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_bas dai,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```

model_treatment_diagnosis_basdai_reduced <- lmer(
  basdai ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_basdai,
    control = lmerControl(optimizer = "bobyqa",
      optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_diagnosis_basdai_full, corr = FALSE))

```

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

Formula:

```

basdai ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
  diagnosis + time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_basdai

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 48655.4

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2855	-0.5995	-0.0696	0.5557	4.6933

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.04297	1.7444	
	time_in_years	0.01092	0.1045	-0.32
Residual		1.93293	1.3903	

Number of obs: 13111, groups: ttas_id, 649

Fixed effects:

	Estimate
(Intercept)	4.368e+00
genderMale	-4.504e-01
hlab27statusNegative	5.377e-01
hlab27statusPositive	1.265e-02
age_at_onset	8.750e-03

diagnosisAxial SpA- nr-axSpA	3.440e-01
treatment_order2	-9.619e-01
treatment_order3	-7.470e-01
treatment_order4	-7.148e-01
treatment_order5	-4.386e-01
treatment_order6	-2.842e-01
treatment_order7	-4.651e-01
treatment_order8	-1.653e-01
treatment_order9	-4.126e-02
treatment_order10	1.578e-01
treatment_order11	1.260e+00
treatment_order12	7.948e-01
treatment_order14	7.635e-01
treatment_order15	-1.905e-01
last_known_smoking_statussex-smoker	-2.776e-01
last_known_smoking_statusnever	-7.606e-01
last_known_smoking_statussmoker	7.144e-01
last_known_vaping_statussex-vaper	1.300e-01
last_known_vaping_statusnever	2.853e-01
last_known_vaping_statusvaper	9.461e-01
treatment_reclassifiedAnti-IL17	-1.386e+00
treatment_reclassifiedAnti-TNF	-1.362e+00
treatment_reclassifiedJAK Inhibitor	-2.113e+00
time_in_years	3.312e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.022e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	4.734e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.218e+00
	Std. Error
(Intercept)	3.278e-01
genderMale	1.492e-01
hlab27statusNegative	3.026e-01
hlab27statusPositive	2.480e-01
age_at_onset	7.371e-03
diagnosisAxial SpA- nr-axSpA	1.921e-01
treatment_order2	9.112e-02
treatment_order3	8.662e-02
treatment_order4	1.114e-01
treatment_order5	1.167e-01
treatment_order6	1.501e-01
treatment_order7	1.987e-01
treatment_order8	2.567e-01
treatment_order9	2.989e-01
treatment_order10	5.609e-01

treatment_order11	6.499e-01
treatment_order12	1.131e+00
treatment_order14	8.988e-01
treatment_order15	1.252e+00
last_known_smoking_statussex-smoker	3.004e-01
last_known_smoking_statusnever	3.024e-01
last_known_smoking_statussmoker	3.718e-01
last_known_vaping_statussex-vaper	6.560e-01
last_known_vaping_statusnever	2.974e-01
last_known_vaping_statusvaper	4.084e-01
treatment_reclassifiedAnti-IL17	1.181e-01
treatment_reclassifiedAnti-TNF	8.246e-02
treatment_reclassifiedJAK Inhibitor	3.761e-01
time_in_years	5.882e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.067e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.461e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	6.940e-01
	df
(Intercept)	6.259e+02
genderMale	5.899e+02
hlab27statusNegative	6.187e+02
hlab27statusPositive	6.273e+02
age_at_onset	5.960e+02
diagnosisAxial SpA- nr-axSpA	6.141e+02
treatment_order2	1.195e+04
treatment_order3	1.051e+04
treatment_order4	1.072e+04
treatment_order5	9.017e+03
treatment_order6	9.524e+03
treatment_order7	8.893e+03
treatment_order8	1.112e+04
treatment_order9	1.163e+04
treatment_order10	1.028e+04
treatment_order11	7.693e+03
treatment_order12	8.268e+03
treatment_order14	9.250e+02
treatment_order15	1.102e+03
last_known_smoking_statussex-smoker	5.594e+02
last_known_smoking_statusnever	5.621e+02
last_known_smoking_statussmoker	5.605e+02
last_known_vaping_statussex-vaper	5.708e+02
last_known_vaping_statusnever	5.644e+02
last_known_vaping_statusvaper	5.597e+02

treatment_reclassifiedAnti-IL17	1.155e+04
treatment_reclassifiedAnti-TNF	1.227e+04
treatment_reclassifiedJAK Inhibitor	6.609e+03
time_in_years	3.986e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	7.534e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	9.450e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.024e+04
	t value
(Intercept)	13.324
genderMale	-3.019
hlab27statusNegative	1.777
hlab27statusPositive	0.051
age_at_onset	1.187
diagnosisAxial SpA- nr-axSpA	1.791
treatment_order2	-10.556
treatment_order3	-8.624
treatment_order4	-6.416
treatment_order5	-3.760
treatment_order6	-1.894
treatment_order7	-2.341
treatment_order8	-0.644
treatment_order9	-0.138
treatment_order10	0.281
treatment_order11	1.939
treatment_order12	0.703
treatment_order14	0.849
treatment_order15	-0.152
last_known_smoking_statussex-smoker	-0.924
last_known_smoking_statusnever	-2.516
last_known_smoking_statussmoker	1.922
last_known_vaping_statussex-vaper	0.198
last_known_vaping_statusnever	0.959
last_known_vaping_statusvaper	2.317
treatment_reclassifiedAnti-IL17	-11.742
treatment_reclassifiedAnti-TNF	-16.523
treatment_reclassifiedJAK Inhibitor	-5.618
time_in_years	5.632
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.311
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3.240
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.756
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.002644 **

```

hlab27statusNegative      0.076098 .
hlab27statusPositive      0.959318
age_at_onset              0.235673
diagnosisAxial SpA- nr-axSpA 0.073742 .
treatment_order2          < 2e-16 ***
treatment_order3          < 2e-16 ***
treatment_order4          1.46e-10 ***
treatment_order5          0.000171 ***
treatment_order6          0.058274 .
treatment_order7          0.019247 *
treatment_order8          0.519584
treatment_order9          0.890225
treatment_order10         0.778497
treatment_order11         0.052597 .
treatment_order12         0.482048
treatment_order14         0.395834
treatment_order15         0.879116
last_known_smoking_statussex-smoker 0.355833
last_known_smoking_statusnever 0.012162 *
last_known_smoking_statussmoker 0.055171 .
last_known_vaping_statussex-vaper 0.843010
last_known_vaping_statusnever 0.337755
last_known_vaping_statusvaper 0.020879 *
treatment_reclassifiedAnti-IL17 < 2e-16 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.01e-08 ***
time_in_years             3.38e-08 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.189745
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF 0.001201 **
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.079150 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_basdai_reduced, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```

basdai ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_basdai

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 48666.6
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-4.2540	-0.5998	-0.0724	0.5549	4.6659

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.04005	1.7436	
	time_in_years	0.01087	0.1043	-0.32
Residual		1.93472	1.3909	

```
Number of obs: 13111, groups: ttas_id, 649
```

```
Fixed effects:
```

	Estimate	Std. Error	df	t value
(Intercept)	4.378e+00	3.278e-01	6.254e+02	13.356
genderMale	-4.511e-01	1.492e-01	5.894e+02	-3.024
hlab27statusNegative	5.345e-01	3.026e-01	6.183e+02	1.766
hlab27statusPositive	3.935e-04	2.480e-01	6.266e+02	0.002
age_at_onset	8.112e-03	7.369e-03	5.950e+02	1.101
diagnosisAxial SpA- nr-axSpA	4.598e-01	1.889e-01	5.823e+02	2.434
treatment_order2	-9.449e-01	9.102e-02	1.196e+04	-10.381
treatment_order3	-7.187e-01	8.625e-02	1.054e+04	-8.333
treatment_order4	-6.840e-01	1.108e-01	1.075e+04	-6.175
treatment_order5	-4.187e-01	1.164e-01	9.075e+03	-3.598
treatment_order6	-2.547e-01	1.493e-01	9.478e+03	-1.706
treatment_order7	-4.551e-01	1.975e-01	8.698e+03	-2.304
treatment_order8	-1.076e-01	2.562e-01	1.113e+04	-0.420
treatment_order9	2.093e-02	2.985e-01	1.169e+04	0.070
treatment_order10	1.358e-01	5.599e-01	1.024e+04	0.243
treatment_order11	1.264e+00	6.498e-01	7.674e+03	1.946
treatment_order12	8.146e-01	1.131e+00	8.277e+03	0.721
treatment_order14	7.831e-01	8.981e-01	9.225e+02	0.872
treatment_order15	-2.141e-01	1.251e+00	1.098e+03	-0.171
last_known_smoking_statussex-smoker	-2.857e-01	3.004e-01	5.585e+02	-0.951
last_known_smoking_statusnever	-7.681e-01	3.023e-01	5.614e+02	-2.540
last_known_smoking_statussmoker	6.966e-01	3.717e-01	5.596e+02	1.874
last_known_vaping_statussex-vaper	1.379e-01	6.560e-01	5.704e+02	0.210
last_known_vaping_statusnever	2.981e-01	2.973e-01	5.634e+02	1.003
last_known_vaping_statusvaper	9.594e-01	4.083e-01	5.590e+02	2.350
treatment_reclassifiedAnti-IL17	-1.343e+00	1.132e-01	1.156e+04	-11.867

```

treatment_reclassifiedAnti-TNF      -1.324e+00  8.145e-02  1.226e+04 -16.251
treatment_reclassifiedJAK Inhibitor -1.837e+00  3.202e-01  8.342e+03  -5.737
time_in_years                        3.277e-02  5.874e-03  3.966e+02   5.580
                                     Pr(>|t|)
(Intercept)                         < 2e-16 ***
genderMale                           0.002604 **
hlab27statusNegative                 0.077811 .
hlab27statusPositive                 0.998734
age_at_onset                         0.271380
diagnosisAxial SpA- nr-axSpA         0.015253 *
treatment_order2                     < 2e-16 ***
treatment_order3                     < 2e-16 ***
treatment_order4                     6.86e-10 ***
treatment_order5                     0.000322 ***
treatment_order6                     0.087996 .
treatment_order7                     0.021223 *
treatment_order8                     0.674473
treatment_order9                     0.944099
treatment_order10                    0.808322
treatment_order11                    0.051741 .
treatment_order12                    0.471235
treatment_order14                    0.383424
treatment_order15                    0.864181
last_known_smoking_statussex-smoker 0.341966
last_known_smoking_statusnever       0.011338 *
last_known_smoking_statussmoker      0.061438 .
last_known_vaping_statussex-vaper    0.833617
last_known_vaping_statusnever        0.316449
last_known_vaping_statusvaper        0.019135 *
treatment_reclassifiedAnti-IL17      < 2e-16 ***
treatment_reclassifiedAnti-TNF       < 2e-16 ***
treatment_reclassifiedJAK Inhibitor   9.99e-09 ***
time_in_years                        4.47e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_bas dai_full,
       model_treatment_diagnosis_bas dai_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_bas dai

Models:

model_treatment_diagnosis_basdai_reduced: basdai ~ gender + hlab27status + age_at_onset + di

model_treatment_diagnosis_basdai_full: basdai ~ gender + hlab27status + age_at_onset + diagn

	npars	AIC	BIC	logLik	deviance
model_treatment_diagnosis_basdai_reduced	33	48681	48928	-24308	48615
model_treatment_diagnosis_basdai_full	36	48674	48944	-24301	48602

Chisq Df Pr(>Chisq)

model_treatment_diagnosis_basdai_reduced

model_treatment_diagnosis_basdai_full 12.685 3 0.00537 **

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

```
anova(model_treatment_diagnosis_basdai_full, corr = FALSE)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value
gender	17.620	17.620	1	589.9	9.1155
hlab27status	12.926	6.463	2	607.6	3.3437
age_at_onset	2.724	2.724	1	596.0	1.4091
diagnosis	20.556	20.556	1	1988.3	10.6345
treatment_order	312.870	24.067	13	5903.5	12.4510
last_known_smoking_status	49.909	16.636	3	568.5	8.6068
last_known_vaping_status	11.488	3.829	3	566.4	1.9811
treatment_reclassified	262.807	87.602	3	10094.2	45.3209
time_in_years	61.301	61.301	1	398.6	31.7140
diagnosis:treatment_reclassified	24.502	8.167	3	9077.3	4.2254

Pr(>F)

gender	0.002644 **
hlab27status	0.035958 *
age_at_onset	0.235673
diagnosis	0.001129 **
treatment_order	< 2.2e-16 ***
last_known_smoking_status	1.354e-05 ***
last_known_vaping_status	0.115691
treatment_reclassified	< 2.2e-16 ***
time_in_years	3.378e-08 ***
diagnosis:treatment_reclassified	0.005412 **

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

lme4 code for treatment and gender: BASDAI score

```
# Define the full and reduced models
model_treatment_gender_basdai_full <- lmer(
  basdai ~ hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basdai,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_gender_basdai_reduced <- lmer(
  basdai ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basdai,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_treatment_gender_basdai_full, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: basdai ~ hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
  gender + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_basdai
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 48667.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.3030	-0.5992	-0.0721	0.5568	4.6477

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.05048	1.747	
	time_in_years	0.01082	0.104	-0.32
Residual		1.93481	1.391	

Number of obs: 13111, groups: ttas_id, 649

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.403e+00	3.287e-01	6.290e+02
hlab27statusNegative	5.345e-01	3.030e-01	6.180e+02
hlab27statusPositive	2.144e-03	2.482e-01	6.259e+02
age_at_onset	7.985e-03	7.378e-03	5.948e+02
diagnosisAxial SpA- nr-axSpA	4.588e-01	1.892e-01	5.820e+02
treatment_order2	-9.410e-01	9.107e-02	1.196e+04
treatment_order3	-7.130e-01	8.630e-02	1.051e+04
treatment_order4	-6.689e-01	1.112e-01	1.072e+04
treatment_order5	-4.083e-01	1.165e-01	9.036e+03
treatment_order6	-2.424e-01	1.496e-01	9.395e+03
treatment_order7	-4.178e-01	1.992e-01	8.679e+03
treatment_order8	-8.152e-02	2.568e-01	1.102e+04
treatment_order9	4.470e-02	2.990e-01	1.160e+04
treatment_order10	1.872e-01	5.623e-01	1.024e+04
treatment_order11	1.261e+00	6.553e-01	7.674e+03
treatment_order12	8.501e-01	1.131e+00	8.247e+03
treatment_order14	8.243e-01	8.979e-01	9.171e+02
treatment_order15	-2.097e-01	1.255e+00	1.115e+03
last_known_smoking_statussex-smoker	-2.849e-01	3.008e-01	5.586e+02
last_known_smoking_statusnever	-7.676e-01	3.028e-01	5.616e+02
last_known_smoking_statussmoker	6.945e-01	3.723e-01	5.600e+02
last_known_vaping_statussex-vaper	1.308e-01	6.569e-01	5.702e+02
last_known_vaping_statusnever	2.953e-01	2.978e-01	5.640e+02
last_known_vaping_statusvaper	9.559e-01	4.089e-01	5.592e+02
treatment_reclassifiedAnti-IL17	-1.301e+00	1.763e-01	9.088e+03
treatment_reclassifiedAnti-TNF	-1.427e+00	1.080e-01	1.160e+04
treatment_reclassifiedJAK Inhibitor	-1.950e+00	3.921e-01	6.838e+03
genderMale	-4.793e-01	1.509e-01	6.153e+02
time_in_years	3.255e-02	5.866e-03	3.960e+02
treatment_reclassifiedAnti-IL17:genderMale	-7.492e-02	2.008e-01	8.163e+03
treatment_reclassifiedAnti-TNF:genderMale	1.415e-01	9.885e-02	1.022e+04
treatment_reclassifiedJAK Inhibitor:genderMale	1.579e-01	6.496e-01	8.204e+03

	t value	Pr(> t)
(Intercept)	13.397	< 2e-16 ***
hlab27statusNegative	1.764	0.078188 .


```

hlab27statusPositive          0.009 0.993110
age_at_onset                  1.082 0.279592
diagnosisAxial SpA- nr-axSpA  2.425 0.015615 *
treatment_order2             -10.333 < 2e-16 ***
treatment_order3             -8.262 < 2e-16 ***
treatment_order4             -6.017 1.83e-09 ***
treatment_order5             -3.504 0.000461 ***
treatment_order6             -1.620 0.105272
treatment_order7             -2.097 0.036022 *
treatment_order8             -0.317 0.750902
treatment_order9              0.149 0.881165
treatment_order10            0.333 0.739253
treatment_order11            1.924 0.054423 .
treatment_order12            0.752 0.452209
treatment_order14            0.918 0.358842
treatment_order15           -0.167 0.867317
last_known_smoking_statussex-smoker -0.947 0.343959
last_known_smoking_statusnever -2.535 0.011514 *
last_known_smoking_statussmoker  1.865 0.062674 .
last_known_vaping_statussex-vaper  0.199 0.842263
last_known_vaping_statusnever  0.992 0.321826
last_known_vaping_statusvaper  2.338 0.019760 *
treatment_reclassifiedAnti-IL17 -7.384 1.68e-13 ***
treatment_reclassifiedAnti-TNF -13.216 < 2e-16 ***
treatment_reclassifiedJAK Inhibitor -4.975 6.70e-07 ***
genderMale                   -3.175 0.001573 **
time_in_years                 5.549 5.26e-08 ***
treatment_reclassifiedAnti-IL17:genderMale -0.373 0.709072
treatment_reclassifiedAnti-TNF:genderMale  1.431 0.152329
treatment_reclassifiedJAK Inhibitor:genderMale 0.243 0.807924
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_basdai_reduced, corr = FALSE))
```

```

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

```

```
Formula:
```

```

basdai ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)

```

```
Data: dataframe_sorted_and_reclassified_basdai
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 48666.6
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-4.2540	-0.5998	-0.0724	0.5549	4.6659

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.04005	1.7436	
	time_in_years	0.01087	0.1043	-0.32
Residual		1.93472	1.3909	

```
Number of obs: 13111, groups: ttas_id, 649
```

```
Fixed effects:
```

	Estimate	Std. Error	df	t value
(Intercept)	4.378e+00	3.278e-01	6.254e+02	13.356
genderMale	-4.511e-01	1.492e-01	5.894e+02	-3.024
hlab27statusNegative	5.345e-01	3.026e-01	6.183e+02	1.766
hlab27statusPositive	3.935e-04	2.480e-01	6.266e+02	0.002
age_at_onset	8.112e-03	7.369e-03	5.950e+02	1.101
diagnosisAxial SpA- nr-axSpA	4.598e-01	1.889e-01	5.823e+02	2.434
treatment_order2	-9.449e-01	9.102e-02	1.196e+04	-10.381
treatment_order3	-7.187e-01	8.625e-02	1.054e+04	-8.333
treatment_order4	-6.840e-01	1.108e-01	1.075e+04	-6.175
treatment_order5	-4.187e-01	1.164e-01	9.075e+03	-3.598
treatment_order6	-2.547e-01	1.493e-01	9.478e+03	-1.706
treatment_order7	-4.551e-01	1.975e-01	8.698e+03	-2.304
treatment_order8	-1.076e-01	2.562e-01	1.113e+04	-0.420
treatment_order9	2.093e-02	2.985e-01	1.169e+04	0.070
treatment_order10	1.358e-01	5.599e-01	1.024e+04	0.243
treatment_order11	1.264e+00	6.498e-01	7.674e+03	1.946
treatment_order12	8.146e-01	1.131e+00	8.277e+03	0.721
treatment_order14	7.831e-01	8.981e-01	9.225e+02	0.872
treatment_order15	-2.141e-01	1.251e+00	1.098e+03	-0.171
last_known_smoking_statussex-smoker	-2.857e-01	3.004e-01	5.585e+02	-0.951
last_known_smoking_statusnever	-7.681e-01	3.023e-01	5.614e+02	-2.540
last_known_smoking_statussmoker	6.966e-01	3.717e-01	5.596e+02	1.874
last_known_vaping_statussex-vaper	1.379e-01	6.560e-01	5.704e+02	0.210
last_known_vaping_statusnever	2.981e-01	2.973e-01	5.634e+02	1.003
last_known_vaping_statusvaper	9.594e-01	4.083e-01	5.590e+02	2.350
treatment_reclassifiedAnti-IL17	-1.343e+00	1.132e-01	1.156e+04	-11.867

```

treatment_reclassifiedAnti-TNF      -1.324e+00  8.145e-02  1.226e+04 -16.251
treatment_reclassifiedJAK Inhibitor -1.837e+00  3.202e-01  8.342e+03  -5.737
time_in_years                       3.277e-02  5.874e-03  3.966e+02   5.580
                                     Pr(>|t|)
(Intercept)                         < 2e-16 ***
genderMale                          0.002604 **
hlab27statusNegative                0.077811 .
hlab27statusPositive                0.998734
age_at_onset                       0.271380
diagnosisAxial SpA- nr-axSpA        0.015253 *
treatment_order2                    < 2e-16 ***
treatment_order3                    < 2e-16 ***
treatment_order4                    6.86e-10 ***
treatment_order5                    0.000322 ***
treatment_order6                    0.087996 .
treatment_order7                    0.021223 *
treatment_order8                    0.674473
treatment_order9                    0.944099
treatment_order10                   0.808322
treatment_order11                   0.051741 .
treatment_order12                   0.471235
treatment_order14                   0.383424
treatment_order15                   0.864181
last_known_smoking_statussex-smoker 0.341966
last_known_smoking_statusnever      0.011338 *
last_known_smoking_statussmoker     0.061438 .
last_known_vaping_statussex-vaper   0.833617
last_known_vaping_statusnever       0.316449
last_known_vaping_statusvaper       0.019135 *
treatment_reclassifiedAnti-IL17      < 2e-16 ***
treatment_reclassifiedAnti-TNF       < 2e-16 ***
treatment_reclassifiedJAK Inhibitor  9.99e-09 ***
time_in_years                       4.47e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_basdai_full,
       model_treatment_gender_basdai_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basdai

Models:

model_treatment_gender_basdai_reduced: basdai ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_gender_basdai_full: basdai ~ hlab27status + age_at_onset + diagnosis + treatment_order

	npar	AIC	BIC	logLik	deviance	Chisq
model_treatment_gender_basdai_reduced	33	48681	48928	-24308	48615	
model_treatment_gender_basdai_full	36	48684	48954	-24306	48612	2.7401

Df Pr(>Chisq)

model_treatment_gender_basdai_reduced		
model_treatment_gender_basdai_full	3	0.4335

```
anova(model_treatment_gender_basdai_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
hlab27status	13.21	6.607	2	606.7	3.4148	0.03351
age_at_onset	2.27	2.266	1	594.8	1.1712	0.27959
diagnosis	11.38	11.377	1	582.0	5.8802	0.01562
treatment_order	306.59	23.584	13	5887.4	12.1893	< 2.2e-16
last_known_smoking_status	49.25	16.418	3	567.8	8.4854	1.602e-05
last_known_vaping_status	11.65	3.882	3	565.9	2.0066	0.11194
treatment_reclassified	528.76	176.254	3	10399.7	91.0963	< 2.2e-16
gender	6.72	6.719	1	2358.2	3.4728	0.06251
time_in_years	59.58	59.580	1	396.0	30.7936	5.262e-08
treatment_reclassified:gender	5.33	1.776	3	8986.7	0.9182	0.43110

hlab27status	*
age_at_onset	
diagnosis	*
treatment_order	***
last_known_smoking_status	***
last_known_vaping_status	
treatment_reclassified	***
gender	.
time_in_years	***
treatment_reclassified:gender	

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

BASFI score

lme4 code for treatment and diagnosis: BASFI score

```
model_treatment_diagnosis_basfi_full <- lmer(  
  basfi ~ gender + hlab27status + age_at_onset +  
    diagnosis + treatment_order + last_known_smoking_status +  
    last_known_vaping_status +  
    treatment_reclassified * diagnosis +  
    time_in_years + (time_in_years | ttas_id),  
  data = dataframe_sorted_and_reclassified_basfi,  
  control = lmerControl(optimizer = "bobyqa",  
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_basfi_reduced <- lmer(  
  basfi ~ gender + hlab27status + age_at_onset +  
    diagnosis + treatment_order + last_known_smoking_status +  
    last_known_vaping_status +  
    treatment_reclassified +  
    time_in_years + (time_in_years | ttas_id),  
  data = dataframe_sorted_and_reclassified_basfi,  
  control = lmerControl(optimizer = "bobyqa",  
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_basfi_full, corr = FALSE))
```

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

Formula:

```
basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +  
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *  
  diagnosis + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 46702.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-----	----	--------	----	-----

-5.5751 -0.4953 -0.0247 0.4969 5.4870

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.87343	2.2076	
	time_in_years	0.01351	0.1162	-0.30
Residual		1.95090	1.3967	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate
(Intercept)	3.503e+00
genderMale	-7.193e-02
hlab27statusNegative	4.730e-01
hlab27statusPositive	-2.658e-01
age_at_onset	1.658e-02
diagnosisAxial SpA- nr-axSpA	-4.265e-01
treatment_order2	-9.905e-01
treatment_order3	-6.712e-01
treatment_order4	-7.469e-01
treatment_order5	-4.108e-01
treatment_order6	-2.559e-01
treatment_order7	-3.056e-01
treatment_order8	-3.865e-02
treatment_order9	-4.415e-02
treatment_order10	9.268e-01
treatment_order11	1.066e+00
treatment_order12	1.746e+00
treatment_order14	1.205e+00
treatment_order15	5.630e-01
last_known_smoking_statussex-smoker	1.625e-01
last_known_smoking_statusnever	-5.465e-01
last_known_smoking_statussmoker	5.492e-01
last_known_vaping_statussex-vaper	-5.536e-01
last_known_vaping_statusnever	-1.377e-01
last_known_vaping_statusvaper	7.249e-01
treatment_reclassifiedAnti-IL17	-9.002e-01
treatment_reclassifiedAnti-TNF	-8.530e-01
treatment_reclassifiedJAK Inhibitor	-2.078e+00
time_in_years	6.455e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.412e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	2.502e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.901e+00

	Std. Error
(Intercept)	4.096e-01
genderMale	1.872e-01
hlab27statusNegative	3.769e-01
hlab27statusPositive	3.087e-01
age_at_onset	9.254e-03
diagnosisAxial SpA- nr-axSpA	2.401e-01
treatment_order2	9.585e-02
treatment_order3	9.198e-02
treatment_order4	1.170e-01
treatment_order5	1.228e-01
treatment_order6	1.567e-01
treatment_order7	2.058e-01
treatment_order8	2.653e-01
treatment_order9	3.074e-01
treatment_order10	5.962e-01
treatment_order11	6.688e-01
treatment_order12	1.152e+00
treatment_order14	9.484e-01
treatment_order15	1.420e+00
last_known_smoking_statussex-smoker	3.780e-01
last_known_smoking_statusnever	3.803e-01
last_known_smoking_statussmoker	4.675e-01
last_known_vaping_statussex-vaper	8.230e-01
last_known_vaping_statusnever	3.744e-01
last_known_vaping_statusvaper	5.137e-01
treatment_reclassifiedAnti-IL17	1.216e-01
treatment_reclassifiedAnti-TNF	8.606e-02
treatment_reclassifiedJAK Inhibitor	3.874e-01
time_in_years	6.433e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.165e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.544e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	7.099e-01
	df
(Intercept)	6.245e+02
genderMale	5.967e+02
hlab27statusNegative	6.150e+02
hlab27statusPositive	6.230e+02
age_at_onset	6.006e+02
diagnosisAxial SpA- nr-axSpA	6.126e+02
treatment_order2	1.173e+04
treatment_order3	1.072e+04
treatment_order4	1.083e+04

treatment_order5	9.324e+03
treatment_order6	9.735e+03
treatment_order7	8.970e+03
treatment_order8	1.077e+04
treatment_order9	1.150e+04
treatment_order10	9.709e+03
treatment_order11	7.419e+03
treatment_order12	7.776e+03
treatment_order14	9.901e+02
treatment_order15	1.683e+03
last_known_smoking_statussex-smoker	5.751e+02
last_known_smoking_statusnever	5.768e+02
last_known_smoking_statussmoker	5.736e+02
last_known_vaping_statussex-vaper	5.792e+02
last_known_vaping_statusnever	5.786e+02
last_known_vaping_statusvaper	5.718e+02
treatment_reclassifiedAnti-IL17	1.121e+04
treatment_reclassifiedAnti-TNF	1.187e+04
treatment_reclassifiedJAK Inhibitor	6.748e+03
time_in_years	4.365e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	7.654e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	9.255e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	9.895e+03
	t value
(Intercept)	8.554
genderMale	-0.384
hlab27statusNegative	1.255
hlab27statusPositive	-0.861
age_at_onset	1.792
diagnosisAxial SpA- nr-axSpA	-1.776
treatment_order2	-10.333
treatment_order3	-7.298
treatment_order4	-6.386
treatment_order5	-3.346
treatment_order6	-1.633
treatment_order7	-1.485
treatment_order8	-0.146
treatment_order9	-0.144
treatment_order10	1.555
treatment_order11	1.593
treatment_order12	1.515
treatment_order14	1.270
treatment_order15	0.396

last_known_smoking_statussex-smoker	0.430
last_known_smoking_statusnever	-1.437
last_known_smoking_statussmoker	1.175
last_known_vaping_statussex-vaper	-0.673
last_known_vaping_statusnever	-0.368
last_known_vaping_statusvaper	1.411
treatment_reclassifiedAnti-IL17	-7.401
treatment_reclassifiedAnti-TNF	-9.913
treatment_reclassifiedJAK Inhibitor	-5.364
time_in_years	10.033
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.026
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.620
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.678
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.700924
hlab27statusNegative	0.210011
hlab27statusPositive	0.389475
age_at_onset	0.073664 .
diagnosisAxial SpA- nr-axSpA	0.076169 .
treatment_order2	< 2e-16 ***
treatment_order3	3.13e-13 ***
treatment_order4	1.78e-10 ***
treatment_order5	0.000823 ***
treatment_order6	0.102407
treatment_order7	0.137511
treatment_order8	0.884175
treatment_order9	0.885789
treatment_order10	0.120089
treatment_order11	0.111109
treatment_order12	0.129705
treatment_order14	0.204338
treatment_order15	0.691854
last_known_smoking_statussex-smoker	0.667398
last_known_smoking_statusnever	0.151276
last_known_smoking_statussmoker	0.240597
last_known_vaping_statussex-vaper	0.501411
last_known_vaping_statusnever	0.713116
last_known_vaping_statusvaper	0.158719
treatment_reclassifiedAnti-IL17	1.45e-13 ***
treatment_reclassifiedAnti-TNF	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	8.39e-08 ***
time_in_years	< 2e-16 ***

```

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17      0.042815 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF      0.105193
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.007413 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_basfi_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula:
basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_basfi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 46713.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5598	-0.4953	-0.0259	0.4953	5.4872

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.87834	2.2087	
	time_in_years	0.01352	0.1163	-0.30
Residual		1.95210	1.3972	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	3.507e+00	4.099e-01	6.242e+02	8.556
genderMale	-7.440e-02	1.874e-01	5.965e+02	-0.397
hlab27statusNegative	4.734e-01	3.773e-01	6.148e+02	1.255
hlab27statusPositive	-2.744e-01	3.089e-01	6.227e+02	-0.888
age_at_onset	1.619e-02	9.260e-03	6.000e+02	1.748
diagnosisAxial SpA- nr-axSpA	-3.453e-01	2.375e-01	5.905e+02	-1.454
treatment_order2	-9.782e-01	9.574e-02	1.174e+04	-10.218
treatment_order3	-6.532e-01	9.157e-02	1.073e+04	-7.134
treatment_order4	-7.212e-01	1.163e-01	1.085e+04	-6.202
treatment_order5	-3.848e-01	1.225e-01	9.374e+03	-3.142

treatment_order6	-2.553e-01	1.559e-01	9.705e+03	-1.638
treatment_order7	-3.392e-01	2.047e-01	8.813e+03	-1.657
treatment_order8	-9.764e-03	2.647e-01	1.077e+04	-0.037
treatment_order9	8.889e-03	3.069e-01	1.154e+04	0.029
treatment_order10	8.487e-01	5.952e-01	9.655e+03	1.426
treatment_order11	1.036e+00	6.689e-01	7.391e+03	1.549
treatment_order12	1.748e+00	1.153e+00	7.763e+03	1.516
treatment_order14	1.203e+00	9.487e-01	9.842e+02	1.268
treatment_order15	4.878e-01	1.421e+00	1.671e+03	0.343
last_known_smoking_statussex-smoker	1.436e-01	3.783e-01	5.747e+02	0.380
last_known_smoking_statusnever	-5.615e-01	3.807e-01	5.766e+02	-1.475
last_known_smoking_statussmoker	5.192e-01	4.678e-01	5.731e+02	1.110
last_known_vaping_statussex-vaper	-5.292e-01	8.237e-01	5.791e+02	-0.642
last_known_vaping_statusnever	-1.144e-01	3.747e-01	5.781e+02	-0.305
last_known_vaping_statusvaper	7.533e-01	5.141e-01	5.714e+02	1.465
treatment_reclassifiedAnti-IL17	-8.290e-01	1.167e-01	1.121e+04	-7.105
treatment_reclassifiedAnti-TNF	-8.339e-01	8.501e-02	1.188e+04	-9.809
treatment_reclassifiedJAK Inhibitor	-1.553e+00	3.289e-01	8.349e+03	-4.722
time_in_years	6.432e-02	6.436e-03	4.331e+02	9.994
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.69141			
hlab27statusNegative	0.21003			
hlab27statusPositive	0.37484			
age_at_onset	0.08091 .			
diagnosisAxial SpA- nr-axSpA	0.14645			
treatment_order2	< 2e-16 ***			
treatment_order3	1.04e-12 ***			
treatment_order4	5.79e-10 ***			
treatment_order5	0.00168 **			
treatment_order6	0.10146			
treatment_order7	0.09757 .			
treatment_order8	0.97058			
treatment_order9	0.97689			
treatment_order10	0.15390			
treatment_order11	0.12141			
treatment_order12	0.12944			
treatment_order14	0.20500			
treatment_order15	0.73138			
last_known_smoking_statussex-smoker	0.70440			
last_known_smoking_statusnever	0.14075			
last_known_smoking_statussmoker	0.26754			
last_known_vaping_statussex-vaper	0.52082			

```

last_known_vaping_statusnever      0.76014
last_known_vaping_statusvaper      0.14338
treatment_reclassifiedAnti-IL17     1.27e-12 ***
treatment_reclassifiedAnti-TNF      < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.37e-06 ***
time_in_years                      < 2e-16 ***
---

```

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

```

anova(model_treatment_diagnosis_basfi_full,
       model_treatment_diagnosis_basfi_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basfi

Models:

model_treatment_diagnosis_basfi_reduced: basfi ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_diagnosis_basfi_full: basfi ~ gender + hlab27status + age_at_onset + diagnosis

	npair	AIC	BIC	logLik	deviance	Chisq
model_treatment_diagnosis_basfi_reduced	33	46735	46980	-23334	46669	
model_treatment_diagnosis_basfi_full	36	46729	46997	-23329	46657	11.672

Df Pr(>Chisq)

model_treatment_diagnosis_basfi_reduced

model_treatment_diagnosis_basfi_full 3 0.008595 **

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

```

anova(model_treatment_diagnosis_basfi_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value
gender	0.288	0.288	1	596.7	0.1477
hlab27status	16.695	8.348	2	607.0	4.2789
age_at_onset	6.264	6.264	1	600.6	3.2106
diagnosis	1.547	1.547	1	1514.9	0.7930
treatment_order	311.309	23.947	13	6390.5	12.2747
last_known_smoking_status	27.426	9.142	3	580.1	4.6861
last_known_vaping_status	10.113	3.371	3	576.5	1.7279
treatment_reclassified	96.300	32.100	3	9891.5	16.4539
time_in_years	196.390	196.390	1	436.5	100.6662
diagnosis:treatment_reclassified	22.694	7.565	3	8969.0	3.8776

	Pr(>F)
gender	0.700924
hlab27status	0.014279 *
age_at_onset	0.073664 .
diagnosis	0.373349
treatment_order	< 2.2e-16 ***
last_known_smoking_status	0.003041 **
last_known_vaping_status	0.160116
treatment_reclassified	1.159e-10 ***
time_in_years	< 2.2e-16 ***
diagnosis:treatment_reclassified	0.008782 **

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

lme4 code for treatment and gender: BASFI score

```
model_treatment_gender_basfi_full <- lmer(
  basfi ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_gender_basfi_reduced <- lmer(
  basfi ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_gender_basfi_full, corr = FALSE))
```

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

```

lmerModLmerTest]
Formula:
basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
      gender + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_basfi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 46705.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5405	-0.4960	-0.0243	0.4962	5.4810

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.90403	2.2145	
	time_in_years	0.01342	0.1159	-0.30
Residual		1.95102	1.3968	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	3.544e+00	4.110e-01	6.270e+02
genderMale	-1.102e-01	1.891e-01	6.149e+02
hlab27statusNegative	4.718e-01	3.778e-01	6.149e+02
hlab27statusPositive	-2.724e-01	3.093e-01	6.224e+02
age_at_onset	1.603e-02	9.274e-03	6.002e+02
diagnosisAxial SpA- nr-axSpA	-3.520e-01	2.378e-01	5.907e+02
treatment_order2	-9.684e-01	9.575e-02	1.174e+04
treatment_order3	-6.397e-01	9.163e-02	1.071e+04
treatment_order4	-6.970e-01	1.167e-01	1.081e+04
treatment_order5	-3.650e-01	1.227e-01	9.335e+03
treatment_order6	-2.236e-01	1.562e-01	9.639e+03
treatment_order7	-2.478e-01	2.066e-01	8.765e+03
treatment_order8	5.756e-02	2.654e-01	1.068e+04
treatment_order9	7.551e-02	3.075e-01	1.148e+04
treatment_order10	9.097e-01	5.977e-01	9.703e+03
treatment_order11	9.301e-01	6.742e-01	7.440e+03
treatment_order12	1.826e+00	1.152e+00	7.754e+03
treatment_order14	1.299e+00	9.477e-01	9.823e+02
treatment_order15	3.686e-01	1.423e+00	1.703e+03
last_known_smoking_statussex-smoker	1.552e-01	3.789e-01	5.749e+02

last_known_smoking_statusnever	-5.552e-01	3.812e-01	5.769e+02
last_known_smoking_statussmoker	5.285e-01	4.686e-01	5.737e+02
last_known_vaping_statussex-vaper	-5.524e-01	8.249e-01	5.792e+02
last_known_vaping_statusnever	-1.277e-01	3.753e-01	5.787e+02
last_known_vaping_statusvaper	7.421e-01	5.149e-01	5.719e+02
treatment_reclassifiedAnti-IL17	-5.987e-01	1.832e-01	9.148e+03
treatment_reclassifiedAnti-TNF	-9.861e-01	1.146e-01	1.121e+04
treatment_reclassifiedJAK Inhibitor	-1.530e+00	4.048e-01	6.952e+03
time_in_years	6.375e-02	6.421e-03	4.348e+02
genderMale:treatment_reclassifiedAnti-IL17	-3.661e-01	2.075e-01	8.433e+03
genderMale:treatment_reclassifiedAnti-TNF	2.071e-01	1.053e-01	1.002e+04
genderMale:treatment_reclassifiedJAK Inhibitor	-3.805e-01	6.653e-01	8.205e+03
	t value	Pr(> t)	
(Intercept)	8.623	< 2e-16	***
genderMale	-0.583	0.560246	
hlab27statusNegative	1.249	0.212205	
hlab27statusPositive	-0.881	0.378840	
age_at_onset	1.729	0.084403	.
diagnosisAxial SpA- nr-axSpA	-1.480	0.139412	
treatment_order2	-10.114	< 2e-16	***
treatment_order3	-6.981	3.10e-12	***
treatment_order4	-5.971	2.44e-09	***
treatment_order5	-2.975	0.002936	**
treatment_order6	-1.432	0.152263	
treatment_order7	-1.200	0.230253	
treatment_order8	0.217	0.828277	
treatment_order9	0.246	0.806005	
treatment_order10	1.522	0.128000	
treatment_order11	1.379	0.167806	
treatment_order12	1.585	0.113108	
treatment_order14	1.371	0.170773	
treatment_order15	0.259	0.795582	
last_known_smoking_statussex-smoker	0.410	0.682215	
last_known_smoking_statusnever	-1.456	0.145833	
last_known_smoking_statussmoker	1.128	0.259906	
last_known_vaping_statussex-vaper	-0.670	0.503340	
last_known_vaping_statusnever	-0.340	0.733760	
last_known_vaping_statusvaper	1.441	0.150043	
treatment_reclassifiedAnti-IL17	-3.268	0.001086	**
treatment_reclassifiedAnti-TNF	-8.607	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-3.779	0.000159	***
time_in_years	9.928	< 2e-16	***
genderMale:treatment_reclassifiedAnti-IL17	-1.764	0.077697	.

```

genderMale:treatment_reclassifiedAnti-TNF      1.968 0.049099 *
genderMale:treatment_reclassifiedJAK Inhibitor -0.572 0.567454
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_basfi_reduced, corr = FALSE))
```

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

Formula:

```
basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 46713.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5598	-0.4953	-0.0259	0.4953	5.4872

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.87834	2.2087	
	time_in_years	0.01352	0.1163	-0.30
Residual		1.95210	1.3972	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	3.507e+00	4.099e-01	6.242e+02	8.556
genderMale	-7.440e-02	1.874e-01	5.965e+02	-0.397
hlab27statusNegative	4.734e-01	3.773e-01	6.148e+02	1.255
hlab27statusPositive	-2.744e-01	3.089e-01	6.227e+02	-0.888
age_at_onset	1.619e-02	9.260e-03	6.000e+02	1.748
diagnosisAxial SpA- nr-axSpA	-3.453e-01	2.375e-01	5.905e+02	-1.454
treatment_order2	-9.782e-01	9.574e-02	1.174e+04	-10.218
treatment_order3	-6.532e-01	9.157e-02	1.073e+04	-7.134
treatment_order4	-7.212e-01	1.163e-01	1.085e+04	-6.202
treatment_order5	-3.848e-01	1.225e-01	9.374e+03	-3.142
treatment_order6	-2.553e-01	1.559e-01	9.705e+03	-1.638

treatment_order7	-3.392e-01	2.047e-01	8.813e+03	-1.657
treatment_order8	-9.764e-03	2.647e-01	1.077e+04	-0.037
treatment_order9	8.889e-03	3.069e-01	1.154e+04	0.029
treatment_order10	8.487e-01	5.952e-01	9.655e+03	1.426
treatment_order11	1.036e+00	6.689e-01	7.391e+03	1.549
treatment_order12	1.748e+00	1.153e+00	7.763e+03	1.516
treatment_order14	1.203e+00	9.487e-01	9.842e+02	1.268
treatment_order15	4.878e-01	1.421e+00	1.671e+03	0.343
last_known_smoking_statussex-smoker	1.436e-01	3.783e-01	5.747e+02	0.380
last_known_smoking_statusnever	-5.615e-01	3.807e-01	5.766e+02	-1.475
last_known_smoking_statussmoker	5.192e-01	4.678e-01	5.731e+02	1.110
last_known_vaping_statussex-vaper	-5.292e-01	8.237e-01	5.791e+02	-0.642
last_known_vaping_statusnever	-1.144e-01	3.747e-01	5.781e+02	-0.305
last_known_vaping_statusvaper	7.533e-01	5.141e-01	5.714e+02	1.465
treatment_reclassifiedAnti-IL17	-8.290e-01	1.167e-01	1.121e+04	-7.105
treatment_reclassifiedAnti-TNF	-8.339e-01	8.501e-02	1.188e+04	-9.809
treatment_reclassifiedJAK Inhibitor	-1.553e+00	3.289e-01	8.349e+03	-4.722
time_in_years	6.432e-02	6.436e-03	4.331e+02	9.994
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.69141			
hlab27statusNegative	0.21003			
hlab27statusPositive	0.37484			
age_at_onset	0.08091 .			
diagnosisAxial SpA- nr-axSpA	0.14645			
treatment_order2	< 2e-16 ***			
treatment_order3	1.04e-12 ***			
treatment_order4	5.79e-10 ***			
treatment_order5	0.00168 **			
treatment_order6	0.10146			
treatment_order7	0.09757 .			
treatment_order8	0.97058			
treatment_order9	0.97689			
treatment_order10	0.15390			
treatment_order11	0.12141			
treatment_order12	0.12944			
treatment_order14	0.20500			
treatment_order15	0.73138			
last_known_smoking_statussex-smoker	0.70440			
last_known_smoking_statusnever	0.14075			
last_known_smoking_statussmoker	0.26754			
last_known_vaping_statussex-vaper	0.52082			
last_known_vaping_statusnever	0.76014			

```

last_known_vaping_statusvaper          0.14338
treatment_reclassifiedAnti-IL17         1.27e-12 ***
treatment_reclassifiedAnti-TNF           < 2e-16 ***
treatment_reclassifiedJAK Inhibitor      2.37e-06 ***
time_in_years                           < 2e-16 ***
---

```

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

```

anova(model_treatment_gender_basfi_full,
       model_treatment_gender_basfi_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basfi

Models:

model_treatment_gender_basfi_reduced: basfi ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_gender_basfi_full: basfi ~ gender + hlab27status + age_at_onset + diagnosis +

	npair	AIC	BIC	logLik	deviance	Chisq	Df
model_treatment_gender_basfi_reduced	33	46735	46980	-23334	46669		
model_treatment_gender_basfi_full	36	46730	46998	-23329	46658	10.533	3

Pr(>Chisq)

model_treatment_gender_basfi_reduced

model_treatment_gender_basfi_full 0.01454 *

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

```

anova(model_treatment_gender_basfi_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1.779	1.779	1	1814.8	0.9117	0.339795
hlab27status	16.894	8.447	2	606.7	4.3294	0.013585
age_at_onset	5.829	5.829	1	600.2	2.9879	0.084403
diagnosis	4.273	4.273	1	590.7	2.1903	0.139412
treatment_order	306.050	23.542	13	6384.4	12.0666	< 2.2e-16
last_known_smoking_status	27.146	9.049	3	579.9	4.6379	0.003249
last_known_vaping_status	10.241	3.414	3	576.6	1.7496	0.155738
treatment_reclassified	212.113	70.704	3	10243.7	36.2396	< 2.2e-16
time_in_years	192.317	192.317	1	434.8	98.5722	< 2.2e-16
gender:treatment_reclassified	20.583	6.861	3	9015.3	3.5166	0.014464

```

gender
hlab27status          *
age_at_onset          .
diagnosis
treatment_order       ***
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years          ***
gender:treatment_reclassified *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Patient Global Score

lme4 code for treatment and diagnosis: Patient Global Score

```

model_treatment_diagnosis_patient_global_full <- lmer(
  patient_global ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_patient_global,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_diagnosis_patient_global_reduced <- lmer(
  patient_global ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_patient_global,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_diagnosis_patient_global_full, corr = FALSE))

```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: patient_global ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * diagnosis + time_in_years + (time_in_years |
  ttas_id)
Data: dataframe_sorted_and_reclassified_patient_global
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 41625.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3109	-0.6236	-0.0894	0.5387	4.9028

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.30602	2.0751	
	time_in_years	0.01285	0.1134	-0.54
Residual		3.14457	1.7733	

Number of obs: 9908, groups: ttas_id, 646

Fixed effects:

	Estimate
(Intercept)	4.235e+00
genderMale	-3.561e-01
hlab27statusNegative	5.607e-01
hlab27statusPositive	7.102e-02
age_at_onset	1.021e-02
diagnosisAxial SpA- nr-axSpA	1.135e-01
treatment_order2	-7.990e-01
treatment_order3	-3.907e-01
treatment_order4	-4.323e-01
treatment_order5	-2.306e-01
treatment_order6	7.531e-02
treatment_order7	3.257e-01
treatment_order8	3.482e-01
treatment_order9	-3.652e-01
treatment_order10	9.850e-01
treatment_order11	1.904e+00
treatment_order12	2.073e+00
treatment_order14	1.756e+00
treatment_order15	1.571e+00

last_known_smoking_statussex-smoker	-3.387e-01
last_known_smoking_statusnever	-8.157e-01
last_known_smoking_statussmoker	3.630e-01
last_known_vaping_statussex-vaper	-3.990e-01
last_known_vaping_statusnever	3.934e-01
last_known_vaping_statusvaper	8.103e-01
treatment_reclassifiedAnti-IL17	-1.621e+00
treatment_reclassifiedAnti-TNF	-1.464e+00
treatment_reclassifiedJAK Inhibitor	-2.895e+00
time_in_years	3.519e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	8.225e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	2.454e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.444e+00
	Std. Error
(Intercept)	3.851e-01
genderMale	1.672e-01
hlab27statusNegative	3.500e-01
hlab27statusPositive	2.912e-01
age_at_onset	8.234e-03
diagnosisAxial SpA- nr-axSpA	2.192e-01
treatment_order2	1.317e-01
treatment_order3	1.218e-01
treatment_order4	1.599e-01
treatment_order5	1.688e-01
treatment_order6	2.101e-01
treatment_order7	2.783e-01
treatment_order8	3.640e-01
treatment_order9	4.235e-01
treatment_order10	7.522e-01
treatment_order11	8.593e-01
treatment_order12	1.415e+00
treatment_order14	1.048e+00
treatment_order15	1.630e+00
last_known_smoking_statussex-smoker	3.293e-01
last_known_smoking_statusnever	3.318e-01
last_known_smoking_statussmoker	4.079e-01
last_known_vaping_statussex-vaper	7.246e-01
last_known_vaping_statusnever	3.274e-01
last_known_vaping_statusvaper	4.502e-01
treatment_reclassifiedAnti-IL17	1.708e-01
treatment_reclassifiedAnti-TNF	1.210e-01
treatment_reclassifiedJAK Inhibitor	4.712e-01
time_in_years	7.120e-03

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.920e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.896e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.748e-01
	df
(Intercept)	5.735e+02
genderMale	5.080e+02
hlab27statusNegative	5.570e+02
hlab27statusPositive	5.639e+02
age_at_onset	5.093e+02
diagnosisAxial SpA- nr-axSpA	5.428e+02
treatment_order2	8.417e+03
treatment_order3	7.139e+03
treatment_order4	7.209e+03
treatment_order5	5.713e+03
treatment_order6	5.458e+03
treatment_order7	4.579e+03
treatment_order8	7.186e+03
treatment_order9	5.802e+03
treatment_order10	7.003e+03
treatment_order11	5.661e+03
treatment_order12	7.483e+03
treatment_order14	8.219e+02
treatment_order15	1.631e+03
last_known_smoking_statussex-smoker	4.697e+02
last_known_smoking_statusnever	4.733e+02
last_known_smoking_statussmoker	4.693e+02
last_known_vaping_statussex-vaper	4.858e+02
last_known_vaping_statusnever	4.775e+02
last_known_vaping_statusvaper	4.763e+02
treatment_reclassifiedAnti-IL17	7.454e+03
treatment_reclassifiedAnti-TNF	8.513e+03
treatment_reclassifiedJAK Inhibitor	5.397e+03
time_in_years	4.716e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.730e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	7.287e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.717e+03
	t value
(Intercept)	10.997
genderMale	-2.130
hlab27statusNegative	1.602
hlab27statusPositive	0.244
age_at_onset	1.240
diagnosisAxial SpA- nr-axSpA	0.518

treatment_order2	-6.066
treatment_order3	-3.207
treatment_order4	-2.704
treatment_order5	-1.366
treatment_order6	0.358
treatment_order7	1.170
treatment_order8	0.957
treatment_order9	-0.862
treatment_order10	1.309
treatment_order11	2.216
treatment_order12	1.464
treatment_order14	1.676
treatment_order15	0.964
last_known_smoking_statussex-smoker	-1.029
last_known_smoking_statusnever	-2.458
last_known_smoking_statussmoker	0.890
last_known_vaping_statussex-vaper	-0.551
last_known_vaping_statusnever	1.201
last_known_vaping_statusvaper	1.800
treatment_reclassifiedAnti-IL17	-9.492
treatment_reclassifiedAnti-TNF	-12.104
treatment_reclassifiedJAK Inhibitor	-6.145
time_in_years	4.943
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.098
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.294
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.651
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.03365 *
hlab27statusNegative	0.10968
hlab27statusPositive	0.80741
age_at_onset	0.21541
diagnosisAxial SpA- nr-axSpA	0.60490
treatment_order2	1.37e-09 ***
treatment_order3	0.00135 **
treatment_order4	0.00688 **
treatment_order5	0.17186
treatment_order6	0.72002
treatment_order7	0.24194
treatment_order8	0.33883
treatment_order9	0.38863
treatment_order10	0.19044
treatment_order11	0.02672 *

```

treatment_order12                0.14310
treatment_order14                0.09408 .
treatment_order15                0.33521
last_known_smoking_statussex-smoker 0.30416
last_known_smoking_statusnever    0.01431 *
last_known_smoking_statussmoker   0.37394
last_known_vaping_statussex-vaper 0.58216
last_known_vaping_statusnever     0.23018
last_known_vaping_statusvaper     0.07249 .
treatment_reclassifiedAnti-IL17    < 2e-16 ***
treatment_reclassifiedAnti-TNF     < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 8.57e-10 ***
time_in_years                     1.07e-06 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.03593 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF 0.19570
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.09875 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_patient_global_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: patient_global ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_patient_global
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 41632.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3185	-0.6256	-0.0896	0.5446	4.8892

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.30875	2.0758	
	time_in_years	0.01275	0.1129	-0.55
Residual		3.14751	1.7741	

Number of obs: 9908, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.238e+00	3.846e-01	5.741e+02	11.019
genderMale	-3.580e-01	1.669e-01	5.082e+02	-2.145
hlab27statusNegative	5.611e-01	3.495e-01	5.573e+02	1.605
hlab27statusPositive	5.814e-02	2.907e-01	5.631e+02	0.200
age_at_onset	9.823e-03	8.222e-03	5.096e+02	1.195
diagnosisAxial SpA- nr-axSpA	2.191e-01	2.121e-01	5.021e+02	1.033
treatment_order2	-7.859e-01	1.316e-01	8.416e+03	-5.973
treatment_order3	-3.685e-01	1.213e-01	7.199e+03	-3.038
treatment_order4	-4.074e-01	1.587e-01	7.249e+03	-2.567
treatment_order5	-1.993e-01	1.683e-01	5.748e+03	-1.184
treatment_order6	6.182e-02	2.089e-01	5.398e+03	0.296
treatment_order7	2.943e-01	2.762e-01	4.480e+03	1.066
treatment_order8	3.795e-01	3.632e-01	7.200e+03	1.045
treatment_order9	-3.120e-01	4.229e-01	5.828e+03	-0.738
treatment_order10	9.289e-01	7.503e-01	6.998e+03	1.238
treatment_order11	1.853e+00	8.585e-01	5.658e+03	2.159
treatment_order12	2.089e+00	1.415e+00	7.513e+03	1.476
treatment_order14	1.776e+00	1.045e+00	8.247e+02	1.699
treatment_order15	1.479e+00	1.627e+00	1.637e+03	0.909
last_known_smoking_statussex-smoker	-3.681e-01	3.286e-01	4.689e+02	-1.120
last_known_smoking_statusnever	-8.394e-01	3.312e-01	4.729e+02	-2.534
last_known_smoking_statussmoker	3.258e-01	4.072e-01	4.691e+02	0.800
last_known_vaping_statussex-vaper	-3.728e-01	7.236e-01	4.857e+02	-0.515
last_known_vaping_statusnever	4.249e-01	3.268e-01	4.771e+02	1.300
last_known_vaping_statusvaper	8.375e-01	4.494e-01	4.763e+02	1.863
treatment_reclassifiedAnti-IL17	-1.506e+00	1.621e-01	7.738e+03	-9.288
treatment_reclassifiedAnti-TNF	-1.438e+00	1.191e-01	8.548e+03	-12.075
treatment_reclassifiedJAK Inhibitor	-2.503e+00	4.037e-01	6.908e+03	-6.201
time_in_years	3.464e-02	7.101e-03	4.708e+02	4.878
Pr(> t)				
(Intercept)	< 2e-16 ***			
genderMale	0.03246 *			
hlab27statusNegative	0.10899			
hlab27statusPositive	0.84153			
age_at_onset	0.23277			
diagnosisAxial SpA- nr-axSpA	0.30215			
treatment_order2	2.42e-09 ***			
treatment_order3	0.00239 **			
treatment_order4	0.01029 *			
treatment_order5	0.23643			
treatment_order6	0.76730			

```

treatment_order7          0.28671
treatment_order8          0.29622
treatment_order9          0.46075
treatment_order10         0.21574
treatment_order11         0.03091 *
treatment_order12         0.13992
treatment_order14         0.08964 .
treatment_order15         0.36357
last_known_smoking_statussex-smoker 0.26318
last_known_smoking_statusnever 0.01159 *
last_known_smoking_statussmoker 0.42399
last_known_vaping_statussex-vaper 0.60665
last_known_vaping_statusnever 0.19419
last_known_vaping_statusvaper 0.06302 .
treatment_reclassifiedAnti-IL17 < 2e-16 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 5.95e-10 ***
time_in_years              1.47e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_patient_global_full,
       model_treatment_diagnosis_patient_global_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_patient_global

Models:

model_treatment_diagnosis_patient_global_reduced: patient_global ~ gender + hlab27status + age_

model_treatment_diagnosis_patient_global_full: patient_global ~ gender + hlab27status + age_

	npar	AIC	BIC	logLik
model_treatment_diagnosis_patient_global_reduced	33	41661	41898	-20797
model_treatment_diagnosis_patient_global_full	36	41659	41918	-20794
	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_patient_global_reduced	41595			
model_treatment_diagnosis_patient_global_full	41587	7.3963	3	0.06028

model_treatment_diagnosis_patient_global_reduced

model_treatment_diagnosis_patient_global_full .

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

```
anova(model_treatment_diagnosis_patient_global_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	14.267	14.267	1	508.0	4.5369	0.033651
hlab27status	15.070	7.535	2	536.6	2.3962	0.092039
age_at_onset	4.838	4.838	1	509.3	1.5385	0.215406
diagnosis	17.494	17.494	1	2069.0	5.5633	0.018433
treatment_order	244.507	18.808	13	4867.7	5.9812	3.654e-11
last_known_smoking_status	49.793	16.598	3	478.1	5.2782	0.001373
last_known_vaping_status	15.177	5.059	3	483.4	1.6088	0.186464
treatment_reclassified	314.334	104.778	3	8244.7	33.3203	< 2.2e-16
time_in_years	76.824	76.824	1	471.6	24.4308	1.072e-06
diagnosis:treatment_reclassified	23.384	7.795	3	7617.5	2.4788	0.059301

```

gender          *
hlab27status    .
age_at_onset
diagnosis       *
treatment_order ***
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years   ***
diagnosis:treatment_reclassified .
---

```

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

lme4 code for treatment and gender: Patient Global Score

```

model_treatment_gender_patient_global_full <- lmer(
  patient_global ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_patient_global,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_patient_global_reduced <- lmer(
  patient_global ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_patient_global,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_treatment_gender_patient_global_full, corr = FALSE))

```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: patient_global ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * gender + time_in_years + (time_in_years |
  ttas_id)
Data: dataframe_sorted_and_reclassified_patient_global
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 41631.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3176	-0.6203	-0.0917	0.5448	4.8623

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.32448	2.0795	
	time_in_years	0.01273	0.1128	-0.55
Residual		3.14728	1.7741	

Number of obs: 9908, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.295e+00	3.866e-01	5.837e+02
genderMale	-4.242e-01	1.722e-01	5.707e+02
hlab27statusNegative	5.586e-01	3.498e-01	5.578e+02
hlab27statusPositive	5.780e-02	2.908e-01	5.628e+02
age_at_onset	9.593e-03	8.233e-03	5.105e+02

diagnosisAxial SpA- nr-axSpA	2.173e-01	2.124e-01	5.029e+02
treatment_order2	-7.813e-01	1.317e-01	8.429e+03
treatment_order3	-3.595e-01	1.214e-01	7.168e+03
treatment_order4	-3.856e-01	1.595e-01	7.176e+03
treatment_order5	-1.836e-01	1.685e-01	5.713e+03
treatment_order6	8.074e-02	2.094e-01	5.346e+03
treatment_order7	3.347e-01	2.781e-01	4.511e+03
treatment_order8	4.087e-01	3.643e-01	7.100e+03
treatment_order9	-2.916e-01	4.234e-01	5.784e+03
treatment_order10	9.742e-01	7.541e-01	6.987e+03
treatment_order11	1.899e+00	8.671e-01	5.563e+03
treatment_order12	2.110e+00	1.415e+00	7.500e+03
treatment_order14	1.796e+00	1.045e+00	8.236e+02
treatment_order15	1.531e+00	1.633e+00	1.661e+03
last_known_smoking_statussex-smoker	-3.673e-01	3.291e-01	4.697e+02
last_known_smoking_statusnever	-8.328e-01	3.317e-01	4.737e+02
last_known_smoking_statussmoker	3.249e-01	4.079e-01	4.701e+02
last_known_vaping_statussex-vaper	-3.874e-01	7.244e-01	4.860e+02
last_known_vaping_statusnever	4.161e-01	3.273e-01	4.782e+02
last_known_vaping_statusvaper	8.290e-01	4.501e-01	4.771e+02
treatment_reclassifiedAnti-IL17	-1.540e+00	2.393e-01	6.361e+03
treatment_reclassifiedAnti-TNF	-1.601e+00	1.520e-01	8.176e+03
treatment_reclassifiedJAK Inhibitor	-2.600e+00	4.923e-01	5.810e+03
time_in_years	3.434e-02	7.100e-03	4.717e+02
genderMale:treatment_reclassifiedAnti-IL17	2.768e-02	2.751e-01	5.329e+03
genderMale:treatment_reclassifiedAnti-TNF	2.351e-01	1.364e-01	7.027e+03
genderMale:treatment_reclassifiedJAK Inhibitor	3.329e-02	8.074e-01	6.736e+03
t value Pr(> t)			
(Intercept)	11.111	< 2e-16	***
genderMale	-2.463	0.01407	*
hlab27statusNegative	1.597	0.11091	
hlab27statusPositive	0.199	0.84254	
age_at_onset	1.165	0.24447	
diagnosisAxial SpA- nr-axSpA	1.023	0.30670	
treatment_order2	-5.935	3.06e-09	***
treatment_order3	-2.961	0.00308	**
treatment_order4	-2.418	0.01563	*
treatment_order5	-1.089	0.27600	
treatment_order6	0.386	0.69985	
treatment_order7	1.204	0.22877	
treatment_order8	1.122	0.26198	
treatment_order9	-0.689	0.49100	
treatment_order10	1.292	0.19644	

treatment_order11	2.190	0.02856	*
treatment_order12	1.491	0.13606	
treatment_order14	1.718	0.08614	.
treatment_order15	0.938	0.34850	
last_known_smoking_statussex-smoker	-1.116	0.26500	
last_known_smoking_statusnever	-2.511	0.01238	*
last_known_smoking_statussmoker	0.797	0.42611	
last_known_vaping_statussex-vaper	-0.535	0.59303	
last_known_vaping_statusnever	1.271	0.20434	
last_known_vaping_statusvaper	1.842	0.06611	.
treatment_reclassifiedAnti-IL17	-6.435	1.33e-10	***
treatment_reclassifiedAnti-TNF	-10.533	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-5.281	1.33e-07	***
time_in_years	4.837	1.79e-06	***
genderMale:treatment_reclassifiedAnti-IL17	0.101	0.91987	
genderMale:treatment_reclassifiedAnti-TNF	1.723	0.08485	.
genderMale:treatment_reclassifiedJAK Inhibitor	0.041	0.96711	

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

```
print(summary(model_treatment_gender_patient_global_reduced, corr = FALSE))
```

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

Formula: patient_global ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_patient_global

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 41632.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3185	-0.6256	-0.0896	0.5446	4.8892

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.30875	2.0758	
	time_in_years	0.01275	0.1129	-0.55
Residual		3.14751	1.7741	

Number of obs: 9908, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.238e+00	3.846e-01	5.741e+02	11.019
genderMale	-3.580e-01	1.669e-01	5.082e+02	-2.145
hlab27statusNegative	5.611e-01	3.495e-01	5.573e+02	1.605
hlab27statusPositive	5.814e-02	2.907e-01	5.631e+02	0.200
age_at_onset	9.823e-03	8.222e-03	5.096e+02	1.195
diagnosisAxial SpA- nr-axSpA	2.191e-01	2.121e-01	5.021e+02	1.033
treatment_order2	-7.859e-01	1.316e-01	8.416e+03	-5.973
treatment_order3	-3.685e-01	1.213e-01	7.199e+03	-3.038
treatment_order4	-4.074e-01	1.587e-01	7.249e+03	-2.567
treatment_order5	-1.993e-01	1.683e-01	5.748e+03	-1.184
treatment_order6	6.182e-02	2.089e-01	5.398e+03	0.296
treatment_order7	2.943e-01	2.762e-01	4.480e+03	1.066
treatment_order8	3.795e-01	3.632e-01	7.200e+03	1.045
treatment_order9	-3.120e-01	4.229e-01	5.828e+03	-0.738
treatment_order10	9.289e-01	7.503e-01	6.998e+03	1.238
treatment_order11	1.853e+00	8.585e-01	5.658e+03	2.159
treatment_order12	2.089e+00	1.415e+00	7.513e+03	1.476
treatment_order14	1.776e+00	1.045e+00	8.247e+02	1.699
treatment_order15	1.479e+00	1.627e+00	1.637e+03	0.909
last_known_smoking_statussex-smoker	-3.681e-01	3.286e-01	4.689e+02	-1.120
last_known_smoking_statusnever	-8.394e-01	3.312e-01	4.729e+02	-2.534
last_known_smoking_statussmoker	3.258e-01	4.072e-01	4.691e+02	0.800
last_known_vaping_statussex-vaper	-3.728e-01	7.236e-01	4.857e+02	-0.515
last_known_vaping_statusnever	4.249e-01	3.268e-01	4.771e+02	1.300
last_known_vaping_statusvaper	8.375e-01	4.494e-01	4.763e+02	1.863
treatment_reclassifiedAnti-IL17	-1.506e+00	1.621e-01	7.738e+03	-9.288
treatment_reclassifiedAnti-TNF	-1.438e+00	1.191e-01	8.548e+03	-12.075
treatment_reclassifiedJAK Inhibitor	-2.503e+00	4.037e-01	6.908e+03	-6.201
time_in_years	3.464e-02	7.101e-03	4.708e+02	4.878

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.03246 *
hlab27statusNegative	0.10899
hlab27statusPositive	0.84153
age_at_onset	0.23277
diagnosisAxial SpA- nr-axSpA	0.30215
treatment_order2	2.42e-09 ***
treatment_order3	0.00239 **
treatment_order4	0.01029 *
treatment_order5	0.23643

```

treatment_order6          0.76730
treatment_order7          0.28671
treatment_order8          0.29622
treatment_order9          0.46075
treatment_order10         0.21574
treatment_order11         0.03091 *
treatment_order12         0.13992
treatment_order14         0.08964 .
treatment_order15         0.36357
last_known_smoking_statussex-smoker 0.26318
last_known_smoking_statusnever 0.01159 *
last_known_smoking_statussmoker 0.42399
last_known_vaping_statussex-vaper 0.60665
last_known_vaping_statusnever 0.19419
last_known_vaping_statusvaper 0.06302 .
treatment_reclassifiedAnti-IL17 < 2e-16 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 5.95e-10 ***
time_in_years             1.47e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_patient_global_full,
       model_treatment_gender_patient_global_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_patient_global

Models:

model_treatment_gender_patient_global_reduced: patient_global ~ gender + hlab27status + age_at_

model_treatment_gender_patient_global_full: patient_global ~ gender + hlab27status + age_at_

	npar	AIC	BIC	logLik	deviance
model_treatment_gender_patient_global_reduced	33	41661	41898	-20797	41595
model_treatment_gender_patient_global_full	36	41663	41923	-20796	41591

	Chisq	Df	Pr(>Chisq)
model_treatment_gender_patient_global_reduced			
model_treatment_gender_patient_global_full	3.1187	3	0.3737

```

anova(model_treatment_gender_patient_global_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	5.35	5.355	1	2156.2	1.7015	0.192236	
hlab27status	15.61	7.806	2	537.1	2.4802	0.084687	.
age_at_onset	4.27	4.273	1	510.5	1.3577	0.244474	
diagnosis	3.30	3.295	1	502.9	1.0469	0.306704	
treatment_order	241.02	18.540	13	4864.6	5.8907	6.016e-11	***
last_known_smoking_status	48.86	16.286	3	478.4	5.1746	0.001583	**
last_known_vaping_status	15.82	5.275	3	484.0	1.6760	0.171272	
treatment_reclassified	519.47	173.158	3	7505.9	55.0182	< 2.2e-16	***
time_in_years	73.63	73.628	1	471.7	23.3941	1.790e-06	***
gender:treatment_reclassified	9.82	3.274	3	6442.9	1.0403	0.373417	

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

Back Pain At Night

lme4 code for treatment and diagnosis: Back Pain At Night

```
model_treatment_diagnosis_back_pain_at_night_full <- lmer(
  back_pain_at_night ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_at_night,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_back_pain_at_night_reduced <- lmer(
  back_pain_at_night ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_at_night,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_back_pain_at_night_full, corr = FALSE))
```

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

Formula:

```
back_pain_at_night ~ gender + hlab27status + age_at_onset + diagnosis +  
  treatment_order + last_known_smoking_status + last_known_vaping_status +  
  treatment_reclassified * diagnosis + time_in_years + (time_in_years |  
  ttas_id)
```

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 38261.5

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3967	-0.6051	-0.1122	0.5219	5.0609

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	5.226	2.2861	
	time_in_years	0.012	0.1096	-0.56
Residual		3.176	1.7823	

Number of obs: 9040, groups: ttas_id, 646

Fixed effects:

	Estimate
(Intercept)	4.018e+00
genderMale	-3.454e-01
hlab27statusNegative	9.070e-01
hlab27statusPositive	3.321e-01
age_at_onset	4.059e-03
diagnosisAxial SpA- nr-axSpA	7.343e-02
treatment_order2	-1.160e+00
treatment_order3	-7.970e-01
treatment_order4	-7.631e-01
treatment_order5	-3.704e-01
treatment_order6	-5.030e-01
treatment_order7	-2.861e-01
treatment_order8	5.357e-01
treatment_order9	-5.211e-01
treatment_order10	9.412e-01

treatment_order11	1.769e+00
treatment_order12	1.503e+00
treatment_order14	1.904e+00
treatment_order15	1.549e+00
last_known_smoking_statussex-smoker	-5.127e-01
last_known_smoking_statusnever	-1.002e+00
last_known_smoking_statussmoker	6.595e-01
last_known_vaping_statussex-vaper	3.563e-01
last_known_vaping_statusnever	4.669e-01
last_known_vaping_statusvaper	1.116e+00
treatment_reclassifiedAnti-IL17	-1.266e+00
treatment_reclassifiedAnti-TNF	-1.158e+00
treatment_reclassifiedJAK Inhibitor	-2.593e+00
time_in_years	5.157e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	7.610e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-4.360e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.389e+00
	Std. Error
(Intercept)	4.129e-01
genderMale	1.801e-01
hlab27statusNegative	3.751e-01
hlab27statusPositive	3.103e-01
age_at_onset	8.918e-03
diagnosisAxial SpA- nr-axSpA	2.382e-01
treatment_order2	1.381e-01
treatment_order3	1.285e-01
treatment_order4	1.668e-01
treatment_order5	1.740e-01
treatment_order6	2.162e-01
treatment_order7	2.844e-01
treatment_order8	3.677e-01
treatment_order9	4.279e-01
treatment_order10	7.623e-01
treatment_order11	8.638e-01
treatment_order12	1.422e+00
treatment_order14	1.036e+00
treatment_order15	1.615e+00
last_known_smoking_statussex-smoker	3.554e-01
last_known_smoking_statusnever	3.582e-01
last_known_smoking_statussmoker	4.421e-01
last_known_vaping_statussex-vaper	7.830e-01
last_known_vaping_statusnever	3.537e-01
last_known_vaping_statusvaper	4.883e-01

treatment_reclassifiedAnti-IL17	1.753e-01
treatment_reclassifiedAnti-TNF	1.274e-01
treatment_reclassifiedJAK Inhibitor	4.726e-01
time_in_years	7.136e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.031e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.957e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.788e-01
	df
(Intercept)	6.175e+02
genderMale	5.478e+02
hlab27statusNegative	5.960e+02
hlab27statusPositive	5.915e+02
age_at_onset	5.560e+02
diagnosisAxial SpA- nr-axSpA	5.926e+02
treatment_order2	7.559e+03
treatment_order3	6.396e+03
treatment_order4	6.620e+03
treatment_order5	5.114e+03
treatment_order6	4.854e+03
treatment_order7	4.205e+03
treatment_order8	6.425e+03
treatment_order9	5.031e+03
treatment_order10	6.574e+03
treatment_order11	5.674e+03
treatment_order12	7.301e+03
treatment_order14	9.026e+02
treatment_order15	1.766e+03
last_known_smoking_statussex-smoker	5.053e+02
last_known_smoking_statusnever	5.098e+02
last_known_smoking_statussmoker	5.115e+02
last_known_vaping_statussex-vaper	5.223e+02
last_known_vaping_statusnever	5.159e+02
last_known_vaping_statusvaper	5.201e+02
treatment_reclassifiedAnti-IL17	6.785e+03
treatment_reclassifiedAnti-TNF	7.571e+03
treatment_reclassifiedJAK Inhibitor	5.161e+03
time_in_years	4.939e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.800e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	7.177e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.035e+03
	t value
(Intercept)	9.732
genderMale	-1.918

hlab27statusNegative	2.418
hlab27statusPositive	1.070
age_at_onset	0.455
diagnosisAxial SpA- nr-axSpA	0.308
treatment_order2	-8.394
treatment_order3	-6.204
treatment_order4	-4.574
treatment_order5	-2.129
treatment_order6	-2.326
treatment_order7	-1.006
treatment_order8	1.457
treatment_order9	-1.218
treatment_order10	1.235
treatment_order11	2.048
treatment_order12	1.057
treatment_order14	1.839
treatment_order15	0.959
last_known_smoking_statussex-smoker	-1.442
last_known_smoking_statusnever	-2.799
last_known_smoking_statussmoker	1.492
last_known_vaping_statussex-vaper	0.455
last_known_vaping_statusnever	1.320
last_known_vaping_statusvaper	2.286
treatment_reclassifiedAnti-IL17	-7.221
treatment_reclassifiedAnti-TNF	-9.092
treatment_reclassifiedJAK Inhibitor	-5.486
time_in_years	0.723
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.888
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-0.223
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.581
Pr(> t)	
(Intercept)	< 2e-16 ***
genderMale	0.05569 .
hlab27statusNegative	0.01590 *
hlab27statusPositive	0.28495
age_at_onset	0.64915
diagnosisAxial SpA- nr-axSpA	0.75794
treatment_order2	< 2e-16 ***
treatment_order3	5.85e-10 ***
treatment_order4	4.88e-06 ***
treatment_order5	0.03331 *
treatment_order6	0.02005 *
treatment_order7	0.31443

treatment_order8	0.14519
treatment_order9	0.22334
treatment_order10	0.21700
treatment_order11	0.04059 *
treatment_order12	0.29063
treatment_order14	0.06626 .
treatment_order15	0.33755
last_known_smoking_statussex-smoker	0.14982
last_known_smoking_statusnever	0.00533 **
last_known_smoking_statussmoker	0.13639
last_known_vaping_statussex-vaper	0.64928
last_known_vaping_statusnever	0.18741
last_known_vaping_statusvaper	0.02264 *
treatment_reclassifiedAnti-IL17	5.72e-13 ***
treatment_reclassifiedAnti-TNF	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	4.31e-08 ***
time_in_years	0.47020
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.05906 .
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.82374
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.11396

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

```
print(summary(model_treatment_diagnosis_back_pain_at_night_reduced, corr = FALSE))
```

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

Formula:

```
back_pain_at_night ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 38268.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.3951	-0.6040	-0.1106	0.5185	5.0624

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
--------	------	----------	----------	------

```

ttas_id (Intercept)    5.22472  2.286
                    time_in_years 0.01189  0.109   -0.56
Residual                3.17940  1.783
Number of obs: 9040, groups: ttas_id, 646

```

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.021e+00	4.124e-01	6.177e+02	9.751
genderMale	-3.483e-01	1.799e-01	5.478e+02	-1.937
hlab27statusNegative	9.123e-01	3.746e-01	5.960e+02	2.436
hlab27statusPositive	3.265e-01	3.097e-01	5.904e+02	1.054
age_at_onset	3.949e-03	8.905e-03	5.558e+02	0.443
diagnosisAxial SpA- nr-axSpA	1.071e-01	2.305e-01	5.498e+02	0.464
treatment_order2	-1.157e+00	1.380e-01	7.557e+03	-8.381
treatment_order3	-7.923e-01	1.281e-01	6.461e+03	-6.187
treatment_order4	-7.504e-01	1.656e-01	6.657e+03	-4.532
treatment_order5	-3.402e-01	1.735e-01	5.142e+03	-1.961
treatment_order6	-5.388e-01	2.150e-01	4.811e+03	-2.506
treatment_order7	-3.452e-01	2.822e-01	4.129e+03	-1.223
treatment_order8	5.308e-01	3.669e-01	6.449e+03	1.447
treatment_order9	-4.920e-01	4.272e-01	5.054e+03	-1.152
treatment_order10	8.615e-01	7.603e-01	6.581e+03	1.133
treatment_order11	1.705e+00	8.630e-01	5.677e+03	1.975
treatment_order12	1.498e+00	1.422e+00	7.330e+03	1.053
treatment_order14	1.901e+00	1.033e+00	9.106e+02	1.840
treatment_order15	1.440e+00	1.612e+00	1.781e+03	0.894
last_known_smoking_statussex-smoker	-5.427e-01	3.548e-01	5.044e+02	-1.530
last_known_smoking_statusnever	-1.027e+00	3.576e-01	5.093e+02	-2.871
last_known_smoking_statussmoker	6.199e-01	4.413e-01	5.110e+02	1.405
last_known_vaping_statussex-vaper	3.898e-01	7.820e-01	5.221e+02	0.499
last_known_vaping_statusnever	4.976e-01	3.531e-01	5.153e+02	1.409
last_known_vaping_statusvaper	1.152e+00	4.875e-01	5.198e+02	2.362
treatment_reclassifiedAnti-IL17	-1.158e+00	1.665e-01	7.034e+03	-6.957
treatment_reclassifiedAnti-TNF	-1.163e+00	1.251e-01	7.615e+03	-9.294
treatment_reclassifiedJAK Inhibitor	-2.174e+00	4.058e-01	6.471e+03	-5.358
time_in_years	4.797e-03	7.113e-03	4.941e+02	0.674

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.05332 .
hlab27statusNegative	0.01515 *
hlab27statusPositive	0.29214
age_at_onset	0.65763
diagnosisAxial SpA- nr-axSpA	0.64249

```

treatment_order2          < 2e-16 ***
treatment_order3          6.51e-10 ***
treatment_order4          5.94e-06 ***
treatment_order5           0.04997 *
treatment_order6           0.01224 *
treatment_order7           0.22127
treatment_order8           0.14808
treatment_order9           0.24951
treatment_order10          0.25718
treatment_order11          0.04829 *
treatment_order12          0.29216
treatment_order14          0.06604 .
treatment_order15          0.37167
last_known_smoking_statussex-smoker 0.12673
last_known_smoking_statusnever 0.00426 **
last_known_smoking_statussmoker 0.16073
last_known_vaping_statussex-vaper 0.61834
last_known_vaping_statusnever 0.15929
last_known_vaping_statusvaper 0.01853 *
treatment_reclassifiedAnti-IL17 3.80e-12 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 8.70e-08 ***
time_in_years              0.50036
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_back_pain_at_night_full,
       model_treatment_diagnosis_back_pain_at_night_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Models:

model_treatment_diagnosis_back_pain_at_night_reduced: back_pain_at_night ~ gender + hlab27sta

model_treatment_diagnosis_back_pain_at_night_full: back_pain_at_night ~ gender + hlab27statu

	npar	AIC	BIC	logLik
model_treatment_diagnosis_back_pain_at_night_reduced	33	38299	38533	-19116
model_treatment_diagnosis_back_pain_at_night_full	36	38298	38554	-19113
		deviance	Chisq	Df
model_treatment_diagnosis_back_pain_at_night_reduced		38233		
model_treatment_diagnosis_back_pain_at_night_full		38226	6.5007	3

Pr(>Chisq)


```

model_treatment_diagnosis_back_pain_at_night_reduced
model_treatment_diagnosis_back_pain_at_night_full      0.08964 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
anova(model_treatment_diagnosis_back_pain_at_night_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	11.68	11.679	1	547.8	3.6769	0.05569
hlab27status	22.69	11.343	2	576.6	3.5710	0.02875
age_at_onset	0.66	0.658	1	556.0	0.2072	0.64915
diagnosis	10.67	10.673	1	1975.8	3.3600	0.06695
treatment_order	365.59	28.122	13	4775.9	8.8534	< 2.2e-16
last_known_smoking_status	75.75	25.251	3	514.8	7.9494	3.438e-05
last_known_vaping_status	16.86	5.619	3	523.6	1.7689	0.15207
treatment_reclassified	221.80	73.934	3	7774.1	23.2759	5.407e-15
time_in_years	1.66	1.659	1	493.9	0.5223	0.47020
diagnosis:treatment_reclassified	20.78	6.926	3	7412.6	2.1804	0.08814

```

gender          .
hlab27status    *
age_at_onset
diagnosis       .
treatment_order ***
last_known_smoking_status ***
last_known_vaping_status
treatment_reclassified ***
time_in_years
diagnosis:treatment_reclassified .

```

```

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

```

lme4 code for treatment and gender: Back Pain At Night

```

model_treatment_gender_back_pain_at_night_full <- lmer(
  back_pain_at_night ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +

```

```

treatment_reclassified * gender +
time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_at_night,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_back_pain_at_night_reduced <- lmer(
  back_pain_at_night ~ gender + hlab27status + age_at_onset +
  diagnosis + treatment_order + last_known_smoking_status +
  last_known_vaping_status +
  treatment_reclassified +
  time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_at_night,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_gender_back_pain_at_night_full, corr = FALSE))

```

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

Formula:

```

back_pain_at_night ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * gender + time_in_years + (time_in_years |
  ttas_id)

```

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 38267.5

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-3.3859	-0.6042	-0.1118	0.5202	5.0481

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	5.22233	2.2852	
	time_in_years	0.01184	0.1088	-0.56
Residual		3.18045	1.7834	

Number of obs: 9040, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.043e+00	4.140e-01	6.279e+02
genderMale	-3.700e-01	1.852e-01	6.129e+02
hlab27statusNegative	9.027e-01	3.744e-01	5.964e+02
hlab27statusPositive	3.239e-01	3.095e-01	5.904e+02
age_at_onset	3.920e-03	8.904e-03	5.565e+02
diagnosisAxial SpA- nr-axSpA	1.047e-01	2.304e-01	5.499e+02
treatment_order2	-1.151e+00	1.381e-01	7.554e+03
treatment_order3	-7.860e-01	1.281e-01	6.437e+03
treatment_order4	-7.308e-01	1.663e-01	6.609e+03
treatment_order5	-3.316e-01	1.737e-01	5.116e+03
treatment_order6	-5.284e-01	2.154e-01	4.767e+03
treatment_order7	-2.988e-01	2.838e-01	4.176e+03
treatment_order8	5.704e-01	3.680e-01	6.365e+03
treatment_order9	-4.719e-01	4.276e-01	5.016e+03
treatment_order10	9.216e-01	7.643e-01	6.572e+03
treatment_order11	1.618e+00	8.716e-01	5.576e+03
treatment_order12	1.544e+00	1.423e+00	7.323e+03
treatment_order14	1.950e+00	1.033e+00	9.103e+02
treatment_order15	1.333e+00	1.618e+00	1.806e+03
last_known_smoking_statussex-smoker	-5.400e-01	3.548e-01	5.053e+02
last_known_smoking_statusnever	-1.025e+00	3.576e-01	5.102e+02
last_known_smoking_statussmoker	6.211e-01	4.414e-01	5.120e+02
last_known_vaping_statussex-vaper	3.760e-01	7.818e-01	5.226e+02
last_known_vaping_statusnever	4.915e-01	3.532e-01	5.165e+02
last_known_vaping_statusvaper	1.158e+00	4.875e-01	5.204e+02
treatment_reclassifiedAnti-IL17	-9.999e-01	2.445e-01	5.835e+03
treatment_reclassifiedAnti-TNF	-1.243e+00	1.589e-01	7.337e+03
treatment_reclassifiedJAK Inhibitor	-2.295e+00	4.939e-01	5.484e+03
time_in_years	4.566e-03	7.107e-03	4.941e+02
genderMale:treatment_reclassifiedAnti-IL17	-2.601e-01	2.799e-01	5.005e+03
genderMale:treatment_reclassifiedAnti-TNF	1.131e-01	1.441e-01	6.060e+03
genderMale:treatment_reclassifiedJAK Inhibitor	2.018e-01	8.088e-01	6.401e+03
	t value	Pr(> t)	
(Intercept)	9.767	< 2e-16 ***	
genderMale	-1.997	0.04622 *	
hlab27statusNegative	2.411	0.01622 *	
hlab27statusPositive	1.047	0.29567	
age_at_onset	0.440	0.65993	
diagnosisAxial SpA- nr-axSpA	0.455	0.64963	
treatment_order2	-8.338	< 2e-16 ***	
treatment_order3	-6.135	9.04e-10 ***	

treatment_order4	-4.395	1.13e-05	***
treatment_order5	-1.909	0.05628	.
treatment_order6	-2.453	0.01420	*
treatment_order7	-1.053	0.29255	
treatment_order8	1.550	0.12118	
treatment_order9	-1.104	0.26981	
treatment_order10	1.206	0.22794	
treatment_order11	1.856	0.06346	.
treatment_order12	1.085	0.27787	
treatment_order14	1.887	0.05943	.
treatment_order15	0.824	0.41017	
last_known_smoking_statussex-smoker	-1.522	0.12868	
last_known_smoking_statusnever	-2.865	0.00434	**
last_known_smoking_statussmoker	1.407	0.16001	
last_known_vaping_statussex-vaper	0.481	0.63073	
last_known_vaping_statusnever	1.392	0.16464	
last_known_vaping_statusvaper	2.375	0.01789	*
treatment_reclassifiedAnti-IL17	-4.090	4.38e-05	***
treatment_reclassifiedAnti-TNF	-7.826	5.72e-15	***
treatment_reclassifiedJAK Inhibitor	-4.648	3.43e-06	***
time_in_years	0.642	0.52086	
genderMale:treatment_reclassifiedAnti-IL17	-0.929	0.35287	
genderMale:treatment_reclassifiedAnti-TNF	0.785	0.43261	
genderMale:treatment_reclassifiedJAK Inhibitor	0.250	0.80297	

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

```
print(summary(model_treatment_gender_back_pain_at_night_reduced, corr = FALSE))
```

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

Formula:

```
back_pain_at_night ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 38268.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-----	----	--------	----	-----

-3.3951 -0.6040 -0.1106 0.5185 5.0624

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	5.22472	2.286	
	time_in_years	0.01189	0.109	-0.56
Residual		3.17940	1.783	

Number of obs: 9040, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.021e+00	4.124e-01	6.177e+02	9.751
genderMale	-3.483e-01	1.799e-01	5.478e+02	-1.937
hlab27statusNegative	9.123e-01	3.746e-01	5.960e+02	2.436
hlab27statusPositive	3.265e-01	3.097e-01	5.904e+02	1.054
age_at_onset	3.949e-03	8.905e-03	5.558e+02	0.443
diagnosisAxial SpA- nr-axSpA	1.071e-01	2.305e-01	5.498e+02	0.464
treatment_order2	-1.157e+00	1.380e-01	7.557e+03	-8.381
treatment_order3	-7.923e-01	1.281e-01	6.461e+03	-6.187
treatment_order4	-7.504e-01	1.656e-01	6.657e+03	-4.532
treatment_order5	-3.402e-01	1.735e-01	5.142e+03	-1.961
treatment_order6	-5.388e-01	2.150e-01	4.811e+03	-2.506
treatment_order7	-3.452e-01	2.822e-01	4.129e+03	-1.223
treatment_order8	5.308e-01	3.669e-01	6.449e+03	1.447
treatment_order9	-4.920e-01	4.272e-01	5.054e+03	-1.152
treatment_order10	8.615e-01	7.603e-01	6.581e+03	1.133
treatment_order11	1.705e+00	8.630e-01	5.677e+03	1.975
treatment_order12	1.498e+00	1.422e+00	7.330e+03	1.053
treatment_order14	1.901e+00	1.033e+00	9.106e+02	1.840
treatment_order15	1.440e+00	1.612e+00	1.781e+03	0.894
last_known_smoking_statussex-smoker	-5.427e-01	3.548e-01	5.044e+02	-1.530
last_known_smoking_statusnever	-1.027e+00	3.576e-01	5.093e+02	-2.871
last_known_smoking_statussmoker	6.199e-01	4.413e-01	5.110e+02	1.405
last_known_vaping_statussex-vaper	3.898e-01	7.820e-01	5.221e+02	0.499
last_known_vaping_statusnever	4.976e-01	3.531e-01	5.153e+02	1.409
last_known_vaping_statusvaper	1.152e+00	4.875e-01	5.198e+02	2.362
treatment_reclassifiedAnti-IL17	-1.158e+00	1.665e-01	7.034e+03	-6.957
treatment_reclassifiedAnti-TNF	-1.163e+00	1.251e-01	7.615e+03	-9.294
treatment_reclassifiedJAK Inhibitor	-2.174e+00	4.058e-01	6.471e+03	-5.358
time_in_years	4.797e-03	7.113e-03	4.941e+02	0.674

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.05332 .

hlab27statusNegative	0.01515 *
hlab27statusPositive	0.29214
age_at_onset	0.65763
diagnosisAxial SpA- nr-axSpA	0.64249
treatment_order2	< 2e-16 ***
treatment_order3	6.51e-10 ***
treatment_order4	5.94e-06 ***
treatment_order5	0.04997 *
treatment_order6	0.01224 *
treatment_order7	0.22127
treatment_order8	0.14808
treatment_order9	0.24951
treatment_order10	0.25718
treatment_order11	0.04829 *
treatment_order12	0.29216
treatment_order14	0.06604 .
treatment_order15	0.37167
last_known_smoking_statussex-smoker	0.12673
last_known_smoking_statusnever	0.00426 **
last_known_smoking_statussmoker	0.16073
last_known_vaping_statussex-vaper	0.61834
last_known_vaping_statusnever	0.15929
last_known_vaping_statusvaper	0.01853 *
treatment_reclassifiedAnti-IL17	3.80e-12 ***
treatment_reclassifiedAnti-TNF	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	8.70e-08 ***
time_in_years	0.50036

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

```
anova(model_treatment_gender_back_pain_at_night_full,
       model_treatment_gender_back_pain_at_night_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_back_pain_at_night

Models:

model_treatment_gender_back_pain_at_night_reduced: back_pain_at_night ~ gender + hlab27status

model_treatment_gender_back_pain_at_night_full: back_pain_at_night ~ gender + hlab27status +

	npar	AIC	BIC	logLik
model_treatment_gender_back_pain_at_night_reduced	33	38299	38533	-19116
model_treatment_gender_back_pain_at_night_full	36	38302	38558	-19115

	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_gender_back_pain_at_night_reduced	38233			
model_treatment_gender_back_pain_at_night_full	38230	2.0861	3	0.5547

```
anova(model_treatment_gender_back_pain_at_night_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	5.29	5.289	1	2048.4	1.6630	0.19735
hlab27status	22.79	11.393	2	576.7	3.5821	0.02844 *
age_at_onset	0.62	0.616	1	556.5	0.1938	0.65993
diagnosis	0.66	0.657	1	549.9	0.2066	0.64963
treatment_order	362.82	27.909	13	4777.9	8.7751	< 2.2e-16 ***
last_known_smoking_status	75.56	25.188	3	515.1	7.9195	3.583e-05 ***
last_known_vaping_status	18.19	6.064	3	524.1	1.9066	0.12748
treatment_reclassified	306.51	102.171	3	6887.7	32.1247	< 2.2e-16 ***
time_in_years	1.31	1.313	1	494.1	0.4128	0.52086
gender:treatment_reclassified	6.53	2.177	3	5944.5	0.6845	0.56140

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

Back Pain Anytime

lme4 code for treatment and diagnosis: Back Pain Anytime

```
model_treatment_diagnosis_back_pain_anytime_full <- lmer(
  back_pain_anytime ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_anytime,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_back_pain_anytime_reduced <- lmer(
  back_pain_anytime ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
```

```

last_known_vaping_status +
treatment_reclassified +
time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_back_pain_anytime,
    control = lmerControl(optimizer = "bobyqa",
                          optCtrl = list(maxfun = 2e5)))

```

```
print(summary(model_treatment_diagnosis_back_pain_anytime_full, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```

back_pain_anytime ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * diagnosis + time_in_years + (time_in_years |
  ttas_id)

```

Data: dataframe_sorted_and_reclassified_back_pain_anytime

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 42107.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5423	-0.6152	-0.1048	0.5318	4.8051

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.49139	2.1193	
	time_in_years	0.01302	0.1141	-0.48
Residual		3.10254	1.7614	

Number of obs: 10040, groups: ttas_id, 646

Fixed effects:

	Estimate
(Intercept)	4.374e+00
genderMale	-4.010e-01
hlab27statusNegative	9.609e-01
hlab27statusPositive	4.371e-01
age_at_onset	1.933e-03
diagnosisAxial SpA- nr-axSpA	2.520e-01
treatment_order2	-1.183e+00

treatment_order3	-8.997e-01
treatment_order4	-8.583e-01
treatment_order5	-5.540e-01
treatment_order6	-5.978e-01
treatment_order7	-3.224e-01
treatment_order8	3.508e-01
treatment_order9	-9.636e-01
treatment_order10	6.732e-01
treatment_order11	1.676e+00
treatment_order14	9.643e-01
treatment_order15	-2.937e-01
last_known_smoking_statussex-smoker	-5.028e-01
last_known_smoking_statusnever	-1.049e+00
last_known_smoking_statussmoker	3.539e-01
last_known_vaping_statussex-vaper	2.271e-01
last_known_vaping_statusnever	4.152e-01
last_known_vaping_statusvaper	1.072e+00
treatment_reclassifiedAnti-IL17	-1.308e+00
treatment_reclassifiedAnti-TNF	-1.305e+00
treatment_reclassifiedJAK Inhibitor	-2.572e+00
time_in_years	1.901e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.792e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.771e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.356e+00
Std. Error	
(Intercept)	4.042e-01
genderMale	1.764e-01
hlab27statusNegative	3.678e-01
hlab27statusPositive	3.065e-01
age_at_onset	8.659e-03
diagnosisAxial SpA- nr-axSpA	2.285e-01
treatment_order2	1.299e-01
treatment_order3	1.206e-01
treatment_order4	1.588e-01
treatment_order5	1.667e-01
treatment_order6	2.090e-01
treatment_order7	2.875e-01
treatment_order8	3.625e-01
treatment_order9	4.224e-01
treatment_order10	7.472e-01
treatment_order11	8.642e-01
treatment_order14	1.062e+00
treatment_order15	1.642e+00

last_known_smoking_statussex-smoker	3.485e-01
last_known_smoking_statusnever	3.509e-01
last_known_smoking_statussmoker	4.310e-01
last_known_vaping_statussex-vaper	7.641e-01
last_known_vaping_statusnever	3.460e-01
last_known_vaping_statusvaper	4.753e-01
treatment_reclassifiedAnti-IL17	1.708e-01
treatment_reclassifiedAnti-TNF	1.190e-01
treatment_reclassifiedJAK Inhibitor	4.728e-01
time_in_years	7.246e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.956e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.898e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.736e-01
	df
(Intercept)	5.975e+02
genderMale	5.330e+02
hlab27statusNegative	5.815e+02
hlab27statusPositive	5.924e+02
age_at_onset	5.313e+02
diagnosisAxial SpA- nr-axSpA	5.553e+02
treatment_order2	8.592e+03
treatment_order3	7.456e+03
treatment_order4	7.457e+03
treatment_order5	5.942e+03
treatment_order6	5.725e+03
treatment_order7	4.563e+03
treatment_order8	7.231e+03
treatment_order9	5.944e+03
treatment_order10	6.971e+03
treatment_order11	5.307e+03
treatment_order14	8.040e+02
treatment_order15	1.575e+03
last_known_smoking_statussex-smoker	4.944e+02
last_known_smoking_statusnever	4.974e+02
last_known_smoking_statussmoker	4.928e+02
last_known_vaping_statussex-vaper	5.085e+02
last_known_vaping_statusnever	5.012e+02
last_known_vaping_statusvaper	4.988e+02
treatment_reclassifiedAnti-IL17	7.580e+03
treatment_reclassifiedAnti-TNF	8.713e+03
treatment_reclassifiedJAK Inhibitor	5.521e+03
time_in_years	4.980e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.715e+03

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	7.373e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.734e+03
	t value
(Intercept)	10.822
genderMale	-2.273
hlab27statusNegative	2.612
hlab27statusPositive	1.426
age_at_onset	0.223
diagnosisAxial SpA- nr-axSpA	1.103
treatment_order2	-9.102
treatment_order3	-7.463
treatment_order4	-5.405
treatment_order5	-3.324
treatment_order6	-2.861
treatment_order7	-1.121
treatment_order8	0.968
treatment_order9	-2.281
treatment_order10	0.901
treatment_order11	1.939
treatment_order14	0.908
treatment_order15	-0.179
last_known_smoking_statussex-smoker	-1.443
last_known_smoking_statusnever	-2.990
last_known_smoking_statussmoker	0.821
last_known_vaping_statussex-vaper	0.297
last_known_vaping_statusnever	1.200
last_known_vaping_statusvaper	2.255
treatment_reclassifiedAnti-IL17	-7.658
treatment_reclassifiedAnti-TNF	-10.971
treatment_reclassifiedJAK Inhibitor	-5.439
time_in_years	2.624
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.211
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.933
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.552
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.023417 *
hlab27statusNegative	0.009226 **
hlab27statusPositive	0.154300
age_at_onset	0.823413
diagnosisAxial SpA- nr-axSpA	0.270613
treatment_order2	< 2e-16 ***
treatment_order3	9.43e-14 ***

treatment_order4	6.68e-08 ***
treatment_order5	0.000892 ***
treatment_order6	0.004243 **
treatment_order7	0.262141
treatment_order8	0.333166
treatment_order9	0.022585 *
treatment_order10	0.367591
treatment_order11	0.052564 .
treatment_order14	0.364353
treatment_order15	0.858088
last_known_smoking_statussex-smoker	0.149743
last_known_smoking_statusnever	0.002927 **
last_known_smoking_statussmoker	0.411998
last_known_vaping_statussex-vaper	0.766434
last_known_vaping_statusnever	0.230758
last_known_vaping_statusvaper	0.024563 *
treatment_reclassifiedAnti-IL17	2.12e-14 ***
treatment_reclassifiedAnti-TNF	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	5.58e-08 ***
time_in_years	0.008961 **
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.225756
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.350790
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.120681

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

```
print(summary(model_treatment_diagnosis_back_pain_anytime_reduced, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```
back_pain_anytime ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_back_pain_anytime

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 42111.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5472	-0.6172	-0.1042	0.5323	4.7971

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.4946	2.1200	
	time_in_years	0.0129	0.1136	-0.48
Residual		3.1042	1.7619	

Number of obs: 10040, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.377e+00	4.038e-01	5.981e+02	10.840
genderMale	-4.024e-01	1.762e-01	5.333e+02	-2.283
hlab27statusNegative	9.613e-01	3.675e-01	5.820e+02	2.616
hlab27statusPositive	4.286e-01	3.060e-01	5.920e+02	1.400
age_at_onset	1.653e-03	8.650e-03	5.315e+02	0.191
diagnosisAxial SpA- nr-axSpA	3.202e-01	2.224e-01	5.195e+02	1.440
treatment_order2	-1.173e+00	1.298e-01	8.596e+03	-9.037
treatment_order3	-8.847e-01	1.200e-01	7.523e+03	-7.370
treatment_order4	-8.327e-01	1.576e-01	7.502e+03	-5.283
treatment_order5	-5.329e-01	1.662e-01	5.996e+03	-3.206
treatment_order6	-5.998e-01	2.077e-01	5.670e+03	-2.887
treatment_order7	-3.550e-01	2.848e-01	4.486e+03	-1.246
treatment_order8	3.757e-01	3.617e-01	7.247e+03	1.039
treatment_order9	-9.199e-01	4.217e-01	5.982e+03	-2.181
treatment_order10	6.166e-01	7.451e-01	6.975e+03	0.828
treatment_order11	1.651e+00	8.633e-01	5.314e+03	1.913
treatment_order14	9.723e-01	1.060e+00	8.103e+02	0.918
treatment_order15	-3.535e-01	1.639e+00	1.587e+03	-0.216
last_known_smoking_statussex-smoker	-5.221e-01	3.480e-01	4.938e+02	-1.500
last_known_smoking_statusnever	-1.065e+00	3.505e-01	4.972e+02	-3.038
last_known_smoking_statussmoker	3.284e-01	4.305e-01	4.926e+02	0.763
last_known_vaping_statussex-vaper	2.408e-01	7.633e-01	5.086e+02	0.316
last_known_vaping_statusnever	4.369e-01	3.455e-01	5.009e+02	1.264
last_known_vaping_statusvaper	1.089e+00	4.748e-01	4.990e+02	2.294
treatment_reclassifiedAnti-IL17	-1.240e+00	1.621e-01	7.837e+03	-7.649
treatment_reclassifiedAnti-TNF	-1.289e+00	1.173e-01	8.718e+03	-10.994
treatment_reclassifiedJAK Inhibitor	-2.202e+00	4.043e-01	7.020e+03	-5.448
time_in_years	1.857e-02	7.224e-03	4.997e+02	2.570

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.02281 *
hlab27statusNegative	0.00913 **
hlab27statusPositive	0.16193

```

age_at_onset                0.84856
diagnosisAxial SpA- nr-axSpA 0.15049
treatment_order2            < 2e-16 ***
treatment_order3            1.89e-13 ***
treatment_order4            1.31e-07 ***
treatment_order5            0.00135 **
treatment_order6            0.00390 **
treatment_order7            0.21276
treatment_order8            0.29901
treatment_order9            0.02921 *
treatment_order10           0.40796
treatment_order11           0.05583 .
treatment_order14           0.35912
treatment_order15           0.82925
last_known_smoking_statussex-smoker 0.13419
last_known_smoking_statusnever 0.00251 **
last_known_smoking_statussmoker 0.44592
last_known_vaping_statussex-vaper 0.75251
last_known_vaping_statusnever 0.20666
last_known_vaping_statusvaper 0.02220 *
treatment_reclassifiedAnti-IL17 2.26e-14 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 5.28e-08 ***
time_in_years               0.01045 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_back_pain_anytime_full,
       model_treatment_diagnosis_back_pain_anytime_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_back_pain_anytime

Models:

model_treatment_diagnosis_back_pain_anytime_reduced: back_pain_anytime ~ gender + hlab27status

model_treatment_diagnosis_back_pain_anytime_full: back_pain_anytime ~ gender + hlab27status +

	npar	AIC	BIC	logLik
model_treatment_diagnosis_back_pain_anytime_reduced	32	42137	42368	-21036
model_treatment_diagnosis_back_pain_anytime_full	35	42139	42391	-21034

	deviance	Chisq	Df
model_treatment_diagnosis_back_pain_anytime_reduced	42073		
model_treatment_diagnosis_back_pain_anytime_full	42069	3.9965	3

```

                                Pr(>Chisq)
model_treatment_diagnosis_back_pain_anytime_reduced
model_treatment_diagnosis_back_pain_anytime_full      0.2618

```

```
anova(model_treatment_diagnosis_back_pain_anytime_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	16.03	16.031	1	533.0	5.1670	0.0234167
hlab27status	23.44	11.719	2	560.0	3.7774	0.0234683
age_at_onset	0.15	0.155	1	531.3	0.0498	0.8234130
diagnosis	17.04	17.038	1	1984.8	5.4915	0.0192075
treatment_order	396.58	33.048	12	4689.1	10.6520	< 2.2e-16
last_known_smoking_status	63.92	21.308	3	503.2	6.8680	0.0001533
last_known_vaping_status	16.44	5.480	3	506.3	1.7664	0.1526155
treatment_reclassified	253.59	84.529	3	8271.9	27.2450	< 2.2e-16
time_in_years	21.36	21.360	1	498.0	6.8846	0.0089611
diagnosis:treatment_reclassified	12.52	4.172	3	7646.1	1.3447	0.2579040

```

gender          *
hlab27status    *
age_at_onset
diagnosis       *
treatment_order ***
last_known_smoking_status ***
last_known_vaping_status
treatment_reclassified ***
time_in_years   **
diagnosis:treatment_reclassified
---

```

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

lme4 code for treatment and gender: Back Pain Anytime

```

model_treatment_gender_back_pain_anytime_full <- lmer(
  back_pain_anytime ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +

```

```

time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_anytime,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_back_pain_anytime_reduced <- lmer(
  back_pain_anytime ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_back_pain_anytime,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_gender_back_pain_anytime_full, corr = FALSE))

```

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

Formula:

```

back_pain_anytime ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * gender + time_in_years + (time_in_years |
    ttas_id)

```

Data: dataframe_sorted_and_reclassified_back_pain_anytime

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 42113.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5464	-0.6162	-0.1042	0.5324	4.7920

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.49674	2.1206	
	time_in_years	0.01291	0.1136	-0.48
Residual		3.10503	1.7621	

Number of obs: 10040, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.387e+00	4.052e-01	6.057e+02
genderMale	-4.149e-01	1.805e-01	5.857e+02
hlab27statusNegative	9.615e-01	3.676e-01	5.818e+02
hlab27statusPositive	4.288e-01	3.061e-01	5.913e+02
age_at_onset	1.595e-03	8.653e-03	5.316e+02
diagnosisAxial SpA- nr-axSpA	3.205e-01	2.224e-01	5.194e+02
treatment_order2	-1.172e+00	1.299e-01	8.616e+03
treatment_order3	-8.838e-01	1.202e-01	7.499e+03
treatment_order4	-8.286e-01	1.583e-01	7.450e+03
treatment_order5	-5.303e-01	1.665e-01	5.963e+03
treatment_order6	-5.998e-01	2.083e-01	5.623e+03
treatment_order7	-3.521e-01	2.872e-01	4.515e+03
treatment_order8	3.764e-01	3.630e-01	7.147e+03
treatment_order9	-9.212e-01	4.223e-01	5.940e+03
treatment_order10	6.367e-01	7.491e-01	6.963e+03
treatment_order11	1.678e+00	8.733e-01	5.191e+03
treatment_order14	9.790e-01	1.061e+00	8.059e+02
treatment_order15	-3.197e-01	1.647e+00	1.600e+03
last_known_smoking_statussex-smoker	-5.248e-01	3.482e-01	4.942e+02
last_known_smoking_statusnever	-1.066e+00	3.508e-01	4.977e+02
last_known_smoking_statussmoker	3.243e-01	4.308e-01	4.932e+02
last_known_vaping_statussex-vaper	2.427e-01	7.635e-01	5.086e+02
last_known_vaping_statusnever	4.385e-01	3.458e-01	5.016e+02
last_known_vaping_statusvaper	1.090e+00	4.751e-01	4.993e+02
treatment_reclassifiedAnti-IL17	-1.267e+00	2.399e-01	6.416e+03
treatment_reclassifiedAnti-TNF	-1.317e+00	1.498e-01	8.460e+03
treatment_reclassifiedJAK Inhibitor	-2.276e+00	4.927e-01	5.922e+03
time_in_years	1.855e-02	7.228e-03	4.985e+02
genderMale:treatment_reclassifiedAnti-IL17	3.979e-02	2.772e-01	5.390e+03
genderMale:treatment_reclassifiedAnti-TNF	4.004e-02	1.340e-01	7.403e+03
genderMale:treatment_reclassifiedJAK Inhibitor	1.807e-01	8.075e-01	6.857e+03
t value Pr(> t)			
(Intercept)	10.827	< 2e-16	***
genderMale	-2.299	0.02187	*
hlab27statusNegative	2.616	0.00914	**
hlab27statusPositive	1.401	0.16177	
age_at_onset	0.184	0.85380	
diagnosisAxial SpA- nr-axSpA	1.441	0.15026	
treatment_order2	-9.026	< 2e-16	***
treatment_order3	-7.354	2.13e-13	***
treatment_order4	-5.233	1.71e-07	***
treatment_order5	-3.186	0.00145	**

treatment_order6	-2.880	0.00399	**
treatment_order7	-1.226	0.22021	
treatment_order8	1.037	0.29975	
treatment_order9	-2.181	0.02920	*
treatment_order10	0.850	0.39538	
treatment_order11	1.921	0.05477	.
treatment_order14	0.923	0.35636	
treatment_order15	-0.194	0.84605	
last_known_smoking_statussex-smoker	-1.507	0.13247	
last_known_smoking_statusnever	-3.040	0.00249	**
last_known_smoking_statussmoker	0.753	0.45192	
last_known_vaping_statussex-vaper	0.318	0.75069	
last_known_vaping_statusnever	1.268	0.20540	
last_known_vaping_statusvaper	2.294	0.02218	*
treatment_reclassifiedAnti-IL17	-5.282	1.32e-07	***
treatment_reclassifiedAnti-TNF	-8.792	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-4.620	3.91e-06	***
time_in_years	2.566	0.01057	*
genderMale:treatment_reclassifiedAnti-IL17	0.144	0.88586	
genderMale:treatment_reclassifiedAnti-TNF	0.299	0.76504	
genderMale:treatment_reclassifiedJAK Inhibitor	0.224	0.82289	

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

```
print(summary(model_treatment_gender_back_pain_anytime_reduced, corr = FALSE))
```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula:
back_pain_anytime ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_back_pain_anytime
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 42111.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5472	-0.6172	-0.1042	0.5323	4.7971

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.4946	2.1200	
	time_in_years	0.0129	0.1136	-0.48
Residual		3.1042	1.7619	

Number of obs: 10040, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.377e+00	4.038e-01	5.981e+02	10.840
genderMale	-4.024e-01	1.762e-01	5.333e+02	-2.283
hlab27statusNegative	9.613e-01	3.675e-01	5.820e+02	2.616
hlab27statusPositive	4.286e-01	3.060e-01	5.920e+02	1.400
age_at_onset	1.653e-03	8.650e-03	5.315e+02	0.191
diagnosisAxial SpA- nr-axSpA	3.202e-01	2.224e-01	5.195e+02	1.440
treatment_order2	-1.173e+00	1.298e-01	8.596e+03	-9.037
treatment_order3	-8.847e-01	1.200e-01	7.523e+03	-7.370
treatment_order4	-8.327e-01	1.576e-01	7.502e+03	-5.283
treatment_order5	-5.329e-01	1.662e-01	5.996e+03	-3.206
treatment_order6	-5.998e-01	2.077e-01	5.670e+03	-2.887
treatment_order7	-3.550e-01	2.848e-01	4.486e+03	-1.246
treatment_order8	3.757e-01	3.617e-01	7.247e+03	1.039
treatment_order9	-9.199e-01	4.217e-01	5.982e+03	-2.181
treatment_order10	6.166e-01	7.451e-01	6.975e+03	0.828
treatment_order11	1.651e+00	8.633e-01	5.314e+03	1.913
treatment_order14	9.723e-01	1.060e+00	8.103e+02	0.918
treatment_order15	-3.535e-01	1.639e+00	1.587e+03	-0.216
last_known_smoking_statussex-smoker	-5.221e-01	3.480e-01	4.938e+02	-1.500
last_known_smoking_statusnever	-1.065e+00	3.505e-01	4.972e+02	-3.038
last_known_smoking_statussmoker	3.284e-01	4.305e-01	4.926e+02	0.763
last_known_vaping_statussex-vaper	2.408e-01	7.633e-01	5.086e+02	0.316
last_known_vaping_statusnever	4.369e-01	3.455e-01	5.009e+02	1.264
last_known_vaping_statusvaper	1.089e+00	4.748e-01	4.990e+02	2.294
treatment_reclassifiedAnti-IL17	-1.240e+00	1.621e-01	7.837e+03	-7.649
treatment_reclassifiedAnti-TNF	-1.289e+00	1.173e-01	8.718e+03	-10.994
treatment_reclassifiedJAK Inhibitor	-2.202e+00	4.043e-01	7.020e+03	-5.448
time_in_years	1.857e-02	7.224e-03	4.997e+02	2.570

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.02281 *
hlab27statusNegative	0.00913 **
hlab27statusPositive	0.16193
age_at_onset	0.84856
diagnosisAxial SpA- nr-axSpA	0.15049

```

treatment_order2          < 2e-16 ***
treatment_order3          1.89e-13 ***
treatment_order4          1.31e-07 ***
treatment_order5           0.00135 **
treatment_order6           0.00390 **
treatment_order7           0.21276
treatment_order8           0.29901
treatment_order9           0.02921 *
treatment_order10          0.40796
treatment_order11          0.05583 .
treatment_order14          0.35912
treatment_order15          0.82925
last_known_smoking_statussex-smoker 0.13419
last_known_smoking_statusnever 0.00251 **
last_known_smoking_statussmoker 0.44592
last_known_vaping_statussex-vaper 0.75251
last_known_vaping_statusnever 0.20666
last_known_vaping_statusvaper 0.02220 *
treatment_reclassifiedAnti-IL17 2.26e-14 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 5.28e-08 ***
time_in_years              0.01045 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_back_pain_anytime_full,
       model_treatment_gender_back_pain_anytime_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_back_pain_anytime

Models:

model_treatment_gender_back_pain_anytime_reduced: back_pain_anytime ~ gender + hlab27status + age

model_treatment_gender_back_pain_anytime_full: back_pain_anytime ~ gender + hlab27status + age

	npars	AIC	BIC	logLik
model_treatment_gender_back_pain_anytime_reduced	32	42137	42368	-21036
model_treatment_gender_back_pain_anytime_full	35	42143	42395	-21036
	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_gender_back_pain_anytime_reduced	42073			
model_treatment_gender_back_pain_anytime_full	42073	0.135	3	0.9873

```
anova(model_treatment_gender_back_pain_anytime_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	5.02	5.017	1	2123.4	1.6159	0.2038004
hlab27status	23.74	11.869	2	560.1	3.8227	0.0224425 *
age_at_onset	0.11	0.106	1	531.6	0.0340	0.8538034
diagnosis	6.45	6.445	1	519.4	2.0757	0.1502601
treatment_order	390.11	32.509	12	4699.8	10.4698	< 2.2e-16 ***
last_known_smoking_status	63.76	21.254	3	503.4	6.8451	0.0001582 ***
last_known_vaping_status	16.94	5.646	3	506.7	1.8182	0.1428338
treatment_reclassified	390.47	130.156	3	7668.4	41.9178	< 2.2e-16 ***
time_in_years	20.45	20.448	1	498.5	6.5854	0.0105729 *
gender:treatment_reclassified	0.41	0.135	3	6596.1	0.0435	0.9879435

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

AsQoL

lme4 code for treatment and diagnosis: AsQoL

```
model_treatment_diagnosis_asqol_full <- lmer(
  as_qol ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_asqol,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_asqol_reduced <- lmer(
  as_qol ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_asqol,
```

```
control = lmerControl(optimizer = "bobyqa",
                      optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_asqol_full, corr = FALSE))
```

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

Formula:

```
as_qol ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
      diagnosis + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_asqol

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40367.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.8891	-0.5391	-0.0443	0.5190	4.6819

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	25.6984	5.0694	
	time_in_years	0.0905	0.3008	-0.50
Residual		7.3903	2.7185	

Number of obs: 7757, groups: ttas_id, 645

Fixed effects:

	Estimate
(Intercept)	8.179e+00
genderMale	-1.360e+00
hlab27statusNegative	2.096e+00
hlab27statusPositive	3.123e-01
age_at_onset	-1.159e-02
diagnosisAxial SpA- nr-axSpA	3.671e-02
treatment_order2	-1.017e+00
treatment_order3	-3.468e-01
treatment_order4	-6.101e-01
treatment_order5	-2.399e-01
treatment_order6	9.302e-03
treatment_order7	-9.565e-02

treatment_order8	5.336e-01
treatment_order9	7.236e-01
treatment_order10	2.140e+00
treatment_order11	2.595e+00
treatment_order12	2.734e+00
treatment_order14	1.811e+00
treatment_order15	7.546e-01
last_known_smoking_statussex-smoker	-1.174e-01
last_known_smoking_statusnever	-1.676e+00
last_known_smoking_statussmoker	2.022e+00
last_known_vaping_statussex-vaper	-2.433e-01
last_known_vaping_statusnever	4.620e-01
last_known_vaping_statusvaper	2.468e+00
treatment_reclassifiedAnti-IL17	-1.610e+00
treatment_reclassifiedAnti-TNF	-1.829e+00
treatment_reclassifiedJAK Inhibitor	-4.577e+00
time_in_years	2.539e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-3.931e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-8.073e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.959e+00
	Std. Error
(Intercept)	9.275e-01
genderMale	4.068e-01
hlab27statusNegative	8.468e-01
hlab27statusPositive	7.076e-01
age_at_onset	1.991e-02
diagnosisAxial SpA- nr-axSpA	5.212e-01
treatment_order2	2.515e-01
treatment_order3	2.400e-01
treatment_order4	3.078e-01
treatment_order5	3.284e-01
treatment_order6	3.922e-01
treatment_order7	5.126e-01
treatment_order8	6.265e-01
treatment_order9	7.701e-01
treatment_order10	1.358e+00
treatment_order11	1.577e+00
treatment_order12	2.400e+00
treatment_order14	2.159e+00
treatment_order15	3.109e+00
last_known_smoking_statussex-smoker	8.044e-01
last_known_smoking_statusnever	8.088e-01
last_known_smoking_statussmoker	9.956e-01

last_known_vaping_statussex-vaper	1.756e+00
last_known_vaping_statusnever	7.980e-01
last_known_vaping_statusvaper	1.098e+00
treatment_reclassifiedAnti-IL17	3.047e-01
treatment_reclassifiedAnti-TNF	2.305e-01
treatment_reclassifiedJAK Inhibitor	8.160e-01
time_in_years	1.661e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.747e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3.508e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.483e+00
	df
(Intercept)	6.369e+02
genderMale	5.724e+02
hlab27statusNegative	6.197e+02
hlab27statusPositive	6.487e+02
age_at_onset	5.558e+02
diagnosisAxial SpA- nr-axSpA	5.708e+02
treatment_order2	7.356e+03
treatment_order3	6.765e+03
treatment_order4	6.912e+03
treatment_order5	6.118e+03
treatment_order6	6.224e+03
treatment_order7	6.063e+03
treatment_order8	6.627e+03
treatment_order9	7.084e+03
treatment_order10	6.525e+03
treatment_order11	5.948e+03
treatment_order12	5.474e+03
treatment_order14	9.902e+02
treatment_order15	1.379e+03
last_known_smoking_statussex-smoker	5.331e+02
last_known_smoking_statusnever	5.330e+02
last_known_smoking_statussmoker	5.312e+02
last_known_vaping_statussex-vaper	5.393e+02
last_known_vaping_statusnever	5.368e+02
last_known_vaping_statusvaper	5.359e+02
treatment_reclassifiedAnti-IL17	7.269e+03
treatment_reclassifiedAnti-TNF	7.483e+03
treatment_reclassifiedJAK Inhibitor	5.805e+03
time_in_years	5.483e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5.946e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	6.555e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	6.871e+03

	t value
(Intercept)	8.818
genderMale	-3.344
hlab27statusNegative	2.475
hlab27statusPositive	0.441
age_at_onset	-0.582
diagnosisAxial SpA- nr-axSpA	0.070
treatment_order2	-4.045
treatment_order3	-1.445
treatment_order4	-1.982
treatment_order5	-0.731
treatment_order6	0.024
treatment_order7	-0.187
treatment_order8	0.852
treatment_order9	0.940
treatment_order10	1.576
treatment_order11	1.645
treatment_order12	1.139
treatment_order14	0.839
treatment_order15	0.243
last_known_smoking_statussex-smoker	-0.146
last_known_smoking_statusnever	-2.072
last_known_smoking_statussmoker	2.031
last_known_vaping_statussex-vaper	-0.139
last_known_vaping_statusnever	0.579
last_known_vaping_statusvaper	2.247
treatment_reclassifiedAnti-IL17	-5.285
treatment_reclassifiedAnti-TNF	-7.937
treatment_reclassifiedJAK Inhibitor	-5.609
time_in_years	1.528
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-0.583
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-2.301
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.996

	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.00088 ***
hlab27statusNegative	0.01359 *
hlab27statusPositive	0.65914
age_at_onset	0.56070
diagnosisAxial SpA- nr-axSpA	0.94388
treatment_order2	5.30e-05 ***
treatment_order3	0.14854
treatment_order4	0.04749 *

treatment_order5	0.46506
treatment_order6	0.98108
treatment_order7	0.85198
treatment_order8	0.39440
treatment_order9	0.34742
treatment_order10	0.11503
treatment_order11	0.09993 .
treatment_order12	0.25471
treatment_order14	0.40188
treatment_order15	0.80826
last_known_smoking_statussex-smoker	0.88404
last_known_smoking_statusnever	0.03871 *
last_known_smoking_statussmoker	0.04279 *
last_known_vaping_statussex-vaper	0.88986
last_known_vaping_statusnever	0.56285
last_known_vaping_statusvaper	0.02502 *
treatment_reclassifiedAnti-IL17	1.29e-07 ***
treatment_reclassifiedAnti-TNF	2.37e-15 ***
treatment_reclassifiedJAK Inhibitor	2.13e-08 ***
time_in_years	0.12707
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.56015
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.02142 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.04601 *

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

```
print(summary(model_treatment_diagnosis_asqol_reduced, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```
as_qol ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_asqol

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40381.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.8976	-0.5354	-0.0444	0.5182	4.6792

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	25.71105	5.0706	
	time_in_years	0.09072	0.3012	-0.50
Residual		7.39880	2.7201	

Number of obs: 7757, groups: ttas_id, 645

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	8.16836	0.92733	636.24606	8.808
genderMale	-1.36357	0.40670	571.87010	-3.353
hlab27statusNegative	2.11979	0.84653	619.04436	2.504
hlab27statusPositive	0.34123	0.70730	647.68647	0.482
age_at_onset	-0.01094	0.01990	554.80786	-0.550
diagnosisAxial SpA- nr-axSpA	-0.16871	0.51122	542.56959	-0.330
treatment_order2	-1.03853	0.25113	7369.57703	-4.135
treatment_order3	-0.39890	0.23897	6803.71244	-1.669
treatment_order4	-0.55544	0.30517	6955.67738	-1.820
treatment_order5	-0.22050	0.32718	6172.14807	-0.674
treatment_order6	-0.02408	0.39059	6207.80989	-0.062
treatment_order7	-0.24321	0.51060	6009.72854	-0.476
treatment_order8	0.46581	0.62545	6644.78801	0.745
treatment_order9	0.74872	0.76902	7122.91526	0.974
treatment_order10	1.90683	1.35556	6513.40113	1.407
treatment_order11	2.51684	1.57754	5942.49127	1.595
treatment_order12	2.58901	2.40071	5476.24066	1.078
treatment_order14	1.63533	2.15932	988.22104	0.757
treatment_order15	0.60939	3.11005	1373.75490	0.196
last_known_smoking_statussex-smoker	-0.12855	0.80378	531.90736	-0.160
last_known_smoking_statusnever	-1.69090	0.80839	532.12485	-2.092
last_known_smoking_statussmoker	2.00668	0.99482	529.96261	2.017
last_known_vaping_statussex-vaper	-0.21191	1.75515	538.60467	-0.121
last_known_vaping_statusnever	0.48161	0.79739	535.67732	0.604
last_known_vaping_statusvaper	2.48224	1.09757	534.89192	2.262
treatment_reclassifiedAnti-IL17	-1.66628	0.28869	7296.79610	-5.772
treatment_reclassifiedAnti-TNF	-1.95820	0.22577	7483.40298	-8.673
treatment_reclassifiedJAK Inhibitor	-3.57577	0.69384	6528.70628	-5.154
time_in_years	0.02540	0.01662	545.56983	1.528

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.000853 ***
hlab27statusNegative	0.012533 *

```

hlab27statusPositive          0.629659
age_at_onset                  0.582568
diagnosisAxial SpA- nr-axSpA  0.741512
treatment_order2              3.58e-05 ***
treatment_order3              0.095118 .
treatment_order4              0.068787 .
treatment_order5              0.500378
treatment_order6              0.950852
treatment_order7              0.633855
treatment_order8              0.456445
treatment_order9              0.330290
treatment_order10             0.159571
treatment_order11             0.110672
treatment_order12             0.280886
treatment_order14             0.449031
treatment_order15             0.844685
last_known_smoking_statussex-smoker 0.872999
last_known_smoking_statusnever 0.036939 *
last_known_smoking_statussmoker 0.044187 *
last_known_vaping_statussex-vaper 0.903946
last_known_vaping_statusnever 0.546111
last_known_vaping_statusvaper 0.024124 *
treatment_reclassifiedAnti-IL17 8.16e-09 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.63e-07 ***
time_in_years                 0.127135
---

```

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

```

anova(model_treatment_diagnosis_asqol_full,
       model_treatment_diagnosis_asqol_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_asqol

Models:

model_treatment_diagnosis_asqol_reduced: as_qol ~ gender + hlab27status + age_at_onset + diag

model_treatment_diagnosis_asqol_full: as_qol ~ gender + hlab27status + age_at_onset + diagno

	npar	AIC	BIC	logLik	deviance	Chisq
model_treatment_diagnosis_asqol_reduced	33	40451	40681	-20193	40385	
model_treatment_diagnosis_asqol_full	36	40446	40697	-20187	40374	11.314

Df Pr(>Chisq)

```

model_treatment_diagnosis_asqol_reduced
model_treatment_diagnosis_asqol_full      3      0.01014 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
anova(model_treatment_diagnosis_asqol_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	82.65	82.646	1	572.4	11.1830	0.0008795
hlab27status	81.68	40.839	2	596.9	5.5261	0.0041879
age_at_onset	2.50	2.505	1	555.8	0.3389	0.5606991
diagnosis	4.02	4.023	1	1314.7	0.5444	0.4607548
treatment_order	275.78	21.214	13	4899.2	2.8705	0.0003830
last_known_smoking_status	178.16	59.386	3	544.0	8.0357	3.013e-05
last_known_vaping_status	48.58	16.193	3	540.6	2.1911	0.0881070
treatment_reclassified	566.60	188.866	3	6962.1	25.5559	< 2.2e-16
time_in_years	17.26	17.257	1	548.3	2.3350	0.1270682
diagnosis:treatment_reclassified	83.45	27.818	3	6524.9	3.7641	0.0102878

```

gender          ***
hlab27status    **
age_at_onset
diagnosis
treatment_order ***
last_known_smoking_status ***
last_known_vaping_status .
treatment_reclassified ***
time_in_years
diagnosis:treatment_reclassified *
---

```

```

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

```

lme4 code for treatment and gender: AsQoL

```

model_treatment_gender_asqol_full <- lmer(
  as_qol ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +

```

```

treatment_reclassified * gender +
time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_asqol,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_asqol_reduced <- lmer(
  as_qol ~ gender + hlab27status + age_at_onset +
  diagnosis + treatment_order + last_known_smoking_status +
  last_known_vaping_status +
  treatment_reclassified +
  time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_asqol,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_gender_asqol_full, corr = FALSE))

```

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

Formula:

```

as_qol ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
  gender + time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_asqol

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40369.4

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-4.8856	-0.5381	-0.0444	0.5205	4.6802

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	25.90022	5.0892	
	time_in_years	0.09021	0.3003	-0.50
	Residual	7.39027	2.7185	

Number of obs: 7757, groups: ttas_id, 645

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	8.32138	0.93112	641.12873
genderMale	-1.53572	0.41427	606.80571
hlab27statusNegative	2.14344	0.84837	619.50836
hlab27statusPositive	0.34690	0.70850	647.19294
age_at_onset	-0.01200	0.01995	555.64729
diagnosisAxial SpA- nr-axSpA	-0.17337	0.51256	543.30622
treatment_order2	-1.04770	0.25103	7363.32756
treatment_order3	-0.37762	0.23899	6782.56758
treatment_order4	-0.54547	0.30654	6932.90582
treatment_order5	-0.18649	0.32736	6144.83101
treatment_order6	0.04361	0.39147	6152.08615
treatment_order7	-0.17689	0.51318	5980.55681
treatment_order8	0.52131	0.62770	6576.55521
treatment_order9	0.84710	0.76977	7098.02281
treatment_order10	1.83883	1.36438	6515.89141
treatment_order11	2.73270	1.59051	5916.83421
treatment_order12	2.51932	2.40066	5454.35092
treatment_order14	1.55261	2.15815	981.94672
treatment_order15	0.83897	3.11550	1388.23669
last_known_smoking_statussex-smoker	-0.09686	0.80589	532.50129
last_known_smoking_statusnever	-1.64025	0.81051	532.71375
last_known_smoking_statussmoker	2.05071	0.99765	530.87489
last_known_vaping_statussex-vaper	-0.26943	1.75957	538.98286
last_known_vaping_statusnever	0.42604	0.79963	536.59284
last_known_vaping_statusvaper	2.41590	1.10048	535.61215
treatment_reclassifiedAnti-IL17	-1.98971	0.43045	6510.21334
treatment_reclassifiedAnti-TNF	-2.42825	0.29599	7225.79653
treatment_reclassifiedJAK Inhibitor	-3.01943	0.86705	5882.76251
time_in_years	0.02480	0.01659	545.98558
genderMale:treatment_reclassifiedAnti-IL17	0.42729	0.49216	6130.97159
genderMale:treatment_reclassifiedAnti-TNF	0.71086	0.27795	6470.11050
genderMale:treatment_reclassifiedJAK Inhibitor	-2.22035	1.37527	6104.15789

	t value	Pr(> t)
(Intercept)	8.937	< 2e-16 ***
genderMale	-3.707	0.000229 ***
hlab27statusNegative	2.527	0.011767 *
hlab27statusPositive	0.490	0.624564
age_at_onset	-0.602	0.547620
diagnosisAxial SpA- nr-axSpA	-0.338	0.735305
treatment_order2	-4.174	3.03e-05 ***
treatment_order3	-1.580	0.114135
treatment_order4	-1.779	0.075208 .

treatment_order5	-0.570	0.568918
treatment_order6	0.111	0.911294
treatment_order7	-0.345	0.730337
treatment_order8	0.830	0.406288
treatment_order9	1.100	0.271172
treatment_order10	1.348	0.177790
treatment_order11	1.718	0.085826 .
treatment_order12	1.049	0.294027
treatment_order14	0.719	0.472055
treatment_order15	0.269	0.787748
last_known_smoking_statussex-smoker	-0.120	0.904373
last_known_smoking_statusnever	-2.024	0.043496 *
last_known_smoking_statussmoker	2.056	0.040315 *
last_known_vaping_statussex-vaper	-0.153	0.878358
last_known_vaping_statusnever	0.533	0.594393
last_known_vaping_statusvaper	2.195	0.028569 *
treatment_reclassifiedAnti-IL17	-4.622	3.87e-06 ***
treatment_reclassifiedAnti-TNF	-8.204	2.73e-16 ***
treatment_reclassifiedJAK Inhibitor	-3.482	0.000501 ***
time_in_years	1.495	0.135621
genderMale:treatment_reclassifiedAnti-IL17	0.868	0.385324
genderMale:treatment_reclassifiedAnti-TNF	2.557	0.010566 *
genderMale:treatment_reclassifiedJAK Inhibitor	-1.614	0.106474

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

```
print(summary(model_treatment_gender_asqol_reduced, corr = FALSE))
```

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

Formula:

```
as_qol ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +  
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +  
  time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_asqol

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40381.9

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-4.8976	-0.5354	-0.0444	0.5182	4.6792

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	25.71105	5.0706	
	time_in_years	0.09072	0.3012	-0.50
Residual		7.39880	2.7201	

Number of obs: 7757, groups: ttas_id, 645

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	8.16836	0.92733	636.24606	8.808
genderMale	-1.36357	0.40670	571.87010	-3.353
hlab27statusNegative	2.11979	0.84653	619.04436	2.504
hlab27statusPositive	0.34123	0.70730	647.68647	0.482
age_at_onset	-0.01094	0.01990	554.80786	-0.550
diagnosisAxial SpA- nr-axSpA	-0.16871	0.51122	542.56959	-0.330
treatment_order2	-1.03853	0.25113	7369.57703	-4.135
treatment_order3	-0.39890	0.23897	6803.71244	-1.669
treatment_order4	-0.55544	0.30517	6955.67738	-1.820
treatment_order5	-0.22050	0.32718	6172.14807	-0.674
treatment_order6	-0.02408	0.39059	6207.80989	-0.062
treatment_order7	-0.24321	0.51060	6009.72854	-0.476
treatment_order8	0.46581	0.62545	6644.78801	0.745
treatment_order9	0.74872	0.76902	7122.91526	0.974
treatment_order10	1.90683	1.35556	6513.40113	1.407
treatment_order11	2.51684	1.57754	5942.49127	1.595
treatment_order12	2.58901	2.40071	5476.24066	1.078
treatment_order14	1.63533	2.15932	988.22104	0.757
treatment_order15	0.60939	3.11005	1373.75490	0.196
last_known_smoking_statussex-smoker	-0.12855	0.80378	531.90736	-0.160
last_known_smoking_statusnever	-1.69090	0.80839	532.12485	-2.092
last_known_smoking_statussmoker	2.00668	0.99482	529.96261	2.017
last_known_vaping_statussex-vaper	-0.21191	1.75515	538.60467	-0.121
last_known_vaping_statusnever	0.48161	0.79739	535.67732	0.604
last_known_vaping_statusvaper	2.48224	1.09757	534.89192	2.262
treatment_reclassifiedAnti-IL17	-1.66628	0.28869	7296.79610	-5.772
treatment_reclassifiedAnti-TNF	-1.95820	0.22577	7483.40298	-8.673
treatment_reclassifiedJAK Inhibitor	-3.57577	0.69384	6528.70628	-5.154
time_in_years	0.02540	0.01662	545.56983	1.528

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.000853 ***
hlab27statusNegative	0.012533 *

```

hlab27statusPositive      0.629659
age_at_onset              0.582568
diagnosisAxial SpA- nr-axSpA 0.741512
treatment_order2         3.58e-05 ***
treatment_order3         0.095118 .
treatment_order4         0.068787 .
treatment_order5         0.500378
treatment_order6         0.950852
treatment_order7         0.633855
treatment_order8         0.456445
treatment_order9         0.330290
treatment_order10        0.159571
treatment_order11        0.110672
treatment_order12        0.280886
treatment_order14        0.449031
treatment_order15        0.844685
last_known_smoking_statussex-smoker 0.872999
last_known_smoking_statusnever 0.036939 *
last_known_smoking_statussmoker 0.044187 *
last_known_vaping_statussex-vaper 0.903946
last_known_vaping_statusnever 0.546111
last_known_vaping_statusvaper 0.024124 *
treatment_reclassifiedAnti-IL17 8.16e-09 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.63e-07 ***
time_in_years             0.127135
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_asqol_full,
       model_treatment_gender_asqol_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_asqol

Models:

model_treatment_gender_asqol_reduced: as_qol ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_gender_asqol_full: as_qol ~ gender + hlab27status + age_at_onset + diagnosis

	npar	AIC	BIC	logLik	deviance	Chisq	Df
model_treatment_gender_asqol_reduced	33	40451	40681	-20193	40385		
model_treatment_gender_asqol_full	36	40447	40697	-20188	40375	10.507	3

Pr(>Chisq)

```
model_treatment_gender_asqol_reduced
model_treatment_gender_asqol_full      0.01472 *
```

```
---
```

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

```
anova(model_treatment_gender_asqol_full)
```

```
Type III Analysis of Variance Table with Satterthwaite's method
```

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	80.73	80.727	1	1547.0	10.9234	0.0009713	***
hlab27status	83.06	41.528	2	596.5	5.6193	0.0038219	**
age_at_onset	2.68	2.676	1	555.6	0.3620	0.5476203	
diagnosis	0.85	0.846	1	543.3	0.1144	0.7353047	
treatment_order	287.03	22.079	13	4888.5	2.9876	0.0002208	***
last_known_smoking_status	175.77	58.591	3	543.6	7.9282	3.496e-05	***
last_known_vaping_status	47.07	15.689	3	540.4	2.1230	0.0962926	.
treatment_reclassified	679.70	226.567	3	6975.6	30.6576	< 2.2e-16	***
time_in_years	16.51	16.506	1	546.0	2.2335	0.1356215	
gender:treatment_reclassified	77.89	25.965	3	6384.2	3.5134	0.0145438	*

```
---
```

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

```
anova(model_treatment_gender_asqol_full)
```

```
Type III Analysis of Variance Table with Satterthwaite's method
```

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	80.73	80.727	1	1547.0	10.9234	0.0009713	***
hlab27status	83.06	41.528	2	596.5	5.6193	0.0038219	**
age_at_onset	2.68	2.676	1	555.6	0.3620	0.5476203	
diagnosis	0.85	0.846	1	543.3	0.1144	0.7353047	
treatment_order	287.03	22.079	13	4888.5	2.9876	0.0002208	***
last_known_smoking_status	175.77	58.591	3	543.6	7.9282	3.496e-05	***
last_known_vaping_status	47.07	15.689	3	540.4	2.1230	0.0962926	.
treatment_reclassified	679.70	226.567	3	6975.6	30.6576	< 2.2e-16	***
time_in_years	16.51	16.506	1	546.0	2.2335	0.1356215	
gender:treatment_reclassified	77.89	25.965	3	6384.2	3.5134	0.0145438	*

```
---
```

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

Jenkins Sleep

lme4 code for treatment and diagnosis: Jenkins Sleep

```
model_treatment_diagnosis_jenkins_sleep_1_full <- lmer(
  jenkins_sleep_1 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_1,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_2_full <- lmer(
  jenkins_sleep_2 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_2,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_3_full <- lmer(
  jenkins_sleep_3 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_3,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_4_full <- lmer(
  jenkins_sleep_4 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_4,
```

```

        control = lmerControl(optimizer = "bobyqa",
                               optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_1_reduced <- lmer(
  jenkins_sleep_1 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_1,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_2_reduced <- lmer(
  jenkins_sleep_2 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_2,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_3_reduced <- lmer(
  jenkins_sleep_3 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_3,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_jenkins_sleep_4_reduced <- lmer(
  jenkins_sleep_4 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_4,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

```

```
print(summary(model_treatment_diagnosis_jenkins_sleep_1_full, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified * diagnosis + time_in_years + (time_in_years |
      ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_1
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 20222.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2533	-0.5084	-0.1071	0.4754	4.2642

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.230412	1.49346	
	time_in_years	0.004182	0.06467	-0.52
Residual		1.050683	1.02503	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate
(Intercept)	1.656e+00
genderMale	-1.456e-01
hlab27statusNegative	5.626e-01
hlab27statusPositive	3.503e-01
age_at_onset	-6.349e-03
diagnosisAxial SpA- nr-axSpA	2.986e-01
treatment_order2	-1.307e-01
treatment_order3	-2.503e-02
treatment_order4	-1.656e-01
treatment_order5	1.213e-02
treatment_order6	8.422e-02
treatment_order7	1.392e-01
treatment_order8	3.010e-01
treatment_order9	3.462e-01
treatment_order10	8.890e-01
treatment_order11	3.721e-01

treatment_order12	2.752e-01
treatment_order14	5.438e-01
treatment_order15	1.788e-01
last_known_smoking_statussex-smoker	-3.312e-02
last_known_smoking_statusnever	-3.426e-01
last_known_smoking_statussmoker	5.156e-01
last_known_vaping_statussex-vaper	-5.937e-01
last_known_vaping_statusnever	-7.871e-02
last_known_vaping_statusvaper	1.642e-02
treatment_reclassifiedAnti-IL17	-2.912e-01
treatment_reclassifiedAnti-TNF	-2.189e-01
treatment_reclassifiedJAK Inhibitor	7.854e-02
time_in_years	5.859e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-7.226e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-4.410e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-2.144e-01
	Std. Error
(Intercept)	3.021e-01
genderMale	1.246e-01
hlab27statusNegative	2.664e-01
hlab27statusPositive	2.251e-01
age_at_onset	6.133e-03
diagnosisAxial SpA- nr-axSpA	1.619e-01
treatment_order2	1.008e-01
treatment_order3	9.576e-02
treatment_order4	1.171e-01
treatment_order5	1.230e-01
treatment_order6	1.426e-01
treatment_order7	1.798e-01
treatment_order8	2.243e-01
treatment_order9	2.780e-01
treatment_order10	5.327e-01
treatment_order11	5.507e-01
treatment_order12	8.710e-01
treatment_order14	6.672e-01
treatment_order15	8.794e-01
last_known_smoking_statussex-smoker	2.493e-01
last_known_smoking_statusnever	2.511e-01
last_known_smoking_statussmoker	3.103e-01
last_known_vaping_statussex-vaper	5.383e-01
last_known_vaping_statusnever	2.489e-01
last_known_vaping_statusvaper	3.398e-01
treatment_reclassifiedAnti-IL17	1.121e-01

treatment_reclassifiedAnti-TNF	8.875e-02
treatment_reclassifiedJAK Inhibitor	2.868e-01
time_in_years	5.183e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.356e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.275e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.358e-01
	df
(Intercept)	5.774e+02
genderMale	5.440e+02
hlab27statusNegative	5.475e+02
hlab27statusPositive	5.112e+02
age_at_onset	5.313e+02
diagnosisAxial SpA- nr-axSpA	5.276e+02
treatment_order2	4.939e+03
treatment_order3	4.430e+03
treatment_order4	4.696e+03
treatment_order5	3.982e+03
treatment_order6	3.340e+03
treatment_order7	2.909e+03
treatment_order8	3.281e+03
treatment_order9	2.348e+03
treatment_order10	3.738e+03
treatment_order11	2.576e+03
treatment_order12	5.406e+03
treatment_order14	9.252e+02
treatment_order15	7.355e+02
last_known_smoking_statussex-smoker	5.228e+02
last_known_smoking_statusnever	5.242e+02
last_known_smoking_statussmoker	5.206e+02
last_known_vaping_statussex-vaper	5.377e+02
last_known_vaping_statusnever	5.272e+02
last_known_vaping_statusvaper	5.321e+02
treatment_reclassifiedAnti-IL17	4.954e+03
treatment_reclassifiedAnti-TNF	5.600e+03
treatment_reclassifiedJAK Inhibitor	3.747e+03
time_in_years	4.686e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.946e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5.065e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.303e+03
	t value
(Intercept)	5.480
genderMale	-1.168
hlab27statusNegative	2.112

hlab27statusPositive	1.556
age_at_onset	-1.035
diagnosisAxial SpA- nr-axSpA	1.844
treatment_order2	-1.297
treatment_order3	-0.261
treatment_order4	-1.414
treatment_order5	0.099
treatment_order6	0.590
treatment_order7	0.774
treatment_order8	1.342
treatment_order9	1.246
treatment_order10	1.669
treatment_order11	0.676
treatment_order12	0.316
treatment_order14	0.815
treatment_order15	0.203
last_known_smoking_statussex-smoker	-0.133
last_known_smoking_statusnever	-1.364
last_known_smoking_statussmoker	1.662
last_known_vaping_statussex-vaper	-1.103
last_known_vaping_statusnever	-0.316
last_known_vaping_statusvaper	0.048
treatment_reclassifiedAnti-IL17	-2.597
treatment_reclassifiedAnti-TNF	-2.467
treatment_reclassifiedJAK Inhibitor	0.274
time_in_years	1.131
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-0.307
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-0.346
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-0.400
	Pr(> t)
(Intercept)	6.35e-08 ***
genderMale	0.24322
hlab27statusNegative	0.03514 *
hlab27statusPositive	0.12027
age_at_onset	0.30104
diagnosisAxial SpA- nr-axSpA	0.06569 .
treatment_order2	0.19467
treatment_order3	0.79377
treatment_order4	0.15730
treatment_order5	0.92149
treatment_order6	0.55490
treatment_order7	0.43876
treatment_order8	0.17984

treatment_order9	0.21300
treatment_order10	0.09524 .
treatment_order11	0.49932
treatment_order12	0.75203
treatment_order14	0.41520
treatment_order15	0.83892
last_known_smoking_statussex-smoker	0.89439
last_known_smoking_statusnever	0.17304
last_known_smoking_statussmoker	0.09720 .
last_known_vaping_statussex-vaper	0.27057
last_known_vaping_statusnever	0.75191
last_known_vaping_statusvaper	0.96149
treatment_reclassifiedAnti-IL17	0.00944 **
treatment_reclassifiedAnti-TNF	0.01367 *
treatment_reclassifiedJAK Inhibitor	0.78423
time_in_years	0.25884
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.75913
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.72944
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.68907

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

```
print(summary(model_treatment_diagnosis_jenkins_sleep_1_reduced, corr = FALSE))
```

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

Formula: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_1

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 20220.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2603	-0.5084	-0.1074	0.4758	4.2835

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.231095	1.49369	
	time_in_years	0.004176	0.06462	-0.52

Residual 1.050212 1.02480
Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	1.657e+00	3.021e-01	5.772e+02	5.484
genderMale	-1.452e-01	1.246e-01	5.439e+02	-1.165
hlab27statusNegative	5.643e-01	2.663e-01	5.473e+02	2.119
hlab27statusPositive	3.537e-01	2.249e-01	5.107e+02	1.572
age_at_onset	-6.293e-03	6.133e-03	5.312e+02	-1.026
diagnosisAxial SpA- nr-axSpA	2.809e-01	1.562e-01	4.971e+02	1.799
treatment_order2	-1.366e-01	9.971e-02	4.999e+03	-1.370
treatment_order3	-3.064e-02	9.463e-02	4.529e+03	-0.324
treatment_order4	-1.733e-01	1.156e-01	4.747e+03	-1.499
treatment_order5	6.397e-03	1.224e-01	4.048e+03	0.052
treatment_order6	8.231e-02	1.416e-01	3.335e+03	0.581
treatment_order7	1.411e-01	1.785e-01	2.885e+03	0.790
treatment_order8	2.944e-01	2.235e-01	3.312e+03	1.317
treatment_order9	3.380e-01	2.774e-01	2.374e+03	1.218
treatment_order10	9.004e-01	5.305e-01	3.722e+03	1.697
treatment_order11	3.787e-01	5.500e-01	2.583e+03	0.689
treatment_order12	2.770e-01	8.703e-01	5.413e+03	0.318
treatment_order14	5.454e-01	6.663e-01	9.261e+02	0.819
treatment_order15	1.905e-01	8.785e-01	7.347e+02	0.217
last_known_smoking_statussex-smoker	-2.932e-02	2.492e-01	5.221e+02	-0.118
last_known_smoking_statusnever	-3.401e-01	2.510e-01	5.239e+02	-1.355
last_known_smoking_statussmoker	5.199e-01	3.102e-01	5.201e+02	1.676
last_known_vaping_statussex-vaper	-5.958e-01	5.382e-01	5.375e+02	-1.107
last_known_vaping_statusnever	-8.092e-02	2.488e-01	5.270e+02	-0.325
last_known_vaping_statusvaper	1.501e-02	3.397e-01	5.317e+02	0.044
treatment_reclassifiedAnti-IL17	-3.015e-01	1.066e-01	5.134e+03	-2.827
treatment_reclassifiedAnti-TNF	-2.247e-01	8.669e-02	5.636e+03	-2.592
treatment_reclassifiedJAK Inhibitor	2.452e-02	2.479e-01	4.508e+03	0.099
time_in_years	5.831e-03	5.180e-03	4.687e+02	1.126

Pr(>|t|)

(Intercept)	6.23e-08 ***
genderMale	0.24453
hlab27statusNegative	0.03455 *
hlab27statusPositive	0.11647
age_at_onset	0.30527
diagnosisAxial SpA- nr-axSpA	0.07262 .
treatment_order2	0.17089
treatment_order3	0.74608

```

treatment_order4          0.13406
treatment_order5          0.95832
treatment_order6          0.56111
treatment_order7          0.42931
treatment_order8          0.18787
treatment_order9          0.22321
treatment_order10         0.08972 .
treatment_order11         0.49116
treatment_order12         0.75033
treatment_order14         0.41328
treatment_order15         0.82841
last_known_smoking_statussex-smoker 0.90637
last_known_smoking_statusnever 0.17608
last_known_smoking_statussmoker 0.09433 .
last_known_vaping_statussex-vaper 0.26880
last_known_vaping_statusnever 0.74508
last_known_vaping_statusvaper 0.96478
treatment_reclassifiedAnti-IL17 0.00472 **
treatment_reclassifiedAnti-TNF 0.00957 **
treatment_reclassifiedJAK Inhibitor 0.92120
time_in_years              0.26087
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_jenkins_sleep_1_full,
       model_treatment_diagnosis_jenkins_sleep_1_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_1

Models:

model_treatment_diagnosis_jenkins_sleep_1_reduced: jenkins_sleep_1 ~ gender + hlab27status + age

model_treatment_diagnosis_jenkins_sleep_1_full: jenkins_sleep_1 ~ gender + hlab27status + age

	npar	AIC	BIC	logLik
model_treatment_diagnosis_jenkins_sleep_1_reduced	33	20226	20449	-10080
model_treatment_diagnosis_jenkins_sleep_1_full	36	20232	20475	-10080

	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_jenkins_sleep_1_reduced	20160			
model_treatment_diagnosis_jenkins_sleep_1_full	20160	0.3041	3	0.9593

```
anova(model_treatment_diagnosis_jenkins_sleep_1_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1.4340	1.4340	1	544.0	1.3648	0.243222
hlab27status	4.7060	2.3530	2	528.6	2.2395	0.107521
age_at_onset	1.1260	1.1260	1	531.3	1.0716	0.301044
diagnosis	1.1140	1.1140	1	1542.1	1.0603	0.303315
treatment_order	17.0000	1.3077	13	3220.2	1.2446	0.240229
last_known_smoking_status	13.6448	4.5483	3	524.1	4.3289	0.004995
last_known_vaping_status	1.4803	0.4934	3	536.9	0.4696	0.703585
treatment_reclassified	8.9792	2.9931	3	5490.7	2.8487	0.036072
time_in_years	1.3428	1.3428	1	468.6	1.2780	0.258841
diagnosis:treatment_reclassified	0.3090	0.1030	3	5228.9	0.0980	0.961125

```

gender
hlab27status
age_at_onset
diagnosis
treatment_order
last_known_smoking_status    **
last_known_vaping_status
treatment_reclassified       *
time_in_years
diagnosis:treatment_reclassified
---
```

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

```
print(summary(model_treatment_diagnosis_jenkins_sleep_2_full, corr = FALSE))
```

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

lmerModLmerTest]

Formula: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * diagnosis + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_2

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 21272.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5941	-0.5573	0.0736	0.5683	3.5286

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.843255	1.68620	
	time_in_years	0.007543	0.08685	-0.66
Residual		1.237996	1.11265	

Number of obs: 6330, groups: ttas_id, 632

Fixed effects:

	Estimate
(Intercept)	2.621e+00
genderMale	-3.807e-01
hlab27statusNegative	4.840e-01
hlab27statusPositive	-9.533e-02
age_at_onset	1.035e-02
diagnosisAxial SpA- nr-axSpA	1.121e-01
treatment_order2	-2.572e-01
treatment_order3	-3.604e-02
treatment_order4	1.276e-01
treatment_order5	-5.622e-02
treatment_order6	-4.625e-02
treatment_order7	1.117e-01
treatment_order8	2.676e-01
treatment_order9	2.465e-01
treatment_order10	-2.740e-01
treatment_order11	1.921e-01
treatment_order12	-2.184e-02
treatment_order14	-1.100e-02
treatment_order15	3.149e-01
last_known_smoking_statussex-smoker	2.438e-03
last_known_smoking_statusnever	-4.035e-01
last_known_smoking_statussmoker	4.499e-01
last_known_vaping_statussex-vaper	-7.611e-01
last_known_vaping_statusnever	2.515e-01
last_known_vaping_statusvaper	-2.479e-01
treatment_reclassifiedAnti-IL17	-3.143e-01
treatment_reclassifiedAnti-TNF	-2.504e-01
treatment_reclassifiedJAK Inhibitor	-5.643e-01
time_in_years	3.376e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.391e-01

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-6.636e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	9.865e-02
	Std. Error
(Intercept)	3.185e-01
genderMale	1.294e-01
hlab27statusNegative	2.805e-01
hlab27statusPositive	2.376e-01
age_at_onset	6.361e-03
diagnosisAxial SpA- nr-axSpA	1.701e-01
treatment_order2	1.104e-01
treatment_order3	1.044e-01
treatment_order4	1.277e-01
treatment_order5	1.342e-01
treatment_order6	1.569e-01
treatment_order7	1.981e-01
treatment_order8	2.482e-01
treatment_order9	3.086e-01
treatment_order10	5.794e-01
treatment_order11	6.108e-01
treatment_order12	9.461e-01
treatment_order14	7.387e-01
treatment_order15	9.865e-01
last_known_smoking_statussex-smoker	2.565e-01
last_known_smoking_statusnever	2.585e-01
last_known_smoking_statussmoker	3.193e-01
last_known_vaping_statussex-vaper	5.558e-01
last_known_vaping_statusnever	2.568e-01
last_known_vaping_statusvaper	3.513e-01
treatment_reclassifiedAnti-IL17	1.231e-01
treatment_reclassifiedAnti-TNF	9.717e-02
treatment_reclassifiedJAK Inhibitor	3.159e-01
time_in_years	5.909e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.570e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.391e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.869e-01
	df
(Intercept)	5.760e+02
genderMale	5.132e+02
hlab27statusNegative	5.579e+02
hlab27statusPositive	5.647e+02
age_at_onset	4.847e+02
diagnosisAxial SpA- nr-axSpA	5.064e+02
treatment_order2	5.361e+03

treatment_order3	4.798e+03
treatment_order4	5.090e+03
treatment_order5	4.509e+03
treatment_order6	4.070e+03
treatment_order7	3.770e+03
treatment_order8	4.315e+03
treatment_order9	3.200e+03
treatment_order10	4.004e+03
treatment_order11	3.190e+03
treatment_order12	5.442e+03
treatment_order14	1.140e+03
treatment_order15	9.644e+02
last_known_smoking_statussex-smoker	4.816e+02
last_known_smoking_statusnever	4.808e+02
last_known_smoking_statussmoker	4.731e+02
last_known_vaping_statussex-vaper	4.971e+02
last_known_vaping_statusnever	4.856e+02
last_known_vaping_statusvaper	4.955e+02
treatment_reclassifiedAnti-IL17	5.538e+03
treatment_reclassifiedAnti-TNF	5.902e+03
treatment_reclassifiedJAK Inhibitor	4.480e+03
time_in_years	5.687e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5.359e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5.462e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.724e+03
	t value
(Intercept)	8.227
genderMale	-2.942
hlab27statusNegative	1.726
hlab27statusPositive	-0.401
age_at_onset	1.627
diagnosisAxial SpA- nr-axSpA	0.659
treatment_order2	-2.329
treatment_order3	-0.345
treatment_order4	0.999
treatment_order5	-0.419
treatment_order6	-0.295
treatment_order7	0.564
treatment_order8	1.078
treatment_order9	0.799
treatment_order10	-0.473
treatment_order11	0.314
treatment_order12	-0.023

treatment_order14	-0.015
treatment_order15	0.319
last_known_smoking_statussex-smoker	0.010
last_known_smoking_statusnever	-1.561
last_known_smoking_statussmoker	1.409
last_known_vaping_statussex-vaper	-1.369
last_known_vaping_statusnever	0.979
last_known_vaping_statusvaper	-0.706
treatment_reclassifiedAnti-IL17	-2.552
treatment_reclassifiedAnti-TNF	-2.577
treatment_reclassifiedJAK Inhibitor	-1.786
time_in_years	5.712
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.487
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-0.477
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.168
	Pr(> t)
(Intercept)	1.28e-15 ***
genderMale	0.0034 **
hlab27statusNegative	0.0849 .
hlab27statusPositive	0.6885
age_at_onset	0.1044
diagnosisAxial SpA- nr-axSpA	0.5101
treatment_order2	0.0199 *
treatment_order3	0.7300
treatment_order4	0.3179
treatment_order5	0.6752
treatment_order6	0.7681
treatment_order7	0.5728
treatment_order8	0.2810
treatment_order9	0.4244
treatment_order10	0.6364
treatment_order11	0.7532
treatment_order12	0.9816
treatment_order14	0.9881
treatment_order15	0.7496
last_known_smoking_statussex-smoker	0.9924
last_known_smoking_statusnever	0.1191
last_known_smoking_statussmoker	0.1595
last_known_vaping_statussex-vaper	0.1715
last_known_vaping_statusnever	0.3279
last_known_vaping_statusvaper	0.4807
treatment_reclassifiedAnti-IL17	0.0107 *
treatment_reclassifiedAnti-TNF	0.0100 *

```

treatment_reclassifiedJAK Inhibitor          0.0741 .
time_in_years                               1.80e-08 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.0129 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF  0.6334
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.8665
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_jenkins_sleep_2_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_2
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 21277.4

```

Scaled residuals:
      Min       1Q   Median       3Q      Max
-3.5915 -0.5558  0.0769  0.5646  3.5248

```

```

Random effects:
Groups   Name              Variance Std.Dev. Corr
ttas_id  (Intercept)      2.842186 1.68588
         time_in_years    0.007599 0.08717  -0.66
Residual                1.239057 1.11313
Number of obs: 6330, groups:  ttas_id, 632

```

```

Fixed effects:
              Estimate Std. Error      df t value
(Intercept)    2.624e+00  3.181e-01 5.747e+02  8.247
genderMale     -3.841e-01  1.292e-01 5.121e+02 -2.974
hlab27statusNegative  4.913e-01  2.801e-01 5.565e+02  1.754
hlab27statusPositive -9.646e-02  2.372e-01 5.628e+02 -0.407
age_at_onset    1.026e-02  6.349e-03 4.836e+02  1.616
diagnosisAxial SpA- nr-axSpA  1.317e-01  1.623e-01 4.623e+02  0.811
treatment_order2 -2.625e-01  1.093e-01 5.420e+03 -2.401
treatment_order3 -3.603e-02  1.033e-01 4.891e+03 -0.349
treatment_order4  1.118e-01  1.262e-01 5.142e+03  0.886

```

treatment_order5	-2.841e-02	1.336e-01	4.564e+03	-0.213
treatment_order6	-8.463e-02	1.559e-01	4.069e+03	-0.543
treatment_order7	1.009e-01	1.969e-01	3.747e+03	0.512
treatment_order8	2.517e-01	2.475e-01	4.361e+03	1.017
treatment_order9	2.498e-01	3.083e-01	3.237e+03	0.810
treatment_order10	-2.753e-01	5.774e-01	3.979e+03	-0.477
treatment_order11	1.416e-01	6.106e-01	3.200e+03	0.232
treatment_order12	-5.211e-03	9.460e-01	5.441e+03	-0.006
treatment_order14	9.717e-03	7.386e-01	1.133e+03	0.013
treatment_order15	2.435e-01	9.868e-01	9.580e+02	0.247
last_known_smoking_statussex-smoker	-2.284e-02	2.559e-01	4.797e+02	-0.089
last_known_smoking_statusnever	-4.248e-01	2.579e-01	4.794e+02	-1.647
last_known_smoking_statussmoker	4.200e-01	3.185e-01	4.716e+02	1.319
last_known_vaping_statussex-vaper	-7.246e-01	5.547e-01	4.959e+02	-1.306
last_known_vaping_statusnever	2.750e-01	2.562e-01	4.843e+02	1.074
last_known_vaping_statusvaper	-2.192e-01	3.505e-01	4.943e+02	-0.626
treatment_reclassifiedAnti-IL17	-2.178e-01	1.171e-01	5.674e+03	-1.861
treatment_reclassifiedAnti-TNF	-2.543e-01	9.498e-02	5.943e+03	-2.678
treatment_reclassifiedJAK Inhibitor	-5.063e-01	2.726e-01	5.167e+03	-1.858
time_in_years	3.364e-02	5.914e-03	5.659e+02	5.688
	Pr(> t)			
(Intercept)	1.11e-15	***		
genderMale	0.00308	**		
hlab27statusNegative	0.07994	.		
hlab27statusPositive	0.68444			
age_at_onset	0.10673			
diagnosisAxial SpA- nr-axSpA	0.41769			
treatment_order2	0.01640	*		
treatment_order3	0.72715			
treatment_order4	0.37572			
treatment_order5	0.83156			
treatment_order6	0.58724			
treatment_order7	0.60841			
treatment_order8	0.30920			
treatment_order9	0.41775			
treatment_order10	0.63353			
treatment_order11	0.81669			
treatment_order12	0.99561			
treatment_order14	0.98951			
treatment_order15	0.80515			
last_known_smoking_statussex-smoker	0.92890			
last_known_smoking_statusnever	0.10013			
last_known_smoking_statussmoker	0.18790			

```

last_known_vaping_statussex-vaper      0.19209
last_known_vaping_statusnever          0.28351
last_known_vaping_statusvaper          0.53192
treatment_reclassifiedAnti-IL17         0.06281 .
treatment_reclassifiedAnti-TNF          0.00744 **
treatment_reclassifiedJAK Inhibitor     0.06328 .
time_in_years                          2.06e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_jenkins_sleep_2_full,
       model_treatment_diagnosis_jenkins_sleep_2_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_2

Models:

model_treatment_diagnosis_jenkins_sleep_2_reduced: jenkins_sleep_2 ~ gender + hlab27status +

model_treatment_diagnosis_jenkins_sleep_2_full: jenkins_sleep_2 ~ gender + hlab27status + age

	npar	AIC	BIC	logLik
model_treatment_diagnosis_jenkins_sleep_2_reduced	33	21288	21511	-10611
model_treatment_diagnosis_jenkins_sleep_2_full	36	21286	21529	-10607

	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_jenkins_sleep_2_reduced	21222			
model_treatment_diagnosis_jenkins_sleep_2_full	21214	7.4705	3	0.05832

model_treatment_diagnosis_jenkins_sleep_2_reduced

model_treatment_diagnosis_jenkins_sleep_2_full .

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

```

anova(model_treatment_diagnosis_jenkins_sleep_2_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	10.719	10.719	1	513.2	8.6582	0.003403
hlab27status	13.466	6.733	2	528.6	5.4387	0.004592
age_at_onset	3.276	3.276	1	484.7	2.6466	0.104424
diagnosis	1.960	1.960	1	1543.0	1.5832	0.208493
treatment_order	32.429	2.495	13	3802.5	2.0150	0.016266
last_known_smoking_status	17.378	5.793	3	489.4	4.6791	0.003111

last_known_vaping_status	9.208	3.069	3	500.6	2.4792	0.060448
treatment_reclassified	12.937	4.312	3	5838.4	3.4834	0.015161
time_in_years	40.397	40.397	1	568.7	32.6313	1.798e-08
diagnosis:treatment_reclassified	9.258	3.086	3	5605.5	2.4926	0.058242

```

gender                **
hlab27status          **
age_at_onset
diagnosis
treatment_order       *
last_known_smoking_status **
last_known_vaping_status .
treatment_reclassified *
time_in_years         ***
diagnosis:treatment_reclassified .

```

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

```
print(summary(model_treatment_diagnosis_jenkins_sleep_3_full, corr = FALSE))
```

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

Formula: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * diagnosis + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_3

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 21532.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.7694	-0.5679	0.0171	0.5557	3.5771

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.593339	1.61038	
	time_in_years	0.005816	0.07626	-0.60

Residual	1.308649	1.14396
----------	----------	---------

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate
(Intercept)	2.242e+00
genderMale	-2.848e-01
hlab27statusNegative	6.810e-01
hlab27statusPositive	1.441e-01
age_at_onset	2.979e-03
diagnosisAxial SpA- nr-axSpA	4.498e-02
treatment_order2	-2.338e-01
treatment_order3	7.990e-02
treatment_order4	8.579e-02
treatment_order5	-1.073e-01
treatment_order6	1.817e-01
treatment_order7	2.914e-01
treatment_order8	-4.564e-02
treatment_order9	-5.142e-01
treatment_order10	8.573e-01
treatment_order11	4.656e-01
treatment_order12	6.988e-01
treatment_order14	7.224e-01
treatment_order15	9.909e-01
last_known_smoking_statussex-smoker	-1.066e-01
last_known_smoking_statusnever	-3.888e-01
last_known_smoking_statussmoker	7.254e-01
last_known_vaping_statussex-vaper	-1.245e+00
last_known_vaping_statusnever	2.886e-01
last_known_vaping_statusvaper	-2.362e-02
treatment_reclassifiedAnti-IL17	-2.433e-01
treatment_reclassifiedAnti-TNF	-2.411e-01
treatment_reclassifiedJAK Inhibitor	-4.778e-01
time_in_years	2.207e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.130e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-3.639e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.206e-01
	Std. Error
(Intercept)	3.166e-01
genderMale	1.294e-01
hlab27statusNegative	2.786e-01
hlab27statusPositive	2.357e-01
age_at_onset	6.370e-03
diagnosisAxial SpA- nr-axSpA	1.698e-01
treatment_order2	1.118e-01
treatment_order3	1.057e-01

treatment_order4	1.295e-01
treatment_order5	1.358e-01
treatment_order6	1.580e-01
treatment_order7	1.995e-01
treatment_order8	2.506e-01
treatment_order9	3.102e-01
treatment_order10	5.871e-01
treatment_order11	6.131e-01
treatment_order12	9.661e-01
treatment_order14	7.364e-01
treatment_order15	9.766e-01
last_known_smoking_statussex-smoker	2.575e-01
last_known_smoking_statusnever	2.594e-01
last_known_smoking_statussmoker	3.206e-01
last_known_vaping_statussex-vaper	5.572e-01
last_known_vaping_statusnever	2.575e-01
last_known_vaping_statusvaper	3.520e-01
treatment_reclassifiedAnti-IL17	1.248e-01
treatment_reclassifiedAnti-TNF	9.856e-02
treatment_reclassifiedJAK Inhibitor	3.196e-01
time_in_years	5.700e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.611e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.412e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.975e-01
df	
(Intercept)	5.877e+02
genderMale	5.381e+02
hlab27statusNegative	5.631e+02
hlab27statusPositive	5.499e+02
age_at_onset	5.157e+02
diagnosisAxial SpA- nr-axSpA	5.264e+02
treatment_order2	5.093e+03
treatment_order3	4.627e+03
treatment_order4	4.928e+03
treatment_order5	4.311e+03
treatment_order6	3.711e+03
treatment_order7	3.337e+03
treatment_order8	3.684e+03
treatment_order9	2.650e+03
treatment_order10	3.965e+03
treatment_order11	2.902e+03
treatment_order12	5.582e+03
treatment_order14	1.145e+03

treatment_order15	9.170e+02
last_known_smoking_statussex-smoker	5.100e+02
last_known_smoking_statusnever	5.100e+02
last_known_smoking_statussmoker	5.033e+02
last_known_vaping_statussex-vaper	5.260e+02
last_known_vaping_statusnever	5.141e+02
last_known_vaping_statusvaper	5.215e+02
treatment_reclassifiedAnti-IL17	5.211e+03
treatment_reclassifiedAnti-TNF	5.726e+03
treatment_reclassifiedJAK Inhibitor	4.151e+03
time_in_years	4.861e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5.337e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5.309e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.567e+03
	t value
(Intercept)	7.080
genderMale	-2.201
hlab27statusNegative	2.444
hlab27statusPositive	0.611
age_at_onset	0.468
diagnosisAxial SpA- nr-axSpA	0.265
treatment_order2	-2.092
treatment_order3	0.756
treatment_order4	0.663
treatment_order5	-0.790
treatment_order6	1.150
treatment_order7	1.461
treatment_order8	-0.182
treatment_order9	-1.657
treatment_order10	1.460
treatment_order11	0.759
treatment_order12	0.723
treatment_order14	0.981
treatment_order15	1.015
last_known_smoking_statussex-smoker	-0.414
last_known_smoking_statusnever	-1.499
last_known_smoking_statussmoker	2.263
last_known_vaping_statussex-vaper	-2.235
last_known_vaping_statusnever	1.121
last_known_vaping_statusvaper	-0.067
treatment_reclassifiedAnti-IL17	-1.949
treatment_reclassifiedAnti-TNF	-2.446
treatment_reclassifiedJAK Inhibitor	-1.495

time_in_years	3.872
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.582
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-2.577
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.202
	Pr(> t)
(Intercept)	4.12e-12 ***
genderMale	0.028124 *
hlab27statusNegative	0.014833 *
hlab27statusPositive	0.541212
age_at_onset	0.640181
diagnosisAxial SpA- nr-axSpA	0.791188
treatment_order2	0.036473 *
treatment_order3	0.449730
treatment_order4	0.507652
treatment_order5	0.429604
treatment_order6	0.250143
treatment_order7	0.144108
treatment_order8	0.855485
treatment_order9	0.097546 .
treatment_order10	0.144311
treatment_order11	0.447687
treatment_order12	0.469528
treatment_order14	0.326844
treatment_order15	0.310587
last_known_smoking_statussex-smoker	0.678974
last_known_smoking_statusnever	0.134600
last_known_smoking_statussmoker	0.024077 *
last_known_vaping_statussex-vaper	0.025830 *
last_known_vaping_statusnever	0.262846
last_known_vaping_statusvaper	0.946532
treatment_reclassifiedAnti-IL17	0.051295 .
treatment_reclassifiedAnti-TNF	0.014463 *
treatment_reclassifiedJAK Inhibitor	0.134991
time_in_years	0.000122 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.113751
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.010002 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.840101

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

```
print(summary(model_treatment_diagnosis_jenkins_sleep_3_reduced, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_3
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 21542.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.8281	-0.5654	0.0249	0.5515	3.5655

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.586692	1.60832	
	time_in_years	0.005766	0.07593	-0.60
Residual		1.311699	1.14529	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.253e+00	3.160e-01	5.848e+02	7.130
genderMale	-2.876e-01	1.291e-01	5.362e+02	-2.227
hlab27statusNegative	6.989e-01	2.780e-01	5.599e+02	2.514
hlab27statusPositive	1.603e-01	2.350e-01	5.452e+02	0.682
age_at_onset	3.162e-03	6.357e-03	5.141e+02	0.497
diagnosisAxial SpA- nr-axSpA	-3.905e-02	1.624e-01	4.841e+02	-0.240
treatment_order2	-2.707e-01	1.107e-01	5.146e+03	-2.445
treatment_order3	4.697e-02	1.046e-01	4.714e+03	0.449
treatment_order4	4.932e-02	1.279e-01	4.970e+03	0.385
treatment_order5	-9.584e-02	1.352e-01	4.358e+03	-0.709
treatment_order6	1.213e-01	1.569e-01	3.694e+03	0.773
treatment_order7	2.451e-01	1.981e-01	3.302e+03	1.237
treatment_order8	-9.836e-02	2.498e-01	3.707e+03	-0.394
treatment_order9	-5.364e-01	3.097e-01	2.661e+03	-1.732
treatment_order10	8.158e-01	5.849e-01	3.943e+03	1.395
treatment_order11	4.031e-01	6.126e-01	2.908e+03	0.658
treatment_order12	6.759e-01	9.662e-01	5.590e+03	0.700

treatment_order14	7.020e-01	7.351e-01	1.145e+03	0.955
treatment_order15	9.088e-01	9.749e-01	9.159e+02	0.932
last_known_smoking_statussex-smoker	-1.188e-01	2.568e-01	5.077e+02	-0.463
last_known_smoking_statusnever	-4.030e-01	2.588e-01	5.082e+02	-1.557
last_known_smoking_statussmoker	7.052e-01	3.197e-01	5.013e+02	2.205
last_known_vaping_statussex-vaper	-1.206e+00	5.559e-01	5.240e+02	-2.169
last_known_vaping_statusnever	3.101e-01	2.568e-01	5.123e+02	1.207
last_known_vaping_statusvaper	1.220e-02	3.511e-01	5.194e+02	0.035
treatment_reclassifiedAnti-IL17	-1.790e-01	1.187e-01	5.377e+03	-1.507
treatment_reclassifiedAnti-TNF	-2.902e-01	9.637e-02	5.761e+03	-3.011
treatment_reclassifiedJAK Inhibitor	-3.763e-01	2.765e-01	4.862e+03	-1.361
time_in_years	2.166e-02	5.687e-03	4.825e+02	3.808
	Pr(> t)			
(Intercept)	2.98e-12	***		
genderMale	0.026351	*		
hlab27statusNegative	0.012207	*		
hlab27statusPositive	0.495316			
age_at_onset	0.619172			
diagnosisAxial SpA- nr-axSpA	0.810055			
treatment_order2	0.014501	*		
treatment_order3	0.653287			
treatment_order4	0.699919			
treatment_order5	0.478342			
treatment_order6	0.439438			
treatment_order7	0.216073			
treatment_order8	0.693798			
treatment_order9	0.083337	.		
treatment_order10	0.163124			
treatment_order11	0.510598			
treatment_order12	0.484245			
treatment_order14	0.339788			
treatment_order15	0.351466			
last_known_smoking_statussex-smoker	0.643752			
last_known_smoking_statusnever	0.120028			
last_known_smoking_statussmoker	0.027878	*		
last_known_vaping_statussex-vaper	0.030568	*		
last_known_vaping_statusnever	0.227805			
last_known_vaping_statusvaper	0.972300			
treatment_reclassifiedAnti-IL17	0.131780			
treatment_reclassifiedAnti-TNF	0.002616	**		
treatment_reclassifiedJAK Inhibitor	0.173567			
time_in_years	0.000158	***		

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

```
anova(model_treatment_diagnosis_jenkins_sleep_3_full,  
       model_treatment_diagnosis_jenkins_sleep_3_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_3

Models:

model_treatment_diagnosis_jenkins_sleep_3_reduced: jenkins_sleep_3 ~ gender + hlab27status +

model_treatment_diagnosis_jenkins_sleep_3_full: jenkins_sleep_3 ~ gender + hlab27status + ag

	npar	AIC	BIC	logLik
model_treatment_diagnosis_jenkins_sleep_3_reduced	33	21553	21776	-10744
model_treatment_diagnosis_jenkins_sleep_3_full	36	21547	21790	-10738
	deviance	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_jenkins_sleep_3_reduced	21487			
model_treatment_diagnosis_jenkins_sleep_3_full	21475	12.075	3	0.007131

model_treatment_diagnosis_jenkins_sleep_3_reduced

model_treatment_diagnosis_jenkins_sleep_3_full **

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

```
anova(model_treatment_diagnosis_jenkins_sleep_3_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	6.342	6.3425	1	538.1	4.8466	0.0281244
hlab27status	13.406	6.7030	2	538.5	5.1221	0.0062576
age_at_onset	0.286	0.2863	1	515.7	0.2188	0.6401807
diagnosis	0.198	0.1976	1	1665.6	0.1510	0.6976290
treatment_order	48.353	3.7194	13	3575.8	2.8422	0.0004428
last_known_smoking_status	24.658	8.2195	3	515.5	6.2809	0.0003428
last_known_vaping_status	14.379	4.7931	3	527.2	3.6626	0.0123632
treatment_reclassified	24.932	8.3106	3	5739.5	6.3505	0.0002706
time_in_years	19.624	19.6244	1	486.1	14.9959	0.0001225
diagnosis:treatment_reclassified	15.858	5.2860	3	5520.5	4.0392	0.0070301

gender *

hlab27status **

age_at_onset

```

diagnosis
treatment_order          ***
last_known_smoking_status ***
last_known_vaping_status *
treatment_reclassified    ***
time_in_years             ***
diagnosis:treatment_reclassified **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_jenkins_sleep_4_full, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_4 ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * diagnosis + time_in_years + (time_in_years |
  ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_4
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 20778.4

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.0757	-0.5641	0.0446	0.5693	3.4569

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.255613	1.50187	
	time_in_years	0.004807	0.06933	-0.55
Residual		1.155409	1.07490	

Number of obs: 6331, groups: ttas_id, 632

Fixed effects:

	Estimate
(Intercept)	2.522e+00
genderMale	-5.141e-01
hlab27statusNegative	8.028e-01
hlab27statusPositive	3.620e-01
age_at_onset	-6.262e-03
diagnosisAxial SpA- nr-axSpA	4.908e-01

treatment_order2	-2.136e-01
treatment_order3	3.297e-02
treatment_order4	5.183e-02
treatment_order5	1.516e-01
treatment_order6	1.779e-01
treatment_order7	3.751e-01
treatment_order8	1.523e-01
treatment_order9	-1.593e-01
treatment_order10	9.991e-01
treatment_order11	5.666e-01
treatment_order12	7.206e-01
treatment_order14	5.841e-01
treatment_order15	3.920e-01
last_known_smoking_statussex-smoker	-1.372e-01
last_known_smoking_statusnever	-4.636e-01
last_known_smoking_statussmoker	5.887e-01
last_known_vaping_statussex-vaper	-2.888e-02
last_known_vaping_statusnever	4.047e-01
last_known_vaping_statusvaper	4.377e-01
treatment_reclassifiedAnti-IL17	-3.249e-01
treatment_reclassifiedAnti-TNF	-2.392e-01
treatment_reclassifiedJAK Inhibitor	-8.335e-01
time_in_years	1.287e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.455e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.211e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.352e-01
	Std. Error
(Intercept)	3.038e-01
genderMale	1.247e-01
hlab27statusNegative	2.677e-01
hlab27statusPositive	2.267e-01
age_at_onset	6.127e-03
diagnosisAxial SpA- nr-axSpA	1.622e-01
treatment_order2	1.053e-01
treatment_order3	9.976e-02
treatment_order4	1.221e-01
treatment_order5	1.282e-01
treatment_order6	1.492e-01
treatment_order7	1.879e-01
treatment_order8	2.354e-01
treatment_order9	2.917e-01
treatment_order10	5.550e-01
treatment_order11	5.766e-01

treatment_order12	9.110e-01
treatment_order14	6.975e-01
treatment_order15	9.223e-01
last_known_smoking_statussex-smoker	2.489e-01
last_known_smoking_statusnever	2.506e-01
last_known_smoking_statussmoker	3.096e-01
last_known_vaping_statussex-vaper	5.380e-01
last_known_vaping_statusnever	2.485e-01
last_known_vaping_statusvaper	3.395e-01
treatment_reclassifiedAnti-IL17	1.175e-01
treatment_reclassifiedAnti-TNF	9.288e-02
treatment_reclassifiedJAK Inhibitor	3.006e-01
time_in_years	5.375e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	2.462e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.331e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.617e-01
df	
(Intercept)	5.526e+02
genderMale	5.126e+02
hlab27statusNegative	5.315e+02
hlab27statusPositive	5.235e+02
age_at_onset	4.864e+02
diagnosisAxial SpA- nr-axSpA	4.803e+02
treatment_order2	4.988e+03
treatment_order3	4.549e+03
treatment_order4	4.846e+03
treatment_order5	4.210e+03
treatment_order6	3.578e+03
treatment_order7	3.187e+03
treatment_order8	3.526e+03
treatment_order9	2.546e+03
treatment_order10	3.914e+03
treatment_order11	2.798e+03
treatment_order12	5.504e+03
treatment_order14	1.058e+03
treatment_order15	8.401e+02
last_known_smoking_statussex-smoker	4.917e+02
last_known_smoking_statusnever	4.902e+02
last_known_smoking_statussmoker	4.835e+02
last_known_vaping_statussex-vaper	5.075e+02
last_known_vaping_statusnever	4.920e+02
last_known_vaping_statusvaper	4.965e+02
treatment_reclassifiedAnti-IL17	5.115e+03

treatment_reclassifiedAnti-TNF	5.665e+03
treatment_reclassifiedJAK Inhibitor	3.977e+03
time_in_years	4.785e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5.191e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5.209e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5.444e+03
	t value
(Intercept)	8.303
genderMale	-4.123
hlab27statusNegative	2.999
hlab27statusPositive	1.597
age_at_onset	-1.022
diagnosisAxial SpA- nr-axSpA	3.025
treatment_order2	-2.030
treatment_order3	0.331
treatment_order4	0.424
treatment_order5	1.182
treatment_order6	1.192
treatment_order7	1.996
treatment_order8	0.647
treatment_order9	-0.546
treatment_order10	1.800
treatment_order11	0.983
treatment_order12	0.791
treatment_order14	0.837
treatment_order15	0.425
last_known_smoking_statussex-smoker	-0.551
last_known_smoking_statusnever	-1.850
last_known_smoking_statussmoker	1.902
last_known_vaping_statussex-vaper	-0.054
last_known_vaping_statusnever	1.628
last_known_vaping_statusvaper	1.289
treatment_reclassifiedAnti-IL17	-2.766
treatment_reclassifiedAnti-TNF	-2.575
treatment_reclassifiedJAK Inhibitor	-2.772
time_in_years	2.395
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.591
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.091
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.953
	Pr(> t)
(Intercept)	7.82e-16 ***
genderMale	4.37e-05 ***
hlab27statusNegative	0.00284 **


```

hlab27statusPositive      0.11092
age_at_onset              0.30724
diagnosisAxial SpA- nr-axSpA 0.00262 **
treatment_order2          0.04245 *
treatment_order3          0.74099
treatment_order4          0.67126
treatment_order5          0.23732
treatment_order6          0.23334
treatment_order7          0.04601 *
treatment_order8          0.51756
treatment_order9          0.58500
treatment_order10         0.07190 .
treatment_order11         0.32588
treatment_order12         0.42897
treatment_order14         0.40252
treatment_order15         0.67091
last_known_smoking_statussex-smoker 0.58166
last_known_smoking_statusnever 0.06494 .
last_known_smoking_statussmoker 0.05781 .
last_known_vaping_statussex-vaper 0.95721
last_known_vaping_statusnever 0.10410
last_known_vaping_statusvaper 0.19788
treatment_reclassifiedAnti-IL17 0.00570 **
treatment_reclassifiedAnti-TNF 0.01004 *
treatment_reclassifiedJAK Inhibitor 0.00559 **
time_in_years             0.01701 *
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.55449
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF 0.92748
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.34073
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_jenkins_sleep_4_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_4 ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_4
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 20777.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.0734	-0.5658	0.0448	0.5683	3.4633

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.257048	1.50235	
	time_in_years	0.004796	0.06925	-0.55
Residual		1.155224	1.07481	

Number of obs: 6331, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.523e+00	3.037e-01	5.527e+02	8.309
genderMale	-5.152e-01	1.247e-01	5.129e+02	-4.133
hlab27statusNegative	8.030e-01	2.675e-01	5.315e+02	3.002
hlab27statusPositive	3.586e-01	2.265e-01	5.229e+02	1.584
age_at_onset	-6.326e-03	6.124e-03	4.866e+02	-1.033
diagnosisAxial SpA- nr-axSpA	5.050e-01	1.559e-01	4.491e+02	3.239
treatment_order2	-2.095e-01	1.042e-01	5.045e+03	-2.011
treatment_order3	3.636e-02	9.862e-02	4.643e+03	0.369
treatment_order4	6.305e-02	1.206e-01	4.894e+03	0.523
treatment_order5	1.622e-01	1.276e-01	4.272e+03	1.271
treatment_order6	1.737e-01	1.481e-01	3.572e+03	1.172
treatment_order7	3.595e-01	1.865e-01	3.163e+03	1.927
treatment_order8	1.562e-01	2.345e-01	3.555e+03	0.666
treatment_order9	-1.467e-01	2.911e-01	2.569e+03	-0.504
treatment_order10	9.590e-01	5.527e-01	3.902e+03	1.735
treatment_order11	5.437e-01	5.759e-01	2.805e+03	0.944
treatment_order12	7.059e-01	9.103e-01	5.512e+03	0.775
treatment_order14	5.703e-01	6.965e-01	1.061e+03	0.819
treatment_order15	3.579e-01	9.211e-01	8.402e+02	0.389
last_known_smoking_statussex-smoker	-1.452e-01	2.487e-01	4.914e+02	-0.584
last_known_smoking_statusnever	-4.704e-01	2.505e-01	4.903e+02	-1.878
last_known_smoking_statussmoker	5.787e-01	3.093e-01	4.833e+02	1.871
last_known_vaping_statussex-vaper	-2.001e-02	5.377e-01	5.075e+02	-0.037
last_known_vaping_statusnever	4.121e-01	2.483e-01	4.922e+02	1.659
last_known_vaping_statusvaper	4.455e-01	3.392e-01	4.965e+02	1.313
treatment_reclassifiedAnti-IL17	-3.036e-01	1.117e-01	5.285e+03	-2.719
treatment_reclassifiedAnti-TNF	-2.394e-01	9.073e-02	5.699e+03	-2.638
treatment_reclassifiedJAK Inhibitor	-6.851e-01	2.598e-01	4.712e+03	-2.637

time_in_years	1.286e-02	5.371e-03	4.783e+02	2.394
	Pr(> t)			
(Intercept)	7.50e-16	***		
genderMale	4.18e-05	***		
hlab27statusNegative	0.00281	**		
hlab27statusPositive	0.11386			
age_at_onset	0.30215			
diagnosisAxial SpA- nr-axSpA	0.00129	**		
treatment_order2	0.04439	*		
treatment_order3	0.71235			
treatment_order4	0.60110			
treatment_order5	0.20376			
treatment_order6	0.24113			
treatment_order7	0.05402	.		
treatment_order8	0.50543			
treatment_order9	0.61442			
treatment_order10	0.08279	.		
treatment_order11	0.34523			
treatment_order12	0.43811			
treatment_order14	0.41305			
treatment_order15	0.69769			
last_known_smoking_statussex-smoker	0.55951			
last_known_smoking_statusnever	0.06094	.		
last_known_smoking_statussmoker	0.06197	.		
last_known_vaping_statussex-vaper	0.97032			
last_known_vaping_statusnever	0.09766	.		
last_known_vaping_statusvaper	0.18968			
treatment_reclassifiedAnti-IL17	0.00657	**		
treatment_reclassifiedAnti-TNF	0.00835	**		
treatment_reclassifiedJAK Inhibitor	0.00840	**		
time_in_years	0.01707	*		

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

```
anova(model_treatment_diagnosis_jenkins_sleep_4_full,
       model_treatment_diagnosis_jenkins_sleep_4_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_4

Models:

model_treatment_diagnosis_jenkins_sleep_4_reduced: jenkins_sleep_4 ~ gender + hlab27status +

```

model_treatment_diagnosis_jenkins_sleep_4_full: jenkins_sleep_4 ~ gender + hlab27status + age_at_onset
              npar    AIC    BIC logLik
model_treatment_diagnosis_jenkins_sleep_4_reduced    33 20785 21008 -10359
model_treatment_diagnosis_jenkins_sleep_4_full      36 20789 21033 -10359
              deviance Chisq Df Pr(>Chisq)
model_treatment_diagnosis_jenkins_sleep_4_reduced    20719
model_treatment_diagnosis_jenkins_sleep_4_full      20717 1.254 3    0.7401

```

```
anova(model_treatment_diagnosis_jenkins_sleep_4_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	19.637	19.6365	1	512.6	16.9953	4.37e-05
hlab27status	12.020	6.0102	2	506.9	5.2018	0.0058045
age_at_onset	1.207	1.2070	1	486.4	1.0447	0.3072403
diagnosis	11.115	11.1154	1	1539.2	9.6203	0.0019593
treatment_order	35.457	2.7275	13	3438.6	2.3606	0.0038550
last_known_smoking_status	21.916	7.3052	3	496.8	6.3226	0.0003255
last_known_vaping_status	4.040	1.3467	3	505.1	1.1656	0.3223076
treatment_reclassified	8.464	2.8215	3	5641.0	2.4420	0.0623177
time_in_years	6.627	6.6273	1	478.5	5.7359	0.0170054
diagnosis:treatment_reclassified	1.448	0.4827	3	5405.7	0.4178	0.7402506

```

gender          ***
hlab27status    **
age_at_onset
diagnosis       **
treatment_order **
last_known_smoking_status ***
last_known_vaping_status
treatment_reclassified .
time_in_years   *
diagnosis:treatment_reclassified
---

```

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

lme4 code for treatment and gender: Jenkins Sleep

```

model_treatment_gender_jenkins_sleep_1_full <- lmer(
  jenkins_sleep_1 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_1,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_2_full <- lmer(
  jenkins_sleep_2 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_2,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_3_full <- lmer(
  jenkins_sleep_3 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_3,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_4_full <- lmer(
  jenkins_sleep_4 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_jenkins_sleep_4,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_jenkins_sleep_1_reduced <- lmer(
  jenkins_sleep_1 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_jenkins_sleep_1,
    control = lmerControl(optimizer = "bobyqa",
      optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_2_reduced <- lmer(
  jenkins_sleep_2 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_jenkins_sleep_2,
    control = lmerControl(optimizer = "bobyqa",
      optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_3_reduced <- lmer(
  jenkins_sleep_3 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_jenkins_sleep_3,
    control = lmerControl(optimizer = "bobyqa",
      optCtrl = list(maxfun = 2e5)))

model_treatment_gender_jenkins_sleep_4_reduced <- lmer(
  jenkins_sleep_4 ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
    data = dataframe_sorted_and_reclassified_jenkins_sleep_4,
    control = lmerControl(optimizer = "bobyqa",
      optCtrl = list(maxfun = 2e5)))

```

```
print(summary(model_treatment_gender_jenkins_sleep_1_full, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified * gender + time_in_years + (time_in_years |
      ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_1
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 20218.4

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2889	-0.5096	-0.1105	0.4718	4.2867

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.2348	1.49492	
	time_in_years	0.0041	0.06403	-0.53
Residual		1.0506	1.02500	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	1.652e+00	3.032e-01	5.877e+02
genderMale	-1.280e-01	1.306e-01	6.290e+02
hlab27statusNegative	5.569e-01	2.658e-01	5.479e+02
hlab27statusPositive	3.481e-01	2.243e-01	5.093e+02
age_at_onset	-6.152e-03	6.129e-03	5.331e+02
diagnosisAxial SpA- nr-axSpA	2.782e-01	1.561e-01	4.988e+02
treatment_order2	-1.307e-01	9.981e-02	5.004e+03
treatment_order3	-2.362e-02	9.471e-02	4.502e+03
treatment_order4	-1.737e-01	1.165e-01	4.700e+03
treatment_order5	1.064e-02	1.226e-01	4.004e+03
treatment_order6	1.064e-01	1.419e-01	3.296e+03
treatment_order7	1.688e-01	1.796e-01	2.898e+03
treatment_order8	3.282e-01	2.242e-01	3.258e+03
treatment_order9	3.762e-01	2.774e-01	2.344e+03
treatment_order10	8.250e-01	5.343e-01	3.764e+03
treatment_order11	2.609e-01	5.540e-01	2.522e+03

treatment_order12	2.601e-01	8.709e-01	5.422e+03
treatment_order14	5.338e-01	6.657e-01	9.395e+02
treatment_order15	3.673e-02	8.800e-01	7.527e+02
last_known_smoking_statussex-smoker	-1.384e-02	2.489e-01	5.236e+02
last_known_smoking_statusnever	-3.257e-01	2.508e-01	5.255e+02
last_known_smoking_statussmoker	5.417e-01	3.100e-01	5.220e+02
last_known_vaping_statussex-vaper	-6.212e-01	5.376e-01	5.387e+02
last_known_vaping_statusnever	-9.855e-02	2.487e-01	5.292e+02
last_known_vaping_statusvaper	4.232e-03	3.394e-01	5.334e+02
treatment_reclassifiedAnti-IL17	-1.538e-01	1.515e-01	4.056e+03
treatment_reclassifiedAnti-TNF	-2.241e-01	1.110e-01	5.424e+03
treatment_reclassifiedJAK Inhibitor	3.472e-01	3.075e-01	3.783e+03
time_in_years	5.483e-03	5.161e-03	4.688e+02
genderMale:treatment_reclassifiedAnti-IL17	-2.446e-01	1.709e-01	3.710e+03
genderMale:treatment_reclassifiedAnti-TNF	1.567e-03	1.076e-01	4.778e+03
genderMale:treatment_reclassifiedJAK Inhibitor	-9.320e-01	4.834e-01	4.186e+03
t value Pr(> t)			
(Intercept)	5.447	7.53e-08	***
genderMale	-0.980	0.3274	
hlab27statusNegative	2.095	0.0366	*
hlab27statusPositive	1.552	0.1213	
age_at_onset	-1.004	0.3159	
diagnosisAxial SpA- nr-axSpA	1.782	0.0754	.
treatment_order2	-1.310	0.1903	
treatment_order3	-0.249	0.8031	
treatment_order4	-1.491	0.1359	
treatment_order5	0.087	0.9308	
treatment_order6	0.750	0.4533	
treatment_order7	0.940	0.3473	
treatment_order8	1.464	0.1433	
treatment_order9	1.356	0.1753	
treatment_order10	1.544	0.1226	
treatment_order11	0.471	0.6377	
treatment_order12	0.299	0.7652	
treatment_order14	0.802	0.4228	
treatment_order15	0.042	0.9667	
last_known_smoking_statussex-smoker	-0.056	0.9557	
last_known_smoking_statusnever	-1.299	0.1946	
last_known_smoking_statussmoker	1.748	0.0811	.
last_known_vaping_statussex-vaper	-1.156	0.2484	
last_known_vaping_statusnever	-0.396	0.6920	
last_known_vaping_statusvaper	0.012	0.9901	
treatment_reclassifiedAnti-IL17	-1.016	0.3098	

treatment_reclassifiedAnti-TNF	-2.018	0.0436 *
treatment_reclassifiedJAK Inhibitor	1.129	0.2589
time_in_years	1.062	0.2886
genderMale:treatment_reclassifiedAnti-IL17	-1.431	0.1525
genderMale:treatment_reclassifiedAnti-TNF	0.015	0.9884
genderMale:treatment_reclassifiedJAK Inhibitor	-1.928	0.0539 .

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

```
print(summary(model_treatment_gender_jenkins_sleep_1_reduced, corr = FALSE))
```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_1
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 20220.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2603	-0.5084	-0.1074	0.4758	4.2835

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.231095	1.49369	
	time_in_years	0.004176	0.06462	-0.52
Residual		1.050212	1.02480	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	1.657e+00	3.021e-01	5.772e+02	5.484
genderMale	-1.452e-01	1.246e-01	5.439e+02	-1.165
hlab27statusNegative	5.643e-01	2.663e-01	5.473e+02	2.119
hlab27statusPositive	3.537e-01	2.249e-01	5.107e+02	1.572
age_at_onset	-6.293e-03	6.133e-03	5.312e+02	-1.026
diagnosisAxial SpA- nr-axSpA	2.809e-01	1.562e-01	4.971e+02	1.799
treatment_order2	-1.366e-01	9.971e-02	4.999e+03	-1.370
treatment_order3	-3.064e-02	9.463e-02	4.529e+03	-0.324

treatment_order4	-1.733e-01	1.156e-01	4.747e+03	-1.499
treatment_order5	6.397e-03	1.224e-01	4.048e+03	0.052
treatment_order6	8.231e-02	1.416e-01	3.335e+03	0.581
treatment_order7	1.411e-01	1.785e-01	2.885e+03	0.790
treatment_order8	2.944e-01	2.235e-01	3.312e+03	1.317
treatment_order9	3.380e-01	2.774e-01	2.374e+03	1.218
treatment_order10	9.004e-01	5.305e-01	3.722e+03	1.697
treatment_order11	3.787e-01	5.500e-01	2.583e+03	0.689
treatment_order12	2.770e-01	8.703e-01	5.413e+03	0.318
treatment_order14	5.454e-01	6.663e-01	9.261e+02	0.819
treatment_order15	1.905e-01	8.785e-01	7.347e+02	0.217
last_known_smoking_statussex-smoker	-2.932e-02	2.492e-01	5.221e+02	-0.118
last_known_smoking_statusnever	-3.401e-01	2.510e-01	5.239e+02	-1.355
last_known_smoking_statussmoker	5.199e-01	3.102e-01	5.201e+02	1.676
last_known_vaping_statussex-vaper	-5.958e-01	5.382e-01	5.375e+02	-1.107
last_known_vaping_statusnever	-8.092e-02	2.488e-01	5.270e+02	-0.325
last_known_vaping_statusvaper	1.501e-02	3.397e-01	5.317e+02	0.044
treatment_reclassifiedAnti-IL17	-3.015e-01	1.066e-01	5.134e+03	-2.827
treatment_reclassifiedAnti-TNF	-2.247e-01	8.669e-02	5.636e+03	-2.592
treatment_reclassifiedJAK Inhibitor	2.452e-02	2.479e-01	4.508e+03	0.099
time_in_years	5.831e-03	5.180e-03	4.687e+02	1.126
	Pr(> t)			
(Intercept)	6.23e-08	***		
genderMale	0.24453			
hlab27statusNegative	0.03455	*		
hlab27statusPositive	0.11647			
age_at_onset	0.30527			
diagnosisAxial SpA- nr-axSpA	0.07262	.		
treatment_order2	0.17089			
treatment_order3	0.74608			
treatment_order4	0.13406			
treatment_order5	0.95832			
treatment_order6	0.56111			
treatment_order7	0.42931			
treatment_order8	0.18787			
treatment_order9	0.22321			
treatment_order10	0.08972	.		
treatment_order11	0.49116			
treatment_order12	0.75033			
treatment_order14	0.41328			
treatment_order15	0.82841			
last_known_smoking_statussex-smoker	0.90637			
last_known_smoking_statusnever	0.17608			

```

last_known_smoking_statussmoker      0.09433 .
last_known_vaping_statussex-vaper     0.26880
last_known_vaping_statusnever         0.74508
last_known_vaping_statusvaper         0.96478
treatment_reclassifiedAnti-IL17        0.00472 **
treatment_reclassifiedAnti-TNF         0.00957 **
treatment_reclassifiedJAK Inhibitor    0.92120
time_in_years                         0.26087
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_jenkins_sleep_1_full,
       model_treatment_gender_jenkins_sleep_1_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_1

Models:

model_treatment_gender_jenkins_sleep_1_reduced: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset

model_treatment_gender_jenkins_sleep_1_full: jenkins_sleep_1 ~ gender + hlab27status + age_at_onset + treatment_order

	npars	AIC	BIC	logLik	deviance
model_treatment_gender_jenkins_sleep_1_reduced	33	20226	20449	-10080	20160
model_treatment_gender_jenkins_sleep_1_full	36	20226	20469	-10077	20154

	Chisq	Df	Pr(>Chisq)
model_treatment_gender_jenkins_sleep_1_reduced			
model_treatment_gender_jenkins_sleep_1_full	5.9553	3	0.1138

```

anova(model_treatment_gender_jenkins_sleep_1_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	6.0414	6.0414	1	1556.8	5.7503	0.016603 *
hlab27status	4.6272	2.3136	2	529.1	2.2021	0.111582
age_at_onset	1.0586	1.0586	1	533.1	1.0076	0.315937
diagnosis	3.3362	3.3362	1	498.8	3.1755	0.075359 .
treatment_order	19.3473	1.4883	13	3214.9	1.4165	0.143130
last_known_smoking_status	13.9108	4.6369	3	525.1	4.4135	0.004449 **
last_known_vaping_status	1.6043	0.5348	3	538.1	0.5090	0.676221
treatment_reclassified	8.4917	2.8306	3	4783.1	2.6942	0.044455 *
time_in_years	1.1859	1.1859	1	468.8	1.1287	0.288594
gender:treatment_reclassified	6.1706	2.0569	3	4286.5	1.9577	0.118114

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

```
print(summary(model_treatment_gender_jenkins_sleep_2_full, corr = FALSE))
```

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

Formula: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * gender + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_2

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 21278.6

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5882	-0.5578	0.0768	0.5657	3.4989

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.852296	1.68887	
	time_in_years	0.007577	0.08705	-0.67
Residual		1.239429	1.11330	

Number of obs: 6330, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.665e+00	3.203e-01	5.857e+02
genderMale	-4.326e-01	1.370e-01	6.103e+02
hlab27statusNegative	4.828e-01	2.801e-01	5.564e+02
hlab27statusPositive	-1.026e-01	2.371e-01	5.616e+02
age_at_onset	1.013e-02	6.354e-03	4.842e+02
diagnosisAxial SpA- nr-axSpA	1.320e-01	1.624e-01	4.627e+02
treatment_order2	-2.540e-01	1.095e-01	5.416e+03
treatment_order3	-2.739e-02	1.034e-01	4.856e+03
treatment_order4	1.293e-01	1.272e-01	5.081e+03
treatment_order5	-1.548e-02	1.339e-01	4.518e+03
treatment_order6	-6.611e-02	1.563e-01	4.024e+03
treatment_order7	1.337e-01	1.982e-01	3.743e+03
treatment_order8	2.796e-01	2.484e-01	4.319e+03

treatment_order9	2.697e-01	3.087e-01	3.208e+03
treatment_order10	-2.637e-01	5.819e-01	3.996e+03
treatment_order11	1.463e-01	6.161e-01	3.128e+03
treatment_order12	6.333e-03	9.469e-01	5.434e+03
treatment_order14	2.057e-02	7.390e-01	1.133e+03
treatment_order15	2.414e-01	9.905e-01	9.705e+02
last_known_smoking_statussex-smoker	-1.739e-02	2.560e-01	4.801e+02
last_known_smoking_statusnever	-4.151e-01	2.581e-01	4.800e+02
last_known_smoking_statussmoker	4.251e-01	3.188e-01	4.721e+02
last_known_vaping_statussex-vaper	-7.451e-01	5.549e-01	4.958e+02
last_known_vaping_statusnever	2.598e-01	2.565e-01	4.853e+02
last_known_vaping_statusvaper	-2.302e-01	3.508e-01	4.948e+02
treatment_reclassifiedAnti-IL17	-2.056e-01	1.670e-01	4.909e+03
treatment_reclassifiedAnti-TNF	-3.503e-01	1.214e-01	5.703e+03
treatment_reclassifiedJAK Inhibitor	-4.955e-01	3.395e-01	4.654e+03
time_in_years	3.351e-02	5.910e-03	5.643e+02
genderMale:treatment_reclassifiedAnti-IL17	-3.213e-02	1.884e-01	4.572e+03
genderMale:treatment_reclassifiedAnti-TNF	1.500e-01	1.175e-01	5.078e+03
genderMale:treatment_reclassifiedJAK Inhibitor	-1.801e-01	5.319e-01	4.785e+03
	t value	Pr(> t)	
(Intercept)	8.322	6.09e-16	***
genderMale	-3.157	0.00167	**
hlab27statusNegative	1.724	0.08535	.
hlab27statusPositive	-0.433	0.66546	
age_at_onset	1.594	0.11169	
diagnosisAxial SpA- nr-axSpA	0.813	0.41692	
treatment_order2	-2.320	0.02037	*
treatment_order3	-0.265	0.79112	
treatment_order4	1.017	0.30938	
treatment_order5	-0.116	0.90796	
treatment_order6	-0.423	0.67242	
treatment_order7	0.675	0.50000	
treatment_order8	1.126	0.26030	
treatment_order9	0.874	0.38226	
treatment_order10	-0.453	0.65041	
treatment_order11	0.237	0.81231	
treatment_order12	0.007	0.99466	
treatment_order14	0.028	0.97780	
treatment_order15	0.244	0.80754	
last_known_smoking_statussex-smoker	-0.068	0.94587	
last_known_smoking_statusnever	-1.609	0.10838	
last_known_smoking_statussmoker	1.334	0.18292	
last_known_vaping_statussex-vaper	-1.343	0.17996	

last_known_vaping_statusnever	1.013	0.31166
last_known_vaping_statusvaper	-0.656	0.51193
treatment_reclassifiedAnti-IL17	-1.231	0.21844
treatment_reclassifiedAnti-TNF	-2.886	0.00391 **
treatment_reclassifiedJAK Inhibitor	-1.459	0.14453
time_in_years	5.671	2.27e-08 ***
genderMale:treatment_reclassifiedAnti-IL17	-0.171	0.86459
genderMale:treatment_reclassifiedAnti-TNF	1.277	0.20163
genderMale:treatment_reclassifiedJAK Inhibitor	-0.339	0.73487

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

```
print(summary(model_treatment_gender_jenkins_sleep_2_reduced, corr = FALSE))
```

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

Formula: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_2

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 21277.4

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5915	-0.5558	0.0769	0.5646	3.5248

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.842186	1.68588	
	time_in_years	0.007599	0.08717	-0.66
Residual		1.239057	1.11313	

Number of obs: 6330, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.624e+00	3.181e-01	5.747e+02	8.247
genderMale	-3.841e-01	1.292e-01	5.121e+02	-2.974
hlab27statusNegative	4.913e-01	2.801e-01	5.565e+02	1.754
hlab27statusPositive	-9.646e-02	2.372e-01	5.628e+02	-0.407
age_at_onset	1.026e-02	6.349e-03	4.836e+02	1.616

diagnosisAxial SpA- nr-axSpA	1.317e-01	1.623e-01	4.623e+02	0.811
treatment_order2	-2.625e-01	1.093e-01	5.420e+03	-2.401
treatment_order3	-3.603e-02	1.033e-01	4.891e+03	-0.349
treatment_order4	1.118e-01	1.262e-01	5.142e+03	0.886
treatment_order5	-2.841e-02	1.336e-01	4.564e+03	-0.213
treatment_order6	-8.463e-02	1.559e-01	4.069e+03	-0.543
treatment_order7	1.009e-01	1.969e-01	3.747e+03	0.512
treatment_order8	2.517e-01	2.475e-01	4.361e+03	1.017
treatment_order9	2.498e-01	3.083e-01	3.237e+03	0.810
treatment_order10	-2.753e-01	5.774e-01	3.979e+03	-0.477
treatment_order11	1.416e-01	6.106e-01	3.200e+03	0.232
treatment_order12	-5.211e-03	9.460e-01	5.441e+03	-0.006
treatment_order14	9.717e-03	7.386e-01	1.133e+03	0.013
treatment_order15	2.435e-01	9.868e-01	9.580e+02	0.247
last_known_smoking_statussex-smoker	-2.284e-02	2.559e-01	4.797e+02	-0.089
last_known_smoking_statusnever	-4.248e-01	2.579e-01	4.794e+02	-1.647
last_known_smoking_statussmoker	4.200e-01	3.185e-01	4.716e+02	1.319
last_known_vaping_statussex-vaper	-7.246e-01	5.547e-01	4.959e+02	-1.306
last_known_vaping_statusnever	2.750e-01	2.562e-01	4.843e+02	1.074
last_known_vaping_statusvaper	-2.192e-01	3.505e-01	4.943e+02	-0.626
treatment_reclassifiedAnti-IL17	-2.178e-01	1.171e-01	5.674e+03	-1.861
treatment_reclassifiedAnti-TNF	-2.543e-01	9.498e-02	5.943e+03	-2.678
treatment_reclassifiedJAK Inhibitor	-5.063e-01	2.726e-01	5.167e+03	-1.858
time_in_years	3.364e-02	5.914e-03	5.659e+02	5.688
Pr(> t)				
(Intercept)	1.11e-15	***		
genderMale	0.00308	**		
hlab27statusNegative	0.07994	.		
hlab27statusPositive	0.68444			
age_at_onset	0.10673			
diagnosisAxial SpA- nr-axSpA	0.41769			
treatment_order2	0.01640	*		
treatment_order3	0.72715			
treatment_order4	0.37572			
treatment_order5	0.83156			
treatment_order6	0.58724			
treatment_order7	0.60841			
treatment_order8	0.30920			
treatment_order9	0.41775			
treatment_order10	0.63353			
treatment_order11	0.81669			
treatment_order12	0.99561			
treatment_order14	0.98951			

```

treatment_order15                0.80515
last_known_smoking_statussex-smoker 0.92890
last_known_smoking_statusnever      0.10013
last_known_smoking_statussmoker     0.18790
last_known_vaping_statussex-vaper   0.19209
last_known_vaping_statusnever       0.28351
last_known_vaping_statusvaper       0.53192
treatment_reclassifiedAnti-IL17     0.06281 .
treatment_reclassifiedAnti-TNF       0.00744 **
treatment_reclassifiedJAK Inhibitor  0.06328 .
time_in_years                     2.06e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_jenkins_sleep_2_full,
       model_treatment_gender_jenkins_sleep_2_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_2

Models:

model_treatment_gender_jenkins_sleep_2_reduced: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset

model_treatment_gender_jenkins_sleep_2_full: jenkins_sleep_2 ~ gender + hlab27status + age_at_onset + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified * gender + time_in_years + (time_in_years | ttas_id)

	npar	AIC	BIC	logLik	deviance
model_treatment_gender_jenkins_sleep_2_reduced	33	21288	21511	-10611	21222
model_treatment_gender_jenkins_sleep_2_full	36	21291	21534	-10610	21219

	Chisq	Df	Pr(>Chisq)
model_treatment_gender_jenkins_sleep_2_reduced			
model_treatment_gender_jenkins_sleep_2_full	2.3044	3	0.5117

```

print(summary(model_treatment_gender_jenkins_sleep_3_full, corr = FALSE))

```

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

lmerModLmerTest]

Formula: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified * gender + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_3

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 21542

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.8139	-0.5702	0.0225	0.5487	3.5624

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.586378	1.60822	
	time_in_years	0.005718	0.07562	-0.61
Residual		1.312235	1.14553	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.277e+00	3.176e-01	5.974e+02
genderMale	-3.081e-01	1.366e-01	6.356e+02
hlab27statusNegative	6.876e-01	2.776e-01	5.618e+02
hlab27statusPositive	1.537e-01	2.345e-01	5.462e+02
age_at_onset	3.151e-03	6.352e-03	5.160e+02
diagnosisAxial SpA- nr-axSpA	-4.157e-02	1.623e-01	4.856e+02
treatment_order2	-2.610e-01	1.108e-01	5.150e+03
treatment_order3	5.683e-02	1.047e-01	4.689e+03
treatment_order4	6.452e-02	1.289e-01	4.921e+03
treatment_order5	-8.463e-02	1.354e-01	4.318e+03
treatment_order6	1.462e-01	1.573e-01	3.660e+03
treatment_order7	2.880e-01	1.994e-01	3.317e+03
treatment_order8	-5.460e-02	2.506e-01	3.670e+03
treatment_order9	-4.969e-01	3.099e-01	2.641e+03
treatment_order10	8.063e-01	5.892e-01	3.969e+03
treatment_order11	3.221e-01	6.175e-01	2.839e+03
treatment_order12	6.924e-01	9.670e-01	5.591e+03
treatment_order14	7.206e-01	7.352e-01	1.156e+03
treatment_order15	8.000e-01	9.782e-01	9.341e+02
last_known_smoking_statussex-smoker	-1.066e-01	2.566e-01	5.094e+02
last_known_smoking_statusnever	-3.892e-01	2.586e-01	5.101e+02
last_known_smoking_statussmoker	7.207e-01	3.195e-01	5.032e+02
last_known_vaping_statussex-vaper	-1.235e+00	5.552e-01	5.255e+02
last_known_vaping_statusnever	2.899e-01	2.568e-01	5.147e+02
last_known_vaping_statusvaper	2.557e-03	3.508e-01	5.214e+02
treatment_reclassifiedAnti-IL17	-4.930e-02	1.688e-01	4.453e+03
treatment_reclassifiedAnti-TNF	-3.590e-01	1.232e-01	5.548e+03
treatment_reclassifiedJAK Inhibitor	-2.414e-01	3.434e-01	4.205e+03

time_in_years	2.137e-02	5.675e-03	4.820e+02
genderMale:treatment_reclassifiedAnti-IL17	-2.197e-01	1.903e-01	4.147e+03
genderMale:treatment_reclassifiedAnti-TNF	1.066e-01	1.190e-01	4.917e+03
genderMale:treatment_reclassifiedJAK Inhibitor	-5.092e-01	5.391e-01	4.568e+03
	t value	Pr(> t)	
(Intercept)	7.170	2.22e-12	***
genderMale	-2.256	0.024398	*
hlab27statusNegative	2.477	0.013540	*
hlab27statusPositive	0.656	0.512371	
age_at_onset	0.496	0.620117	
diagnosisAxial SpA- nr-axSpA	-0.256	0.797917	
treatment_order2	-2.355	0.018542	*
treatment_order3	0.543	0.587175	
treatment_order4	0.501	0.616600	
treatment_order5	-0.625	0.532002	
treatment_order6	0.930	0.352685	
treatment_order7	1.444	0.148725	
treatment_order8	-0.218	0.827556	
treatment_order9	-1.603	0.109036	
treatment_order10	1.368	0.171248	
treatment_order11	0.522	0.601967	
treatment_order12	0.716	0.473985	
treatment_order14	0.980	0.327217	
treatment_order15	0.818	0.413666	
last_known_smoking_statussex-smoker	-0.415	0.678047	
last_known_smoking_statusnever	-1.505	0.132900	
last_known_smoking_statussmoker	2.256	0.024520	*
last_known_vaping_statussex-vaper	-2.223	0.026607	*
last_known_vaping_statusnever	1.129	0.259354	
last_known_vaping_statusvaper	0.007	0.994188	
treatment_reclassifiedAnti-IL17	-0.292	0.770259	
treatment_reclassifiedAnti-TNF	-2.914	0.003586	**
treatment_reclassifiedJAK Inhibitor	-0.703	0.482055	
time_in_years	3.765	0.000187	***
genderMale:treatment_reclassifiedAnti-IL17	-1.154	0.248396	
genderMale:treatment_reclassifiedAnti-TNF	0.895	0.370741	
genderMale:treatment_reclassifiedJAK Inhibitor	-0.944	0.344994	

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

```
print(summary(model_treatment_gender_jenkins_sleep_3_reduced, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_jenkins_sleep_3
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 21542.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.8281	-0.5654	0.0249	0.5515	3.5655

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.586692	1.60832	
	time_in_years	0.005766	0.07593	-0.60
Residual		1.311699	1.14529	

Number of obs: 6329, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.253e+00	3.160e-01	5.848e+02	7.130
genderMale	-2.876e-01	1.291e-01	5.362e+02	-2.227
hlab27statusNegative	6.989e-01	2.780e-01	5.599e+02	2.514
hlab27statusPositive	1.603e-01	2.350e-01	5.452e+02	0.682
age_at_onset	3.162e-03	6.357e-03	5.141e+02	0.497
diagnosisAxial SpA- nr-axSpA	-3.905e-02	1.624e-01	4.841e+02	-0.240
treatment_order2	-2.707e-01	1.107e-01	5.146e+03	-2.445
treatment_order3	4.697e-02	1.046e-01	4.714e+03	0.449
treatment_order4	4.932e-02	1.279e-01	4.970e+03	0.385
treatment_order5	-9.584e-02	1.352e-01	4.358e+03	-0.709
treatment_order6	1.213e-01	1.569e-01	3.694e+03	0.773
treatment_order7	2.451e-01	1.981e-01	3.302e+03	1.237
treatment_order8	-9.836e-02	2.498e-01	3.707e+03	-0.394
treatment_order9	-5.364e-01	3.097e-01	2.661e+03	-1.732
treatment_order10	8.158e-01	5.849e-01	3.943e+03	1.395
treatment_order11	4.031e-01	6.126e-01	2.908e+03	0.658
treatment_order12	6.759e-01	9.662e-01	5.590e+03	0.700

treatment_order14	7.020e-01	7.351e-01	1.145e+03	0.955
treatment_order15	9.088e-01	9.749e-01	9.159e+02	0.932
last_known_smoking_statussex-smoker	-1.188e-01	2.568e-01	5.077e+02	-0.463
last_known_smoking_statusnever	-4.030e-01	2.588e-01	5.082e+02	-1.557
last_known_smoking_statussmoker	7.052e-01	3.197e-01	5.013e+02	2.205
last_known_vaping_statussex-vaper	-1.206e+00	5.559e-01	5.240e+02	-2.169
last_known_vaping_statusnever	3.101e-01	2.568e-01	5.123e+02	1.207
last_known_vaping_statusvaper	1.220e-02	3.511e-01	5.194e+02	0.035
treatment_reclassifiedAnti-IL17	-1.790e-01	1.187e-01	5.377e+03	-1.507
treatment_reclassifiedAnti-TNF	-2.902e-01	9.637e-02	5.761e+03	-3.011
treatment_reclassifiedJAK Inhibitor	-3.763e-01	2.765e-01	4.862e+03	-1.361
time_in_years	2.166e-02	5.687e-03	4.825e+02	3.808
	Pr(> t)			
(Intercept)	2.98e-12	***		
genderMale	0.026351	*		
hlab27statusNegative	0.012207	*		
hlab27statusPositive	0.495316			
age_at_onset	0.619172			
diagnosisAxial SpA- nr-axSpA	0.810055			
treatment_order2	0.014501	*		
treatment_order3	0.653287			
treatment_order4	0.699919			
treatment_order5	0.478342			
treatment_order6	0.439438			
treatment_order7	0.216073			
treatment_order8	0.693798			
treatment_order9	0.083337	.		
treatment_order10	0.163124			
treatment_order11	0.510598			
treatment_order12	0.484245			
treatment_order14	0.339788			
treatment_order15	0.351466			
last_known_smoking_statussex-smoker	0.643752			
last_known_smoking_statusnever	0.120028			
last_known_smoking_statussmoker	0.027878	*		
last_known_vaping_statussex-vaper	0.030568	*		
last_known_vaping_statusnever	0.227805			
last_known_vaping_statusvaper	0.972300			
treatment_reclassifiedAnti-IL17	0.131780			
treatment_reclassifiedAnti-TNF	0.002616	**		
treatment_reclassifiedJAK Inhibitor	0.173567			
time_in_years	0.000158	***		

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

```
anova(model_treatment_gender_jenkins_sleep_2_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	7.091	7.091	1	1663.6	5.7215	0.016869 *
hlab27status	13.799	6.900	2	527.0	5.5668	0.004051 **
age_at_onset	3.147	3.147	1	484.2	2.5395	0.111685
diagnosis	0.818	0.818	1	462.7	0.6602	0.416919
treatment_order	32.842	2.526	13	3788.1	2.0383	0.014811 *
last_known_smoking_status	16.932	5.644	3	488.3	4.5536	0.003693 **
last_known_vaping_status	9.100	3.033	3	499.8	2.4475	0.063030 .
treatment_reclassified	12.137	4.046	3	5378.1	3.2640	0.020494 *
time_in_years	39.858	39.858	1	564.3	32.1582	2.271e-08 ***
gender:treatment_reclassified	2.825	0.942	3	4927.8	0.7598	0.516516

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

```
anova(model_treatment_gender_jenkins_sleep_3_full,
      model_treatment_gender_jenkins_sleep_3_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_3

Models:

model_treatment_gender_jenkins_sleep_3_reduced: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset

model_treatment_gender_jenkins_sleep_3_full: jenkins_sleep_3 ~ gender + hlab27status + age_at_onset + treatment_order

	npars	AIC	BIC	logLik	deviance
model_treatment_gender_jenkins_sleep_3_reduced	33	21553	21776	-10744	21487
model_treatment_gender_jenkins_sleep_3_full	36	21555	21798	-10742	21483

Chisq Df Pr(>Chisq)

model_treatment_gender_jenkins_sleep_3_reduced

model_treatment_gender_jenkins_sleep_3_full 4.2696 3 0.2338

```
anova(model_treatment_gender_jenkins_sleep_3_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	7.909	7.9093	1	1758.9	6.0274	0.0141818 *

hlab27status	13.474	6.7370	2	537.3	5.1340	0.0061856	**
age_at_onset	0.323	0.3228	1	516.0	0.2460	0.6201168	
diagnosis	0.086	0.0861	1	485.6	0.0656	0.7979166	
treatment_order	47.158	3.6275	13	3565.4	2.7644	0.0006344	***
last_known_smoking_status	24.725	8.2416	3	515.2	6.2806	0.0003430	***
last_known_vaping_status	14.203	4.7344	3	527.0	3.6079	0.0133151	*
treatment_reclassified	14.832	4.9442	3	5097.5	3.7677	0.0102481	*
time_in_years	18.604	18.6044	1	482.0	14.1777	0.0001869	***
gender:treatment_reclassified	5.510	1.8366	3	4640.8	1.3996	0.2409243	

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

```
print(summary(model_treatment_gender_jenkins_sleep_4_full, corr = FALSE))
```

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

Formula: jenkins_sleep_4 ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * gender + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_4

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 20773

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.0731	-0.5603	0.0445	0.5697	3.4325

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.242086	1.49736	
	time_in_years	0.004738	0.06883	-0.54
Residual		1.154654	1.07455	

Number of obs: 6331, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.509e+00	3.052e-01	5.624e+02
genderMale	-4.932e-01	1.313e-01	5.945e+02
hlab27statusNegative	7.894e-01	2.674e-01	5.324e+02
hlab27statusPositive	3.561e-01	2.263e-01	5.239e+02

age_at_onset	-6.079e-03	6.122e-03	4.874e+02
diagnosisAxial SpA- nr-axSpA	5.003e-01	1.558e-01	4.493e+02
treatment_order2	-2.017e-01	1.043e-01	5.047e+03
treatment_order3	4.171e-02	9.872e-02	4.623e+03
treatment_order4	7.867e-02	1.215e-01	4.853e+03
treatment_order5	1.660e-01	1.278e-01	4.238e+03
treatment_order6	1.871e-01	1.485e-01	3.546e+03
treatment_order7	4.069e-01	1.878e-01	3.189e+03
treatment_order8	2.078e-01	2.353e-01	3.523e+03
treatment_order9	-1.057e-01	2.914e-01	2.558e+03
treatment_order10	1.025e+00	5.570e-01	3.938e+03
treatment_order11	3.772e-01	5.805e-01	2.747e+03
treatment_order12	7.818e-01	9.112e-01	5.510e+03
treatment_order14	6.485e-01	6.974e-01	1.070e+03
treatment_order15	1.478e-01	9.250e-01	8.560e+02
last_known_smoking_statussex-smoker	-1.384e-01	2.487e-01	4.928e+02
last_known_smoking_statusnever	-4.688e-01	2.505e-01	4.917e+02
last_known_smoking_statussmoker	5.876e-01	3.094e-01	4.849e+02
last_known_vaping_statussex-vaper	-3.405e-02	5.376e-01	5.090e+02
last_known_vaping_statusnever	4.067e-01	2.485e-01	4.939e+02
last_known_vaping_statusvaper	4.600e-01	3.393e-01	4.977e+02
treatment_reclassifiedAnti-IL17	-1.295e-02	1.587e-01	4.297e+03
treatment_reclassifiedAnti-TNF	-2.496e-01	1.160e-01	5.491e+03
treatment_reclassifiedJAK Inhibitor	-7.148e-01	3.226e-01	4.033e+03
time_in_years	1.265e-02	5.362e-03	4.797e+02
genderMale:treatment_reclassifiedAnti-IL17	-4.699e-01	1.790e-01	3.990e+03
genderMale:treatment_reclassifiedAnti-TNF	6.831e-03	1.122e-01	4.883e+03
genderMale:treatment_reclassifiedJAK Inhibitor	-4.377e-03	5.069e-01	4.403e+03
t value Pr(> t)			
(Intercept)	8.218	1.43e-15	***
genderMale	-3.756	0.00019	***
hlab27statusNegative	2.952	0.00330	**
hlab27statusPositive	1.573	0.11629	
age_at_onset	-0.993	0.32120	
diagnosisAxial SpA- nr-axSpA	3.212	0.00141	**
treatment_order2	-1.935	0.05307	.
treatment_order3	0.423	0.67267	
treatment_order4	0.648	0.51723	
treatment_order5	1.298	0.19425	
treatment_order6	1.259	0.20800	
treatment_order7	2.166	0.03037	*
treatment_order8	0.883	0.37719	
treatment_order9	-0.363	0.71694	

treatment_order10	1.840	0.06578	.
treatment_order11	0.650	0.51593	
treatment_order12	0.858	0.39091	
treatment_order14	0.930	0.35268	
treatment_order15	0.160	0.87313	
last_known_smoking_statussex-smoker	-0.556	0.57822	
last_known_smoking_statusnever	-1.871	0.06191	.
last_known_smoking_statussmoker	1.899	0.05814	.
last_known_vaping_statussex-vaper	-0.063	0.94952	
last_known_vaping_statusnever	1.637	0.10232	
last_known_vaping_statusvaper	1.356	0.17580	
treatment_reclassifiedAnti-IL17	-0.082	0.93497	
treatment_reclassifiedAnti-TNF	-2.152	0.03141	*
treatment_reclassifiedJAK Inhibitor	-2.216	0.02677	*
time_in_years	2.360	0.01869	*
genderMale:treatment_reclassifiedAnti-IL17	-2.625	0.00870	**
genderMale:treatment_reclassifiedAnti-TNF	0.061	0.95147	
genderMale:treatment_reclassifiedJAK Inhibitor	-0.009	0.99311	

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

```
print(summary(model_treatment_gender_jenkins_sleep_4_reduced, corr = FALSE))
```

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

Formula: jenkins_sleep_4 ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_4

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 20777.1

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-4.0734	-0.5658	0.0448	0.5683	3.4633

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	2.257048	1.50235	
	time_in_years	0.004796	0.06925	-0.55
Residual		1.155224	1.07481	

Number of obs: 6331, groups: ttas_id, 632

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.523e+00	3.037e-01	5.527e+02	8.309
genderMale	-5.152e-01	1.247e-01	5.129e+02	-4.133
hlab27statusNegative	8.030e-01	2.675e-01	5.315e+02	3.002
hlab27statusPositive	3.586e-01	2.265e-01	5.229e+02	1.584
age_at_onset	-6.326e-03	6.124e-03	4.866e+02	-1.033
diagnosisAxial SpA- nr-axSpA	5.050e-01	1.559e-01	4.491e+02	3.239
treatment_order2	-2.095e-01	1.042e-01	5.045e+03	-2.011
treatment_order3	3.636e-02	9.862e-02	4.643e+03	0.369
treatment_order4	6.305e-02	1.206e-01	4.894e+03	0.523
treatment_order5	1.622e-01	1.276e-01	4.272e+03	1.271
treatment_order6	1.737e-01	1.481e-01	3.572e+03	1.172
treatment_order7	3.595e-01	1.865e-01	3.163e+03	1.927
treatment_order8	1.562e-01	2.345e-01	3.555e+03	0.666
treatment_order9	-1.467e-01	2.911e-01	2.569e+03	-0.504
treatment_order10	9.590e-01	5.527e-01	3.902e+03	1.735
treatment_order11	5.437e-01	5.759e-01	2.805e+03	0.944
treatment_order12	7.059e-01	9.103e-01	5.512e+03	0.775
treatment_order14	5.703e-01	6.965e-01	1.061e+03	0.819
treatment_order15	3.579e-01	9.211e-01	8.402e+02	0.389
last_known_smoking_statussex-smoker	-1.452e-01	2.487e-01	4.914e+02	-0.584
last_known_smoking_statusnever	-4.704e-01	2.505e-01	4.903e+02	-1.878
last_known_smoking_statussmoker	5.787e-01	3.093e-01	4.833e+02	1.871
last_known_vaping_statussex-vaper	-2.001e-02	5.377e-01	5.075e+02	-0.037
last_known_vaping_statusnever	4.121e-01	2.483e-01	4.922e+02	1.659
last_known_vaping_statusvaper	4.455e-01	3.392e-01	4.965e+02	1.313
treatment_reclassifiedAnti-IL17	-3.036e-01	1.117e-01	5.285e+03	-2.719
treatment_reclassifiedAnti-TNF	-2.394e-01	9.073e-02	5.699e+03	-2.638
treatment_reclassifiedJAK Inhibitor	-6.851e-01	2.598e-01	4.712e+03	-2.637
time_in_years	1.286e-02	5.371e-03	4.783e+02	2.394

Pr(>|t|)

(Intercept)	7.50e-16 ***
genderMale	4.18e-05 ***
hlab27statusNegative	0.00281 **
hlab27statusPositive	0.11386
age_at_onset	0.30215
diagnosisAxial SpA- nr-axSpA	0.00129 **
treatment_order2	0.04439 *
treatment_order3	0.71235
treatment_order4	0.60110

```

treatment_order5          0.20376
treatment_order6          0.24113
treatment_order7          0.05402 .
treatment_order8          0.50543
treatment_order9          0.61442
treatment_order10         0.08279 .
treatment_order11         0.34523
treatment_order12         0.43811
treatment_order14         0.41305
treatment_order15         0.69769
last_known_smoking_statussex-smoker 0.55951
last_known_smoking_statusnever 0.06094 .
last_known_smoking_statussmoker 0.06197 .
last_known_vaping_statussex-vaper 0.97032
last_known_vaping_statusnever 0.09766 .
last_known_vaping_statusvaper 0.18968
treatment_reclassifiedAnti-IL17 0.00657 **
treatment_reclassifiedAnti-TNF 0.00835 **
treatment_reclassifiedJAK Inhibitor 0.00840 **
time_in_years             0.01707 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_jenkins_sleep_4_full,
       model_treatment_gender_jenkins_sleep_4_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_jenkins_sleep_4

Models:

model_treatment_gender_jenkins_sleep_4_reduced: jenkins_sleep_4 ~ gender + hlab27status + age_a

model_treatment_gender_jenkins_sleep_4_full: jenkins_sleep_4 ~ gender + hlab27status + age_a

	npar	AIC	BIC	logLik	deviance
model_treatment_gender_jenkins_sleep_4_reduced	33	20785	21008	-10359	20719
model_treatment_gender_jenkins_sleep_4_full	36	20783	21026	-10355	20711

	Chisq	Df	Pr(>Chisq)
model_treatment_gender_jenkins_sleep_4_reduced			
model_treatment_gender_jenkins_sleep_4_full	7.9432	3	0.0472 *

```

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

```

```
anova(model_treatment_gender_jenkins_sleep_4_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	13.218	13.2183	1	1660.9	11.4479	0.0007324	***
hlab27status	11.632	5.8158	2	507.6	5.0369	0.0068226	**
age_at_onset	1.139	1.1385	1	487.4	0.9860	0.3212039	
diagnosis	11.910	11.9103	1	449.3	10.3150	0.0014143	**
treatment_order	36.501	2.8078	13	3435.2	2.4317	0.0028306	**
last_known_smoking_status	22.149	7.3829	3	498.3	6.3940	0.0002949	***
last_known_vaping_status	4.177	1.3924	3	506.5	1.2059	0.3069816	
treatment_reclassified	12.887	4.2956	3	4979.5	3.7203	0.0109448	*
time_in_years	6.429	6.4291	1	479.7	5.5680	0.0186913	*
gender:treatment_reclassified	9.112	3.0373	3	4510.8	2.6305	0.0484418	*

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

WPL

lme4 code for treatment and diagnosis: WPL

```
model_treatment_diagnosis_wpl_full <- lmer(
  wpl ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_wpl,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_wpl_reduced <- lmer(
  wpl ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_wpl,
```

```
control = lmerControl(optimizer = "bobyqa",
                      optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_wpl_full, corr = FALSE))
```

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

Formula:

```
wpl ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
      diagnosis + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_wpl

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36793.3

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-3.7214	-0.5537	-0.1235	0.4592	4.7320

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	428.703	20.705	
	time_in_years	1.263	1.124	-0.51
Residual		286.336	16.921	

Number of obs: 4211, groups: ttas_id, 434

Fixed effects:

	Estimate
(Intercept)	21.86022
genderMale	-4.30534
hlab27statusNegative	14.92938
hlab27statusPositive	9.54546
age_at_onset	0.03324
diagnosisAxial SpA- nr-axSpA	1.01646
treatment_order2	0.26324
treatment_order3	4.21270
treatment_order4	0.17832
treatment_order5	0.79763
treatment_order6	6.33983
treatment_order7	-1.86005

treatment_order8	4.52273
treatment_order9	2.73862
last_known_smoking_statussex-smoker	1.29384
last_known_smoking_statusnever	-5.45595
last_known_smoking_statussmoker	6.71630
last_known_vaping_statussex-vaper	-8.46127
last_known_vaping_statusnever	5.21722
last_known_vaping_statusvaper	6.25846
treatment_reclassifiedAnti-IL17	-10.51512
treatment_reclassifiedAnti-TNF	-10.06478
treatment_reclassifiedJAK Inhibitor	-19.93077
time_in_years	-0.01053
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.66763
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-2.67675
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	33.47519
	Std. Error
(Intercept)	5.57017
genderMale	2.17353
hlab27statusNegative	5.09053
hlab27statusPositive	4.38584
age_at_onset	0.11546
diagnosisAxial SpA- nr-axSpA	2.64984
treatment_order2	1.96021
treatment_order3	1.82338
treatment_order4	2.34006
treatment_order5	2.51197
treatment_order6	3.49294
treatment_order7	4.01874
treatment_order8	6.22490
treatment_order9	6.28169
last_known_smoking_statussex-smoker	4.32685
last_known_smoking_statusnever	4.32968
last_known_smoking_statussmoker	5.35408
last_known_vaping_statussex-vaper	8.45535
last_known_vaping_statusnever	4.40290
last_known_vaping_statusvaper	5.86150
treatment_reclassifiedAnti-IL17	2.52385
treatment_reclassifiedAnti-TNF	1.75090
treatment_reclassifiedJAK Inhibitor	7.43559
time_in_years	0.10624
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.84577
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	2.56804
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	11.38142

	df
(Intercept)	392.22976
genderMale	358.35795
hlab27statusNegative	386.30807
hlab27statusPositive	387.05303
age_at_onset	342.77893
diagnosisAxial SpA- nr-axSpA	374.12203
treatment_order2	2980.01496
treatment_order3	2943.50762
treatment_order4	3008.91170
treatment_order5	2543.09446
treatment_order6	2685.10566
treatment_order7	2387.26901
treatment_order8	1385.79849
treatment_order9	1021.24121
last_known_smoking_statussex-smoker	346.35153
last_known_smoking_statusnever	346.52208
last_known_smoking_statussmoker	335.60432
last_known_vaping_statussex-vaper	340.12727
last_known_vaping_statusnever	349.78124
last_known_vaping_statusvaper	349.14384
treatment_reclassifiedAnti-IL17	3298.05685
treatment_reclassifiedAnti-TNF	3437.85214
treatment_reclassifiedJAK Inhibitor	2385.73328
time_in_years	336.35536
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3302.44885
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3037.81928
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	3517.77084
	t value
(Intercept)	3.925
genderMale	-1.981
hlab27statusNegative	2.933
hlab27statusPositive	2.176
age_at_onset	0.288
diagnosisAxial SpA- nr-axSpA	0.384
treatment_order2	0.134
treatment_order3	2.310
treatment_order4	0.076
treatment_order5	0.318
treatment_order6	1.815
treatment_order7	-0.463
treatment_order8	0.727
treatment_order9	0.436

last_known_smoking_statussex-smoker	0.299	
last_known_smoking_statusnever	-1.260	
last_known_smoking_statussmoker	1.254	
last_known_vaping_statussex-vaper	-1.001	
last_known_vaping_statusnever	1.185	
last_known_vaping_statusvaper	1.068	
treatment_reclassifiedAnti-IL17	-4.166	
treatment_reclassifiedAnti-TNF	-5.748	
treatment_reclassifiedJAK Inhibitor	-2.680	
time_in_years	-0.099	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.757	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-1.042	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.941	
	Pr(> t)	
(Intercept)	0.000103	***
genderMale	0.048377	*
hlab27statusNegative	0.003560	**
hlab27statusPositive	0.030127	*
age_at_onset	0.773591	
diagnosisAxial SpA- nr-axSpA	0.701497	
treatment_order2	0.893181	
treatment_order3	0.020936	*
treatment_order4	0.939262	
treatment_order5	0.750866	
treatment_order6	0.069629	.
treatment_order7	0.643517	
treatment_order8	0.467621	
treatment_order9	0.662952	
last_known_smoking_statussex-smoker	0.765100	
last_known_smoking_statusnever	0.208471	
last_known_smoking_statussmoker	0.210560	
last_known_vaping_statussex-vaper	0.317683	
last_known_vaping_statusnever	0.236842	
last_known_vaping_statusvaper	0.286384	
treatment_reclassifiedAnti-IL17	3.18e-05	***
treatment_reclassifiedAnti-TNF	9.80e-09	***
treatment_reclassifiedJAK Inhibitor	0.007403	**
time_in_years	0.921088	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.449180	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.297342	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.003291	**

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

```
print(summary(model_treatment_diagnosis_wpl_reduced, corr = FALSE))
```

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

```
Formula:
```

```
wpl ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)
```

```
Data: dataframe_sorted_and_reclassified_wpl
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 36820.7
```

```
Scaled residuals:
```

```
      Min       1Q   Median       3Q      Max
-3.7209 -0.5504 -0.1228  0.4546  4.7234
```

```
Random effects:
```

```
Groups   Name              Variance Std.Dev. Corr
ttas_id  (Intercept)      428.07    20.690
         time_in_years    1.23     1.109   -0.51
Residual                287.40    16.953
```

```
Number of obs: 4211, groups: ttas_id, 434
```

```
Fixed effects:
```

	Estimate	Std. Error	df	t value
(Intercept)	21.85173	5.55772	393.83210	3.932
genderMale	-4.26148	2.16821	359.61687	-1.965
hlab27statusNegative	15.16775	5.07383	387.18009	2.989
hlab27statusPositive	9.58846	4.36762	386.87924	2.195
age_at_onset	0.03536	0.11523	343.85226	0.307
diagnosisAxial SpA- nr-axSpA	0.52555	2.52681	337.54703	0.208
treatment_order2	0.16050	1.94407	2985.67059	0.083
treatment_order3	4.08614	1.80328	3036.91202	2.266
treatment_order4	0.42604	2.30280	3030.13826	0.185
treatment_order5	1.04748	2.49333	2616.36004	0.420
treatment_order6	6.42751	3.46721	2711.90132	1.854
treatment_order7	-4.49878	3.93601	2314.02292	-1.143
treatment_order8	4.05580	6.18555	1381.80090	0.656
treatment_order9	2.96808	6.26202	992.84569	0.474
last_known_smoking_statussex-smoker	1.43825	4.31509	347.01332	0.333
last_known_smoking_statusnever	-5.30032	4.31913	347.52655	-1.227

last_known_smoking_statussmoker	6.90103	5.33548	335.39116	1.293
last_known_vaping_statussex-vaper	-8.53451	8.43056	340.87066	-1.012
last_known_vaping_statusnever	5.08311	4.39172	350.65224	1.157
last_known_vaping_statusvaper	6.17715	5.84514	349.74139	1.057
treatment_reclassifiedAnti-IL17	-9.71380	2.32956	3493.44952	-4.170
treatment_reclassifiedAnti-TNF	-10.45725	1.71606	3422.57350	-6.094
treatment_reclassifiedJAK Inhibitor	-5.23993	5.78958	3254.16998	-0.905
time_in_years	-0.01531	0.10568	337.12482	-0.145

Pr(>|t|)

(Intercept)	9.96e-05 ***
genderMale	0.05013 .
hlab27statusNegative	0.00297 **
hlab27statusPositive	0.02873 *
age_at_onset	0.75913
diagnosisAxial SpA- nr-axSpA	0.83536
treatment_order2	0.93421
treatment_order3	0.02352 *
treatment_order4	0.85324
treatment_order5	0.67444
treatment_order6	0.06388 .
treatment_order7	0.25317
treatment_order8	0.51213
treatment_order9	0.63562
last_known_smoking_statussex-smoker	0.73910
last_known_smoking_statusnever	0.22059
last_known_smoking_statussmoker	0.19676
last_known_vaping_statussex-vaper	0.31210
last_known_vaping_statusnever	0.24788
last_known_vaping_statusvaper	0.29133
treatment_reclassifiedAnti-IL17	3.12e-05 ***
treatment_reclassifiedAnti-TNF	1.23e-09 ***
treatment_reclassifiedJAK Inhibitor	0.36550
time_in_years	0.88487

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

```
anova(model_treatment_diagnosis_wpl_full,
       model_treatment_diagnosis_wpl_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_wpl

Models:

model_treatment_diagnosis_wpl_reduced: wpl ~ gender + hlab27status + age_at_onset + diagnosis +

model_treatment_diagnosis_wpl_full: wpl ~ gender + hlab27status + age_at_onset + diagnosis +

	npar	AIC	BIC	logLik	deviance	Chisq
model_treatment_diagnosis_wpl_reduced	28	36955	37133	-18450	36899	
model_treatment_diagnosis_wpl_full	31	36949	37146	-18444	36887	11.932

Df Pr(>Chisq)

model_treatment_diagnosis_wpl_reduced

model_treatment_diagnosis_wpl_full 3 0.00762 **

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

```
anova(model_treatment_diagnosis_wpl_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1123.5	1123.5	1	358.4	3.9236	0.048377
hlab27status	2516.3	1258.1	2	371.3	4.3940	0.013001
age_at_onset	23.7	23.7	1	342.8	0.0829	0.773591
diagnosis	1726.3	1726.3	1	1525.7	6.0291	0.014183
treatment_order	4873.8	609.2	8	2197.6	2.1277	0.030330
last_known_smoking_status	3395.1	1131.7	3	345.4	3.9523	0.008584
last_known_vaping_status	1405.1	468.4	3	348.2	1.6357	0.180814
treatment_reclassified	10265.3	3421.8	3	3607.8	11.9501	8.758e-08
time_in_years	2.8	2.8	1	336.4	0.0098	0.921088
diagnosis:treatment_reclassified	3440.8	1146.9	3	3384.8	4.0055	0.007393

gender *

hlab27status *

age_at_onset

diagnosis *

treatment_order *

last_known_smoking_status **

last_known_vaping_status

treatment_reclassified ***

time_in_years

diagnosis:treatment_reclassified **

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

lme4 code for treatment and gender: WPL

```
model_treatment_gender_wpl_full <- lmer(
  wpl ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_wpl,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
fixed-effect model matrix is rank deficient so dropping 1 column / coefficient

```
model_treatment_gender_wpl_reduced <- lmer(
  wpl ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_wpl,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_gender_wpl_full, corr = FALSE))
```

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

Formula:

```
wpl ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
  gender + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_wpl

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36809.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-----	----	--------	----	-----

-3.7349 -0.5557 -0.1247 0.4521 4.7232

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	427.582	20.678	
	time_in_years	1.183	1.088	-0.50
Residual		287.439	16.954	

Number of obs: 4211, groups: ttas_id, 434

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	22.70737	5.59414	399.75955
genderMale	-5.34697	2.30373	434.59653
hlab27statusNegative	15.05446	5.07915	386.23566
hlab27statusPositive	9.59801	4.36963	385.04610
age_at_onset	0.03605	0.11558	344.01418
diagnosisAxial SpA- nr-axSpA	0.50637	2.53467	337.64344
treatment_order2	0.33857	1.94561	2972.68224
treatment_order3	4.24695	1.80381	3014.72658
treatment_order4	0.91370	2.31574	2991.88864
treatment_order5	1.21418	2.49609	2573.43914
treatment_order6	7.04123	3.47860	2632.42669
treatment_order7	-3.45584	3.97832	2240.67323
treatment_order8	4.81492	6.19095	1300.43240
treatment_order9	3.63877	6.24426	953.28616
last_known_smoking_statussex-smoker	1.47143	4.32789	347.67459
last_known_smoking_statusnever	-5.21934	4.33166	347.95219
last_known_smoking_statussmoker	6.79742	5.35226	336.23510
last_known_vaping_statussex-vaper	-8.80384	8.45341	341.30028
last_known_vaping_statusnever	4.83669	4.40621	351.52588
last_known_vaping_statusvaper	5.95944	5.86302	349.87577
treatment_reclassifiedAnti-IL17	-8.58128	3.66537	3297.42020
treatment_reclassifiedAnti-TNF	-13.07129	2.31712	3190.41460
treatment_reclassifiedJAK Inhibitor	-7.64980	5.94306	3100.42860
time_in_years	-0.01822	0.10512	335.72060
genderMale:treatment_reclassifiedAnti-IL17	-1.99138	4.09453	2831.24438
genderMale:treatment_reclassifiedAnti-TNF	3.58163	2.21453	2745.20628

	t value	Pr(> t)
(Intercept)	4.059	5.93e-05 ***
genderMale	-2.321	0.02075 *
hlab27statusNegative	2.964	0.00323 **
hlab27statusPositive	2.197	0.02865 *
age_at_onset	0.312	0.75533

```

diagnosisAxial SpA- nr-axSpA          0.200  0.84178
treatment_order2                      0.174  0.86187
treatment_order3                      2.354  0.01862 *
treatment_order4                      0.395  0.69319
treatment_order5                      0.486  0.62670
treatment_order6                      2.024  0.04306 *
treatment_order7                     -0.869  0.38512
treatment_order8                      0.778  0.43687
treatment_order9                      0.583  0.56021
last_known_smoking_statussex-smoker   0.340  0.73407
last_known_smoking_statusnever        -1.205  0.22905
last_known_smoking_statussmoker        1.270  0.20496
last_known_vaping_statussex-vaper     -1.041  0.29840
last_known_vaping_statusnever          1.098  0.27309
last_known_vaping_statusvaper          1.016  0.31012
treatment_reclassifiedAnti-IL17        -2.341  0.01928 *
treatment_reclassifiedAnti-TNF         -5.641 1.84e-08 ***
treatment_reclassifiedJAK Inhibitor     -1.287  0.19813
time_in_years                         -0.173  0.86248
genderMale:treatment_reclassifiedAnti-IL17 -0.486  0.62676
genderMale:treatment_reclassifiedAnti-TNF  1.617  0.10592
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
fit warnings:
fixed-effect model matrix is rank deficient so dropping 1 column / coefficient

```

```
print(summary(model_treatment_gender_wpl_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula:
wpl ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_wpl
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36820.7

```

```

Scaled residuals:
      Min       1Q   Median       3Q      Max
-3.7209 -0.5504 -0.1228  0.4546  4.7234

```

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	428.07	20.690	
	time_in_years	1.23	1.109	-0.51
Residual		287.40	16.953	

Number of obs: 4211, groups: ttas_id, 434

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	21.85173	5.55772	393.83210	3.932
genderMale	-4.26148	2.16821	359.61687	-1.965
hlab27statusNegative	15.16775	5.07383	387.18009	2.989
hlab27statusPositive	9.58846	4.36762	386.87924	2.195
age_at_onset	0.03536	0.11523	343.85226	0.307
diagnosisAxial SpA- nr-axSpA	0.52555	2.52681	337.54703	0.208
treatment_order2	0.16050	1.94407	2985.67059	0.083
treatment_order3	4.08614	1.80328	3036.91202	2.266
treatment_order4	0.42604	2.30280	3030.13826	0.185
treatment_order5	1.04748	2.49333	2616.36004	0.420
treatment_order6	6.42751	3.46721	2711.90132	1.854
treatment_order7	-4.49878	3.93601	2314.02292	-1.143
treatment_order8	4.05580	6.18555	1381.80090	0.656
treatment_order9	2.96808	6.26202	992.84569	0.474
last_known_smoking_statussex-smoker	1.43825	4.31509	347.01332	0.333
last_known_smoking_statusnever	-5.30032	4.31913	347.52655	-1.227
last_known_smoking_statussmoker	6.90103	5.33548	335.39116	1.293
last_known_vaping_statussex-vaper	-8.53451	8.43056	340.87066	-1.012
last_known_vaping_statusnever	5.08311	4.39172	350.65224	1.157
last_known_vaping_statusvaper	6.17715	5.84514	349.74139	1.057
treatment_reclassifiedAnti-IL17	-9.71380	2.32956	3493.44952	-4.170
treatment_reclassifiedAnti-TNF	-10.45725	1.71606	3422.57350	-6.094
treatment_reclassifiedJAK Inhibitor	-5.23993	5.78958	3254.16998	-0.905
time_in_years	-0.01531	0.10568	337.12482	-0.145

Pr(>|t|)

(Intercept)	9.96e-05 ***
genderMale	0.05013 .
hlab27statusNegative	0.00297 **
hlab27statusPositive	0.02873 *
age_at_onset	0.75913
diagnosisAxial SpA- nr-axSpA	0.83536
treatment_order2	0.93421
treatment_order3	0.02352 *

```

treatment_order4          0.85324
treatment_order5          0.67444
treatment_order6          0.06388 .
treatment_order7          0.25317
treatment_order8          0.51213
treatment_order9          0.63562
last_known_smoking_statussex-smoker 0.73910
last_known_smoking_statusnever 0.22059
last_known_smoking_statussmoker 0.19676
last_known_vaping_statussex-vaper 0.31210
last_known_vaping_statusnever 0.24788
last_known_vaping_statusvaper 0.29133
treatment_reclassifiedAnti-IL17 3.12e-05 ***
treatment_reclassifiedAnti-TNF 1.23e-09 ***
treatment_reclassifiedJAK Inhibitor 0.36550
time_in_years             0.88487
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_wpl_full,
       model_treatment_gender_wpl_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_wpl

Models:

model_treatment_gender_wpl_reduced: wpl ~ gender + hlab27status + age_at_onset + diagnosis + tr

model_treatment_gender_wpl_full: wpl ~ gender + hlab27status + age_at_onset + diagnosis + tr

	npar	AIC	BIC	logLik	deviance	Chisq	Df
model_treatment_gender_wpl_reduced	28	36955	37133	-18450	36899		
model_treatment_gender_wpl_full	30	36956	37146	-18448	36896	3.5236	2

Pr(>Chisq)

model_treatment_gender_wpl_reduced

model_treatment_gender_wpl_full 0.1717

```

anova(model_treatment_gender_wpl_full)

```

Missing cells for: genderMale:treatment_reclassifiedJAK Inhibitor.

Interpret type III hypotheses with care.

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1065.0	1065.0	1	559.0	3.7051	0.054754
hlab27status	2579.4	1289.7	2	371.4	4.4869	0.011873
age_at_onset	28.0	28.0	1	344.0	0.0973	0.755328
diagnosis	11.5	11.5	1	337.6	0.0399	0.841776
treatment_order	5395.7	674.5	8	2106.1	2.3464	0.016461
last_known_smoking_status	3326.3	1108.8	3	346.8	3.8574	0.009749
last_known_vaping_status	1356.3	452.1	3	349.2	1.5729	0.195646
treatment_reclassified	11887.9	3962.6	3	3294.4	13.7860	6.207e-09
time_in_years	8.6	8.6	1	335.7	0.0300	0.862484
gender:treatment_reclassified	1020.3	510.2	2	2894.5	1.7748	0.169694

```

gender          .
hlab27status    *
age_at_onset
diagnosis
treatment_order *
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years
gender:treatment_reclassified
---

```

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

Daily Activity Impairment

lme4 code for treatment and diagnosis: Daily Activity Impairment

```

model_treatment_diagnosis_daily_activity_impairment_full <- lmer(
  daily_activity_impairment ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_daily_activity_impairment,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```



```

model_treatment_diagnosis_daily_activity_impairment_reduced <- lmer(
  daily_activity_impairment ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_daily_activity_impairment,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_treatment_diagnosis_daily_activity_impairment_full, corr = FALSE))

```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: daily_activity_impairment ~ gender + hlab27status + age_at_onset +
  diagnosis + treatment_order + last_known_smoking_status +
  last_known_vaping_status + treatment_reclassified * diagnosis +
  time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_daily_activity_impairment
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 70277.5

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.9918	-0.5798	-0.0813	0.5009	4.3654

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	583.45	24.155	
	time_in_years	1.89	1.375	-0.55
	Residual	287.52	16.957	

Number of obs: 8029, groups: ttas_id, 633

Fixed effects:

	Estimate
(Intercept)	4.229e+01
genderMale	-5.490e+00
hlab27statusNegative	8.043e+00
hlab27statusPositive	2.076e+00
age_at_onset	4.436e-03

diagnosisAxial SpA- nr-axSpA	-2.173e+00
treatment_order2	-1.754e+00
treatment_order3	1.936e+00
treatment_order4	5.649e-01
treatment_order5	4.716e+00
treatment_order6	5.206e+00
treatment_order7	5.458e+00
treatment_order8	6.328e+00
treatment_order9	1.836e+00
treatment_order10	1.853e+00
treatment_order11	1.180e+01
treatment_order12	1.141e+01
treatment_order14	1.856e+01
treatment_order15	-2.721e+00
last_known_smoking_statussex-smoker	-3.107e+00
last_known_smoking_statusnever	-9.146e+00
last_known_smoking_statussmoker	4.791e+00
last_known_vaping_statussex-vaper	-4.800e+00
last_known_vaping_statusnever	2.830e+00
last_known_vaping_statusvaper	5.840e+00
treatment_reclassifiedAnti-IL17	-1.563e+01
treatment_reclassifiedAnti-TNF	-1.320e+01
treatment_reclassifiedJAK Inhibitor	-2.641e+01
time_in_years	1.391e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.312e+01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	9.733e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.134e+01
	Std. Error
(Intercept)	4.674e+00
genderMale	1.992e+00
hlab27statusNegative	4.220e+00
hlab27statusPositive	3.525e+00
age_at_onset	9.783e-02
diagnosisAxial SpA- nr-axSpA	2.562e+00
treatment_order2	1.428e+00
treatment_order3	1.367e+00
treatment_order4	1.684e+00
treatment_order5	1.758e+00
treatment_order6	2.168e+00
treatment_order7	2.759e+00
treatment_order8	3.503e+00
treatment_order9	4.132e+00
treatment_order10	7.905e+00

treatment_order11	9.804e+00
treatment_order12	1.414e+01
treatment_order14	1.146e+01
treatment_order15	1.578e+01
last_known_smoking_statussex-smoker	3.948e+00
last_known_smoking_statusnever	3.977e+00
last_known_smoking_statussmoker	4.817e+00
last_known_vaping_statussex-vaper	8.523e+00
last_known_vaping_statusnever	3.923e+00
last_known_vaping_statusvaper	5.336e+00
treatment_reclassifiedAnti-IL17	1.642e+00
treatment_reclassifiedAnti-TNF	1.208e+00
treatment_reclassifiedJAK Inhibitor	4.780e+00
time_in_years	8.689e-02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.991e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	2.158e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.983e+00
	df
(Intercept)	5.604e+02
genderMale	4.995e+02
hlab27statusNegative	5.385e+02
hlab27statusPositive	5.580e+02
age_at_onset	4.793e+02
diagnosisAxial SpA- nr-axSpA	4.965e+02
treatment_order2	6.430e+03
treatment_order3	5.480e+03
treatment_order4	5.743e+03
treatment_order5	5.015e+03
treatment_order6	4.960e+03
treatment_order7	4.417e+03
treatment_order8	5.537e+03
treatment_order9	4.181e+03
treatment_order10	5.522e+03
treatment_order11	4.485e+03
treatment_order12	5.425e+03
treatment_order14	6.639e+02
treatment_order15	7.504e+02
last_known_smoking_statussex-smoker	4.687e+02
last_known_smoking_statusnever	4.672e+02
last_known_smoking_statussmoker	4.606e+02
last_known_vaping_statussex-vaper	4.903e+02
last_known_vaping_statusnever	4.698e+02
last_known_vaping_statusvaper	4.740e+02

treatment_reclassifiedAnti-IL17	6.921e+03
treatment_reclassifiedAnti-TNF	7.360e+03
treatment_reclassifiedJAK Inhibitor	5.425e+03
time_in_years	5.255e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	6.005e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5.882e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	7.231e+03
	t value
(Intercept)	9.049
genderMale	-2.756
hlab27statusNegative	1.906
hlab27statusPositive	0.589
age_at_onset	0.045
diagnosisAxial SpA- nr-axSpA	-0.848
treatment_order2	-1.228
treatment_order3	1.417
treatment_order4	0.336
treatment_order5	2.683
treatment_order6	2.401
treatment_order7	1.978
treatment_order8	1.806
treatment_order9	0.444
treatment_order10	0.234
treatment_order11	1.204
treatment_order12	0.807
treatment_order14	1.619
treatment_order15	-0.172
last_known_smoking_statussex-smoker	-0.787
last_known_smoking_statusnever	-2.299
last_known_smoking_statussmoker	0.995
last_known_vaping_statussex-vaper	-0.563
last_known_vaping_statusnever	0.721
last_known_vaping_statusvaper	1.094
treatment_reclassifiedAnti-IL17	-9.521
treatment_reclassifiedAnti-TNF	-10.931
treatment_reclassifiedJAK Inhibitor	-5.526
time_in_years	1.600
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.287
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.451
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.376
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.00607 **

hlab27statusNegative	0.05718	.
hlab27statusPositive	0.55622	
age_at_onset	0.96385	
diagnosisAxial SpA- nr-axSpA	0.39678	
treatment_order2	0.21942	
treatment_order3	0.15663	
treatment_order4	0.73723	
treatment_order5	0.00732	**
treatment_order6	0.01636	*
treatment_order7	0.04796	*
treatment_order8	0.07092	.
treatment_order9	0.65680	
treatment_order10	0.81466	
treatment_order11	0.22881	
treatment_order12	0.41968	
treatment_order14	0.10590	
treatment_order15	0.86313	
last_known_smoking_statussex-smoker	0.43167	
last_known_smoking_statusnever	0.02192	*
last_known_smoking_statussmoker	0.32043	
last_known_vaping_statussex-vaper	0.57353	
last_known_vaping_statusnever	0.47106	
last_known_vaping_statusvaper	0.27436	
treatment_reclassifiedAnti-IL17	< 2e-16	***
treatment_reclassifiedAnti-TNF	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	3.43e-08	***
time_in_years	0.11009	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.00102	**
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.65198	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.01753	*

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

```
print(summary(model_treatment_diagnosis_daily_activity_impairment_reduced, corr = FALSE))
```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: daily_activity_impairment ~ gender + hlab27status + age_at_onset +
diagnosis + treatment_order + last_known_smoking_status +
last_known_vaping_status + treatment_reclassified + time_in_years +
(time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_daily_activity_impairment

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 70307.9
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-3.9813	-0.5833	-0.0813	0.5016	4.3619

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	583.087	24.147	
	time_in_years	1.887	1.374	-0.55
Residual		288.083	16.973	

```
Number of obs: 8029, groups: ttas_id, 633
```

```
Fixed effects:
```

	Estimate	Std. Error	df	t value
(Intercept)	4.224e+01	4.673e+00	5.593e+02	9.040
genderMale	-5.565e+00	1.992e+00	4.987e+02	-2.794
hlab27statusNegative	8.108e+00	4.219e+00	5.371e+02	1.922
hlab27statusPositive	1.925e+00	3.523e+00	5.549e+02	0.546
age_at_onset	1.933e-03	9.779e-02	4.789e+02	0.020
diagnosisAxial SpA- nr-axSpA	-1.153e+00	2.472e+00	4.589e+02	-0.466
treatment_order2	-1.515e+00	1.419e+00	6.471e+03	-1.068
treatment_order3	2.188e+00	1.353e+00	5.559e+03	1.617
treatment_order4	7.952e-01	1.667e+00	5.773e+03	0.477
treatment_order5	5.256e+00	1.750e+00	5.079e+03	3.003
treatment_order6	4.925e+00	2.154e+00	4.910e+03	2.286
treatment_order7	4.931e+00	2.743e+00	4.336e+03	1.797
treatment_order8	6.420e+00	3.492e+00	5.538e+03	1.838
treatment_order9	2.411e+00	4.126e+00	4.183e+03	0.584
treatment_order10	7.168e-01	7.891e+00	5.472e+03	0.091
treatment_order11	1.093e+01	9.806e+00	4.460e+03	1.115
treatment_order12	1.136e+01	1.415e+01	5.411e+03	0.803
treatment_order14	1.852e+01	1.146e+01	6.541e+02	1.617
treatment_order15	-4.288e+00	1.578e+01	7.386e+02	-0.272
last_known_smoking_statussex-smoker	-3.673e+00	3.945e+00	4.672e+02	-0.931
last_known_smoking_statusnever	-9.591e+00	3.975e+00	4.663e+02	-2.413
last_known_smoking_statussmoker	4.124e+00	4.813e+00	4.597e+02	0.857
last_known_vaping_statussex-vaper	-4.091e+00	8.520e+00	4.895e+02	-0.480
last_known_vaping_statusnever	3.381e+00	3.920e+00	4.688e+02	0.862
last_known_vaping_statusvaper	6.431e+00	5.334e+00	4.734e+02	1.206
treatment_reclassifiedAnti-IL17	-1.408e+01	1.575e+00	7.082e+03	-8.945

```

treatment_reclassifiedAnti-TNF      -1.309e+01  1.189e+00  7.352e+03 -11.012
treatment_reclassifiedJAK Inhibitor -2.030e+01  4.110e+00  6.364e+03  -4.940
time_in_years                       1.384e-01  8.687e-02  5.189e+02   1.593
                                Pr(>|t|)
(Intercept)                        < 2e-16 ***
genderMale                         0.00540 **
hlab27statusNegative               0.05515 .
hlab27statusPositive               0.58507
age_at_onset                       0.98424
diagnosisAxial SpA- nr-axSpA       0.64116
treatment_order2                   0.28576
treatment_order3                   0.10587
treatment_order4                   0.63327
treatment_order5                   0.00269 **
treatment_order6                   0.02228 *
treatment_order7                   0.07234 .
treatment_order8                   0.06607 .
treatment_order9                   0.55900
treatment_order10                  0.92762
treatment_order11                  0.26489
treatment_order12                  0.42190
treatment_order14                  0.10646
treatment_order15                  0.78587
last_known_smoking_statussex-smoker 0.35232
last_known_smoking_statusnever      0.01623 *
last_known_smoking_statussmoker     0.39197
last_known_vaping_statussex-vaper   0.63134
last_known_vaping_statusnever       0.38888
last_known_vaping_statusvaper       0.22854
treatment_reclassifiedAnti-IL17     < 2e-16 ***
treatment_reclassifiedAnti-TNF      < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 8.01e-07 ***
time_in_years                       0.11172
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_daily_activity_impairment_full,
       model_treatment_diagnosis_daily_activity_impairment_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_daily_activity_impairment

```

Models:
model_treatment_diagnosis_daily_activity_impairment_reduced: daily_activity_impairment ~ gen
model_treatment_diagnosis_daily_activity_impairment_full: daily_activity_impairment ~ gender

              npar    AIC    BIC
model_treatment_diagnosis_daily_activity_impairment_reduced    33 70474 70705
model_treatment_diagnosis_daily_activity_impairment_full       36 70464 70715

              logLik deviance
model_treatment_diagnosis_daily_activity_impairment_reduced -35204    70408
model_treatment_diagnosis_daily_activity_impairment_full    -35196    70392

              Chisq Df
model_treatment_diagnosis_daily_activity_impairment_reduced
model_treatment_diagnosis_daily_activity_impairment_full    16.296  3
              Pr(>Chisq)

model_treatment_diagnosis_daily_activity_impairment_reduced
model_treatment_diagnosis_daily_activity_impairment_full    0.0009859 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
anova(model_treatment_diagnosis_daily_activity_impairment_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	2183.8	2183.8	1	499.5	7.5951	0.0060667
hlab27status	1588.7	794.3	2	516.0	2.7627	0.0640580
age_at_onset	0.6	0.6	1	479.3	0.0021	0.9638493
diagnosis	1097.7	1097.7	1	1568.2	3.8176	0.0508937
treatment_order	11100.2	853.9	13	3687.4	2.9697	0.0002435
last_known_smoking_status	4580.8	1526.9	3	477.3	5.3107	0.0013137
last_known_vaping_status	644.8	214.9	3	484.4	0.7475	0.5241720
treatment_reclassified	21802.1	7267.4	3	7056.6	25.2757	2.934e-16
time_in_years	736.5	736.5	1	525.5	2.5616	0.1100909
diagnosis:treatment_reclassified	4679.2	1559.7	3	6522.1	5.4247	0.0010053

```

gender          **
hlab27status    .
age_at_onset    .
diagnosis       .
treatment_order ***
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years

```



```
diagnosis:treatment_reclassified **
```

```
---
```

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

lme4 code for treatment and gender: Daily Activity Impairment

```
model_treatment_gender_daily_activity_impairment_full <- lmer(
  daily_activity_impairment ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_daily_activity_impairment,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_gender_daily_activity_impairment_reduced <- lmer(
  daily_activity_impairment ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_daily_activity_impairment,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_gender_daily_activity_impairment_full, corr = FALSE))
```

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

Formula: daily_activity_impairment ~ gender + hlab27status + age_at_onset +
diagnosis + treatment_order + last_known_smoking_status +
last_known_vaping_status + treatment_reclassified * gender +
time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_daily_activity_impairment

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 70283.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.9422	-0.5795	-0.0822	0.5031	4.3515

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	587.68	24.24	
	time_in_years	1.85	1.36	-0.55
Residual		287.92	16.97	

Number of obs: 8029, groups: ttas_id, 633

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.339e+01	4.701e+00	5.721e+02
genderMale	-6.770e+00	2.077e+00	5.773e+02
hlab27statusNegative	7.791e+00	4.222e+00	5.392e+02
hlab27statusPositive	1.808e+00	3.523e+00	5.554e+02
age_at_onset	-2.845e-04	9.798e-02	4.817e+02
diagnosisAxial SpA- nr-axSpA	-1.202e+00	2.478e+00	4.619e+02
treatment_order2	-1.310e+00	1.419e+00	6.488e+03
treatment_order3	2.443e+00	1.354e+00	5.537e+03
treatment_order4	1.386e+00	1.679e+00	5.677e+03
treatment_order5	5.752e+00	1.757e+00	4.998e+03
treatment_order6	5.397e+00	2.161e+00	4.860e+03
treatment_order7	6.373e+00	2.771e+00	4.296e+03
treatment_order8	7.522e+00	3.501e+00	5.395e+03
treatment_order9	3.329e+00	4.128e+00	4.105e+03
treatment_order10	2.290e+00	7.938e+00	5.500e+03
treatment_order11	1.016e+01	9.904e+00	4.354e+03
treatment_order12	1.244e+01	1.413e+01	5.431e+03
treatment_order14	1.970e+01	1.140e+01	6.551e+02
treatment_order15	-5.063e+00	1.579e+01	7.548e+02
last_known_smoking_statussex-smoker	-3.532e+00	3.952e+00	4.696e+02
last_known_smoking_statusnever	-9.454e+00	3.983e+00	4.689e+02
last_known_smoking_statussmoker	4.258e+00	4.824e+00	4.625e+02
last_known_vaping_statussex-vaper	-4.669e+00	8.532e+00	4.911e+02
last_known_vaping_statusnever	3.092e+00	3.929e+00	4.719e+02
last_known_vaping_statusvaper	6.216e+00	5.344e+00	4.762e+02
treatment_reclassifiedAnti-IL17	-1.203e+01	2.485e+00	5.649e+03
treatment_reclassifiedAnti-TNF	-1.615e+01	1.692e+00	6.774e+03
treatment_reclassifiedJAK Inhibitor	-2.227e+01	5.165e+00	5.545e+03
time_in_years	1.291e-01	8.646e-02	5.227e+02
genderMale:treatment_reclassifiedAnti-IL17	-3.463e+00	2.769e+00	5.031e+03

```

genderMale:treatment_reclassifiedAnti-TNF      4.214e+00  1.659e+00  5.948e+03
genderMale:treatment_reclassifiedJAK Inhibitor  1.985e-02  8.162e+00  5.995e+03
t value Pr(>|t|)
(Intercept)                9.231  < 2e-16 ***
genderMale                 -3.259  0.00118 **
hlab27statusNegative        1.845  0.06555 .
hlab27statusPositive        0.513  0.60793
age_at_onset               -0.003  0.99768
diagnosisAxial SpA- nr-axSpA -0.485  0.62782
treatment_order2           -0.923  0.35597
treatment_order3            1.805  0.07117 .
treatment_order4            0.826  0.40910
treatment_order5            3.273  0.00107 **
treatment_order6            2.497  0.01254 *
treatment_order7            2.300  0.02150 *
treatment_order8            2.149  0.03171 *
treatment_order9            0.806  0.42009
treatment_order10           0.288  0.77298
treatment_order11           1.026  0.30505
treatment_order12           0.881  0.37851
treatment_order14           1.728  0.08442 .
treatment_order15          -0.321  0.74856
last_known_smoking_statussex-smoker -0.894  0.37189
last_known_smoking_statusnever -2.374  0.01801 *
last_known_smoking_statussmoker  0.883  0.37784
last_known_vaping_statussex-vaper -0.547  0.58444
last_known_vaping_statusnever  0.787  0.43168
last_known_vaping_statusvaper  1.163  0.24537
treatment_reclassifiedAnti-IL17 -4.842  1.32e-06 ***
treatment_reclassifiedAnti-TNF  -9.549  < 2e-16 ***
treatment_reclassifiedJAK Inhibitor -4.313  1.64e-05 ***
time_in_years               1.493  0.13594
genderMale:treatment_reclassifiedAnti-IL17 -1.251  0.21109
genderMale:treatment_reclassifiedAnti-TNF  2.540  0.01112 *
genderMale:treatment_reclassifiedJAK Inhibitor 0.002  0.99806
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_daily_activity_impairment_reduced, corr = FALSE))
```

```

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

```

Formula: daily_activity_impairment ~ gender + hlab27status + age_at_onset +
 diagnosis + treatment_order + last_known_smoking_status +
 last_known_vaping_status + treatment_reclassified + time_in_years +
 (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_daily_activity_impairment

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 70307.9

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.9813	-0.5833	-0.0813	0.5016	4.3619

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	583.087	24.147	
	time_in_years	1.887	1.374	-0.55
Residual		288.083	16.973	

Number of obs: 8029, groups: ttas_id, 633

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.224e+01	4.673e+00	5.593e+02	9.040
genderMale	-5.565e+00	1.992e+00	4.987e+02	-2.794
hlab27statusNegative	8.108e+00	4.219e+00	5.371e+02	1.922
hlab27statusPositive	1.925e+00	3.523e+00	5.549e+02	0.546
age_at_onset	1.933e-03	9.779e-02	4.789e+02	0.020
diagnosisAxial SpA- nr-axSpA	-1.153e+00	2.472e+00	4.589e+02	-0.466
treatment_order2	-1.515e+00	1.419e+00	6.471e+03	-1.068
treatment_order3	2.188e+00	1.353e+00	5.559e+03	1.617
treatment_order4	7.952e-01	1.667e+00	5.773e+03	0.477
treatment_order5	5.256e+00	1.750e+00	5.079e+03	3.003
treatment_order6	4.925e+00	2.154e+00	4.910e+03	2.286
treatment_order7	4.931e+00	2.743e+00	4.336e+03	1.797
treatment_order8	6.420e+00	3.492e+00	5.538e+03	1.838
treatment_order9	2.411e+00	4.126e+00	4.183e+03	0.584
treatment_order10	7.168e-01	7.891e+00	5.472e+03	0.091
treatment_order11	1.093e+01	9.806e+00	4.460e+03	1.115
treatment_order12	1.136e+01	1.415e+01	5.411e+03	0.803
treatment_order14	1.852e+01	1.146e+01	6.541e+02	1.617
treatment_order15	-4.288e+00	1.578e+01	7.386e+02	-0.272
last_known_smoking_statussex-smoker	-3.673e+00	3.945e+00	4.672e+02	-0.931
last_known_smoking_statusnever	-9.591e+00	3.975e+00	4.663e+02	-2.413

last_known_smoking_statussmoker	4.124e+00	4.813e+00	4.597e+02	0.857
last_known_vaping_statussex-vaper	-4.091e+00	8.520e+00	4.895e+02	-0.480
last_known_vaping_statusnever	3.381e+00	3.920e+00	4.688e+02	0.862
last_known_vaping_statusvaper	6.431e+00	5.334e+00	4.734e+02	1.206
treatment_reclassifiedAnti-IL17	-1.408e+01	1.575e+00	7.082e+03	-8.945
treatment_reclassifiedAnti-TNF	-1.309e+01	1.189e+00	7.352e+03	-11.012
treatment_reclassifiedJAK Inhibitor	-2.030e+01	4.110e+00	6.364e+03	-4.940
time_in_years	1.384e-01	8.687e-02	5.189e+02	1.593

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.00540 **
hlab27statusNegative	0.05515 .
hlab27statusPositive	0.58507
age_at_onset	0.98424
diagnosisAxial SpA- nr-axSpA	0.64116
treatment_order2	0.28576
treatment_order3	0.10587
treatment_order4	0.63327
treatment_order5	0.00269 **
treatment_order6	0.02228 *
treatment_order7	0.07234 .
treatment_order8	0.06607 .
treatment_order9	0.55900
treatment_order10	0.92762
treatment_order11	0.26489
treatment_order12	0.42190
treatment_order14	0.10646
treatment_order15	0.78587
last_known_smoking_statussex-smoker	0.35232
last_known_smoking_statusnever	0.01623 *
last_known_smoking_statussmoker	0.39197
last_known_vaping_statussex-vaper	0.63134
last_known_vaping_statusnever	0.38888
last_known_vaping_statusvaper	0.22854
treatment_reclassifiedAnti-IL17	< 2e-16 ***
treatment_reclassifiedAnti-TNF	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	8.01e-07 ***
time_in_years	0.11172

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

```
anova(model_treatment_gender_daily_activity_impairment_full,
       model_treatment_gender_daily_activity_impairment_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_daily_activity_impairment

Models:

model_treatment_gender_daily_activity_impairment_reduced: daily_activity_impairment ~ gender

model_treatment_gender_daily_activity_impairment_full: daily_activity_impairment ~ gender + 1

	npar	AIC	BIC	
model_treatment_gender_daily_activity_impairment_reduced	33	70474	70705	
model_treatment_gender_daily_activity_impairment_full	36	70468	70720	
	logLik	deviance	Chisq	
model_treatment_gender_daily_activity_impairment_reduced	-35204	70408		
model_treatment_gender_daily_activity_impairment_full	-35198	70396	11.616	
	Df	Pr(>Chisq)		
model_treatment_gender_daily_activity_impairment_reduced				
model_treatment_gender_daily_activity_impairment_full	3	0.00882	**	

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

```
anova(model_treatment_gender_daily_activity_impairment_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	1483	1483.2	1	1680.8	5.1514	0.023354	*
hlab27status	1558	778.9	2	517.1	2.7052	0.067803	.
age_at_onset	0	0.0	1	481.7	0.0000	0.997685	
diagnosis	68	67.8	1	461.9	0.2353	0.627822	
treatment_order	12268	943.7	13	3652.5	3.2775	5.58e-05	***
last_known_smoking_status	4501	1500.5	3	478.6	5.2114	0.001505	**
last_known_vaping_status	700	233.5	3	486.0	0.8109	0.488216	
treatment_reclassified	39412	13137.3	3	6622.8	45.6287	< 2.2e-16	***
time_in_years	642	642.1	1	522.7	2.2302	0.135944	
gender:treatment_reclassified	3348	1116.1	3	5795.5	3.8763	0.008812	**

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

Presenteeism

lme4 code for treatment and diagnosis: Presenteeism

```
model_treatment_diagnosis_presenteeism_full <- lmer(
  presenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_presenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

model_treatment_diagnosis_presenteeism_reduced <- lmer(
  presenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_presenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_treatment_diagnosis_presenteeism_full, corr = FALSE))
```

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: presenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * diagnosis + time_in_years + (time_in_years |
  ttas_id)
Data: dataframe_sorted_and_reclassified_presenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36409.8
```

```
Scaled residuals:
      Min       1Q   Median       3Q      Max
```

-3.5390 -0.5381 -0.1042 0.4779 4.9204

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	405.091	20.13	
	time_in_years	1.322	1.15	-0.54
Residual		239.282	15.47	

Number of obs: 4247, groups: ttas_id, 437

Fixed effects:

	Estimate
(Intercept)	1.976e+01
genderMale	-3.776e+00
hlab27statusNegative	1.514e+01
hlab27statusPositive	9.694e+00
age_at_onset	3.168e-02
diagnosisAxial SpA- nr-axSpA	5.242e-01
treatment_order2	3.820e-01
treatment_order3	2.933e+00
treatment_order4	-6.025e-02
treatment_order5	2.919e-01
treatment_order6	4.557e+00
treatment_order7	-2.773e+00
treatment_order8	5.566e+00
treatment_order9	2.289e+00
last_known_smoking_statussex-smoker	5.041e-01
last_known_smoking_statusnever	-5.603e+00
last_known_smoking_statussmoker	6.071e+00
last_known_vaping_statussex-vaper	-7.862e+00
last_known_vaping_statusnever	5.708e+00
last_known_vaping_statusvaper	7.450e+00
treatment_reclassifiedAnti-IL17	-1.072e+01
treatment_reclassifiedAnti-TNF	-9.962e+00
treatment_reclassifiedJAK Inhibitor	-1.588e+01
time_in_years	-9.417e-03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5.140e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-2.379e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.707e+01
	Std. Error
(Intercept)	5.313e+00
genderMale	2.064e+00
hlab27statusNegative	4.870e+00
hlab27statusPositive	4.205e+00

age_at_onset	1.098e-01
diagnosisAxial SpA- nr-axSpA	2.500e+00
treatment_order2	1.811e+00
treatment_order3	1.683e+00
treatment_order4	2.161e+00
treatment_order5	2.331e+00
treatment_order6	3.239e+00
treatment_order7	3.734e+00
treatment_order8	5.821e+00
treatment_order9	5.889e+00
last_known_smoking_statussex-smoker	4.120e+00
last_known_smoking_statusnever	4.124e+00
last_known_smoking_statussmoker	5.101e+00
last_known_vaping_statussex-vaper	8.069e+00
last_known_vaping_statusnever	4.189e+00
last_known_vaping_statusvaper	5.582e+00
treatment_reclassifiedAnti-IL17	2.327e+00
treatment_reclassifiedAnti-TNF	1.609e+00
treatment_reclassifiedJAK Inhibitor	6.900e+00
time_in_years	1.020e-01
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.483e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	2.377e+00
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.048e+01
	df
(Intercept)	3.883e+02
genderMale	3.566e+02
hlab27statusNegative	3.838e+02
hlab27statusPositive	3.854e+02
age_at_onset	3.408e+02
diagnosisAxial SpA- nr-axSpA	3.758e+02
treatment_order2	3.118e+03
treatment_order3	2.978e+03
treatment_order4	3.043e+03
treatment_order5	2.567e+03
treatment_order6	2.806e+03
treatment_order7	2.525e+03
treatment_order8	1.496e+03
treatment_order9	1.213e+03
last_known_smoking_statussex-smoker	3.438e+02
last_known_smoking_statusnever	3.441e+02
last_known_smoking_statussmoker	3.334e+02
last_known_vaping_statussex-vaper	3.379e+02
last_known_vaping_statusnever	3.476e+02

last_known_vaping_statusvaper	3.470e+02
treatment_reclassifiedAnti-IL17	3.422e+03
treatment_reclassifiedAnti-TNF	3.582e+03
treatment_reclassifiedJAK Inhibitor	2.359e+03
time_in_years	3.309e+02
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.242e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3.117e+03
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	3.519e+03
	t value
(Intercept)	3.719
genderMale	-1.829
hlab27statusNegative	3.108
hlab27statusPositive	2.306
age_at_onset	0.289
diagnosisAxial SpA- nr-axSpA	0.210
treatment_order2	0.211
treatment_order3	1.742
treatment_order4	-0.028
treatment_order5	0.125
treatment_order6	1.407
treatment_order7	-0.743
treatment_order8	0.956
treatment_order9	0.389
last_known_smoking_statussex-smoker	0.122
last_known_smoking_statusnever	-1.359
last_known_smoking_statussmoker	1.190
last_known_vaping_statussex-vaper	-0.974
last_known_vaping_statusnever	1.362
last_known_vaping_statusvaper	1.335
treatment_reclassifiedAnti-IL17	-4.607
treatment_reclassifiedAnti-TNF	-6.192
treatment_reclassifiedJAK Inhibitor	-2.302
time_in_years	-0.092
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.147
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	-1.001
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.583
	Pr(> t)
(Intercept)	0.00023 ***
genderMale	0.06823 .
hlab27statusNegative	0.00202 **
hlab27statusPositive	0.02166 *
age_at_onset	0.77304
diagnosisAxial SpA- nr-axSpA	0.83406

treatment_order2	0.83293	
treatment_order3	0.08153	.
treatment_order4	0.97776	
treatment_order5	0.90035	
treatment_order6	0.15967	
treatment_order7	0.45773	
treatment_order8	0.33915	
treatment_order9	0.69760	
last_known_smoking_statussex-smoker	0.90269	
last_known_smoking_statusnever	0.17512	
last_known_smoking_statussmoker	0.23487	
last_known_vaping_statussex-vaper	0.33053	
last_known_vaping_statusnever	0.17394	
last_known_vaping_statusvaper	0.18288	
treatment_reclassifiedAnti-IL17	4.24e-06	***
treatment_reclassifiedAnti-TNF	6.60e-10	***
treatment_reclassifiedJAK Inhibitor	0.02144	*
time_in_years	0.92652	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.25161	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.31692	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	0.00983	**

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

```
print(summary(model_treatment_diagnosis_presenteeism_reduced, corr = FALSE))
```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [lmerModLmerTest]
Formula: presenteeism ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order + last_known_smoking_status + last_known_vaping_status + treatment_reclassified + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_presenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36435.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5357	-0.5364	-0.1014	0.4717	4.9128

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
--------	------	----------	----------	------

```

ttas_id (Intercept)  404.981  20.12
                    time_in_years  1.299  1.14  -0.54
Residual              240.031  15.49
Number of obs: 4247, groups: ttas_id, 437

```

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	19.76463	5.30312	388.94280	3.727
genderMale	-3.76129	2.05998	357.14855	-1.826
hlab27statusNegative	15.35567	4.85683	383.79340	3.162
hlab27statusPositive	9.71705	4.18992	384.28775	2.319
age_at_onset	0.03330	0.10956	341.38769	0.304
diagnosisAxial SpA- nr-axSpA	0.16159	2.39059	339.68583	0.068
treatment_order2	0.26230	1.79503	3130.52063	0.146
treatment_order3	2.83945	1.66347	3078.21449	1.707
treatment_order4	0.01735	2.12621	3067.46686	0.008
treatment_order5	0.57427	2.31295	2643.33838	0.248
treatment_order6	4.53298	3.21553	2839.60745	1.410
treatment_order7	-5.07482	3.65881	2435.35701	-1.387
treatment_order8	5.12481	5.78556	1493.80160	0.886
treatment_order9	2.51675	5.87510	1186.53063	0.428
last_known_smoking_statussex-smoker	0.58352	4.10939	343.79092	0.142
last_known_smoking_statusnever	-5.50538	4.11466	344.39222	-1.338
last_known_smoking_statussmoker	6.17533	5.08487	332.61892	1.214
last_known_vaping_statussex-vaper	-7.83783	8.04763	337.93084	-0.974
last_known_vaping_statusnever	5.63862	4.17958	347.80098	1.349
last_known_vaping_statusvaper	7.43770	5.56802	346.94610	1.336
treatment_reclassifiedAnti-IL17	-9.62290	2.14762	3593.93846	-4.481
treatment_reclassifiedAnti-TNF	-10.27132	1.57733	3573.16699	-6.512
treatment_reclassifiedJAK Inhibitor	-3.55840	5.33719	3290.66731	-0.667
time_in_years	-0.01406	0.10162	331.02863	-0.138

Pr(>|t|)

(Intercept)	0.000223 ***
genderMale	0.068702 .
hlab27statusNegative	0.001693 **
hlab27statusPositive	0.020911 *
age_at_onset	0.761353
diagnosisAxial SpA- nr-axSpA	0.946149
treatment_order2	0.883831
treatment_order3	0.087932 .
treatment_order4	0.993488
treatment_order5	0.803932
treatment_order6	0.158733

```

treatment_order7          0.165565
treatment_order8          0.375871
treatment_order9          0.668456
last_known_smoking_statussex-smoker 0.887165
last_known_smoking_statusnever 0.181782
last_known_smoking_statussmoker 0.225436
last_known_vaping_statussex-vaper 0.330788
last_known_vaping_statusnever 0.178187
last_known_vaping_statusvaper 0.182493
treatment_reclassifiedAnti-IL17 7.67e-06 ***
treatment_reclassifiedAnti-TNF 8.46e-11 ***
treatment_reclassifiedJAK Inhibitor 0.504999
time_in_years              0.890069
---

```

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

```

anova(model_treatment_diagnosis_presenteeism_full,
       model_treatment_diagnosis_presenteeism_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_presenteeism

Models:

model_treatment_diagnosis_presenteeism_reduced: presenteeism ~ gender + hlab27status + age_at_onset

model_treatment_diagnosis_presenteeism_full: presenteeism ~ gender + hlab27status + age_at_onset

	npars	AIC	BIC	logLik	deviance
model_treatment_diagnosis_presenteeism_reduced	28	36567	36745	-18256	36511
model_treatment_diagnosis_presenteeism_full	31	36562	36759	-18250	36500

Chisq Df Pr(>Chisq)

model_treatment_diagnosis_presenteeism_reduced

model_treatment_diagnosis_presenteeism_full 10.685 3 0.01355 *

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

```

anova(model_treatment_diagnosis_presenteeism_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	800.5	800.5	1	356.6	3.3453	0.068234
hlab27status	2365.8	1182.9	2	369.3	4.9436	0.007607
age_at_onset	19.9	19.9	1	340.8	0.0833	0.773035

diagnosis	1140.9	1140.9	1	1451.5	4.7678	0.029156
treatment_order	2691.2	336.4	8	2390.3	1.4059	0.188762
last_known_smoking_status	2752.7	917.6	3	343.1	3.8346	0.010061
last_known_vaping_status	1399.5	466.5	3	346.1	1.9496	0.121318
treatment_reclassified	9743.9	3248.0	3	3633.8	13.5738	8.346e-09
time_in_years	2.0	2.0	1	330.9	0.0085	0.926524
diagnosis:treatment_reclassified	2570.2	856.7	3	3391.9	3.5804	0.013304

```

gender .
hlab27status **
age_at_onset
diagnosis *
treatment_order
last_known_smoking_status *
last_known_vaping_status
treatment_reclassified ***
time_in_years
diagnosis:treatment_reclassified *
---
```

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

lme4 code for treatment and gender: Presenteeism

```

model_treatment_gender_presenteeism_full <- lmer(
  presenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_presenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
 fixed-effect model matrix is rank deficient so dropping 1 column / coefficient

```

model_treatment_gender_presenteeism_reduced <- lmer(
  presenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
```

```

last_known_vaping_status +
treatment_reclassified +
time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_presenteeism,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

```

```
print(summary(model_treatment_gender_presenteeism_full, corr = FALSE))
```

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

Formula: presenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * gender + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_presenteeism

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 36423.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5330	-0.5406	-0.1010	0.4716	4.9123

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	404.577	20.114	
	time_in_years	1.251	1.119	-0.53
Residual		240.044	15.493	

Number of obs: 4247, groups: ttas_id, 437

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	20.67710	5.33428	394.10837
genderMale	-4.92319	2.18026	427.10077
hlab27statusNegative	15.24466	4.86139	382.72855
hlab27statusPositive	9.71651	4.19125	382.37790
age_at_onset	0.03363	0.10988	341.48101
diagnosisAxial SpA- nr-axSpA	0.14055	2.39782	339.72462
treatment_order2	0.45094	1.79636	3115.44373
treatment_order3	3.02036	1.66403	3051.44992

treatment_order4	0.52866	2.13829	3025.22805
treatment_order5	0.77333	2.31527	2599.63017
treatment_order6	5.18155	3.22656	2755.15089
treatment_order7	-3.98762	3.69826	2355.89141
treatment_order8	5.94360	5.79303	1399.01526
treatment_order9	3.21210	5.85941	1134.57697
last_known_smoking_statussex-smoker	0.61688	4.12088	344.43568
last_known_smoking_statusnever	-5.42976	4.12612	344.82942
last_known_smoking_statussmoker	6.05802	5.09985	333.42139
last_known_vaping_statussex-vaper	-8.09797	8.06763	338.33983
last_known_vaping_statusnever	5.40219	4.19267	348.63039
last_known_vaping_statusvaper	7.22163	5.58412	347.03871
treatment_reclassifiedAnti-IL17	-8.69242	3.39221	3391.23040
treatment_reclassifiedAnti-TNF	-13.06064	2.14347	3291.69201
treatment_reclassifiedJAK Inhibitor	-6.17744	5.48871	3122.54801
time_in_years	-0.01758	0.10102	329.41944
genderMale:treatment_reclassifiedAnti-IL17	-1.71793	3.79253	2926.44558
genderMale:treatment_reclassifiedAnti-TNF	3.81506	2.05106	2828.06699
t value Pr(> t)			
(Intercept)	3.876	0.000124	***
genderMale	-2.258	0.024445	*
hlab27statusNegative	3.136	0.001846	**
hlab27statusPositive	2.318	0.020961	*
age_at_onset	0.306	0.759711	
diagnosisAxial SpA- nr-axSpA	0.059	0.953294	
treatment_order2	0.251	0.801808	
treatment_order3	1.815	0.069608	.
treatment_order4	0.247	0.804743	
treatment_order5	0.334	0.738398	
treatment_order6	1.606	0.108409	
treatment_order7	-1.078	0.281037	
treatment_order8	1.026	0.305073	
treatment_order9	0.548	0.583666	
last_known_smoking_statussex-smoker	0.150	0.881092	
last_known_smoking_statusnever	-1.316	0.189066	
last_known_smoking_statussmoker	1.188	0.235726	
last_known_vaping_statussex-vaper	-1.004	0.316211	
last_known_vaping_statusnever	1.288	0.198432	
last_known_vaping_statusvaper	1.293	0.196787	
treatment_reclassifiedAnti-IL17	-2.562	0.010436	*
treatment_reclassifiedAnti-TNF	-6.093	1.23e-09	***
treatment_reclassifiedJAK Inhibitor	-1.125	0.260472	
time_in_years	-0.174	0.861961	


```

genderMale:treatment_reclassifiedAnti-IL17  -0.453 0.650598
genderMale:treatment_reclassifiedAnti-TNF    1.860 0.062983 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
fit warnings:
fixed-effect model matrix is rank deficient so dropping 1 column / coefficient

```

```
print(summary(model_treatment_gender_presenteeism_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: presenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_presenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 36435.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5357	-0.5364	-0.1014	0.4717	4.9128

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	404.981	20.12	
	time_in_years	1.299	1.14	-0.54
Residual		240.031	15.49	

Number of obs: 4247, groups: ttas_id, 437

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	19.76463	5.30312	388.94280	3.727
genderMale	-3.76129	2.05998	357.14855	-1.826
hlab27statusNegative	15.35567	4.85683	383.79340	3.162
hlab27statusPositive	9.71705	4.18992	384.28775	2.319
age_at_onset	0.03330	0.10956	341.38769	0.304
diagnosisAxial SpA- nr-axSpA	0.16159	2.39059	339.68583	0.068
treatment_order2	0.26230	1.79503	3130.52063	0.146
treatment_order3	2.83945	1.66347	3078.21449	1.707
treatment_order4	0.01735	2.12621	3067.46686	0.008
treatment_order5	0.57427	2.31295	2643.33838	0.248

treatment_order6	4.53298	3.21553	2839.60745	1.410
treatment_order7	-5.07482	3.65881	2435.35701	-1.387
treatment_order8	5.12481	5.78556	1493.80160	0.886
treatment_order9	2.51675	5.87510	1186.53063	0.428
last_known_smoking_statussex-smoker	0.58352	4.10939	343.79092	0.142
last_known_smoking_statusnever	-5.50538	4.11466	344.39222	-1.338
last_known_smoking_statussmoker	6.17533	5.08487	332.61892	1.214
last_known_vaping_statussex-vaper	-7.83783	8.04763	337.93084	-0.974
last_known_vaping_statusnever	5.63862	4.17958	347.80098	1.349
last_known_vaping_statusvaper	7.43770	5.56802	346.94610	1.336
treatment_reclassifiedAnti-IL17	-9.62290	2.14762	3593.93846	-4.481
treatment_reclassifiedAnti-TNF	-10.27132	1.57733	3573.16699	-6.512
treatment_reclassifiedJAK Inhibitor	-3.55840	5.33719	3290.66731	-0.667
time_in_years	-0.01406	0.10162	331.02863	-0.138

Pr(>|t|)

(Intercept)	0.000223 ***
genderMale	0.068702 .
hlab27statusNegative	0.001693 **
hlab27statusPositive	0.020911 *
age_at_onset	0.761353
diagnosisAxial SpA- nr-axSpA	0.946149
treatment_order2	0.883831
treatment_order3	0.087932 .
treatment_order4	0.993488
treatment_order5	0.803932
treatment_order6	0.158733
treatment_order7	0.165565
treatment_order8	0.375871
treatment_order9	0.668456
last_known_smoking_statussex-smoker	0.887165
last_known_smoking_statusnever	0.181782
last_known_smoking_statussmoker	0.225436
last_known_vaping_statussex-vaper	0.330788
last_known_vaping_statusnever	0.178187
last_known_vaping_statusvaper	0.182493
treatment_reclassifiedAnti-IL17	7.67e-06 ***
treatment_reclassifiedAnti-TNF	8.46e-11 ***
treatment_reclassifiedJAK Inhibitor	0.504999
time_in_years	0.890069

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

```
anova(model_treatment_gender_presenteeism_full,
       model_treatment_gender_presenteeism_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_presenteeism

Models:

model_treatment_gender_presenteeism_reduced: presenteeism ~ gender + hlab27status + age_at_onset

model_treatment_gender_presenteeism_full: presenteeism ~ gender + hlab27status + age_at_onset

	npars	AIC	BIC	logLik	deviance
model_treatment_gender_presenteeism_reduced	28	36567	36745	-18256	36511
model_treatment_gender_presenteeism_full	30	36567	36757	-18253	36507

	Chisq	Df	Pr(>Chisq)
model_treatment_gender_presenteeism_reduced			
model_treatment_gender_presenteeism_full	4.4461	2	0.1083

```
anova(model_treatment_gender_presenteeism_full)
```

Missing cells for: genderMale:treatment_reclassifiedJAK Inhibitor.

Interpret type III hypotheses with care.

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	765.9	765.9	1	545.3	3.1905	0.074622
hlab27status	2417.7	1208.8	2	368.6	5.0359	0.006955
age_at_onset	22.5	22.5	1	341.5	0.0937	0.759711
diagnosis	0.8	0.8	1	339.7	0.0034	0.953294
treatment_order	3151.2	393.9	8	2294.9	1.6409	0.108213
last_known_smoking_status	2680.7	893.6	3	343.8	3.7225	0.011694
last_known_vaping_status	1355.7	451.9	3	346.5	1.8826	0.132181
treatment_reclassified	11601.3	3867.1	3	3370.4	16.1100	2.136e-10
time_in_years	7.3	7.3	1	329.4	0.0303	0.861961
gender:treatment_reclassified	1073.7	536.8	2	2988.9	2.2364	0.107022

gender	.
hlab27status	**
age_at_onset	
diagnosis	
treatment_order	
last_known_smoking_status	*

```

last_known_vaping_status
treatment_reclassified      ***
time_in_years
gender:treatment_reclassified
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Absenteeism

lme4 code for treatment and diagnosis: Absenteeism

```

model_treatment_diagnosis_absenteeism_full <- lmer(
  absenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_absenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_diagnosis_absenteeism_reduced <- lmer(
  absenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_absenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_diagnosis_absenteeism_full, corr = FALSE))

```

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

Formula: absenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * diagnosis + time_in_years + (time_in_years |

```

ttas_id)
Data: dataframe_sorted_and_reclassified_absenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 37546.1

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5395	-0.3160	-0.1293	-0.0112	6.5106

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	89.7042	9.4712	
	time_in_years	0.2802	0.5293	-0.70
Residual		217.4853	14.7474	

Number of obs: 4509, groups: ttas_id, 441

Fixed effects:

	Estimate
(Intercept)	7.26010
genderMale	-2.41449
hlab27statusNegative	3.24514
hlab27statusPositive	1.65025
age_at_onset	-0.05839
diagnosisAxial SpA- nr-axSpA	-0.56018
treatment_order2	2.49864
treatment_order3	6.38981
treatment_order4	5.82184
treatment_order5	6.59440
treatment_order6	12.17352
treatment_order7	9.86401
treatment_order8	17.94685
treatment_order9	1.24289
last_known_smoking_statussex-smoker	6.23692
last_known_smoking_statusnever	3.11163
last_known_smoking_statussmoker	7.76276
last_known_vaping_statussex-vaper	-9.83649
last_known_vaping_statusnever	-5.19409
last_known_vaping_statusvaper	-5.94397
treatment_reclassifiedAnti-IL17	-5.31060
treatment_reclassifiedAnti-TNF	-4.95357
treatment_reclassifiedJAK Inhibitor	-13.89457
time_in_years	-0.02170

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-1.10971
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.23361
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	16.72979
	Std. Error
(Intercept)	2.74006
genderMale	1.01309
hlab27statusNegative	2.44274
hlab27statusPositive	2.10213
age_at_onset	0.05498
diagnosisAxial SpA- nr-axSpA	1.35114
treatment_order2	1.40991
treatment_order3	1.28993
treatment_order4	1.66195
treatment_order5	1.78042
treatment_order6	2.50744
treatment_order7	2.78701
treatment_order8	4.15317
treatment_order9	4.42357
last_known_smoking_statussex-smoker	1.99180
last_known_smoking_statusnever	2.00185
last_known_smoking_statussmoker	2.39620
last_known_vaping_statussex-vaper	3.84542
last_known_vaping_statusnever	2.02972
last_known_vaping_statusvaper	2.66023
treatment_reclassifiedAnti-IL17	1.84295
treatment_reclassifiedAnti-TNF	1.27377
treatment_reclassifiedJAK Inhibitor	4.60057
time_in_years	0.05737
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.53761
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1.80658
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	8.53488
	df
(Intercept)	414.35679
genderMale	347.08802
hlab27statusNegative	385.12827
hlab27statusPositive	370.59328
age_at_onset	343.51648
diagnosisAxial SpA- nr-axSpA	410.67139
treatment_order2	2843.08568
treatment_order3	2825.05913
treatment_order4	2611.06816
treatment_order5	2188.54041
treatment_order6	2604.87032

treatment_order7	2437.05961
treatment_order8	1770.57806
treatment_order9	653.18075
last_known_smoking_statussex-smoker	343.10432
last_known_smoking_statusnever	345.13843
last_known_smoking_statussmoker	328.14067
last_known_vaping_statussex-vaper	314.25115
last_known_vaping_statusnever	352.47011
last_known_vaping_statusvaper	332.31068
treatment_reclassifiedAnti-IL17	2710.04801
treatment_reclassifiedAnti-TNF	3306.50166
treatment_reclassifiedJAK Inhibitor	3403.67779
time_in_years	222.14022
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3038.17056
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	1880.09732
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	4362.90857
	t value
(Intercept)	2.650
genderMale	-2.383
hlab27statusNegative	1.328
hlab27statusPositive	0.785
age_at_onset	-1.062
diagnosisAxial SpA- nr-axSpA	-0.415
treatment_order2	1.772
treatment_order3	4.954
treatment_order4	3.503
treatment_order5	3.704
treatment_order6	4.855
treatment_order7	3.539
treatment_order8	4.321
treatment_order9	0.281
last_known_smoking_statussex-smoker	3.131
last_known_smoking_statusnever	1.554
last_known_smoking_statussmoker	3.240
last_known_vaping_statussex-vaper	-2.558
last_known_vaping_statusnever	-2.559
last_known_vaping_statusvaper	-2.234
treatment_reclassifiedAnti-IL17	-2.882
treatment_reclassifiedAnti-TNF	-3.889
treatment_reclassifiedJAK Inhibitor	-3.020
time_in_years	-0.378
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	-0.314
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.129

```

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor    1.960
                                                                    Pr(>|t|)
(Intercept)                                                         0.008367 **
genderMale                                                           0.017696 *
hlab27statusNegative                                                0.184805
hlab27statusPositive                                                0.432932
age_at_onset                                                         0.289034
diagnosisAxial SpA- nr-axSpA                                       0.678651
treatment_order2                                                    0.076468 .
treatment_order3                                                    7.71e-07 ***
treatment_order4                                                    0.000468 ***
treatment_order5                                                    0.000218 ***
treatment_order6                                                    1.28e-06 ***
treatment_order7                                                    0.000409 ***
treatment_order8                                                    1.64e-05 ***
treatment_order9                                                    0.778823
last_known_smoking_statussex-smoker                                0.001890 **
last_known_smoking_statusnever                                     0.121010
last_known_smoking_statussmoker                                    0.001319 **
last_known_vaping_statussex-vaper                                  0.010997 *
last_known_vaping_statusnever                                      0.010914 *
last_known_vaping_statusvaper                                      0.026123 *
treatment_reclassifiedAnti-IL17                                     0.003988 **
treatment_reclassifiedAnti-TNF                                      0.000103 ***
treatment_reclassifiedJAK Inhibitor                                0.002545 **
time_in_years                                                        0.705539
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17      0.753778
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF       0.897127
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor  0.050040 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_absenteeism_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: absenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_absenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```


REML criterion at convergence: 37563.5

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5360	-0.3152	-0.1320	-0.0120	6.5108

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	89.9358	9.4834	
	time_in_years	0.2792	0.5284	-0.70
Residual		217.5960	14.7511	

Number of obs: 4509, groups: ttas_id, 441

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	7.19867	2.73766	414.15618	2.629
genderMale	-2.38967	1.01153	346.23818	-2.362
hlab27statusNegative	3.25821	2.43728	384.16506	1.337
hlab27statusPositive	1.60592	2.09470	368.18861	0.767
age_at_onset	-0.05876	0.05488	342.81153	-1.071
diagnosisAxial SpA- nr-axSpA	-0.46278	1.21903	330.46188	-0.380
treatment_order2	2.56410	1.40115	2892.42386	1.830
treatment_order3	6.40600	1.27921	2938.14487	5.008
treatment_order4	6.18839	1.63892	2662.36520	3.776
treatment_order5	6.57622	1.77090	2221.38860	3.713
treatment_order6	12.14376	2.49049	2646.28242	4.876
treatment_order7	9.29342	2.74627	2471.11031	3.384
treatment_order8	18.06064	4.13551	1803.66892	4.367
treatment_order9	1.28111	4.41498	651.58259	0.290
last_known_smoking_statussex-smoker	6.26958	1.98697	341.37864	3.155
last_known_smoking_statusnever	3.14612	1.99832	344.03330	1.574
last_known_smoking_statussmoker	7.80344	2.38707	325.57166	3.269
last_known_vaping_statussex-vaper	-9.86761	3.83729	313.01970	-2.572
last_known_vaping_statusnever	-5.18970	2.02499	350.97020	-2.563
last_known_vaping_statusvaper	-5.96444	2.65447	331.29312	-2.247
treatment_reclassifiedAnti-IL17	-5.54414	1.71413	3039.69483	-3.234
treatment_reclassifiedAnti-TNF	-4.98704	1.25124	3367.22564	-3.986
treatment_reclassifiedJAK Inhibitor	-9.42567	3.96626	3851.18868	-2.376
time_in_years	-0.02047	0.05727	221.14697	-0.357

Pr(>|t|)

(Intercept)	0.008870 **
genderMale	0.018708 *
hlab27statusNegative	0.182073

```

hlab27statusPositive          0.443776
age_at_onset                  0.285103
diagnosisAxial SpA- nr-axSpA  0.704467
treatment_order2              0.067352 .
treatment_order3              5.83e-07 ***
treatment_order4              0.000163 ***
treatment_order5              0.000209 ***
treatment_order6              1.15e-06 ***
treatment_order7              0.000725 ***
treatment_order8              1.33e-05 ***
treatment_order9              0.771776
last_known_smoking_statussex-smoker 0.001746 **
last_known_smoking_statusnever 0.116319
last_known_smoking_statussmoker 0.001194 **
last_known_vaping_statussex-vaper  0.010587 *
last_known_vaping_statusnever  0.010799 *
last_known_vaping_statusvaper  0.025302 *
treatment_reclassifiedAnti-IL17 0.001232 **
treatment_reclassifiedAnti-TNF  6.87e-05 ***
treatment_reclassifiedJAK Inhibitor 0.017528 *
time_in_years                  0.721068
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_absenteeism_full,
       model_treatment_diagnosis_absenteeism_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_absenteeism

Models:

model_treatment_diagnosis_absenteeism_reduced: absenteeism ~ gender + hlab27status + age_at_onset

model_treatment_diagnosis_absenteeism_full: absenteeism ~ gender + hlab27status + age_at_onset

	npar	AIC	BIC	logLik	deviance
model_treatment_diagnosis_absenteeism_reduced	28	37671	37851	-18808	37615
model_treatment_diagnosis_absenteeism_full	31	37673	37872	-18806	37611

	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_absenteeism_reduced			
model_treatment_diagnosis_absenteeism_full	3.9799	3	0.2636

```
anova(model_treatment_diagnosis_absenteeism_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1235.3	1235.33	1	347.1	5.6801	0.0176962
hlab27status	450.5	225.26	2	365.4	1.0358	0.3559952
age_at_onset	245.2	245.24	1	343.5	1.1276	0.2890339
diagnosis	390.3	390.33	1	2581.2	1.7947	0.1804697
treatment_order	14096.4	1762.05	8	2142.8	8.1019	7.805e-11
last_known_smoking_status	3817.1	1272.37	3	330.6	5.8504	0.0006655
last_known_vaping_status	1980.4	660.13	3	323.3	3.0353	0.0293725
treatment_reclassified	2966.4	988.79	3	3547.2	4.5465	0.0034786
time_in_years	31.1	31.13	1	222.1	0.1431	0.7055385
diagnosis:treatment_reclassified	866.4	288.79	3	2867.1	1.3279	0.2634651

```

gender *
hlab27status
age_at_onset
diagnosis
treatment_order ***
last_known_smoking_status ***
last_known_vaping_status *
treatment_reclassified **
time_in_years
diagnosis:treatment_reclassified
---
```

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

lme4 code for treatment and gender: Absenteeism

```

model_treatment_gender_absenteeism_full <- lmer(
  absenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_absenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```

model_treatment_gender_absenteeism_reduced <- lmer(
  absenteeism ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_absenteeism,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_treatment_gender_absenteeism_full, corr = FALSE))

```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: absenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
  treatment_order + last_known_smoking_status + last_known_vaping_status +
  treatment_reclassified * gender + time_in_years + (time_in_years |
  ttas_id)
Data: dataframe_sorted_and_reclassified_absenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 37549.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5076	-0.3164	-0.1314	-0.0081	6.5142

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	89.2704	9.4483	
	time_in_years	0.2794	0.5286	-0.69
Residual		217.6403	14.7526	

Number of obs: 4509, groups: ttas_id, 441

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	6.99660	2.77596	425.44861
genderMale	-2.16715	1.16019	512.55980
hlab27statusNegative	3.34536	2.44147	384.68901
hlab27statusPositive	1.63475	2.09825	368.79436
age_at_onset	-0.05960	0.05494	341.86912

diagnosisAxial SpA- nr-axSpA	-0.43274	1.21989	329.96237
treatment_order2	2.53240	1.40222	2875.28143
treatment_order3	6.38430	1.28030	2920.65913
treatment_order4	6.02142	1.64850	2608.66324
treatment_order5	6.63391	1.77735	2220.57680
treatment_order6	12.06740	2.51915	2579.97704
treatment_order7	8.83352	2.79805	2443.35947
treatment_order8	17.69820	4.15648	1720.88094
treatment_order9	1.21908	4.42350	650.58703
last_known_smoking_statussex-smoker	6.23356	1.99633	344.74760
last_known_smoking_statusnever	3.12567	2.00502	345.25811
last_known_smoking_statussmoker	7.75786	2.39589	328.07345
last_known_vaping_statussex-vaper	-9.75059	3.85130	314.76373
last_known_vaping_statusnever	-5.12752	2.03477	353.51680
last_known_vaping_statusvaper	-5.94215	2.66301	332.40616
treatment_reclassifiedAnti-IL17	-6.80957	2.64543	2976.56174
treatment_reclassifiedAnti-TNF	-4.37869	1.61180	2520.97645
treatment_reclassifiedJAK Inhibitor	-8.39810	4.62389	3600.40894
time_in_years	-0.01863	0.05741	220.04933
genderMale:treatment_reclassifiedAnti-IL17	1.87300	2.93539	2460.08508
genderMale:treatment_reclassifiedAnti-TNF	-0.84571	1.49531	1679.17118
genderMale:treatment_reclassifiedJAK Inhibitor	-2.44870	8.71930	3900.28008
	t value	Pr(> t)	
(Intercept)	2.520	0.012086	*
genderMale	-1.868	0.062342	.
hlab27statusNegative	1.370	0.171416	
hlab27statusPositive	0.779	0.436418	
age_at_onset	-1.085	0.278739	
diagnosisAxial SpA- nr-axSpA	-0.355	0.723017	
treatment_order2	1.806	0.071024	.
treatment_order3	4.987	6.51e-07	***
treatment_order4	3.653	0.000265	***
treatment_order5	3.732	0.000194	***
treatment_order6	4.790	1.76e-06	***
treatment_order7	3.157	0.001613	**
treatment_order8	4.258	2.17e-05	***
treatment_order9	0.276	0.782949	
last_known_smoking_statussex-smoker	3.123	0.001945	**
last_known_smoking_statusnever	1.559	0.119931	
last_known_smoking_statussmoker	3.238	0.001327	**
last_known_vaping_statussex-vaper	-2.532	0.011835	*
last_known_vaping_statusnever	-2.520	0.012177	*
last_known_vaping_statusvaper	-2.231	0.026323	*

```

treatment_reclassifiedAnti-IL17          -2.574 0.010098 *
treatment_reclassifiedAnti-TNF            -2.717 0.006640 **
treatment_reclassifiedJAK Inhibitor        -1.816 0.069417 .
time_in_years                            -0.325 0.745852
genderMale:treatment_reclassifiedAnti-IL17 0.638 0.523484
genderMale:treatment_reclassifiedAnti-TNF  -0.566 0.571757
genderMale:treatment_reclassifiedJAK Inhibitor -0.281 0.778851
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_absenteeism_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: absenteeism ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_absenteeism
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 37563.5

Scaled residuals:

Min	1Q	Median	3Q	Max
-3.5360	-0.3152	-0.1320	-0.0120	6.5108

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	89.9358	9.4834	
	time_in_years	0.2792	0.5284	-0.70
Residual		217.5960	14.7511	

Number of obs: 4509, groups: ttas_id, 441

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	7.19867	2.73766	414.15618	2.629
genderMale	-2.38967	1.01153	346.23818	-2.362
hlab27statusNegative	3.25821	2.43728	384.16506	1.337
hlab27statusPositive	1.60592	2.09470	368.18861	0.767
age_at_onset	-0.05876	0.05488	342.81153	-1.071
diagnosisAxial SpA- nr-axSpA	-0.46278	1.21903	330.46188	-0.380
treatment_order2	2.56410	1.40115	2892.42386	1.830

treatment_order3	6.40600	1.27921	2938.14487	5.008
treatment_order4	6.18839	1.63892	2662.36520	3.776
treatment_order5	6.57622	1.77090	2221.38860	3.713
treatment_order6	12.14376	2.49049	2646.28242	4.876
treatment_order7	9.29342	2.74627	2471.11031	3.384
treatment_order8	18.06064	4.13551	1803.66892	4.367
treatment_order9	1.28111	4.41498	651.58259	0.290
last_known_smoking_statussex-smoker	6.26958	1.98697	341.37864	3.155
last_known_smoking_statusnever	3.14612	1.99832	344.03330	1.574
last_known_smoking_statussmoker	7.80344	2.38707	325.57166	3.269
last_known_vaping_statussex-vaper	-9.86761	3.83729	313.01970	-2.572
last_known_vaping_statusnever	-5.18970	2.02499	350.97020	-2.563
last_known_vaping_statusvaper	-5.96444	2.65447	331.29312	-2.247
treatment_reclassifiedAnti-IL17	-5.54414	1.71413	3039.69483	-3.234
treatment_reclassifiedAnti-TNF	-4.98704	1.25124	3367.22564	-3.986
treatment_reclassifiedJAK Inhibitor	-9.42567	3.96626	3851.18868	-2.376
time_in_years	-0.02047	0.05727	221.14697	-0.357
	Pr(> t)			
(Intercept)	0.008870	**		
genderMale	0.018708	*		
hlab27statusNegative	0.182073			
hlab27statusPositive	0.443776			
age_at_onset	0.285103			
diagnosisAxial SpA- nr-axSpA	0.704467			
treatment_order2	0.067352	.		
treatment_order3	5.83e-07	***		
treatment_order4	0.000163	***		
treatment_order5	0.000209	***		
treatment_order6	1.15e-06	***		
treatment_order7	0.000725	***		
treatment_order8	1.33e-05	***		
treatment_order9	0.771776			
last_known_smoking_statussex-smoker	0.001746	**		
last_known_smoking_statusnever	0.116319			
last_known_smoking_statussmoker	0.001194	**		
last_known_vaping_statussex-vaper	0.010587	*		
last_known_vaping_statusnever	0.010799	*		
last_known_vaping_statusvaper	0.025302	*		
treatment_reclassifiedAnti-IL17	0.001232	**		
treatment_reclassifiedAnti-TNF	6.87e-05	***		
treatment_reclassifiedJAK Inhibitor	0.017528	*		
time_in_years	0.721068			

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

```
anova(model_treatment_gender_absenteeism_full,
       model_treatment_gender_absenteeism_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_absenteeism

Models:

model_treatment_gender_absenteeism_reduced: absenteeism ~ gender + hlab27status + age_at_onset

model_treatment_gender_absenteeism_full: absenteeism ~ gender + hlab27status + age_at_onset +

	npars	AIC	BIC	logLik	deviance
model_treatment_gender_absenteeism_reduced	28	37671	37851	-18808	37615
model_treatment_gender_absenteeism_full	31	37676	37875	-18807	37614

Chisq Df Pr(>Chisq)

model_treatment_gender_absenteeism_reduced

model_treatment_gender_absenteeism_full 0.9889 3 0.8039

```
anova(model_treatment_gender_absenteeism_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	227.5	227.49	1	2476.0	1.0453	0.3066981
hlab27status	493.6	246.78	2	364.0	1.1339	0.3229124
age_at_onset	256.2	256.15	1	341.9	1.1770	0.2787393
diagnosis	27.4	27.39	1	330.0	0.1258	0.7230170
treatment_order	13744.6	1718.07	8	2124.7	7.8941	1.631e-10
last_known_smoking_status	3787.5	1262.50	3	331.4	5.8009	0.0007113
last_known_vaping_status	1940.0	646.66	3	323.6	2.9712	0.0319741
treatment_reclassified	3755.8	1251.95	3	3296.8	5.7524	0.0006384
time_in_years	22.9	22.92	1	220.0	0.1053	0.7458517
gender:treatment_reclassified	219.5	73.15	3	2490.7	0.3361	0.7992385

gender

hlab27status

age_at_onset

diagnosis

treatment_order

last_known_smoking_status

last_known_vaping_status

*

treatment_reclassified

```
time_in_years
gender:treatment_reclassified
---
```

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

FACIT

lme4 code for treatment and diagnosis: FACIT

```
model_treatment_diagnosis_facit_full <- lmer(
  facit ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_facit,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
model_treatment_diagnosis_facit_reduced <- lmer(
  facit ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_facit,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_diagnosis_facit_full, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```
facit ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
  diagnosis + time_in_years + (time_in_years | ttas_id)
Data: dataframe_sorted_and_reclassified_facit
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 43479.4
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-4.5673	-0.5237	0.0497	0.5463	3.8411

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	112.2805	10.5962	
	time_in_years	0.3611	0.6009	-0.49
Residual		47.2364	6.8729	

Number of obs: 6188, groups: ttas_id, 634

```
Fixed effects:
```

	Estimate
(Intercept)	33.44874
genderMale	4.13470
hlab27statusNegative	-4.22467
hlab27statusPositive	-0.45291
age_at_onset	0.03729
diagnosisAxial SpA- nr-axSpA	-3.62522
treatment_order2	0.16722
treatment_order3	-1.30853
treatment_order4	-1.78531
treatment_order5	-2.07611
treatment_order6	-3.35460
treatment_order7	-2.28733
treatment_order8	-3.76945
treatment_order9	0.40460
treatment_order10	-4.56590
treatment_order11	-8.28971
treatment_order12	-8.43928
treatment_order14	-7.61761
treatment_order15	-0.05826
last_known_smoking_statussex-smoker	0.94307
last_known_smoking_statusnever	3.71162
last_known_smoking_statussmoker	-4.70891
last_known_vaping_statussex-vaper	2.82235
last_known_vaping_statusnever	-2.28790
last_known_vaping_statusvaper	-7.34634
treatment_reclassifiedAnti-IL17	5.02319

treatment_reclassifiedAnti-TNF	3.62313
treatment_reclassifiedJAK Inhibitor	9.47155
time_in_years	-0.23223
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.55094
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3.24778
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-6.52427
	Std. Error
(Intercept)	2.21876
genderMale	0.91815
hlab27statusNegative	1.96726
hlab27statusPositive	1.68433
age_at_onset	0.04476
diagnosisAxial SpA- nr-axSpA	1.15490
treatment_order2	0.68675
treatment_order3	0.65827
treatment_order4	0.82091
treatment_order5	0.85012
treatment_order6	1.00543
treatment_order7	1.30266
treatment_order8	1.59570
treatment_order9	1.88879
treatment_order10	3.62239
treatment_order11	4.08852
treatment_order12	6.03857
treatment_order14	5.06291
treatment_order15	6.76164
last_known_smoking_statussex-smoker	1.84175
last_known_smoking_statusnever	1.85168
last_known_smoking_statussmoker	2.27686
last_known_vaping_statussex-vaper	3.96475
last_known_vaping_statusnever	1.83181
last_known_vaping_statusvaper	2.49335
treatment_reclassifiedAnti-IL17	0.77839
treatment_reclassifiedAnti-TNF	0.59666
treatment_reclassifiedJAK Inhibitor	2.00865
time_in_years	0.04062
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.68732
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.90263
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	3.70708
	df
(Intercept)	547.58549
genderMale	492.73023
hlab27statusNegative	532.05321

hlab27statusPositive	548.25802
age_at_onset	467.34907
diagnosisAxial SpA- nr-axSpA	469.93596
treatment_order2	5046.28299
treatment_order3	4660.11186
treatment_order4	4890.02093
treatment_order5	4367.63657
treatment_order6	3976.59593
treatment_order7	3603.19439
treatment_order8	4167.82796
treatment_order9	2925.45261
treatment_order10	4321.19574
treatment_order11	2664.93300
treatment_order12	4957.27234
treatment_order14	842.13613
treatment_order15	688.51213
last_known_smoking_statussex-smoker	467.20977
last_known_smoking_statusnever	464.44461
last_known_smoking_statussmoker	465.31613
last_known_vaping_statussex-vaper	492.78305
last_known_vaping_statusnever	467.10028
last_known_vaping_statusvaper	474.81904
treatment_reclassifiedAnti-IL17	5351.68335
treatment_reclassifiedAnti-TNF	5726.86862
treatment_reclassifiedJAK Inhibitor	4168.00253
time_in_years	535.38721
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4851.39376
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5220.11048
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5390.35174
t value	
(Intercept)	15.075
genderMale	4.503
hlab27statusNegative	-2.147
hlab27statusPositive	-0.269
age_at_onset	0.833
diagnosisAxial SpA- nr-axSpA	-3.139
treatment_order2	0.243
treatment_order3	-1.988
treatment_order4	-2.175
treatment_order5	-2.442
treatment_order6	-3.336
treatment_order7	-1.756
treatment_order8	-2.362

treatment_order9	0.214
treatment_order10	-1.260
treatment_order11	-2.028
treatment_order12	-1.398
treatment_order14	-1.505
treatment_order15	-0.009
last_known_smoking_statussex-smoker	0.512
last_known_smoking_statusnever	2.004
last_known_smoking_statussmoker	-2.068
last_known_vaping_statussex-vaper	0.712
last_known_vaping_statusnever	-1.249
last_known_vaping_statusvaper	-2.946
treatment_reclassifiedAnti-IL17	6.453
treatment_reclassifiedAnti-TNF	6.072
treatment_reclassifiedJAK Inhibitor	4.715
time_in_years	-5.717
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	0.919
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	3.598
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	-1.760
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	8.36e-06 ***
hlab27statusNegative	0.032206 *
hlab27statusPositive	0.788111
age_at_onset	0.405256
diagnosisAxial SpA- nr-axSpA	0.001802 **
treatment_order2	0.807635
treatment_order3	0.046891 *
treatment_order4	0.029692 *
treatment_order5	0.014640 *
treatment_order6	0.000856 ***
treatment_order7	0.079190 .
treatment_order8	0.018210 *
treatment_order9	0.830395
treatment_order10	0.207569
treatment_order11	0.042705 *
treatment_order12	0.162307
treatment_order14	0.132804
treatment_order15	0.993128
last_known_smoking_statussex-smoker	0.608857
last_known_smoking_statusnever	0.045601 *
last_known_smoking_statussmoker	0.039177 *
last_known_vaping_statussex-vaper	0.476888

```

last_known_vaping_statusnever                0.212295
last_known_vaping_statusvaper                0.003373 **
treatment_reclassifiedAnti-IL17              1.19e-10 ***
treatment_reclassifiedAnti-TNF               1.34e-09 ***
treatment_reclassifiedJAK Inhibitor           2.49e-06 ***
time_in_years                               1.80e-08 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.358049
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF 0.000323 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.078474 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_facit_reduced, corr = FALSE))
```

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

Formula:

```

facit ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
      time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_facit

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 43507.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.5697	-0.5274	0.0527	0.5483	3.8736

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	111.728	10.5701	
	time_in_years	0.363	0.6025	-0.49
Residual		47.373	6.8828	

Number of obs: 6188, groups: ttas_id, 634

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	33.38131	2.21714	546.38806	15.056
genderMale	4.13221	0.91727	491.45077	4.505
hlab27statusNegative	-4.40308	1.96534	530.64218	-2.240
hlab27statusPositive	-0.66025	1.68259	546.77563	-0.392

age_at_onset	0.03543	0.04470	465.83894	0.793
diagnosisAxial SpA- nr-axSpA	-2.64039	1.11617	434.84412	-2.366
treatment_order2	0.51053	0.67947	5102.90549	0.751
treatment_order3	-0.93326	0.65068	4740.60785	-1.434
treatment_order4	-1.68142	0.81025	4956.26589	-2.075
treatment_order5	-1.91578	0.84661	4451.67659	-2.263
treatment_order6	-3.05283	0.99895	3974.52690	-3.056
treatment_order7	-1.63893	1.29499	3571.74418	-1.266
treatment_order8	-3.30288	1.59128	4202.22200	-2.076
treatment_order9	0.59289	1.88676	2968.65148	0.314
treatment_order10	-3.69073	3.61706	4294.28804	-1.020
treatment_order11	-7.87737	4.09273	2676.26671	-1.925
treatment_order12	-7.82516	6.04585	4960.66878	-1.294
treatment_order14	-6.98114	5.07064	840.60730	-1.377
treatment_order15	0.42589	6.77377	686.05085	0.063
last_known_smoking_statussex-smoker	0.92456	1.83906	465.20911	0.503
last_known_smoking_statusnever	3.75143	1.84928	462.74498	2.029
last_known_smoking_statussmoker	-4.67549	2.27317	463.31404	-2.057
last_known_vaping_statussex-vaper	2.65299	3.96019	491.47514	0.670
last_known_vaping_statusnever	-2.37596	1.82912	465.28168	-1.299
last_known_vaping_statusvaper	-7.50701	2.48965	472.93580	-3.015
treatment_reclassifiedAnti-IL17	5.19940	0.73849	5451.37467	7.041
treatment_reclassifiedAnti-TNF	4.13651	0.58315	5733.66688	7.093
treatment_reclassifiedJAK Inhibitor	7.11569	1.72587	4890.59735	4.123
time_in_years	-0.22967	0.04068	533.82811	-5.646
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	8.31e-06 ***			
hlab27statusNegative	0.02548 *			
hlab27statusPositive	0.69491			
age_at_onset	0.42845			
diagnosisAxial SpA- nr-axSpA	0.01844 *			
treatment_order2	0.45247			
treatment_order3	0.15156			
treatment_order4	0.03802 *			
treatment_order5	0.02369 *			
treatment_order6	0.00226 **			
treatment_order7	0.20574			
treatment_order8	0.03799 *			
treatment_order9	0.75336			
treatment_order10	0.30761			
treatment_order11	0.05437 .			
treatment_order12	0.19562			

```

treatment_order14          0.16895
treatment_order15          0.94989
last_known_smoking_statussex-smoker 0.61539
last_known_smoking_statusnever 0.04307 *
last_known_smoking_statussmoker 0.04026 *
last_known_vaping_statussex-vaper 0.50323
last_known_vaping_statusnever 0.19460
last_known_vaping_statusvaper 0.00271 **
treatment_reclassifiedAnti-IL17 2.15e-12 ***
treatment_reclassifiedAnti-TNF 1.47e-12 ***
treatment_reclassifiedJAK Inhibitor 3.80e-05 ***
time_in_years              2.67e-08 ***

```

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

```

anova(model_treatment_diagnosis_facit_full,
       model_treatment_diagnosis_facit_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_facit

Models:

model_treatment_diagnosis_facit_reduced: facit ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_diagnosis_facit_full: facit ~ gender + hlab27status + age_at_onset + diagnosis

	npars	AIC	BIC	logLik	deviance	Chisq
model_treatment_diagnosis_facit_reduced	33	43628	43850	-21781	43562	
model_treatment_diagnosis_facit_full	36	43615	43857	-21771	43543	18.929

Df Pr(>Chisq)

model_treatment_diagnosis_facit_reduced

model_treatment_diagnosis_facit_full 3 0.0002828 ***

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

```

anova(model_treatment_diagnosis_facit_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	957.9	957.95	1	492.7	20.2798	8.361e-06
hlab27status	472.2	236.09	2	502.7	4.9980	0.0070906
age_at_onset	32.8	32.78	1	467.3	0.6939	0.4052556
diagnosis	351.9	351.89	1	1293.6	7.4495	0.0064315

treatment_order	1756.9	135.14	13	3310.2	2.8610	0.0004073
last_known_smoking_status	1065.3	355.09	3	479.6	7.5172	6.337e-05
last_known_vaping_status	560.3	186.76	3	486.6	3.9536	0.0083650
treatment_reclassified	3311.4	1103.80	3	5557.7	23.3676	5.021e-15
time_in_years	1543.8	1543.78	1	535.4	32.6820	1.805e-08
diagnosis:treatment_reclassified	893.4	297.79	3	5252.9	6.3044	0.0002893

```

gender          ***
hlab27status    **
age_at_onset
diagnosis       **
treatment_order ***
last_known_smoking_status ***
last_known_vaping_status **
treatment_reclassified ***
time_in_years   ***
diagnosis:treatment_reclassified ***
---
```

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

lme4 code for treatment and gender: FACIT

```

model_treatment_gender_facit_full <- lmer(
  facit ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_facit,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))
```

```

model_treatment_gender_facit_reduced <- lmer(
  facit ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_facit,
```

```
control = lmerControl(optimizer = "bobyqa",
                      optCtrl = list(maxfun = 2e5)))
```

```
print(summary(model_treatment_gender_facit_full, corr = FALSE))
```

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

Formula:

```
facit ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
      last_known_smoking_status + last_known_vaping_status + treatment_reclassified *
      gender + time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_facit

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 43486.3

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-4.5628	-0.5227	0.0512	0.5442	3.8411

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	113.1581	10.6376	
	time_in_years	0.3623	0.6019	-0.50
Residual		47.2707	6.8754	

Number of obs: 6188, groups: ttas_id, 634

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	32.65432	2.23206	556.77157
genderMale	5.01233	0.95759	564.18369
hlab27statusNegative	-4.31911	1.96971	532.08035
hlab27statusPositive	-0.57931	1.68511	546.84819
age_at_onset	0.03777	0.04483	467.65682
diagnosisAxial SpA- nr-axSpA	-2.65867	1.11996	437.24846
treatment_order2	0.44403	0.67964	5121.65974
treatment_order3	-1.05866	0.65126	4719.03613
treatment_order4	-1.92712	0.81679	4915.04360
treatment_order5	-2.12126	0.84827	4414.01951
treatment_order6	-3.31754	1.00164	3931.05343
treatment_order7	-1.98645	1.30372	3568.94855

treatment_order8	-3.55114	1.59655	4164.03414
treatment_order9	0.41676	1.88735	2950.21559
treatment_order10	-3.95994	3.64320	4321.39775
treatment_order11	-8.89416	4.13401	2582.65535
treatment_order12	-7.91005	6.04400	4952.52465
treatment_order14	-7.04924	5.06756	840.23210
treatment_order15	-0.74697	6.79729	693.46838
last_known_smoking_statussex-smoker	0.87920	1.84392	466.92748
last_known_smoking_statusnever	3.62127	1.85455	464.70707
last_known_smoking_statussmoker	-4.72569	2.28000	465.39265
last_known_vaping_statussex-vaper	3.00332	3.97009	492.62061
last_known_vaping_statusnever	-2.15253	1.83510	467.86733
last_known_vaping_statusvaper	-7.26802	2.49707	475.14502
treatment_reclassifiedAnti-IL17	6.32210	1.06922	4487.43259
treatment_reclassifiedAnti-TNF	5.73340	0.75576	5617.87123
treatment_reclassifiedJAK Inhibitor	6.91562	2.15797	4215.86622
time_in_years	-0.22852	0.04066	534.76666
genderMale:treatment_reclassifiedAnti-IL17	-1.54358	1.22754	4239.59773
genderMale:treatment_reclassifiedAnti-TNF	-2.56457	0.75755	5122.74844
genderMale:treatment_reclassifiedJAK Inhibitor	2.77491	3.37864	4507.19200
	t value	Pr(> t)	
(Intercept)	14.630	< 2e-16	***
genderMale	5.234	2.34e-07	***
hlab27statusNegative	-2.193	0.028756	*
hlab27statusPositive	-0.344	0.731144	
age_at_onset	0.843	0.399929	
diagnosisAxial SpA- nr-axSpA	-2.374	0.018032	*
treatment_order2	0.653	0.513571	
treatment_order3	-1.626	0.104110	
treatment_order4	-2.359	0.018345	*
treatment_order5	-2.501	0.012431	*
treatment_order6	-3.312	0.000934	***
treatment_order7	-1.524	0.127678	
treatment_order8	-2.224	0.026184	*
treatment_order9	0.221	0.825249	
treatment_order10	-1.087	0.277124	
treatment_order11	-2.151	0.031532	*
treatment_order12	-1.309	0.190681	
treatment_order14	-1.391	0.164578	
treatment_order15	-0.110	0.912527	
last_known_smoking_statussex-smoker	0.477	0.633718	
last_known_smoking_statusnever	1.953	0.051462	.
last_known_smoking_statussmoker	-2.073	0.038752	*

last_known_vaping_statussex-vaper	0.756	0.449719
last_known_vaping_statusnever	-1.173	0.241402
last_known_vaping_statusvaper	-2.911	0.003776 **
treatment_reclassifiedAnti-IL17	5.913	3.61e-09 ***
treatment_reclassifiedAnti-TNF	7.586	3.83e-14 ***
treatment_reclassifiedJAK Inhibitor	3.205	0.001362 **
time_in_years	-5.620	3.07e-08 ***
genderMale:treatment_reclassifiedAnti-IL17	-1.257	0.208654
genderMale:treatment_reclassifiedAnti-TNF	-3.385	0.000716 ***
genderMale:treatment_reclassifiedJAK Inhibitor	0.821	0.411515

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

```
print(summary(model_treatment_gender_facit_reduced, corr = FALSE))
```

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

Formula:

facit ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_facit

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 43507.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.5697	-0.5274	0.0527	0.5483	3.8736

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	111.728	10.5701	
	time_in_years	0.363	0.6025	-0.49
Residual		47.373	6.8828	

Number of obs: 6188, groups: ttas_id, 634

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	33.38131	2.21714	546.38806	15.056
genderMale	4.13221	0.91727	491.45077	4.505
hlab27statusNegative	-4.40308	1.96534	530.64218	-2.240

hlab27statusPositive	-0.66025	1.68259	546.77563	-0.392
age_at_onset	0.03543	0.04470	465.83894	0.793
diagnosisAxial SpA- nr-axSpA	-2.64039	1.11617	434.84412	-2.366
treatment_order2	0.51053	0.67947	5102.90549	0.751
treatment_order3	-0.93326	0.65068	4740.60785	-1.434
treatment_order4	-1.68142	0.81025	4956.26589	-2.075
treatment_order5	-1.91578	0.84661	4451.67659	-2.263
treatment_order6	-3.05283	0.99895	3974.52690	-3.056
treatment_order7	-1.63893	1.29499	3571.74418	-1.266
treatment_order8	-3.30288	1.59128	4202.22200	-2.076
treatment_order9	0.59289	1.88676	2968.65148	0.314
treatment_order10	-3.69073	3.61706	4294.28804	-1.020
treatment_order11	-7.87737	4.09273	2676.26671	-1.925
treatment_order12	-7.82516	6.04585	4960.66878	-1.294
treatment_order14	-6.98114	5.07064	840.60730	-1.377
treatment_order15	0.42589	6.77377	686.05085	0.063
last_known_smoking_statussex-smoker	0.92456	1.83906	465.20911	0.503
last_known_smoking_statusnever	3.75143	1.84928	462.74498	2.029
last_known_smoking_statussmoker	-4.67549	2.27317	463.31404	-2.057
last_known_vaping_statussex-vaper	2.65299	3.96019	491.47514	0.670
last_known_vaping_statusnever	-2.37596	1.82912	465.28168	-1.299
last_known_vaping_statusvaper	-7.50701	2.48965	472.93580	-3.015
treatment_reclassifiedAnti-IL17	5.19940	0.73849	5451.37467	7.041
treatment_reclassifiedAnti-TNF	4.13651	0.58315	5733.66688	7.093
treatment_reclassifiedJAK Inhibitor	7.11569	1.72587	4890.59735	4.123
time_in_years	-0.22967	0.04068	533.82811	-5.646
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	8.31e-06 ***			
hlab27statusNegative	0.02548 *			
hlab27statusPositive	0.69491			
age_at_onset	0.42845			
diagnosisAxial SpA- nr-axSpA	0.01844 *			
treatment_order2	0.45247			
treatment_order3	0.15156			
treatment_order4	0.03802 *			
treatment_order5	0.02369 *			
treatment_order6	0.00226 **			
treatment_order7	0.20574			
treatment_order8	0.03799 *			
treatment_order9	0.75336			
treatment_order10	0.30761			
treatment_order11	0.05437 .			

```

treatment_order12          0.19562
treatment_order14          0.16895
treatment_order15          0.94989
last_known_smoking_statussex-smoker 0.61539
last_known_smoking_statusnever 0.04307 *
last_known_smoking_statussmoker 0.04026 *
last_known_vaping_statussex-vaper 0.50323
last_known_vaping_statusnever 0.19460
last_known_vaping_statusvaper 0.00271 **
treatment_reclassifiedAnti-IL17 2.15e-12 ***
treatment_reclassifiedAnti-TNF 1.47e-12 ***
treatment_reclassifiedJAK Inhibitor 3.80e-05 ***
time_in_years              2.67e-08 ***
---

```

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

```

anova(model_treatment_gender_facit_full,
       model_treatment_gender_facit_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_facit

Models:

model_treatment_gender_facit_reduced: facit ~ gender + hlab27status + age_at_onset + diagnosis

model_treatment_gender_facit_full: facit ~ gender + hlab27status + age_at_onset + diagnosis

	npars	AIC	BIC	logLik	deviance	Chisq	Df
model_treatment_gender_facit_reduced	33	43628	43850	-21781	43562		
model_treatment_gender_facit_full	36	43621	43863	-21774	43549	13.255	3

Pr(>Chisq)

model_treatment_gender_facit_reduced

model_treatment_gender_facit_full 0.004116 **

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

```

anova(model_treatment_gender_facit_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	638.5	638.50	1	1415.8	13.5073	0.0002465 ***
hlab27status	467.5	233.75	2	502.8	4.9449	0.0074699 **
age_at_onset	33.6	33.55	1	467.7	0.7098	0.3999286

```

diagnosis                266.4  266.39      1  437.2  5.6354 0.0180321 *
treatment_order          1919.5  147.66     13 3296.1  3.1236 0.0001180 ***
last_known_smoking_status 1042.1  347.35      3  479.6  7.3482 7.994e-05 ***
last_known_vaping_status  558.5  186.18      3  486.9  3.9386 0.0085371 **
treatment_reclassified    3516.3 1172.09      3 5201.9 24.7953 6.341e-16 ***
time_in_years            1493.1 1493.11      1  534.8 31.5864 3.074e-08 ***
gender:treatment_reclassified 628.3  209.43      3 4710.8  4.4304 0.0040801 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Margolis

lme4 code for treatment and diagnosis: Margolis

```

model_treatment_diagnosis_margolis_full <- lmer(
  margolis ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_margolis,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_diagnosis_margolis_reduced <- lmer(
  margolis ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_margolis,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

print(summary(model_treatment_diagnosis_margolis_full, corr = FALSE))

```

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

```
Formula: margolis ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified * diagnosis + time_in_years + (time_in_years |
      ttas_id)
```

```
Data: dataframe_sorted_and_reclassified_margolis
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 41277
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-5.8049	-0.5006	-0.0797	0.4408	5.6657

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	33.18902	5.7610	
	time_in_years	0.07863	0.2804	-0.59
Residual		30.48414	5.5212	

```
Number of obs: 6370, groups: ttas_id, 635
```

```
Fixed effects:
```

	Estimate
(Intercept)	11.67740
genderMale	-1.26547
hlab27statusNegative	2.07346
hlab27statusPositive	0.97478
age_at_onset	-0.03694
diagnosisAxial SpA- nr-axSpA	-0.52923
treatment_order2	-0.22245
treatment_order3	-0.17170
treatment_order4	0.26183
treatment_order5	0.77219
treatment_order6	0.82899
treatment_order7	1.13530
treatment_order8	-0.45260
treatment_order9	-1.21275
treatment_order10	3.93994
treatment_order11	7.36066
treatment_order12	10.63261
treatment_order14	-6.97178
treatment_order15	-0.41206
last_known_smoking_statussex-smoker	-1.19582
last_known_smoking_statusnever	-2.59985

last_known_smoking_statussmoker	0.29618
last_known_vaping_statussex-vaper	-1.51102
last_known_vaping_statusnever	0.70770
last_known_vaping_statusvaper	-0.15358
treatment_reclassifiedAnti-IL17	-2.22175
treatment_reclassifiedAnti-TNF	-1.98553
treatment_reclassifiedJAK Inhibitor	-4.06843
time_in_years	-0.07651
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	4.16575
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.20545
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	4.62792
	Std. Error
(Intercept)	1.16373
genderMale	0.48305
hlab27statusNegative	1.03051
hlab27statusPositive	0.86243
age_at_onset	0.02382
diagnosisAxial SpA- nr-axSpA	0.64476
treatment_order2	0.49619
treatment_order3	0.45944
treatment_order4	0.57990
treatment_order5	0.59990
treatment_order6	0.70568
treatment_order7	0.91457
treatment_order8	1.16216
treatment_order9	1.35350
treatment_order10	2.64718
treatment_order11	2.86088
treatment_order12	4.44132
treatment_order14	3.10098
treatment_order15	4.82627
last_known_smoking_statussex-smoker	0.95310
last_known_smoking_statusnever	0.96035
last_known_smoking_statussmoker	1.17374
last_known_vaping_statussex-vaper	2.08160
last_known_vaping_statusnever	0.95137
last_known_vaping_statusvaper	1.30272
treatment_reclassifiedAnti-IL17	0.57048
treatment_reclassifiedAnti-TNF	0.44479
treatment_reclassifiedJAK Inhibitor	1.46989
time_in_years	0.02221
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	1.25276
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.64526

diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	2.80998	df
(Intercept)	622.94810	
genderMale	554.72850	
hlab27statusNegative	582.83352	
hlab27statusPositive	559.96872	
age_at_onset	539.75032	
diagnosisAxial SpA- nr-axSpA	570.08382	
treatment_order2	5095.14474	
treatment_order3	4470.15533	
treatment_order4	4872.44849	
treatment_order5	4197.28518	
treatment_order6	3540.83804	
treatment_order7	3076.39201	
treatment_order8	3968.30703	
treatment_order9	2262.81301	
treatment_order10	4882.62551	
treatment_order11	3247.82038	
treatment_order12	5798.96418	
treatment_order14	975.00486	
treatment_order15	1728.94130	
last_known_smoking_statussex-smoker	513.02909	
last_known_smoking_statusnever	513.79022	
last_known_smoking_statussmoker	518.36084	
last_known_vaping_statussex-vaper	548.32804	
last_known_vaping_statusnever	521.40583	
last_known_vaping_statusvaper	531.05252	
treatment_reclassifiedAnti-IL17	4909.68003	
treatment_reclassifiedAnti-TNF	5384.76179	
treatment_reclassifiedJAK Inhibitor	4367.51527	
time_in_years	392.31067	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	5642.52101	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	5150.40516	
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	5813.01741	t value
(Intercept)	10.034	
genderMale	-2.620	
hlab27statusNegative	2.012	
hlab27statusPositive	1.130	
age_at_onset	-1.551	
diagnosisAxial SpA- nr-axSpA	-0.821	
treatment_order2	-0.448	
treatment_order3	-0.374	

treatment_order4	0.452
treatment_order5	1.287
treatment_order6	1.175
treatment_order7	1.241
treatment_order8	-0.389
treatment_order9	-0.896
treatment_order10	1.488
treatment_order11	2.573
treatment_order12	2.394
treatment_order14	-2.248
treatment_order15	-0.085
last_known_smoking_statussex-smoker	-1.255
last_known_smoking_statusnever	-2.707
last_known_smoking_statussmoker	0.252
last_known_vaping_statussex-vaper	-0.726
last_known_vaping_statusnever	0.744
last_known_vaping_statusvaper	-0.118
treatment_reclassifiedAnti-IL17	-3.894
treatment_reclassifiedAnti-TNF	-4.464
treatment_reclassifiedJAK Inhibitor	-2.768
time_in_years	-3.445
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17	3.325
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF	0.318
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor	1.647
	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	0.009041 **
hlab27statusNegative	0.044672 *
hlab27statusPositive	0.258845
age_at_onset	0.121507
diagnosisAxial SpA- nr-axSpA	0.412087
treatment_order2	0.653949
treatment_order3	0.708632
treatment_order4	0.651639
treatment_order5	0.198099
treatment_order6	0.240180
treatment_order7	0.214575
treatment_order8	0.696969
treatment_order9	0.370342
treatment_order10	0.136722
treatment_order11	0.010130 *
treatment_order12	0.016696 *
treatment_order14	0.024783 *

```

treatment_order15                                0.931971
last_known_smoking_statussex-smoker              0.210173
last_known_smoking_statusnever                   0.007011 **
last_known_smoking_statussmoker                  0.800878
last_known_vaping_statussex-vaper                0.468214
last_known_vaping_statusnever                    0.457289
last_known_vaping_statusvaper                    0.906200
treatment_reclassifiedAnti-IL17                   9.97e-05 ***
treatment_reclassifiedAnti-TNF                    8.21e-06 ***
treatment_reclassifiedJAK Inhibitor               0.005667 **
time_in_years                                     0.000633 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-IL17 0.000889 ***
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedAnti-TNF 0.750189
diagnosisAxial SpA- nr-axSpA:treatment_reclassifiedJAK Inhibitor 0.099620 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_diagnosis_margolis_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: margolis ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_margolis
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 41297.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.8008	-0.5033	-0.0804	0.4380	5.6642

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	33.21102	5.7629	
	time_in_years	0.07634	0.2763	-0.59
Residual		30.57574	5.5295	

Number of obs: 6370, groups: ttas_id, 635

Fixed effects:

Estimate	Std. Error	df	t value
----------	------------	----	---------

(Intercept)	1.168e+01	1.162e+00	6.241e+02	10.058
genderMale	-1.288e+00	4.823e-01	5.560e+02	-2.671
hlab27statusNegative	2.079e+00	1.028e+00	5.828e+02	2.022
hlab27statusPositive	9.277e-01	8.590e-01	5.566e+02	1.080
age_at_onset	-3.793e-02	2.380e-02	5.415e+02	-1.594
diagnosisAxial SpA- nr-axSpA	-2.380e-01	6.090e-01	5.024e+02	-0.391
treatment_order2	-1.664e-01	4.932e-01	5.120e+03	-0.337
treatment_order3	-1.257e-01	4.558e-01	4.562e+03	-0.276
treatment_order4	3.164e-01	5.739e-01	4.925e+03	0.551
treatment_order5	9.664e-01	5.972e-01	4.242e+03	1.618
treatment_order6	6.639e-01	7.008e-01	3.537e+03	0.947
treatment_order7	9.872e-01	9.067e-01	3.057e+03	1.089
treatment_order8	-4.008e-01	1.158e+00	3.970e+03	-0.346
treatment_order9	-1.058e+00	1.350e+00	2.249e+03	-0.784
treatment_order10	3.662e+00	2.638e+00	4.907e+03	1.388
treatment_order11	7.161e+00	2.858e+00	3.261e+03	2.506
treatment_order12	1.070e+01	4.443e+00	5.817e+03	2.408
treatment_order14	-6.892e+00	3.089e+00	1.000e+03	-2.231
treatment_order15	-8.837e-01	4.814e+00	1.770e+03	-0.184
last_known_smoking_statussex-smoker	-1.327e+00	9.513e-01	5.134e+02	-1.395
last_known_smoking_statusnever	-2.689e+00	9.590e-01	5.149e+02	-2.804
last_known_smoking_statussmoker	1.319e-01	1.172e+00	5.191e+02	0.113
last_known_vaping_statussex-vaper	-1.349e+00	2.078e+00	5.488e+02	-0.649
last_known_vaping_statusnever	8.124e-01	9.499e-01	5.226e+02	0.855
last_known_vaping_statusvaper	-8.763e-03	1.301e+00	5.320e+02	-0.007
treatment_reclassifiedAnti-IL17	-1.658e+00	5.456e-01	5.173e+03	-3.039
treatment_reclassifiedAnti-TNF	-1.968e+00	4.356e-01	5.470e+03	-4.518
treatment_reclassifiedJAK Inhibitor	-2.798e+00	1.281e+00	5.048e+03	-2.185
time_in_years	-7.620e-02	2.208e-02	3.917e+02	-3.450
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.007794 **			
hlab27statusNegative	0.043619 *			
hlab27statusPositive	0.280622			
age_at_onset	0.111568			
diagnosisAxial SpA- nr-axSpA	0.696134			
treatment_order2	0.735841			
treatment_order3	0.782747			
treatment_order4	0.581479			
treatment_order5	0.105700			
treatment_order6	0.343544			
treatment_order7	0.276338			
treatment_order8	0.729339			

```

treatment_order9          0.433291
treatment_order10         0.165172
treatment_order11         0.012260 *
treatment_order12         0.016074 *
treatment_order14         0.025911 *
treatment_order15         0.854375
last_known_smoking_statussex-smoker 0.163515
last_known_smoking_statusnever 0.005245 **
last_known_smoking_statussmoker 0.910416
last_known_vaping_statussex-vaper 0.516422
last_known_vaping_statusnever 0.392822
last_known_vaping_statusvaper 0.994627
treatment_reclassifiedAnti-IL17 0.002385 **
treatment_reclassifiedAnti-TNF 6.37e-06 ***
treatment_reclassifiedJAK Inhibitor 0.028935 *
time_in_years              0.000621 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_diagnosis_margolis_full,
       model_treatment_diagnosis_margolis_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_margolis

Models:

model_treatment_diagnosis_margolis_reduced: margolis ~ gender + hlab27status + age_at_onset + d

model_treatment_diagnosis_margolis_full: margolis ~ gender + hlab27status + age_at_onset + d

	npars	AIC	BIC	logLik	deviance
model_treatment_diagnosis_margolis_reduced	33	41392	41615	-20663	41326
model_treatment_diagnosis_margolis_full	36	41384	41628	-20656	41312

	Chisq	Df	Pr(>Chisq)
model_treatment_diagnosis_margolis_reduced			
model_treatment_diagnosis_margolis_full	13.704	3	0.003337 **

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

```

anova(model_treatment_diagnosis_margolis_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
--	--------	---------	-------	-------	---------	--------

gender	209.21	209.21	1	554.7	6.8630	0.0090407
hlab27status	137.08	68.54	2	553.4	2.2483	0.1065408
age_at_onset	73.33	73.33	1	539.8	2.4054	0.1215066
diagnosis	98.46	98.46	1	2434.3	3.2297	0.0724364
treatment_order	1135.74	87.36	13	3611.4	2.8659	0.0003964
last_known_smoking_status	439.85	146.62	3	525.6	4.8096	0.0025864
last_known_vaping_status	71.34	23.78	3	541.5	0.7800	0.5054243
treatment_reclassified	548.28	182.76	3	5909.4	5.9952	0.0004483
time_in_years	361.72	361.72	1	392.3	11.8658	0.0006334
diagnosis:treatment_reclassified	420.39	140.13	3	5655.3	4.5969	0.0032279

```

gender                **
hlab27status
age_at_onset
diagnosis              .
treatment_order       ***
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years          ***
diagnosis:treatment_reclassified **
---

```

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

lme4 code for treatment and gender: Margolis

```

model_treatment_gender_margolis_full <- lmer(
  margolis ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified * gender +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_margolis,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

```

```

model_treatment_gender_margolis_reduced <- lmer(
  margolis ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +

```

```

treatment_reclassified +
time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_margolis,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

```

```
print(summary(model_treatment_gender_margolis_full, corr = FALSE))
```

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

Formula: margolis ~ gender + hlab27status + age_at_onset + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified * gender + time_in_years + (time_in_years |
ttas_id)

Data: dataframe_sorted_and_reclassified_margolis

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 41268.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.7534	-0.5004	-0.0793	0.4402	5.6545

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	33.64374	5.8003	
	time_in_years	0.07473	0.2734	-0.60

Residual	30.47644	5.5205
----------	----------	--------

Number of obs: 6370, groups: ttas_id, 635

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	12.44668	1.17364	638.65698
genderMale	-2.15261	0.52109	694.58475
hlab27statusNegative	1.97030	1.02842	579.28662
hlab27statusPositive	0.85594	0.85801	548.97488
age_at_onset	-0.04068	0.02386	542.75205
diagnosisAxial SpA- nr-axSpA	-0.25739	0.61110	503.36248
treatment_order2	-0.10660	0.49265	5126.01897
treatment_order3	-0.02167	0.45553	4517.20504
treatment_order4	0.55494	0.57684	4841.78246

treatment_order5	1.13372	0.59715	4171.20685
treatment_order6	0.88981	0.70095	3482.13531
treatment_order7	1.31177	0.91034	3078.32395
treatment_order8	-0.11785	1.15863	3918.18008
treatment_order9	-0.84519	1.34660	2230.72108
treatment_order10	4.06273	2.65376	4886.30900
treatment_order11	7.75743	2.87591	3157.49704
treatment_order12	10.78468	4.43537	5813.11746
treatment_order14	-6.82492	3.07585	1015.82128
treatment_order15	-0.16487	4.82055	1815.16525
last_known_smoking_statussex-smoker	-1.31554	0.95321	514.23289
last_known_smoking_statusnever	-2.58763	0.96113	516.05292
last_known_smoking_statussmoker	0.11385	1.17520	520.95946
last_known_vaping_statussex-vaper	-1.60017	2.08136	548.22796
last_known_vaping_statusnever	0.65045	0.95253	524.27174
last_known_vaping_statusvaper	-0.15289	1.30343	532.76678
treatment_reclassifiedAnti-IL17	-2.32654	0.78853	4325.02710
treatment_reclassifiedAnti-TNF	-3.61872	0.55966	5268.96661
treatment_reclassifiedJAK Inhibitor	-3.09222	1.57869	4245.57782
time_in_years	-0.07828	0.02199	393.44020
genderMale:treatment_reclassifiedAnti-IL17	0.85709	0.88313	3824.57999
genderMale:treatment_reclassifiedAnti-TNF	2.51790	0.53212	4358.51784
genderMale:treatment_reclassifiedJAK Inhibitor	-1.37416	2.49072	5026.01624
t value Pr(> t)			
(Intercept)	10.605	< 2e-16	***
genderMale	-4.131	4.05e-05	***
hlab27statusNegative	1.916	0.055876	.
hlab27statusPositive	0.998	0.318921	
age_at_onset	-1.705	0.088792	.
diagnosisAxial SpA- nr-axSpA	-0.421	0.673801	
treatment_order2	-0.216	0.828699	
treatment_order3	-0.048	0.962065	
treatment_order4	0.962	0.336077	
treatment_order5	1.899	0.057693	.
treatment_order6	1.269	0.204370	
treatment_order7	1.441	0.149697	
treatment_order8	-0.102	0.918991	
treatment_order9	-0.628	0.530301	
treatment_order10	1.531	0.125851	
treatment_order11	2.697	0.007026	**
treatment_order12	2.432	0.015066	*
treatment_order14	-2.219	0.026716	*
treatment_order15	-0.034	0.972720	

```

last_known_smoking_statussex-smoker      -1.380 0.168149
last_known_smoking_statusnever            -2.692 0.007327 **
last_known_smoking_statussmoker           0.097 0.922863
last_known_vaping_statussex-vaper         -0.769 0.442339
last_known_vaping_statusnever             0.683 0.494995
last_known_vaping_statusvaper             -0.117 0.906670
treatment_reclassifiedAnti-IL17            -2.950 0.003190 **
treatment_reclassifiedAnti-TNF            -6.466 1.10e-10 ***
treatment_reclassifiedJAK Inhibitor        -1.959 0.050211 .
time_in_years                             -3.560 0.000416 ***
genderMale:treatment_reclassifiedAnti-IL17 0.971 0.331849
genderMale:treatment_reclassifiedAnti-TNF  4.732 2.30e-06 ***
genderMale:treatment_reclassifiedJAK Inhibitor -0.552 0.581171
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
print(summary(model_treatment_gender_margolis_reduced, corr = FALSE))
```

```

Linear mixed model fit by REML. t-tests use Satterthwaite's method [
lmerModLmerTest]
Formula: margolis ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_margolis
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 41297.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.8008	-0.5033	-0.0804	0.4380	5.6642

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	33.21102	5.7629	
	time_in_years	0.07634	0.2763	-0.59
Residual		30.57574	5.5295	

Number of obs: 6370, groups: ttas_id, 635

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	1.168e+01	1.162e+00	6.241e+02	10.058

genderMale	-1.288e+00	4.823e-01	5.560e+02	-2.671
hlab27statusNegative	2.079e+00	1.028e+00	5.828e+02	2.022
hlab27statusPositive	9.277e-01	8.590e-01	5.566e+02	1.080
age_at_onset	-3.793e-02	2.380e-02	5.415e+02	-1.594
diagnosisAxial SpA- nr-axSpA	-2.380e-01	6.090e-01	5.024e+02	-0.391
treatment_order2	-1.664e-01	4.932e-01	5.120e+03	-0.337
treatment_order3	-1.257e-01	4.558e-01	4.562e+03	-0.276
treatment_order4	3.164e-01	5.739e-01	4.925e+03	0.551
treatment_order5	9.664e-01	5.972e-01	4.242e+03	1.618
treatment_order6	6.639e-01	7.008e-01	3.537e+03	0.947
treatment_order7	9.872e-01	9.067e-01	3.057e+03	1.089
treatment_order8	-4.008e-01	1.158e+00	3.970e+03	-0.346
treatment_order9	-1.058e+00	1.350e+00	2.249e+03	-0.784
treatment_order10	3.662e+00	2.638e+00	4.907e+03	1.388
treatment_order11	7.161e+00	2.858e+00	3.261e+03	2.506
treatment_order12	1.070e+01	4.443e+00	5.817e+03	2.408
treatment_order14	-6.892e+00	3.089e+00	1.000e+03	-2.231
treatment_order15	-8.837e-01	4.814e+00	1.770e+03	-0.184
last_known_smoking_statussex-smoker	-1.327e+00	9.513e-01	5.134e+02	-1.395
last_known_smoking_statusnever	-2.689e+00	9.590e-01	5.149e+02	-2.804
last_known_smoking_statussmoker	1.319e-01	1.172e+00	5.191e+02	0.113
last_known_vaping_statussex-vaper	-1.349e+00	2.078e+00	5.488e+02	-0.649
last_known_vaping_statusnever	8.124e-01	9.499e-01	5.226e+02	0.855
last_known_vaping_statusvaper	-8.763e-03	1.301e+00	5.320e+02	-0.007
treatment_reclassifiedAnti-IL17	-1.658e+00	5.456e-01	5.173e+03	-3.039
treatment_reclassifiedAnti-TNF	-1.968e+00	4.356e-01	5.470e+03	-4.518
treatment_reclassifiedJAK Inhibitor	-2.798e+00	1.281e+00	5.048e+03	-2.185
time_in_years	-7.620e-02	2.208e-02	3.917e+02	-3.450
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.007794 **			
hlab27statusNegative	0.043619 *			
hlab27statusPositive	0.280622			
age_at_onset	0.111568			
diagnosisAxial SpA- nr-axSpA	0.696134			
treatment_order2	0.735841			
treatment_order3	0.782747			
treatment_order4	0.581479			
treatment_order5	0.105700			
treatment_order6	0.343544			
treatment_order7	0.276338			
treatment_order8	0.729339			
treatment_order9	0.433291			

```

treatment_order10          0.165172
treatment_order11          0.012260 *
treatment_order12          0.016074 *
treatment_order14          0.025911 *
treatment_order15          0.854375
last_known_smoking_statussex-smoker 0.163515
last_known_smoking_statusnever 0.005245 **
last_known_smoking_statussmoker 0.910416
last_known_vaping_statussex-vaper 0.516422
last_known_vaping_statusnever 0.392822
last_known_vaping_statusvaper 0.994627
treatment_reclassifiedAnti-IL17 0.002385 **
treatment_reclassifiedAnti-TNF 6.37e-06 ***
treatment_reclassifiedJAK Inhibitor 0.028935 *
time_in_years              0.000621 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

anova(model_treatment_gender_margolis_full,
       model_treatment_gender_margolis_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_margolis

Models:

model_treatment_gender_margolis_reduced: margolis ~ gender + hlab27status + age_at_onset + d

model_treatment_gender_margolis_full: margolis ~ gender + hlab27status + age_at_onset + diag

	npars	AIC	BIC	logLik	deviance	Chisq
model_treatment_gender_margolis_reduced	33	41392	41615	-20663	41326	
model_treatment_gender_margolis_full	36	41374	41617	-20651	41302	23.932

	Df	Pr(>Chisq)
model_treatment_gender_margolis_reduced		
model_treatment_gender_margolis_full	3	2.581e-05 ***

```

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

```

```

anova(model_treatment_gender_margolis_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	129.40	129.40	1	2382.2	4.2460	0.0394521

hlab27status	129.05	64.53	2	551.2	2.1172	0.1213401
age_at_onset	88.58	88.58	1	542.8	2.9066	0.0887919
diagnosis	5.41	5.41	1	503.4	0.1774	0.6738012
treatment_order	1187.83	91.37	13	3616.7	2.9981	0.0002131
last_known_smoking_status	395.98	131.99	3	526.3	4.3310	0.0049783
last_known_vaping_status	68.07	22.69	3	542.4	0.7445	0.5258490
treatment_reclassified	922.74	307.58	3	5120.5	10.0923	1.258e-06
time_in_years	386.25	386.25	1	393.4	12.6736	0.0004162
gender:treatment_reclassified	729.56	243.19	3	4508.2	7.9795	2.649e-05

```

gender                *
hlab27status
age_at_onset          .
diagnosis
treatment_order       ***
last_known_smoking_status **
last_known_vaping_status
treatment_reclassified ***
time_in_years         ***
gender:treatment_reclassified ***
---
```

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

```

# Old code: French cohort study
# # Data for the forest plot
# forest_data <- data.frame(
#   Study = c("Tournadre et al. (2013) - Male", "Tournadre et al. (2013) - Female",
#             "RUH cohort - Male", "RUH cohort - Female",
#             "Existing Literature - Male", "Existing Literature - Female"),
#   BASFI = c(2.7, 3.3,
#             3.3 + (-1.45), 3.3, # RUH cohort: female score is 3.3, male difference es
#             3.0, 3.0), # No difference for existing literature
#   Lower_CI = c(2.7 - 2.1, 3.3 - 2.3,
#               3.3 + (-1.53572), 3.3,
#               3.0, 3.0), # Confidence intervals or no difference
#   Upper_CI = c(2.7 + 2.1, 3.3 + 2.3,
#               3.3 + (-1.36357), 3.3,
#               3.0, 3.0) # Confidence intervals or no difference
# )
#
#
# # Create the forest plot
```

```
# ggplot(forest_data, aes(x = BASFI, y = Study)) +
#   geom_point(size = 3) +
#   geom_errorbarh(aes(xmin = Lower_CI, xmax = Upper_CI), height = 0.2) +
#   geom_vline(xintercept = 2.7, linetype = "dashed", color = "blue", size = 0.8) + # Add v
#   geom_vline(xintercept = 3.3, linetype = "dashed", color = "#C11C84", size = 0.8) + # Ad
#     geom_vline(data = dummy_lines, aes(xintercept = BASFI_Average, color = Gender),
#               linetype = "dashed", size = 0.8) +
#   # labs(title = "BASFI Scores by Gender and Study",
#   #       x = "BASFI Score",
#   #       y = "Study and Gender") +
#   xlim(0, 10) + # Set appropriate limits for the BASFI score range
#   theme_bw()
#
# # Save for A4 size in mm
# ggsave("forest_plot.png", width = 200, height = 150, units = "mm")
```

Investigating Age at Onset/Age at Diagnosis and Diagnosis

```
model_onset_diagnosis_basmi_full <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status + treatment_reclassified +
    age_at_onset * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basmi_full, corr = FALSE))
```

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

lmerModLmerTest]

Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
 treatment_order + last_known_smoking_status + last_known_vaping_status +
 treatment_reclassified + age_at_onset * diagnosis + time_in_years +
 (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_basmi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 39048.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6693	-0.5722	0.0005	0.5701	6.0466

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.159151	1.77740	
	time_in_years	0.003911	0.06254	-0.12
Residual		0.483463	0.69532	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.955e+00	2.293e-01	8.640e+02
genderMale	5.428e-01	1.359e-01	8.617e+02
hlab27statusNegative	6.262e-02	2.387e-01	8.646e+02
hlab27statusPositive	-2.346e-01	1.607e-01	8.615e+02
age_at_onset	6.451e-03	7.197e-03	8.590e+02
diagnosisAxial SpA- nr-axSpA	-1.599e+00	4.955e-01	8.658e+02
treatment_order2	-1.636e-01	7.843e-02	1.370e+04
treatment_order3	-1.089e-01	6.332e-02	1.292e+04
treatment_order4	-3.349e-01	9.409e-02	1.349e+04
treatment_order5	-3.041e-01	1.019e-01	1.193e+04
treatment_order6	-4.319e-01	1.404e-01	1.371e+04
treatment_order7	-5.521e-01	1.951e-01	8.306e+03
treatment_order8	-1.009e+00	2.837e-01	1.470e+04
treatment_order9	-1.411e-01	3.354e-01	1.475e+04
treatment_order11	1.338e+00	5.078e-01	1.291e+04
last_known_smoking_statussex-smoker	3.119e-01	3.209e-01	8.587e+02
last_known_smoking_statusnever	1.069e-01	3.240e-01	8.590e+02
last_known_smoking_statussmoker	5.031e-01	3.966e-01	8.563e+02
last_known_vaping_statussex-vaper	-2.201e+00	7.065e-01	8.465e+02
last_known_vaping_statusnever	-6.787e-01	3.106e-01	8.586e+02
last_known_vaping_statusvaper	-7.592e-01	4.358e-01	8.556e+02
treatment_reclassifiedAnti-IL17	3.975e-02	1.161e-01	1.256e+04
treatment_reclassifiedAnti-TNF	-9.861e-02	7.475e-02	1.363e+04
treatment_reclassifiedJAK Inhibitor	1.622e-01	3.278e-01	6.679e+03
time_in_years	5.329e-02	2.881e-03	6.501e+02
age_at_onset:diagnosisAxial SpA- nr-axSpA	1.506e-02	1.851e-02	8.623e+02
	t value	Pr(> t)	
(Intercept)	12.885	< 2e-16 ***	

genderMale	3.994	7.06e-05	***
hlab27statusNegative	0.262	0.793168	
hlab27statusPositive	-1.460	0.144741	
age_at_onset	0.896	0.370304	
diagnosisAxial SpA- nr-axSpA	-3.226	0.001301	**
treatment_order2	-2.086	0.036977	*
treatment_order3	-1.719	0.085567	.
treatment_order4	-3.559	0.000373	***
treatment_order5	-2.983	0.002863	**
treatment_order6	-3.077	0.002092	**
treatment_order7	-2.830	0.004666	**
treatment_order8	-3.557	0.000376	***
treatment_order9	-0.421	0.674002	
treatment_order11	2.635	0.008413	**
last_known_smoking_statussex-smoker	0.972	0.331293	
last_known_smoking_statusnever	0.330	0.741503	
last_known_smoking_statussmoker	1.269	0.204898	
last_known_vaping_statussex-vaper	-3.115	0.001902	**
last_known_vaping_statusnever	-2.185	0.029125	*
last_known_vaping_statusvaper	-1.742	0.081878	.
treatment_reclassifiedAnti-IL17	0.342	0.732018	
treatment_reclassifiedAnti-TNF	-1.319	0.187130	
treatment_reclassifiedJAK Inhibitor	0.495	0.620743	
time_in_years	18.500	< 2e-16	***
age_at_onset:diagnosisAxial SpA- nr-axSpA	0.813	0.416324	

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

```

model_onset_diagnosis_basmi_reduced <- lmer(
  basmi_score ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basmi_reduced, corr = FALSE))

```

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


```

Formula: basmi_score ~ gender + hlab27status + age_at_onset + diagnosis +
      treatment_order + last_known_smoking_status + last_known_vaping_status +
      treatment_reclassified + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_basmi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

```

REML criterion at convergence: 39042.7

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6692	-0.5717	0.0010	0.5701	6.0465

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.158152	1.77712	
	time_in_years	0.003911	0.06254	-0.12
Residual		0.483466	0.69532	

Number of obs: 16051, groups: ttas_id, 881

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.904e+00	2.205e-01	8.656e+02	13.168
genderMale	5.466e-01	1.358e-01	8.628e+02	4.025
hlab27statusNegative	8.003e-02	2.377e-01	8.657e+02	0.337
hlab27statusPositive	-2.364e-01	1.607e-01	8.625e+02	-1.471
age_at_onset	8.555e-03	6.717e-03	8.599e+02	1.274
diagnosisAxial SpA- nr-axSpA	-1.231e+00	2.024e-01	8.724e+02	-6.081
treatment_order2	-1.643e-01	7.843e-02	1.370e+04	-2.095
treatment_order3	-1.091e-01	6.332e-02	1.292e+04	-1.724
treatment_order4	-3.353e-01	9.408e-02	1.349e+04	-3.564
treatment_order5	-3.044e-01	1.019e-01	1.193e+04	-2.986
treatment_order6	-4.331e-01	1.403e-01	1.372e+04	-3.086
treatment_order7	-5.529e-01	1.951e-01	8.306e+03	-2.834
treatment_order8	-1.010e+00	2.836e-01	1.470e+04	-3.562
treatment_order9	-1.415e-01	3.354e-01	1.475e+04	-0.422
treatment_order11	1.338e+00	5.078e-01	1.291e+04	2.634
last_known_smoking_statussex-smoker	3.235e-01	3.205e-01	8.596e+02	1.009
last_known_smoking_statusnever	1.149e-01	3.237e-01	8.599e+02	0.355
last_known_smoking_statussmoker	4.919e-01	3.963e-01	8.573e+02	1.241
last_known_vaping_statussex-vaper	-2.209e+00	7.063e-01	8.474e+02	-3.127
last_known_vaping_statusnever	-6.835e-01	3.104e-01	8.594e+02	-2.202
last_known_vaping_statusvaper	-7.590e-01	4.357e-01	8.566e+02	-1.742
treatment_reclassifiedAnti-IL17	4.056e-02	1.161e-01	1.257e+04	0.349

```

treatment_reclassifiedAnti-TNF      -9.808e-02  7.475e-02  1.363e+04  -1.312
treatment_reclassifiedJAK Inhibitor  1.629e-01  3.278e-01  6.679e+03   0.497
time_in_years                        5.329e-02  2.881e-03  6.501e+02  18.501
                                     Pr(>|t|)
(Intercept)                         < 2e-16 ***
genderMale                          6.19e-05 ***
hlab27statusNegative                 0.736451
hlab27statusPositive                 0.141679
age_at_onset                        0.203155
diagnosisAxial SpA- nr-axSpA         1.78e-09 ***
treatment_order2                     0.036192 *
treatment_order3                     0.084808 .
treatment_order4                     0.000366 ***
treatment_order5                     0.002834 **
treatment_order6                     0.002035 **
treatment_order7                     0.004604 **
treatment_order8                     0.000369 ***
treatment_order9                     0.673067
treatment_order11                    0.008444 **
last_known_smoking_statussex-smoker  0.313087
last_known_smoking_statusnever       0.722757
last_known_smoking_statussmoker      0.214862
last_known_vaping_statussex-vaper    0.001823 **
last_known_vaping_statusnever        0.027947 *
last_known_vaping_statusvaper        0.081882 .
treatment_reclassifiedAnti-IL17       0.726803
treatment_reclassifiedAnti-TNF        0.189490
treatment_reclassifiedJAK Inhibitor    0.619224
time_in_years                        < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
anova(model_onset_diagnosis_basmi_full, model_onset_diagnosis_basmi_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basmi

Models:

model_onset_diagnosis_basmi_reduced: basmi_score ~ gender + hlab27status + age_at_onset + di

model_onset_diagnosis_basmi_full: basmi_score ~ gender + hlab27status + age_at_onset + diagn

	npair	AIC	BIC	logLik	deviance	Chisq	Df
model_onset_diagnosis_basmi_reduced	29	39040	39263	-19491	38982		

```

model_onset_diagnosis_basmi_full      30 39041 39272 -19491      38981 0.6705  1
                                Pr(>Chisq)
model_onset_diagnosis_basmi_reduced
model_onset_diagnosis_basmi_full      0.4129

```

```
anova(model_onset_diagnosis_basmi_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	7.712	7.712	1	861.7	15.9507	7.056e-05	***
hlab27status	1.781	0.891	2	863.1	1.8420	0.159121	
age_at_onset	1.053	1.053	1	861.1	2.1777	0.140389	
diagnosis	5.033	5.033	1	865.8	10.4096	0.001301	**
treatment_order	20.331	2.259	9	13284.6	4.6726	3.289e-06	***
last_known_smoking_status	1.367	0.456	3	859.4	0.9423	0.419581	
last_known_vaping_status	5.223	1.741	3	852.9	3.6014	0.013202	*
treatment_reclassified	1.615	0.538	3	9808.0	1.1132	0.342209	
time_in_years	165.457	165.457	1	650.1	342.2325	< 2.2e-16	***
age_at_onset:diagnosis	0.320	0.320	1	862.3	0.6613	0.416324	

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

```

model_onset_diagnosis_basdai_full <- lmer(
  basdai ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status + treatment_reclassified +
    age_at_onset * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basdai,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basdai_full, corr = FALSE))

```

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

lmerModLmerTest]

Formula:

```

basdai ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  age_at_onset * diagnosis + time_in_years + (time_in_years |      ttas_id)
Data: dataframe_sorted_and_reclassified_basdai

```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

```
REML criterion at convergence: 48670.4
```

```
Scaled residuals:
```

Min	1Q	Median	3Q	Max
-4.2551	-0.5999	-0.0715	0.5550	4.6678

```
Random effects:
```

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.04128	1.7439	
	time_in_years	0.01085	0.1042	-0.32
Residual		1.93482	1.3910	

```
Number of obs: 13111, groups: ttas_id, 649
```

```
Fixed effects:
```

	Estimate	Std. Error	df
(Intercept)	4.233e+00	3.399e-01	6.220e+02
genderMale	-4.397e-01	1.492e-01	5.884e+02
hlab27statusNegative	5.786e-01	3.036e-01	6.170e+02
hlab27statusPositive	6.726e-03	2.477e-01	6.258e+02
age_at_onset	1.380e-02	8.191e-03	5.969e+02
diagnosisAxial SpA- nr-axSpA	1.132e+00	4.667e-01	5.817e+02
treatment_order2	-9.462e-01	9.103e-02	1.196e+04
treatment_order3	-7.203e-01	8.626e-02	1.053e+04
treatment_order4	-6.848e-01	1.108e-01	1.074e+04
treatment_order5	-4.190e-01	1.164e-01	9.064e+03
treatment_order6	-2.565e-01	1.493e-01	9.466e+03
treatment_order7	-4.556e-01	1.975e-01	8.684e+03
treatment_order8	-1.099e-01	2.562e-01	1.112e+04
treatment_order9	1.840e-02	2.985e-01	1.168e+04
treatment_order10	1.369e-01	5.598e-01	1.024e+04
treatment_order11	1.266e+00	6.497e-01	7.670e+03
treatment_order12	8.183e-01	1.130e+00	8.277e+03
treatment_order14	7.882e-01	8.974e-01	9.208e+02
treatment_order15	-2.084e-01	1.251e+00	1.096e+03
last_known_smoking_statussex-smoker	-2.629e-01	3.004e-01	5.576e+02
last_known_smoking_statusnever	-7.523e-01	3.022e-01	5.606e+02
last_known_smoking_statussmoker	6.838e-01	3.714e-01	5.591e+02
last_known_vaping_statussex-vaper	1.204e-01	6.554e-01	5.698e+02
last_known_vaping_statusnever	2.820e-01	2.972e-01	5.628e+02
last_known_vaping_statusvaper	9.435e-01	4.080e-01	5.583e+02
treatment_reclassifiedAnti-IL17	-1.343e+00	1.132e-01	1.155e+04

treatment_reclassifiedAnti-TNF	-1.324e+00	8.145e-02	1.226e+04
treatment_reclassifiedJAK Inhibitor	-1.837e+00	3.201e-01	8.336e+03
time_in_years	3.287e-02	5.870e-03	3.967e+02
age_at_onset:diagnosisAxial SpA- nr-axSpA	-2.709e-02	1.718e-02	5.834e+02
	t value	Pr(> t)	
(Intercept)	12.453	< 2e-16	***
genderMale	-2.947	0.003336	**
hlab27statusNegative	1.906	0.057163	.
hlab27statusPositive	0.027	0.978348	
age_at_onset	1.685	0.092470	.
diagnosisAxial SpA- nr-axSpA	2.427	0.015542	*
treatment_order2	-10.394	< 2e-16	***
treatment_order3	-8.351	< 2e-16	***
treatment_order4	-6.182	6.55e-10	***
treatment_order5	-3.601	0.000318	***
treatment_order6	-1.718	0.085816	.
treatment_order7	-2.307	0.021060	*
treatment_order8	-0.429	0.667828	
treatment_order9	0.062	0.950841	
treatment_order10	0.244	0.806853	
treatment_order11	1.948	0.051426	.
treatment_order12	0.724	0.469165	
treatment_order14	0.878	0.380002	
treatment_order15	-0.167	0.867684	
last_known_smoking_statussex-smoker	-0.875	0.381983	
last_known_smoking_statusnever	-2.489	0.013088	*
last_known_smoking_statussmoker	1.841	0.066105	.
last_known_vaping_statussex-vaper	0.184	0.854277	
last_known_vaping_statusnever	0.949	0.343117	
last_known_vaping_statusvaper	2.312	0.021113	*
treatment_reclassifiedAnti-IL17	-11.861	< 2e-16	***
treatment_reclassifiedAnti-TNF	-16.251	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-5.738	9.89e-09	***
time_in_years	5.600	4.01e-08	***
age_at_onset:diagnosisAxial SpA- nr-axSpA	-1.577	0.115340	

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

```
model_onset_diagnosis_basdai_reduced <- lmer(
  basdai ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
```

```

treatment_reclassified +
time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basdai,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basdai_reduced, corr = FALSE))

```

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

lmerModLmerTest]

Formula:

```

basdai ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_basdai

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 48666.6

Scaled residuals:

	Min	1Q	Median	3Q	Max
	-4.2540	-0.5998	-0.0724	0.5549	4.6659

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.04005	1.7436	
	time_in_years	0.01087	0.1043	-0.32
Residual		1.93472	1.3909	

Number of obs: 13111, groups: ttas_id, 649

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.378e+00	3.278e-01	6.254e+02	13.356
genderMale	-4.511e-01	1.492e-01	5.894e+02	-3.024
hlab27statusNegative	5.345e-01	3.026e-01	6.183e+02	1.766
hlab27statusPositive	3.935e-04	2.480e-01	6.266e+02	0.002
age_at_onset	8.112e-03	7.369e-03	5.950e+02	1.101
diagnosisAxial SpA- nr-axSpA	4.598e-01	1.889e-01	5.823e+02	2.434
treatment_order2	-9.449e-01	9.102e-02	1.196e+04	-10.381
treatment_order3	-7.187e-01	8.625e-02	1.054e+04	-8.333
treatment_order4	-6.840e-01	1.108e-01	1.075e+04	-6.175
treatment_order5	-4.187e-01	1.164e-01	9.075e+03	-3.598

treatment_order6	-2.547e-01	1.493e-01	9.478e+03	-1.706
treatment_order7	-4.551e-01	1.975e-01	8.698e+03	-2.304
treatment_order8	-1.076e-01	2.562e-01	1.113e+04	-0.420
treatment_order9	2.093e-02	2.985e-01	1.169e+04	0.070
treatment_order10	1.358e-01	5.599e-01	1.024e+04	0.243
treatment_order11	1.264e+00	6.498e-01	7.674e+03	1.946
treatment_order12	8.146e-01	1.131e+00	8.277e+03	0.721
treatment_order14	7.831e-01	8.981e-01	9.225e+02	0.872
treatment_order15	-2.141e-01	1.251e+00	1.098e+03	-0.171
last_known_smoking_statussex-smoker	-2.857e-01	3.004e-01	5.585e+02	-0.951
last_known_smoking_statusnever	-7.681e-01	3.023e-01	5.614e+02	-2.540
last_known_smoking_statussmoker	6.966e-01	3.717e-01	5.596e+02	1.874
last_known_vaping_statussex-vaper	1.379e-01	6.560e-01	5.704e+02	0.210
last_known_vaping_statusnever	2.981e-01	2.973e-01	5.634e+02	1.003
last_known_vaping_statusvaper	9.594e-01	4.083e-01	5.590e+02	2.350
treatment_reclassifiedAnti-IL17	-1.343e+00	1.132e-01	1.156e+04	-11.867
treatment_reclassifiedAnti-TNF	-1.324e+00	8.145e-02	1.226e+04	-16.251
treatment_reclassifiedJAK Inhibitor	-1.837e+00	3.202e-01	8.342e+03	-5.737
time_in_years	3.277e-02	5.874e-03	3.966e+02	5.580
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.002604 **			
hlab27statusNegative	0.077811 .			
hlab27statusPositive	0.998734			
age_at_onset	0.271380			
diagnosisAxial SpA- nr-axSpA	0.015253 *			
treatment_order2	< 2e-16 ***			
treatment_order3	< 2e-16 ***			
treatment_order4	6.86e-10 ***			
treatment_order5	0.000322 ***			
treatment_order6	0.087996 .			
treatment_order7	0.021223 *			
treatment_order8	0.674473			
treatment_order9	0.944099			
treatment_order10	0.808322			
treatment_order11	0.051741 .			
treatment_order12	0.471235			
treatment_order14	0.383424			
treatment_order15	0.864181			
last_known_smoking_statussex-smoker	0.341966			
last_known_smoking_statusnever	0.011338 *			
last_known_smoking_statussmoker	0.061438 .			
last_known_vaping_statussex-vaper	0.833617			

```

last_known_vaping_statusnever      0.316449
last_known_vaping_statusvaper      0.019135 *
treatment_reclassifiedAnti-IL17     < 2e-16 ***
treatment_reclassifiedAnti-TNF      < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 9.99e-09 ***
time_in_years                      4.47e-08 ***
---

```

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

```
anova(model_onset_diagnosis_basdai_full, model_onset_diagnosis_basdai_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basdai

Models:

model_onset_diagnosis_basdai_reduced: basdai ~ gender + hlab27status + age_at_onset + diagnosis

model_onset_diagnosis_basdai_full: basdai ~ gender + hlab27status + age_at_onset + diagnosis

	npars	AIC	BIC	logLik	deviance	Chisq	Df
model_onset_diagnosis_basdai_reduced	33	48681	48928	-24308	48615		
model_onset_diagnosis_basdai_full	34	48681	48935	-24306	48613	2.5327	1

Pr(>Chisq)

model_onset_diagnosis_basdai_reduced

model_onset_diagnosis_basdai_full 0.1115

```
anova(model_onset_diagnosis_basdai_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	16.80	16.803	1	588.4	8.6846	0.003336 **
hlab27status	15.12	7.561	2	606.3	3.9077	0.020595 *
age_at_onset	0.00	0.002	1	584.3	0.0009	0.976696
diagnosis	11.39	11.393	1	581.7	5.8886	0.015542 *
treatment_order	306.88	23.606	13	5884.2	12.2008	< 2.2e-16 ***
last_known_smoking_status	47.98	15.992	3	567.2	8.2652	2.173e-05 ***
last_known_vaping_status	11.51	3.835	3	565.4	1.9821	0.115542
treatment_reclassified	542.53	180.843	3	10103.8	93.4677	< 2.2e-16 ***
time_in_years	60.68	60.680	1	396.7	31.3619	4.007e-08 ***
age_at_onset:diagnosis	4.81	4.812	1	583.4	2.4869	0.115340

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


```

model_onset_diagnosis_basfi_full <- lmer(
  basfi ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status + treatment_reclassified +
    age_at_onset * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basfi_full, corr = FALSE))

```

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

Formula:

```

basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  age_at_onset * diagnosis + time_in_years + (time_in_years |      ttas_id)

```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 46718.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5601	-0.4961	-0.0262	0.4957	5.4870

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.88508	2.2102	
	time_in_years	0.01352	0.1163	-0.30
Residual		1.95212	1.3972	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	3.441e+00	4.262e-01	6.220e+02
genderMale	-6.896e-02	1.877e-01	5.957e+02
hlab27statusNegative	4.936e-01	3.791e-01	6.133e+02
hlab27statusPositive	-2.714e-01	3.092e-01	6.217e+02
age_at_onset	1.878e-02	1.031e-02	6.013e+02
diagnosisAxial SpA- nr-axSpA	-3.662e-02	5.888e-01	5.931e+02

treatment_order2	-9.790e-01	9.574e-02	1.174e+04
treatment_order3	-6.544e-01	9.159e-02	1.074e+04
treatment_order4	-7.222e-01	1.163e-01	1.085e+04
treatment_order5	-3.858e-01	1.225e-01	9.375e+03
treatment_order6	-2.568e-01	1.559e-01	9.704e+03
treatment_order7	-3.404e-01	2.047e-01	8.811e+03
treatment_order8	-1.162e-02	2.647e-01	1.077e+04
treatment_order9	6.894e-03	3.069e-01	1.154e+04
treatment_order10	8.475e-01	5.952e-01	9.656e+03
treatment_order11	1.035e+00	6.689e-01	7.392e+03
treatment_order12	1.747e+00	1.153e+00	7.765e+03
treatment_order14	1.203e+00	9.486e-01	9.843e+02
treatment_order15	4.869e-01	1.421e+00	1.671e+03
last_known_smoking_statussex-smoker	1.551e-01	3.791e-01	5.738e+02
last_known_smoking_statusnever	-5.532e-01	3.812e-01	5.758e+02
last_known_smoking_statussmoker	5.145e-01	4.682e-01	5.723e+02
last_known_vaping_statussex-vaper	-5.356e-01	8.243e-01	5.783e+02
last_known_vaping_statusnever	-1.227e-01	3.752e-01	5.774e+02
last_known_vaping_statusvaper	7.455e-01	5.146e-01	5.705e+02
treatment_reclassifiedAnti-IL17	-8.288e-01	1.167e-01	1.121e+04
treatment_reclassifiedAnti-TNF	-8.338e-01	8.501e-02	1.188e+04
treatment_reclassifiedJAK Inhibitor	-1.553e+00	3.289e-01	8.348e+03
time_in_years	6.439e-02	6.436e-03	4.334e+02
age_at_onset:diagnosisAxial SpA- nr-axSpA	-1.239e-02	2.163e-02	5.911e+02
t value Pr(> t)			
(Intercept)	8.073	3.56e-15	***
genderMale	-0.367	0.71348	
hlab27statusNegative	1.302	0.19342	
hlab27statusPositive	-0.878	0.38038	
age_at_onset	1.822	0.06892	.
diagnosisAxial SpA- nr-axSpA	-0.062	0.95044	
treatment_order2	-10.226	< 2e-16	***
treatment_order3	-7.145	9.58e-13	***
treatment_order4	-6.210	5.51e-10	***
treatment_order5	-3.150	0.00164	**
treatment_order6	-1.647	0.09956	.
treatment_order7	-1.663	0.09641	.
treatment_order8	-0.044	0.96500	
treatment_order9	0.022	0.98208	
treatment_order10	1.424	0.15452	
treatment_order11	1.547	0.12182	
treatment_order12	1.516	0.12959	
treatment_order14	1.268	0.20520	

treatment_order15	0.343	0.73180
last_known_smoking_statussex-smoker	0.409	0.68257
last_known_smoking_statusnever	-1.451	0.14725
last_known_smoking_statussmoker	1.099	0.27226
last_known_vaping_statussex-vaper	-0.650	0.51610
last_known_vaping_statusnever	-0.327	0.74380
last_known_vaping_statusvaper	1.449	0.14798
treatment_reclassifiedAnti-IL17	-7.104	1.29e-12 ***
treatment_reclassifiedAnti-TNF	-9.808	< 2e-16 ***
treatment_reclassifiedJAK Inhibitor	-4.723	2.36e-06 ***
time_in_years	10.004	< 2e-16 ***
age_at_onset:diagnosisAxial SpA- nr-axSpA	-0.573	0.56682

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

```
model_onset_diagnosis_basfi_reduced <- lmer(
  basfi ~ gender + hlab27status + age_at_onset +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_onset_diagnosis_basfi_reduced, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```
basfi ~ gender + hlab27status + age_at_onset + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 46713.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5598	-0.4953	-0.0259	0.4953	5.4872

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.87834	2.2087	
	time_in_years	0.01352	0.1163	-0.30
Residual		1.95210	1.3972	

Number of obs: 12437, groups: ttas_id, 646

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	3.507e+00	4.099e-01	6.242e+02	8.556
genderMale	-7.440e-02	1.874e-01	5.965e+02	-0.397
hlab27statusNegative	4.734e-01	3.773e-01	6.148e+02	1.255
hlab27statusPositive	-2.744e-01	3.089e-01	6.227e+02	-0.888
age_at_onset	1.619e-02	9.260e-03	6.000e+02	1.748
diagnosisAxial SpA- nr-axSpA	-3.453e-01	2.375e-01	5.905e+02	-1.454
treatment_order2	-9.782e-01	9.574e-02	1.174e+04	-10.218
treatment_order3	-6.532e-01	9.157e-02	1.073e+04	-7.134
treatment_order4	-7.212e-01	1.163e-01	1.085e+04	-6.202
treatment_order5	-3.848e-01	1.225e-01	9.374e+03	-3.142
treatment_order6	-2.553e-01	1.559e-01	9.705e+03	-1.638
treatment_order7	-3.392e-01	2.047e-01	8.813e+03	-1.657
treatment_order8	-9.764e-03	2.647e-01	1.077e+04	-0.037
treatment_order9	8.889e-03	3.069e-01	1.154e+04	0.029
treatment_order10	8.487e-01	5.952e-01	9.655e+03	1.426
treatment_order11	1.036e+00	6.689e-01	7.391e+03	1.549
treatment_order12	1.748e+00	1.153e+00	7.763e+03	1.516
treatment_order14	1.203e+00	9.487e-01	9.842e+02	1.268
treatment_order15	4.878e-01	1.421e+00	1.671e+03	0.343
last_known_smoking_statussex-smoker	1.436e-01	3.783e-01	5.747e+02	0.380
last_known_smoking_statusnever	-5.615e-01	3.807e-01	5.766e+02	-1.475
last_known_smoking_statussmoker	5.192e-01	4.678e-01	5.731e+02	1.110
last_known_vaping_statussex-vaper	-5.292e-01	8.237e-01	5.791e+02	-0.642
last_known_vaping_statusnever	-1.144e-01	3.747e-01	5.781e+02	-0.305
last_known_vaping_statusvaper	7.533e-01	5.141e-01	5.714e+02	1.465
treatment_reclassifiedAnti-IL17	-8.290e-01	1.167e-01	1.121e+04	-7.105
treatment_reclassifiedAnti-TNF	-8.339e-01	8.501e-02	1.188e+04	-9.809
treatment_reclassifiedJAK Inhibitor	-1.553e+00	3.289e-01	8.349e+03	-4.722
time_in_years	6.432e-02	6.436e-03	4.331e+02	9.994

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.69141
hlab27statusNegative	0.21003
hlab27statusPositive	0.37484

```

age_at_onset                0.08091 .
diagnosisAxial SpA- nr-axSpA 0.14645
treatment_order2            < 2e-16 ***
treatment_order3            1.04e-12 ***
treatment_order4            5.79e-10 ***
treatment_order5            0.00168 **
treatment_order6            0.10146
treatment_order7            0.09757 .
treatment_order8            0.97058
treatment_order9            0.97689
treatment_order10           0.15390
treatment_order11           0.12141
treatment_order12           0.12944
treatment_order14           0.20500
treatment_order15           0.73138
last_known_smoking_statussex-smoker 0.70440
last_known_smoking_statusnever 0.14075
last_known_smoking_statussmoker 0.26754
last_known_vaping_statussex-vaper 0.52082
last_known_vaping_statusnever 0.76014
last_known_vaping_statusvaper 0.14338
treatment_reclassifiedAnti-IL17 1.27e-12 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.37e-06 ***
time_in_years                < 2e-16 ***

```

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

```
anova(model_onset_diagnosis_basfi_full, model_onset_diagnosis_basfi_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basfi

Models:

model_onset_diagnosis_basfi_reduced: basfi ~ gender + hlab27status + age_at_onset + diagnosis

model_onset_diagnosis_basfi_full: basfi ~ gender + hlab27status + age_at_onset + diagnosis +

	npar	AIC	BIC	logLik	deviance	Chisq	Df
model_onset_diagnosis_basfi_reduced	33	46735	46980	-23334	46669		
model_onset_diagnosis_basfi_full	34	46737	46989	-23334	46669	0.3359	1

Pr(>Chisq)

model_onset_diagnosis_basfi_reduced

model_onset_diagnosis_basfi_full 0.5622

```
anova(model_onset_diagnosis_basfi_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	0.263	0.263	1	595.7	0.1350	0.713484
hlab27status	17.623	8.812	2	605.6	4.5139	0.011326 *
age_at_onset	2.463	2.463	1	591.3	1.2618	0.261761
diagnosis	0.008	0.008	1	593.1	0.0039	0.950439
treatment_order	303.634	23.356	13	6369.0	11.9647	< 2.2e-16 ***
last_known_smoking_status	26.778	8.926	3	579.1	4.5725	0.003554 **
last_known_vaping_status	10.177	3.392	3	575.6	1.7378	0.158092
treatment_reclassified	207.088	69.029	3	10035.2	35.3612	< 2.2e-16 ***
time_in_years	195.383	195.383	1	433.4	100.0877	< 2.2e-16 ***
age_at_onset:diagnosis	0.641	0.641	1	591.1	0.3284	0.566821

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

```
model_diag_diagnosis_basmi_full <- lmer(
  basmi_score ~ gender + hlab27status + age_at_diag +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status + treatment_reclassified +
    age_at_diag * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_diag_diagnosis_basmi_full, corr = FALSE))
```

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

Formula: basmi_score ~ gender + hlab27status + age_at_diag + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified + age_at_diag * diagnosis + time_in_years +
(time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_basmi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40813

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6646	-0.5743	-0.0019	0.5696	6.0515

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.119985	1.7663	
	time_in_years	0.003856	0.0621	-0.12
Residual		0.483705	0.6955	

Number of obs: 16759, groups: ttas_id, 937

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	2.685e+00	2.304e-01	9.238e+02
genderMale	5.797e-01	1.304e-01	9.167e+02
hlab27statusNegative	-4.758e-02	2.280e-01	9.190e+02
hlab27statusPositive	-2.461e-01	1.532e-01	9.158e+02
age_at_diag	1.273e-02	5.225e-03	9.218e+02
diagnosisAxial SpA- nr-axSpA	-2.307e+00	6.005e-01	9.356e+02
treatment_order2	-1.598e-01	7.578e-02	1.403e+04
treatment_order3	-1.013e-01	6.247e-02	1.354e+04
treatment_order4	-3.234e-01	9.139e-02	1.394e+04
treatment_order5	-2.767e-01	1.008e-01	1.230e+04
treatment_order6	-3.290e-01	1.339e-01	1.326e+04
treatment_order7	-5.058e-01	1.936e-01	8.505e+03
treatment_order8	-9.728e-01	2.831e-01	1.532e+04
treatment_order9	-1.178e-01	3.351e-01	1.536e+04
treatment_order11	1.375e+00	5.073e-01	1.342e+04
last_known_smoking_statussex-smoker	3.641e-01	3.108e-01	9.128e+02
last_known_smoking_statusnever	2.233e-01	3.119e-01	9.128e+02
last_known_smoking_statussmoker	4.066e-01	3.854e-01	9.123e+02
last_known_vaping_statussex-vaper	-2.366e+00	6.673e-01	9.037e+02
last_known_vaping_statusnever	-7.314e-01	2.993e-01	9.123e+02
last_known_vaping_statusvaper	-7.614e-01	4.307e-01	9.142e+02
treatment_reclassifiedAnti-IL17	-1.056e-02	1.134e-01	1.298e+04
treatment_reclassifiedAnti-TNF	-1.122e-01	7.229e-02	1.404e+04
treatment_reclassifiedJAK Inhibitor	1.033e-01	3.261e-01	6.917e+03
time_in_years	5.293e-02	2.799e-03	6.820e+02
age_at_diag:diagnosisAxial SpA- nr-axSpA	3.169e-02	1.659e-02	9.303e+02

	t value	Pr(> t)
(Intercept)	11.655	< 2e-16 ***
genderMale	4.445	9.86e-06 ***
hlab27statusNegative	-0.209	0.834732
hlab27statusPositive	-1.607	0.108495

age_at_diag	2.437	0.014980	*
diagnosisAxial SpA- nr-axSpA	-3.842	0.000130	***
treatment_order2	-2.109	0.034923	*
treatment_order3	-1.621	0.104977	
treatment_order4	-3.539	0.000403	***
treatment_order5	-2.746	0.006050	**
treatment_order6	-2.458	0.013994	*
treatment_order7	-2.612	0.009010	**
treatment_order8	-3.437	0.000591	***
treatment_order9	-0.352	0.725063	
treatment_order11	2.711	0.006724	**
last_known_smoking_statussex-smoker	1.171	0.241781	
last_known_smoking_statusnever	0.716	0.474152	
last_known_smoking_statussmoker	1.055	0.291680	
last_known_vaping_statussex-vaper	-3.545	0.000412	***
last_known_vaping_statusnever	-2.444	0.014732	*
last_known_vaping_statusvaper	-1.768	0.077388	.
treatment_reclassifiedAnti-IL17	-0.093	0.925797	
treatment_reclassifiedAnti-TNF	-1.552	0.120716	
treatment_reclassifiedJAK Inhibitor	0.317	0.751478	
time_in_years	18.912	< 2e-16	***
age_at_diag:diagnosisAxial SpA- nr-axSpA	1.911	0.056354	.

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

```
model_diag_diagnosis_basmi_reduced <- lmer(
  basmi_score ~ gender + hlab27status + age_at_diag +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basmi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_diag_diagnosis_basmi_reduced, corr = FALSE))
```

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

Formula: basmi_score ~ gender + hlab27status + age_at_diag + diagnosis +
treatment_order + last_known_smoking_status + last_known_vaping_status +
treatment_reclassified + time_in_years + (time_in_years | ttas_id)

Data: dataframe_sorted_and_reclassified_basmi
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 40810.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.6646	-0.5740	-0.0017	0.5697	6.0521

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.130005	1.7692	
	time_in_years	0.003856	0.0621	-0.12
Residual		0.483705	0.6955	

Number of obs: 16759, groups: ttas_id, 937

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	2.599e+00	2.263e-01	9.251e+02	11.485
genderMale	5.783e-01	1.306e-01	9.177e+02	4.428
hlab27statusNegative	-3.027e-02	2.281e-01	9.202e+02	-0.133
hlab27statusPositive	-2.569e-01	1.533e-01	9.169e+02	-1.676
age_at_diag	1.561e-02	5.012e-03	9.230e+02	3.114
diagnosisAxial SpA- nr-axSpA	-1.222e+00	1.947e-01	9.279e+02	-6.276
treatment_order2	-1.619e-01	7.577e-02	1.404e+04	-2.136
treatment_order3	-1.020e-01	6.247e-02	1.354e+04	-1.632
treatment_order4	-3.247e-01	9.139e-02	1.394e+04	-3.553
treatment_order5	-2.774e-01	1.008e-01	1.230e+04	-2.753
treatment_order6	-3.326e-01	1.339e-01	1.326e+04	-2.485
treatment_order7	-5.091e-01	1.936e-01	8.505e+03	-2.629
treatment_order8	-9.760e-01	2.831e-01	1.532e+04	-3.448
treatment_order9	-1.186e-01	3.351e-01	1.536e+04	-0.354
treatment_order11	1.373e+00	5.073e-01	1.342e+04	2.706
last_known_smoking_statussex-smoker	3.861e-01	3.111e-01	9.136e+02	1.241
last_known_smoking_statusnever	2.473e-01	3.120e-01	9.137e+02	0.793
last_known_smoking_statussmoker	4.266e-01	3.858e-01	9.132e+02	1.106
last_known_vaping_statussex-vaper	-2.383e+00	6.682e-01	9.047e+02	-3.566
last_known_vaping_statusnever	-7.494e-01	2.996e-01	9.132e+02	-2.501
last_known_vaping_statusvaper	-7.884e-01	4.311e-01	9.152e+02	-1.829
treatment_reclassifiedAnti-IL17	-8.487e-03	1.134e-01	1.298e+04	-0.075
treatment_reclassifiedAnti-TNF	-1.103e-01	7.229e-02	1.404e+04	-1.526
treatment_reclassifiedJAK Inhibitor	1.070e-01	3.261e-01	6.915e+03	0.328
time_in_years	5.293e-02	2.799e-03	6.821e+02	18.913

	Pr(> t)
(Intercept)	< 2e-16 ***
genderMale	1.06e-05 ***
hlab27statusNegative	0.894496
hlab27statusPositive	0.094111 .
age_at_diag	0.001903 **
diagnosisAxial SpA- nr-axSpA	5.31e-10 ***
treatment_order2	0.032687 *
treatment_order3	0.102695
treatment_order4	0.000382 ***
treatment_order5	0.005916 **
treatment_order6	0.012971 *
treatment_order7	0.008578 **
treatment_order8	0.000566 ***
treatment_order9	0.723472
treatment_order11	0.006810 **
last_known_smoking_statussex-smoker	0.214884
last_known_smoking_statusnever	0.428240
last_known_smoking_statussmoker	0.269113
last_known_vaping_statussex-vaper	0.000382 ***
last_known_vaping_statusnever	0.012548 *
last_known_vaping_statusvaper	0.067739 .
treatment_reclassifiedAnti-IL17	0.940351
treatment_reclassifiedAnti-TNF	0.127149
treatment_reclassifiedJAK Inhibitor	0.742939
time_in_years	< 2e-16 ***

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

```
anova(model_diag_diagnosis_basmi_full, model_diag_diagnosis_basmi_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basmi

Models:

model_diag_diagnosis_basmi_reduced: basmi_score ~ gender + hlab27status + age_at_diag + diagnosis

model_diag_diagnosis_basmi_full: basmi_score ~ gender + hlab27status + age_at_diag + diagnosis

	npar	AIC	BIC	logLik	deviance	Chisq	Df
--	------	-----	-----	--------	----------	-------	----

model_diag_diagnosis_basmi_reduced	29	40806	41030	-20374	40748		
------------------------------------	----	-------	-------	--------	-------	--	--

model_diag_diagnosis_basmi_full	30	40804	41036	-20372	40744	3.695	1
---------------------------------	----	-------	-------	--------	-------	-------	---

Pr(>Chisq)

model_diag_diagnosis_basmi_reduced

```
model_diag_diagnosis_basmi_full          0.05458 .
```

```
---
```

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

```
anova(model_diag_diagnosis_basmi_full)
```

```
Type III Analysis of Variance Table with Satterthwaite's method
```

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)	
gender	9.557	9.557	1	916.7	19.7587	9.861e-06	***
hlab27status	1.571	0.785	2	917.6	1.6234	0.1977896	
age_at_diag	5.548	5.548	1	928.8	11.4702	0.0007369	***
diagnosis	7.141	7.141	1	935.6	14.7630	0.0001301	***
treatment_order	18.905	2.101	9	13699.4	4.3425	1.134e-05	***
last_known_smoking_status	0.916	0.305	3	914.9	0.6313	0.5949057	
last_known_vaping_status	6.616	2.205	3	910.2	4.5592	0.0035308	**
treatment_reclassified	1.542	0.514	3	10160.1	1.0627	0.3635595	
time_in_years	173.002	173.002	1	682.0	357.6603	< 2.2e-16	***
age_at_diag:diagnosis	1.766	1.766	1	930.3	3.6507	0.0563539	.

```
---
```

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

```
model_diag_diagnosis_basdai_full <- lmer(  
  basdai ~ gender + hlab27status + age_at_diag +  
    diagnosis + treatment_order + last_known_smoking_status +  
    last_known_vaping_status + treatment_reclassified +  
    age_at_diag * diagnosis +  
    time_in_years + (time_in_years | ttas_id),  
  data = dataframe_sorted_and_reclassified_basdai,  
  control = lmerControl(optimizer = "bobyqa",  
    optCtrl = list(maxfun = 2e5)))  
  
print(summary(model_diag_diagnosis_basdai_full, corr = FALSE))
```

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

```
lmerModLmerTest]
```

```
Formula:
```

```
basdai ~ gender + hlab27status + age_at_diag + diagnosis + treatment_order +  
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +  
  age_at_diag * diagnosis + time_in_years + (time_in_years | ttas_id)
```

```
Data: dataframe_sorted_and_reclassified_basdai
```

```
Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))
```

REML criterion at convergence: 51330.3

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2488	-0.5976	-0.0704	0.5542	4.6781

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.08176	1.7555	
	time_in_years	0.01099	0.1049	-0.33
Residual		1.92601	1.3878	

Number of obs: 13825, groups: ttas_id, 716

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	4.536e+00	3.217e-01	6.919e+02
genderMale	-5.063e-01	1.424e-01	6.495e+02
hlab27statusNegative	4.190e-01	2.768e-01	6.855e+02
hlab27statusPositive	-1.707e-01	2.213e-01	7.088e+02
age_at_diag	5.171e-03	5.919e-03	6.594e+02
diagnosisAxial SpA- nr-axSpA	4.722e-01	5.476e-01	6.562e+02
treatment_order2	-9.060e-01	8.825e-02	1.255e+04
treatment_order3	-6.291e-01	8.427e-02	1.112e+04
treatment_order4	-6.462e-01	1.076e-01	1.130e+04
treatment_order5	-3.581e-01	1.141e-01	9.498e+03
treatment_order6	-2.372e-01	1.430e-01	9.504e+03
treatment_order7	-3.947e-01	1.954e-01	9.215e+03
treatment_order8	-4.979e-02	2.544e-01	1.178e+04
treatment_order9	7.991e-02	2.969e-01	1.238e+04
treatment_order10	2.033e-01	5.581e-01	1.082e+04
treatment_order11	1.336e+00	6.478e-01	8.111e+03
treatment_order12	8.775e-01	1.128e+00	8.712e+03
treatment_order14	8.576e-01	8.977e-01	9.707e+02
treatment_order15	-1.075e-01	1.251e+00	1.154e+03
last_known_smoking_statussex-smoker	-2.303e-01	2.931e-01	6.154e+02
last_known_smoking_statusnever	-5.968e-01	2.934e-01	6.190e+02
last_known_smoking_statussmoker	7.608e-01	3.645e-01	6.153e+02
last_known_vaping_statussex-vaper	1.869e-01	6.293e-01	6.299e+02
last_known_vaping_statusnever	2.510e-01	2.894e-01	6.223e+02
last_known_vaping_statusvaper	8.640e-01	4.020e-01	6.194e+02
treatment_reclassifiedAnti-IL17	-1.365e+00	1.109e-01	1.214e+04
treatment_reclassifiedAnti-TNF	-1.332e+00	7.892e-02	1.292e+04

treatment_reclassifiedJAK Inhibitor	-1.844e+00	3.190e-01	8.783e+03
time_in_years	3.071e-02	5.701e-03	4.243e+02
age_at_diag:diagnosisAxial SpA- nr-axSpA	6.296e-04	1.505e-02	6.535e+02
	t value	Pr(> t)	
(Intercept)	14.101	< 2e-16	***
genderMale	-3.554	0.000407	***
hlab27statusNegative	1.514	0.130581	
hlab27statusPositive	-0.772	0.440558	
age_at_diag	0.874	0.382652	
diagnosisAxial SpA- nr-axSpA	0.862	0.388836	
treatment_order2	-10.267	< 2e-16	***
treatment_order3	-7.465	8.94e-14	***
treatment_order4	-6.007	1.95e-09	***
treatment_order5	-3.139	0.001698	**
treatment_order6	-1.659	0.097096	.
treatment_order7	-2.020	0.043459	*
treatment_order8	-0.196	0.844823	
treatment_order9	0.269	0.787842	
treatment_order10	0.364	0.715715	
treatment_order11	2.062	0.039211	*
treatment_order12	0.778	0.436738	
treatment_order14	0.955	0.339661	
treatment_order15	-0.086	0.931528	
last_known_smoking_statussex-smoker	-0.786	0.432253	
last_known_smoking_statusnever	-2.034	0.042368	*
last_known_smoking_statussmoker	2.087	0.037263	*
last_known_vaping_statussex-vaper	0.297	0.766561	
last_known_vaping_statusnever	0.868	0.385954	
last_known_vaping_statusvaper	2.149	0.032006	*
treatment_reclassifiedAnti-IL17	-12.310	< 2e-16	***
treatment_reclassifiedAnti-TNF	-16.879	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-5.781	7.67e-09	***
time_in_years	5.387	1.19e-07	***
age_at_diag:diagnosisAxial SpA- nr-axSpA	0.042	0.966637	

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

```
model_diag_diagnosis_basdai_reduced <- lmer(
  basdai ~ gender + hlab27status + age_at_diag +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
```

```

time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basdai,
  control = lmerControl(optimizer = "bobyqa",
                        optCtrl = list(maxfun = 2e5)))

print(summary(model_diag_diagnosis_basdai_reduced, corr = FALSE))

```

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

Formula:

```

basdai ~ gender + hlab27status + age_at_diag + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)

```

Data: dataframe_sorted_and_reclassified_basdai

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 51323.8

Scaled residuals:

Min	1Q	Median	3Q	Max
-4.2487	-0.5976	-0.0704	0.5544	4.6781

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	3.07703	1.7541	
	time_in_years	0.01099	0.1048	-0.33
Residual		1.92603	1.3878	

Number of obs: 13825, groups: ttas_id, 716

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	4.533e+00	3.144e-01	6.962e+02	14.417
genderMale	-5.063e-01	1.423e-01	6.502e+02	-3.557
hlab27statusNegative	4.195e-01	2.763e-01	6.872e+02	1.518
hlab27statusPositive	-1.710e-01	2.210e-01	7.098e+02	-0.774
age_at_diag	5.259e-03	5.515e-03	6.588e+02	0.954
diagnosisAxial SpA- nr-axSpA	4.938e-01	1.808e-01	6.453e+02	2.731
treatment_order2	-9.059e-01	8.824e-02	1.255e+04	-10.266
treatment_order3	-6.289e-01	8.425e-02	1.112e+04	-7.464
treatment_order4	-6.459e-01	1.076e-01	1.130e+04	-6.005
treatment_order5	-3.578e-01	1.141e-01	9.499e+03	-3.137
treatment_order6	-2.369e-01	1.429e-01	9.504e+03	-1.657

treatment_order7	-3.944e-01	1.954e-01	9.214e+03	-2.018
treatment_order8	-4.951e-02	2.543e-01	1.178e+04	-0.195
treatment_order9	8.031e-02	2.969e-01	1.238e+04	0.270
treatment_order10	2.038e-01	5.581e-01	1.082e+04	0.365
treatment_order11	1.336e+00	6.478e-01	8.113e+03	2.063
treatment_order12	8.782e-01	1.128e+00	8.714e+03	0.778
treatment_order14	8.583e-01	8.976e-01	9.708e+02	0.956
treatment_order15	-1.068e-01	1.251e+00	1.154e+03	-0.085
last_known_smoking_statussex-smoker	-2.298e-01	2.926e-01	6.160e+02	-0.785
last_known_smoking_statusnever	-5.962e-01	2.927e-01	6.195e+02	-2.037
last_known_smoking_statussmoker	7.614e-01	3.639e-01	6.158e+02	2.092
last_known_vaping_statussex-vaper	1.865e-01	6.288e-01	6.307e+02	0.297
last_known_vaping_statusnever	2.506e-01	2.889e-01	6.224e+02	0.867
last_known_vaping_statusvaper	8.632e-01	4.012e-01	6.201e+02	2.151
treatment_reclassifiedAnti-IL17	-1.365e+00	1.109e-01	1.214e+04	-12.310
treatment_reclassifiedAnti-TNF	-1.332e+00	7.892e-02	1.292e+04	-16.880
treatment_reclassifiedJAK Inhibitor	-1.844e+00	3.190e-01	8.784e+03	-5.781
time_in_years	3.070e-02	5.699e-03	4.241e+02	5.386
	Pr(> t)			
(Intercept)	< 2e-16 ***			
genderMale	0.000402 ***			
hlab27statusNegative	0.129446			
hlab27statusPositive	0.439411			
age_at_diag	0.340623			
diagnosisAxial SpA- nr-axSpA	0.006489 **			
treatment_order2	< 2e-16 ***			
treatment_order3	9.00e-14 ***			
treatment_order4	1.98e-09 ***			
treatment_order5	0.001713 **			
treatment_order6	0.097505 .			
treatment_order7	0.043584 *			
treatment_order8	0.845665			
treatment_order9	0.786796			
treatment_order10	0.715023			
treatment_order11	0.039127 *			
treatment_order12	0.436383			
treatment_order14	0.339228			
treatment_order15	0.931990			
last_known_smoking_statussex-smoker	0.432530			
last_known_smoking_statusnever	0.042111 *			
last_known_smoking_statussmoker	0.036826 *			
last_known_vaping_statussex-vaper	0.766846			
last_known_vaping_statusnever	0.386059			

```

last_known_vaping_statusvaper      0.031829 *
treatment_reclassifiedAnti-IL17     < 2e-16 ***
treatment_reclassifiedAnti-TNF       < 2e-16 ***
treatment_reclassifiedJAK Inhibitor  7.68e-09 ***
time_in_years                       1.19e-07 ***
---

```

```

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

```

```

anova(model_diag_diagnosis_basdai_full, model_diag_diagnosis_basdai_reduced)

```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basdai

Models:

model_diag_diagnosis_basdai_reduced: basdai ~ gender + hlab27status + age_at_diag + diagnosis

model_diag_diagnosis_basdai_full: basdai ~ gender + hlab27status + age_at_diag + diagnosis +

	npar	AIC	BIC	logLik	deviance	Chisq	Df
model_diag_diagnosis_basdai_reduced	33	51336	51585	-25635	51270		
model_diag_diagnosis_basdai_full	34	51338	51594	-25635	51270	0.0018	1

Pr(>Chisq)

model_diag_diagnosis_basdai_reduced

model_diag_diagnosis_basdai_full 0.9662

```

anova(model_diag_diagnosis_basdai_full)

```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	24.33	24.330	1	649.5	12.6326	0.0004066 ***
hlab27status	18.21	9.106	2	673.2	4.7280	0.0091399 **
age_at_diag	0.97	0.975	1	651.6	0.5061	0.4770828
diagnosis	1.43	1.432	1	656.2	0.7436	0.3888360
treatment_order	292.00	22.461	13	6191.8	11.6621	< 2.2e-16 ***
last_known_smoking_status	42.78	14.260	3	623.9	7.4037	7.035e-05 ***
last_known_vaping_status	9.96	3.319	3	626.3	1.7231	0.1609806
treatment_reclassified	584.98	194.994	3	10661.1	101.2428	< 2.2e-16 ***
time_in_years	55.89	55.888	1	424.3	29.0177	1.191e-07 ***
age_at_diag:diagnosis	0.00	0.003	1	653.5	0.0018	0.9666370

```

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

```



```

model_diag_diagnosis_basfi_full <- lmer(
  basfi ~ gender + hlab27status + age_at_diag +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status + treatment_reclassified +
    age_at_diag * diagnosis +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_diag_diagnosis_basfi_full, corr = FALSE))

```

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

Formula:

```

basfi ~ gender + hlab27status + age_at_diag + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  age_at_diag * diagnosis + time_in_years + (time_in_years |      ttas_id)

```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 49291.2

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5623	-0.4978	-0.0272	0.4948	5.5152

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.86734	2.2062	
	time_in_years	0.01472	0.1213	-0.31
Residual		1.94123	1.3933	

Number of obs: 13113, groups: ttas_id, 713

Fixed effects:

	Estimate	Std. Error	df
(Intercept)	3.414e+00	3.997e-01	6.903e+02
genderMale	-1.681e-01	1.778e-01	6.580e+02
hlab27statusNegative	2.739e-01	3.433e-01	6.816e+02
hlab27statusPositive	-3.855e-01	2.740e-01	7.023e+02
age_at_diag	1.989e-02	7.387e-03	6.679e+02
diagnosisAxial SpA- nr-axSpA	-6.246e-01	6.862e-01	6.696e+02

treatment_order2	-1.000e+00	9.292e-02	1.241e+04
treatment_order3	-6.297e-01	8.972e-02	1.147e+04
treatment_order4	-6.971e-01	1.132e-01	1.156e+04
treatment_order5	-3.373e-01	1.201e-01	1.006e+04
treatment_order6	-2.788e-01	1.497e-01	1.008e+04
treatment_order7	-3.160e-01	2.031e-01	9.627e+03
treatment_order8	4.411e-03	2.633e-01	1.154e+04
treatment_order9	3.194e-02	3.057e-01	1.231e+04
treatment_order10	8.759e-01	5.952e-01	1.030e+04
treatment_order11	1.045e+00	6.698e-01	7.891e+03
treatment_order12	1.754e+00	1.155e+00	8.110e+03
treatment_order14	1.197e+00	9.646e-01	1.073e+03
treatment_order15	4.679e-01	1.438e+00	1.787e+03
last_known_smoking_statussex-smoker	2.368e-01	3.670e-01	6.341e+02
last_known_smoking_statusnever	-3.554e-01	3.673e-01	6.365e+02
last_known_smoking_statussmoker	5.780e-01	4.561e-01	6.307e+02
last_known_vaping_statussex-vaper	-7.134e-01	7.850e-01	6.387e+02
last_known_vaping_statusnever	-2.974e-01	3.624e-01	6.387e+02
last_known_vaping_statusvaper	5.692e-01	5.029e-01	6.327e+02
treatment_reclassifiedAnti-IL17	-8.257e-01	1.145e-01	1.189e+04
treatment_reclassifiedAnti-TNF	-8.041e-01	8.245e-02	1.256e+04
treatment_reclassifiedJAK Inhibitor	-1.544e+00	3.290e-01	8.907e+03
time_in_years	6.384e-02	6.407e-03	4.713e+02
age_at_diag:diagnosisAxial SpA- nr-axSpA	1.012e-02	1.882e-02	6.638e+02
t value Pr(> t)			
(Intercept)	8.543	< 2e-16	***
genderMale	-0.945	0.34482	
hlab27statusNegative	0.798	0.42514	
hlab27statusPositive	-1.407	0.15979	
age_at_diag	2.692	0.00727	**
diagnosisAxial SpA- nr-axSpA	-0.910	0.36299	
treatment_order2	-10.761	< 2e-16	***
treatment_order3	-7.019	2.36e-12	***
treatment_order4	-6.160	7.52e-10	***
treatment_order5	-2.807	0.00501	**
treatment_order6	-1.862	0.06259	.
treatment_order7	-1.556	0.11980	
treatment_order8	0.017	0.98664	
treatment_order9	0.104	0.91679	
treatment_order10	1.472	0.14114	
treatment_order11	1.560	0.11870	
treatment_order12	1.518	0.12901	
treatment_order14	1.241	0.21485	

treatment_order15	0.325	0.74488	
last_known_smoking_statussex-smoker	0.645	0.51896	
last_known_smoking_statusnever	-0.968	0.33360	
last_known_smoking_statussmoker	1.267	0.20547	
last_known_vaping_statussex-vaper	-0.909	0.36380	
last_known_vaping_statusnever	-0.821	0.41222	
last_known_vaping_statusvaper	1.132	0.25813	
treatment_reclassifiedAnti-IL17	-7.214	5.75e-13	***
treatment_reclassifiedAnti-TNF	-9.752	< 2e-16	***
treatment_reclassifiedJAK Inhibitor	-4.694	2.72e-06	***
time_in_years	9.963	< 2e-16	***
age_at_diag:diagnosisAxial SpA- nr-axSpA	0.538	0.59102	

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

```
model_diag_diagnosis_basfi_reduced <- lmer(
  basfi ~ gender + hlab27status + age_at_diag +
    diagnosis + treatment_order + last_known_smoking_status +
    last_known_vaping_status +
    treatment_reclassified +
    time_in_years + (time_in_years | ttas_id),
  data = dataframe_sorted_and_reclassified_basfi,
  control = lmerControl(optimizer = "bobyqa",
    optCtrl = list(maxfun = 2e5)))

print(summary(model_diag_diagnosis_basfi_reduced, corr = FALSE))
```

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

lmerModLmerTest]

Formula:

```
basfi ~ gender + hlab27status + age_at_diag + diagnosis + treatment_order +
  last_known_smoking_status + last_known_vaping_status + treatment_reclassified +
  time_in_years + (time_in_years | ttas_id)
```

Data: dataframe_sorted_and_reclassified_basfi

Control: lmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

REML criterion at convergence: 49285.4

Scaled residuals:

Min	1Q	Median	3Q	Max
-5.5623	-0.4981	-0.0272	0.4947	5.5150

Random effects:

Groups	Name	Variance	Std.Dev.	Corr
ttas_id	(Intercept)	4.86370	2.2054	
	time_in_years	0.01471	0.1213	-0.31
Residual		1.94126	1.3933	

Number of obs: 13113, groups: ttas_id, 713

Fixed effects:

	Estimate	Std. Error	df	t value
(Intercept)	3.369e+00	3.905e-01	6.932e+02	8.627
genderMale	-1.688e-01	1.777e-01	6.590e+02	-0.950
hlab27statusNegative	2.823e-01	3.427e-01	6.833e+02	0.824
hlab27statusPositive	-3.895e-01	2.737e-01	7.034e+02	-1.423
age_at_diag	2.132e-02	6.887e-03	6.677e+02	3.096
diagnosisAxial SpA- nr-axSpA	-2.764e-01	2.258e-01	6.524e+02	-1.224
treatment_order2	-1.000e+00	9.291e-02	1.241e+04	-10.768
treatment_order3	-6.303e-01	8.970e-02	1.147e+04	-7.027
treatment_order4	-6.973e-01	1.132e-01	1.156e+04	-6.162
treatment_order5	-3.374e-01	1.201e-01	1.005e+04	-2.809
treatment_order6	-2.793e-01	1.497e-01	1.008e+04	-1.866
treatment_order7	-3.169e-01	2.031e-01	9.625e+03	-1.560
treatment_order8	3.625e-03	2.633e-01	1.154e+04	0.014
treatment_order9	3.125e-02	3.057e-01	1.231e+04	0.102
treatment_order10	8.757e-01	5.952e-01	1.030e+04	1.471
treatment_order11	1.045e+00	6.697e-01	7.892e+03	1.560
treatment_order12	1.754e+00	1.155e+00	8.112e+03	1.519
treatment_order14	1.198e+00	9.644e-01	1.073e+03	1.242
treatment_order15	4.687e-01	1.438e+00	1.788e+03	0.326
last_known_smoking_statussex-smoker	2.460e-01	3.664e-01	6.347e+02	0.671
last_known_smoking_statusnever	-3.444e-01	3.665e-01	6.371e+02	-0.940
last_known_smoking_statussmoker	5.877e-01	4.554e-01	6.314e+02	1.291
last_known_vaping_statussex-vaper	-7.184e-01	7.846e-01	6.396e+02	-0.916
last_known_vaping_statusnever	-3.052e-01	3.619e-01	6.391e+02	-0.843
last_known_vaping_statusvaper	5.556e-01	5.019e-01	6.335e+02	1.107
treatment_reclassifiedAnti-IL17	-8.257e-01	1.145e-01	1.189e+04	-7.214
treatment_reclassifiedAnti-TNF	-8.038e-01	8.245e-02	1.256e+04	-9.749
treatment_reclassifiedJAK Inhibitor	-1.544e+00	3.289e-01	8.908e+03	-4.693
time_in_years	6.386e-02	6.406e-03	4.713e+02	9.969

Pr(>|t|)

(Intercept)	< 2e-16 ***
genderMale	0.34268
hlab27statusNegative	0.41043
hlab27statusPositive	0.15523

```

age_at_diag                0.00205 **
diagnosisAxial SpA- nr-axSpA 0.22142
treatment_order2           < 2e-16 ***
treatment_order3           2.22e-12 ***
treatment_order4           7.40e-10 ***
treatment_order5           0.00498 **
treatment_order6           0.06202 .
treatment_order7           0.11870
treatment_order8           0.98901
treatment_order9           0.91858
treatment_order10          0.14122
treatment_order11          0.11870
treatment_order12          0.12890
treatment_order14          0.21456
treatment_order15          0.74446
last_known_smoking_statussex-smoker 0.50217
last_known_smoking_statusnever 0.34771
last_known_smoking_statussmoker 0.19733
last_known_vaping_statussex-vaper 0.36016
last_known_vaping_statusnever 0.39942
last_known_vaping_statusvaper 0.26879
treatment_reclassifiedAnti-IL17 5.75e-13 ***
treatment_reclassifiedAnti-TNF < 2e-16 ***
treatment_reclassifiedJAK Inhibitor 2.73e-06 ***
time_in_years              < 2e-16 ***

```

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

```
anova(model_diag_diagnosis_basfi_full, model_diag_diagnosis_basfi_reduced)
```

refitting model(s) with ML (instead of REML)

Data: dataframe_sorted_and_reclassified_basfi

Models:

model_diag_diagnosis_basfi_reduced: basfi ~ gender + hlab27status + age_at_diag + diagnosis + t

model_diag_diagnosis_basfi_full: basfi ~ gender + hlab27status + age_at_diag + diagnosis + t

	npars	AIC	BIC	logLik	deviance	Chisq	Df
model_diag_diagnosis_basfi_reduced	33	49305	49552	-24620	49239		
model_diag_diagnosis_basfi_full	34	49307	49561	-24619	49239	0.2946	1

Pr(>Chisq)

model_diag_diagnosis_basfi_reduced

model_diag_diagnosis_basfi_full 0.5873

```
anova(model_diag_diagnosis_basfi_full)
```

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
gender	1.73	1.735	1	658.0	0.8937	0.344821
hlab27status	16.80	8.401	2	672.8	4.3277	0.013567 *
age_at_diag	12.99	12.987	1	662.1	6.6903	0.009906 **
diagnosis	1.61	1.609	1	669.6	0.8286	0.362991
treatment_order	327.82	25.217	13	6827.8	12.9903	< 2.2e-16 ***
last_known_smoking_status	21.05	7.015	3	638.3	3.6137	0.013106 *
last_known_vaping_status	11.89	3.962	3	637.2	2.0411	0.106897
treatment_reclassified	206.67	68.890	3	10701.4	35.4876	< 2.2e-16 ***
time_in_years	192.70	192.699	1	471.3	99.2663	< 2.2e-16 ***
age_at_diag:diagnosis	0.56	0.561	1	663.8	0.2890	0.591021

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