Analysis update

The updated analysis included:

1. A table of all 64 subjects clinical summary by their EDSS scores;
2. 4-panel plots of models: 24hr, 2hr, 2hr connected, FOSR, for 3 types of models:
   - Type1-3models: Model with EDSS/T25fw/TUG + Age + Sex + BMI (Plot of EDSS/T25fw/TUG)
   - Type2-1model: Model with Device + Age + Sex + BMI (Plot of binary device)
   - Type3-3models: Model with EDSS/T25fw/TUG + Age + Sex + BMI + Device (Plots of EDSS/T25fw/TUG and binary device)

   In total, we have 7 models, and 10 4-panel plots
3. 24hr-interval linear regression summary, total of 7 tables
4. 2hr-interval linear regression summary tables, total of 10 tables

Subject summary table by EDSS scores

EDSS	No.Subjects	No.Female	No.useDevice	T25fw.AVE (sd)	TUG.AVE (sd)	AGE.AVE (sd)	BMI.AVE (sd)
1	7	7	0	3.72 (0.66)	5.65 (0.64)	39 (13.01)	26.00 (5.03)
1.5	12	6	0	3.90 (0.34)	6.09 (0.80)	47 (10.22)	28.02 (6.04)
2	7	3	0	4.04 (0.86)	5.92 (1.07)	42 (11.31)	28.35 (5.75)
3	2	1	0	5.15 (0.48)	7.39 (0.45)	56 (8.49)	30.68 (4.18)
3.5	3	2	0	4.59 (0.78)	7.66 (1.65)	56 (10.58)	27.85 (5.61)
4	11	10	1	5.14 (1.24)	7.65 (1.31)	49 (13.75)	27.37 (6.22)
4.5	4	3	2	5.51 (1.54)	8.52 (3.92)	48 (5.48)	26.33 (7.90)
5	2	2	0	7.80 (0.48)	10.41 (0.88)	38 (9.19)	28.00 (8.77)
5.5	1	1	0	6.69 (NA)	8.45 (NA)	46 (NA)	27.64 (NA)
6	9	7	7	12.33 (9.63)	15.51 (9.06)	52 (11.29)	32.65 (6.90)
6.5	5	4	4	28.63 (28.78)	37.01 (30.23)	60 (4.16)	23.45 (5.25)
7	1	0	1	29.33 (NA)	41.12 (NA)	60 (NA)	24.69 (NA)
Total	64	46	15	7.96 (10.87)	11.02 (12.44)	48 (11.79)	27.93 (6.10)

Model Type 1

24hr interval linear model summary

Model1. $y_{tlac10} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model2. $y_{tlac10} = \beta_0 + \beta_1 T25\text{fw} + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model3. $y_{tlac10} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model1

```
lm(formula = Mean.lac_24hrs ~ EDSS + Age + Sex + BMI, data = ac)

Residuals:
    Min      1Q  Median      3Q     Max
-9.4612 -3.0873  0.7169  3.1383  7.3222

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 48.23388    1.37492  35.081   <2e-16 ***
EDSS        -0.72657    0.33664  -2.158   0.0351 *
Age         -0.11070    0.05611  -1.973   0.0534 .
SexMale     -0.79403    1.32942  -0.597   0.5527
BMI         -0.18495    0.10007  -1.848   0.0698 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.677 on 57 degrees of freedom
Multiple R-squared:  0.2443,    Adjusted R-squared:  0.1913
F-statistic: 4.606 on 4 and 57 DF,  p-value: 0.002718
```

Model2

```
lm(formula = Mean.lac_24hrs ~ T25fw + Age + Sex + BMI, data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.7742  -2.8784   0.4767   3.4961   7.4770

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 45.91623    0.97254  47.213   <2e-16 ***
T25fw       -0.03356    0.09454  -0.355   0.7239
Age         -0.14867    0.05633  -2.639   0.0107 *
SexMale     -0.69460    1.38145  -0.503   0.6170
BMI         -0.19880    0.10441  -1.904   0.0620 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.86 on 57 degrees of freedom
Multiple R-squared:  0.1843,    Adjusted R-squared:  0.1271
F-statistic:  3.22 on 4 and 57 DF,  p-value: 0.0188
```

Model3

```
lm(formula = Mean.lac_24hrs ~ TUG + Age + Sex + BMI, data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.7145  -2.9042   0.4751   3.5224   7.4688

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 45.91876    0.99272  46.256   <2e-16 ***
TUG         -0.02313    0.06752  -0.343   0.7332
Age         -0.14876    0.05639  -2.638   0.0107 *
SexMale     -0.70095    1.38107  -0.508   0.6137
BMI         -0.20097    0.10385  -1.935   0.0579 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.86 on 57 degrees of freedom
Multiple R-squared:  0.1842,    Adjusted R-squared:  0.127
F-statistic: 3.218 on 4 and 57 DF,  p-value: 0.01888
```

Model Type 1

2hr interval linear model summary

$y_{tlac10_i} = i^{th}\ interval\ for\ i = 1, 2, \ldots, 12$

Model1. $y_{tlac10\_i} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model2. $y_{tlac10\_i} = \beta_0 + \beta_1 T25\text{fw} + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model3. $y_{tlac10\_i} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$

Model1

time.interval	intercept	EDSS	p-value	ajd.R^2
0 -- 2	15.21	0.9065	0.3474	0.1092
2 -- 4	10.97	0.184	0.737	0.05882
4 -- 6	13.5	-0.0948	0.8518	0.008287
6 -- 8	40.44	-1.419	0.2583	0.04539
8 -- 10	58.64	-0.576	0.5975	0.1026
10 -- 12	66.34	-0.6024	0.3701	0.1386
12 -- 14	69.31	-1.213	0.01712	0.1763
14 -- 16	68.57	-1.068	0.03063	0.2215
16 -- 18	71.32	-1.717	0.000412	0.4037
18 -- 20	72.07	-2.273	2.56E-05	0.4382
20 -- 22	61.09	-1.641	0.0326	0.2071
22 -- 24	31.34	0.796	0.5022	0.06388

Model2

time.interval	intercept	T25fw	p-value	ajd.R^2
0 -- 2	12.61	0.8592	0.000545	0.2677
2 -- 4	9.065	0.3787	0.008422	0.166
4 -- 6	13.14	0.0046	0.9733	0.007694
6 -- 8	40.44	-0.7385	0.02705	0.1045
8 -- 10	61.82	-0.7724	0.006912	0.2074
10 -- 12	65.9	-0.2484	0.1695	0.155
12 -- 14	65.75	-0.1019	0.4692	0.09758
14 -- 16	65.36	-0.07847	0.5642	0.1594
16 -- 18	65.85	-0.08128	0.5572	0.2609
18 -- 20	66.08	-0.2919	0.05986	0.278
20 -- 22	55.21	0.02058	0.9226	0.1405
22 -- 24	29.78	0.647	0.04023	0.1241

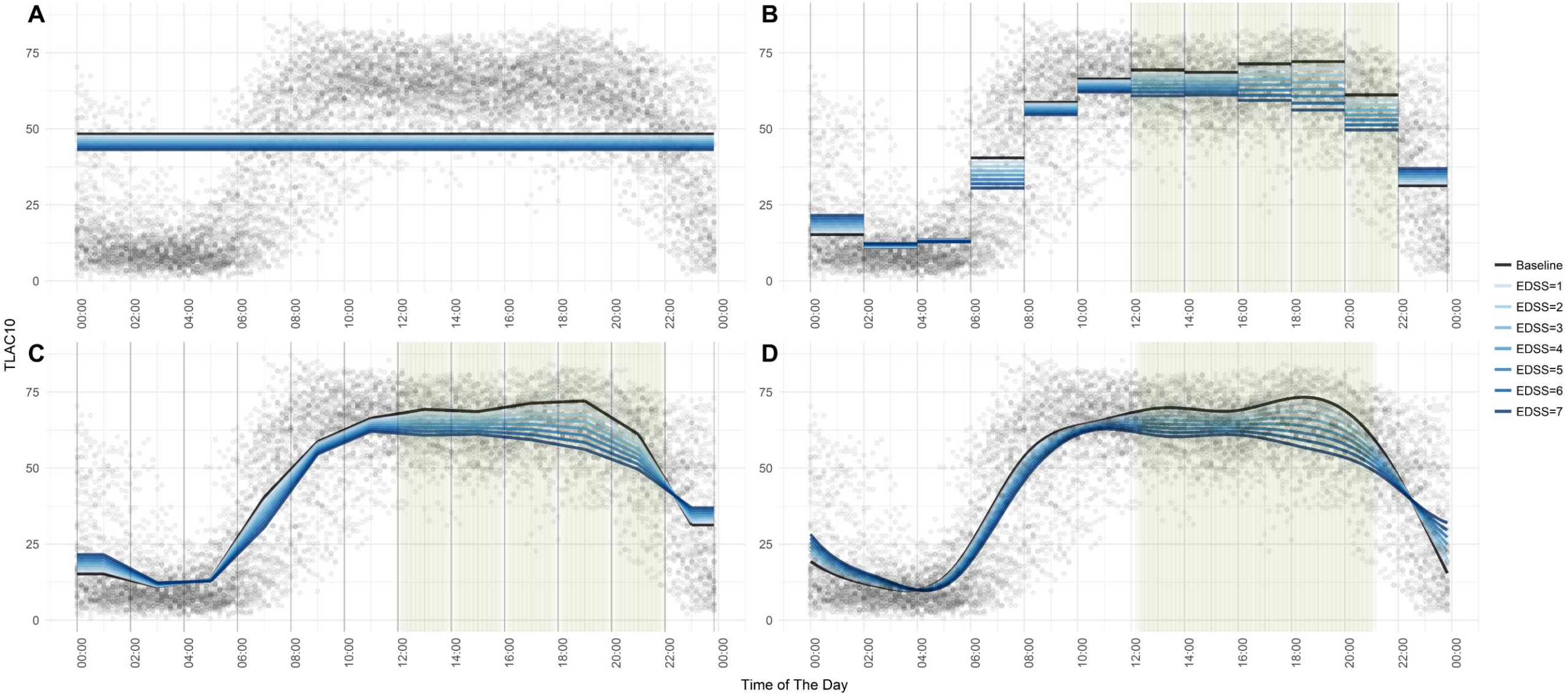
Model3

time.interval	intercept	TUG	p-value	ajd.R^2
0 -- 2	12.09	0.6382	0.000302	0.2819
2 -- 4	9.518	0.2122	0.04108	0.1241
4 -- 6	13.21	-0.00366	0.9702	0.007698
6 -- 8	40.85	-0.5447	0.02221	0.1099
8 -- 10	61.95	-0.5396	0.008324	0.2027
10 -- 12	65.81	-0.1595	0.2175	0.1495
12 -- 14	65.85	-0.0796	0.4281	0.09924
14 -- 16	65.68	-0.08657	0.3721	0.1662
16 -- 18	65.88	-0.05818	0.5563	0.2609
18 -- 20	66.13	-0.2045	0.06505	0.2762
20 -- 22	55.09	0.02565	0.8654	0.1408
22 -- 24	28.97	0.5226	0.01965	0.143

Model Type 1 – Plot of EDSS

Model 1

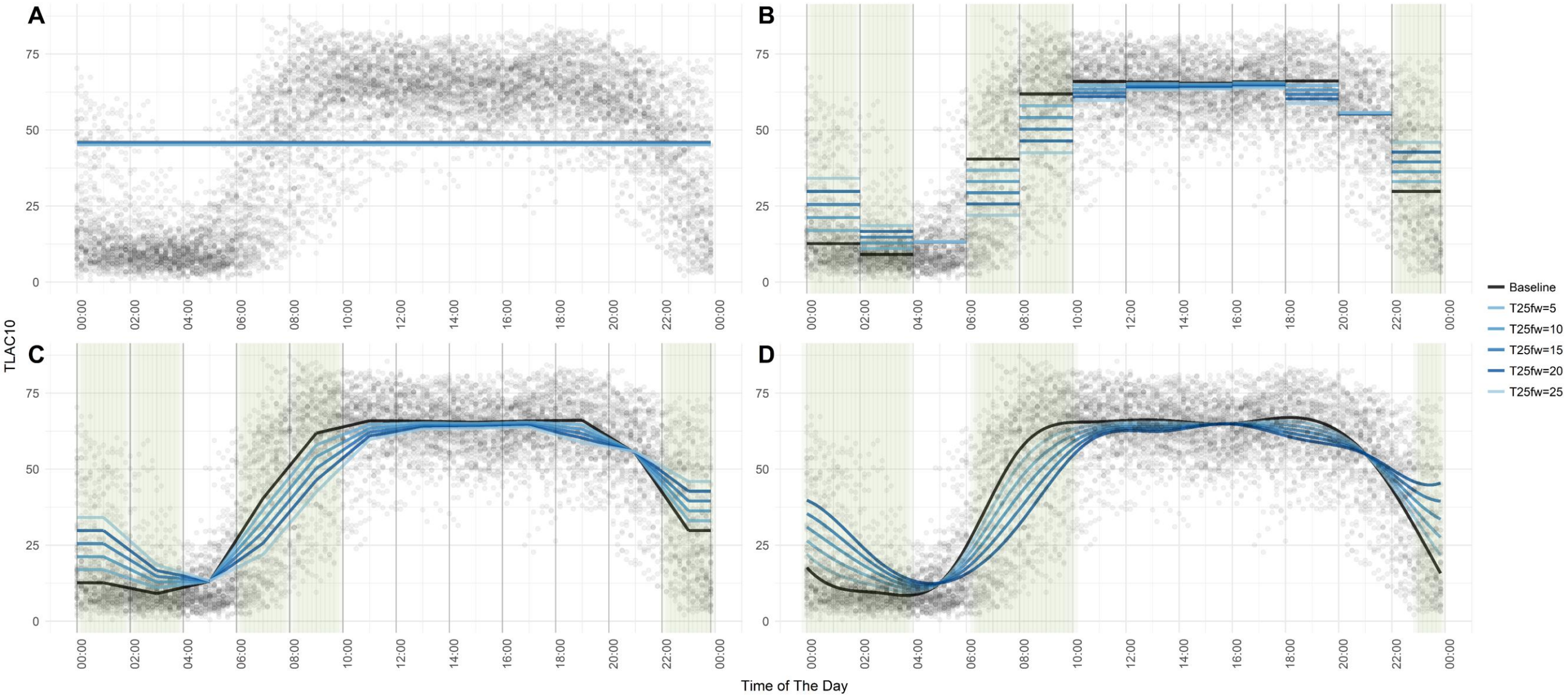
$$y_{tlac10} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$$



Model Type 1 – Plot of T25fw

Model 2

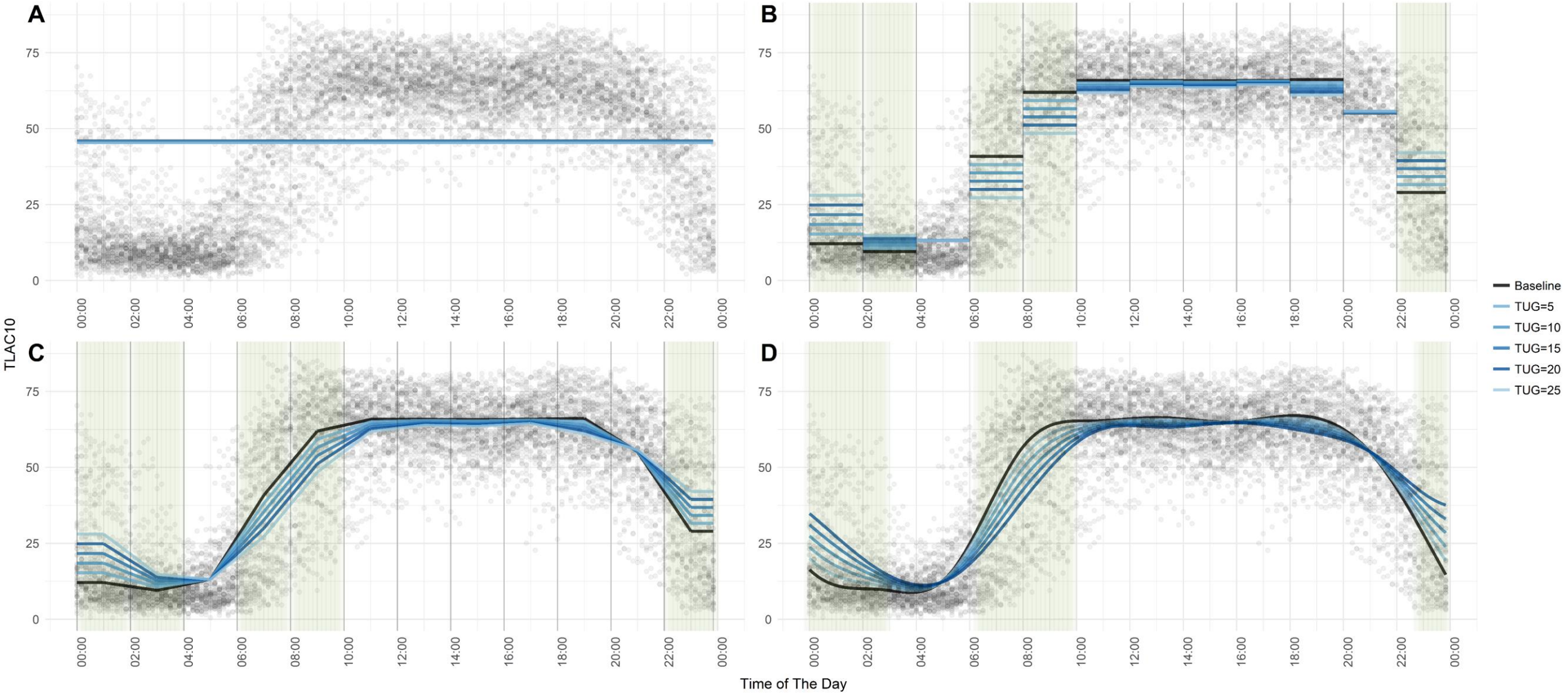
$$y_{tlac10} = \beta_0 + \beta_1 T25fw + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$$



Model Type 1 – Plot of TUG

Model 3

$$y_{tlac10} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$$



Model Type 2

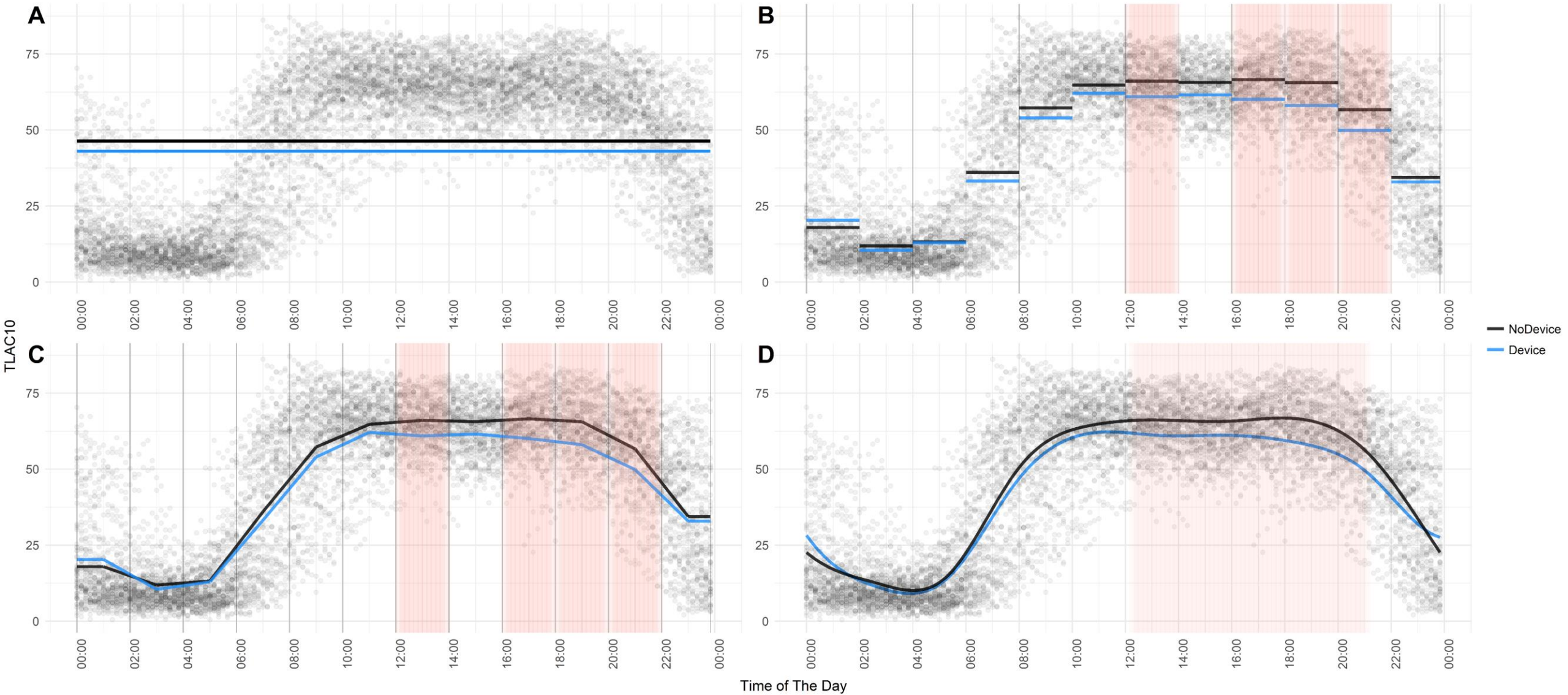
$$y_{tlac10} = \beta_0 + \beta_1 Device + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male$$

```
lm(formula = Mean.lac_24hrs ~ Device + TUG + Age + Sex + BMI,
    data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.9055  -2.7532   0.7812   2.8723   6.9508

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 45.97136    0.95775  47.999   <2e-16 ***
Device1     -3.71568    1.61810  -2.296   0.0254 *
TUG          0.04415    0.07141   0.618   0.5389
Age         -0.13176    0.05489  -2.400   0.0197 *
SexMale     -0.31089    1.34283  -0.232   0.8178
BMI         -0.18659    0.10036  -1.859   0.0682 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.687 on 56 degrees of freedom
Multiple R-squared:  0.2544,    Adjusted R-squared:  0.1878
F-statistic: 3.822 on 5 and 56 DF,  p-value: 0.004761
```

time.interval	intercept	Device1	p-value	ajd.R^2
0 -- 2	12.15	-4.322	0.2982	0.2957
2 -- 4	9.576	-4.065	0.1077	0.164
4 -- 6	13.21	-0.3278	0.8938	0.008017
6 -- 8	40.81	2.723	0.6404	0.1133
8 -- 10	61.92	2.072	0.6766	0.2052
10 -- 12	65.83	-1.411	0.6611	0.1524
12 -- 14	65.92	-5.264	0.03242	0.1705
14 -- 16	65.74	-3.942	0.09961	0.206
16 -- 18	65.98	-7.139	0.002681	0.3717
18 -- 20	66.23	-6.812	0.01039	0.357
20 -- 22	55.21	-8.458	0.02241	0.2179
22 -- 24	29.08	-7.642	0.1596	0.173

Model Type 2 – Plot of Device

$$y_{tlac10} = \beta_0 + \beta_1 Device + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale$$



Model Type 3

24hr interval linear model summary

Model1. $y_{tlac10} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model2. $y_{tlac10} = \beta_0 + \beta_1 T25\text{fw} + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model3. $y_{tlac10} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model1

```
lm(formula = Mean.lac_24hrs ~ EDSS + Age + Sex + BMI + Device,
    data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.0300  -2.9751   0.3075   3.4920   6.8464

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 47.52782    1.51345  31.404   <2e-16 ***
EDSS        -0.40673    0.44329  -0.918   0.3628
Age         -0.11149    0.05601  -1.991   0.0514 .
SexMale     -0.51427    1.35072  -0.381   0.7048
BMI         -0.18063    0.09995  -1.807   0.0761 .
Device1     -2.14468    1.93901  -1.106   0.2734
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.668 on 56 degrees of freedom
Multiple R-squared:  0.2604,    Adjusted R-squared:  0.1944
F-statistic: 3.944 on 5 and 56 DF,  p-value: 0.003911
```

Model2

```
lm(formula = Mean.lac_24hrs ~ T25fw + Age + Sex + BMI + Device,
    data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.7881  -2.7318   0.7845   2.8624   6.9147

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 46.02090    0.93975  48.971   <2e-16 ***
T25fw        0.05588    0.09933   0.563   0.5759
Age         -0.13116    0.05491  -2.389   0.0203 *
SexMale     -0.32481    1.34313  -0.242   0.8098
BMI         -0.18990    0.10085  -1.883   0.0649 .
Device1     -3.66259    1.60732  -2.279   0.0265 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.69 on 56 degrees of freedom
Multiple R-squared:  0.2535,    Adjusted R-squared:  0.1869
F-statistic: 3.804 on 5 and 56 DF,  p-value: 0.004897
```

Model3

```
lm(formula = Mean.lac_24hrs ~ TUG + Age + Sex + BMI + Device,
    data = ac)

Residuals:
     Min       1Q   Median       3Q      Max
-10.9055  -2.7532   0.7812   2.8723   6.9508

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 45.97136    0.95775  47.999   <2e-16 ***
TUG          0.04415    0.07141   0.618   0.5389
Age         -0.13176    0.05489  -2.400   0.0197 *
SexMale     -0.31089    1.34283  -0.232   0.8178
BMI         -0.18659    0.10036  -1.859   0.0682 .
Device1     -3.71568    1.61810  -2.296   0.0254 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.687 on 56 degrees of freedom
Multiple R-squared:  0.2544,    Adjusted R-squared:  0.1878
F-statistic: 3.822 on 5 and 56 DF,  p-value: 0.004761
```

Model Type3

2hr interval linear model summary of
EDSS/T25fw/TUG

Model1. $y_{tlac10\_i} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model2. $y_{tlac10\_i} = \beta_0 + \beta_1 T25\text{fw} + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model3. $y_{tlac10\_i} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model1

time.interval	intercept	EDSS	p-value	ajd.R^2
0 -- 2	15.07	0.9707	0.449	0.1093
2 -- 4	9.861	0.6857	0.344	0.07769
4 -- 6	13.48	-0.0854	0.8994	0.008295
6 -- 8	41.16	-1.744	0.296	0.04693
8 -- 10	57.69	-0.1475	0.9188	0.1059
10 -- 12	65.8	-0.3591	0.6869	0.1413
12 -- 14	68.36	-0.7838	0.2342	0.1911
14 -- 16	67.97	-0.7989	0.2163	0.2273
16 -- 18	70.41	-1.306	0.03455	0.4151
18 -- 20	71.45	-1.993	0.003704	0.4425
20 -- 22	59.88	-1.093	0.2748	0.2172
22 -- 24	29.18	1.774	0.2591	0.07914

Model2

time.interval	intercept	T25fw	p-value	ajd.R^2
0 -- 2	12.71	0.9505	0.000466	0.2783
2 -- 4	9.195	0.4895	0.001615	0.2164
4 -- 6	13.15	0.01433	0.9242	0.008171
6 -- 8	40.37	-0.7942	0.03012	0.1069
8 -- 10	61.76	-0.82	0.00884	0.2097
10 -- 12	65.94	-0.2175	0.2714	0.1574
12 -- 14	65.9	0.02738	0.8531	0.1707
14 -- 16	65.48	0.02517	0.8623	0.2061
16 -- 18	66.06	0.09116	0.5161	0.3709
18 -- 20	66.27	-0.127	0.4232	0.3586
20 -- 22	55.44	0.2211	0.3225	0.2142
22 -- 24	29.97	0.8101	0.01853	0.1473

Model3

time.interval	intercept	TUG	p-value	ajd.R^2
0 -- 2	12.15	0.7165	0.000225	0.2957
2 -- 4	9.576	0.2858	0.01176	0.164
4 -- 6	13.21	0.002276	0.9832	0.008017
6 -- 8	40.81	-0.594	0.0239	0.1133
8 -- 10	61.92	-0.5771	0.01052	0.2052
10 -- 12	65.83	-0.134	0.3471	0.1524
12 -- 14	65.92	0.01571	0.8826	0.1705
14 -- 16	65.74	-0.0152	0.8842	0.206
16 -- 18	65.98	0.07109	0.4813	0.3717
18 -- 20	66.23	-0.08117	0.4769	0.357
20 -- 22	55.21	0.1788	0.2654	0.2179
22 -- 24	29.08	0.661	0.007116	0.173

Model Type3

2hr interval linear model summary of
Device

Model1. $y_{tlac10\_i} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model2. $y_{tlac10\_i} = \beta_0 + \beta_1 T25\text{fw} + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model3. $y_{tlac10\_i} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 SexMale + \beta_5 \text{Device1}$

Model1

time.interval	intercept	Device1	p-value	ajd.R^2
0 -- 2	15.07	-0.431	0.9386	0.1093
2 -- 4	9.861	-3.364	0.289	0.07769
4 -- 6	13.48	-0.06298	0.983	0.008295
6 -- 8	41.16	2.177	0.7645	0.04693
8 -- 10	57.69	-2.873	0.6504	0.1059
10 -- 12	65.8	-1.632	0.6754	0.1413
12 -- 14	68.36	-2.881	0.3166	0.1911
14 -- 16	67.97	-1.803	0.5213	0.2273
16 -- 18	70.41	-2.751	0.3016	0.4151
18 -- 20	71.45	-1.88	0.5164	0.4425
20 -- 22	59.88	-3.677	0.4	0.2172
22 -- 24	29.18	-6.558	0.3394	0.07914

Model2

time.interval	intercept	Device1	p-value	ajd.R^2
0 -- 2	12.71	-3.74	0.3699	0.2783
2 -- 4	9.195	-4.538	0.06278	0.2164
4 -- 6	13.15	-0.3983	0.8702	0.008171
6 -- 8	40.37	2.279	0.6946	0.1069
8 -- 10	61.76	1.95	0.6917	0.2097
10 -- 12	65.94	-1.265	0.6912	0.1574
12 -- 14	65.9	-5.293	0.03033	0.1707
14 -- 16	65.48	-4.244	0.07469	0.2061
16 -- 18	66.06	-7.061	0.002789	0.3709
18 -- 20	66.27	-6.755	0.01039	0.3586
20 -- 22	55.44	-8.21	0.02578	0.2142
22 -- 24	29.97	-6.677	0.2218	0.1473

Model3

time.interval	intercept	Device1	p-value	ajd.R^2
0 -- 2	12.15	-4.322	0.2982	0.2957
2 -- 4	9.576	-4.065	0.1077	0.164
4 -- 6	13.21	-0.3278	0.8938	0.008017
6 -- 8	40.81	2.723	0.6404	0.1133
8 -- 10	61.92	2.072	0.6766	0.2052
10 -- 12	65.83	-1.411	0.6611	0.1524
12 -- 14	65.92	-5.264	0.03242	0.1705
14 -- 16	65.74	-3.942	0.09961	0.206
16 -- 18	65.98	-7.139	0.002681	0.3717
18 -- 20	66.23	-6.812	0.01039	0.357
20 -- 22	55.21	-8.458	0.02241	0.2179
22 -- 24	29.08	-7.642	0.1596	0.173

Comments

For models with predictors: EDSS/T25fw/TUG+Device:

- The significance region of EDSS+Device is correlated
- The significance region of T25fw/TUG+Device is complementary

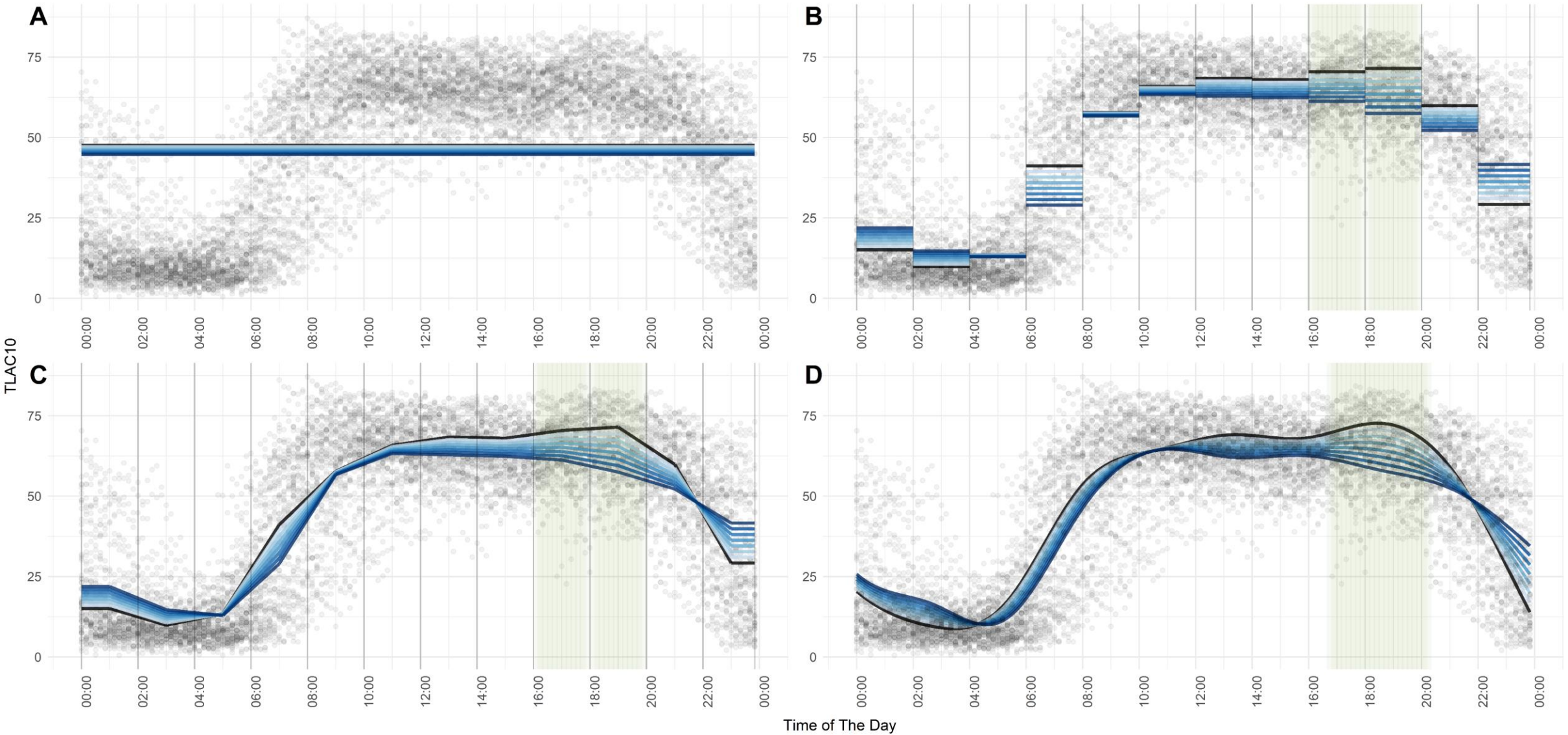
TALC10 decreases through the day when use a walking device, i.e. less activities for device users.

This makes sense, since subjects who use a device have EDSS score >4

Model Type 3 – Plot of EDSS

Model 1: EDSS+DEVICE

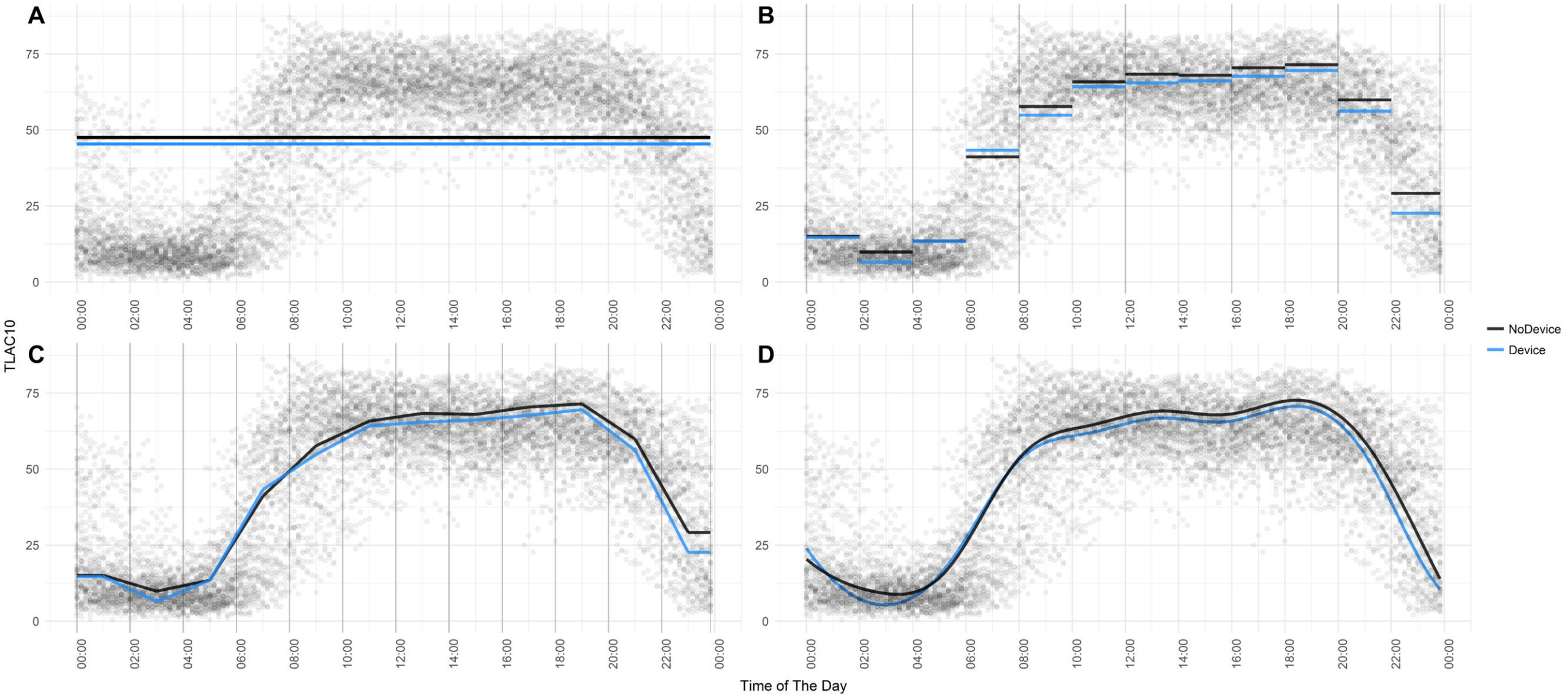
$$y_{tlac10} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$



Model Type 3 – Plot of Device

Model 1: EDSS+DEVICE

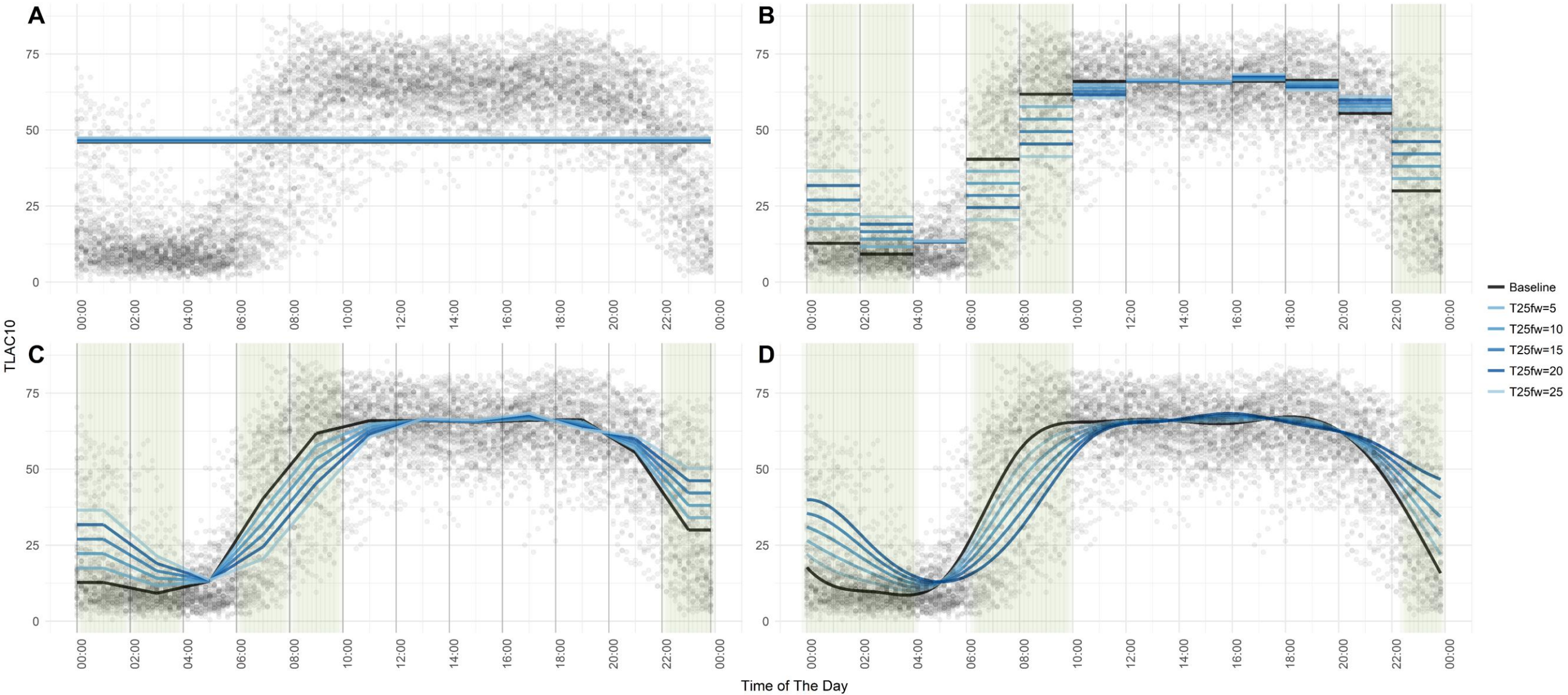
$$y_{tlac10} = \beta_0 + \beta_1 EDSS + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$



Model Type 3 – Plot of T25fw

Model 2: T25fw+DEVICE

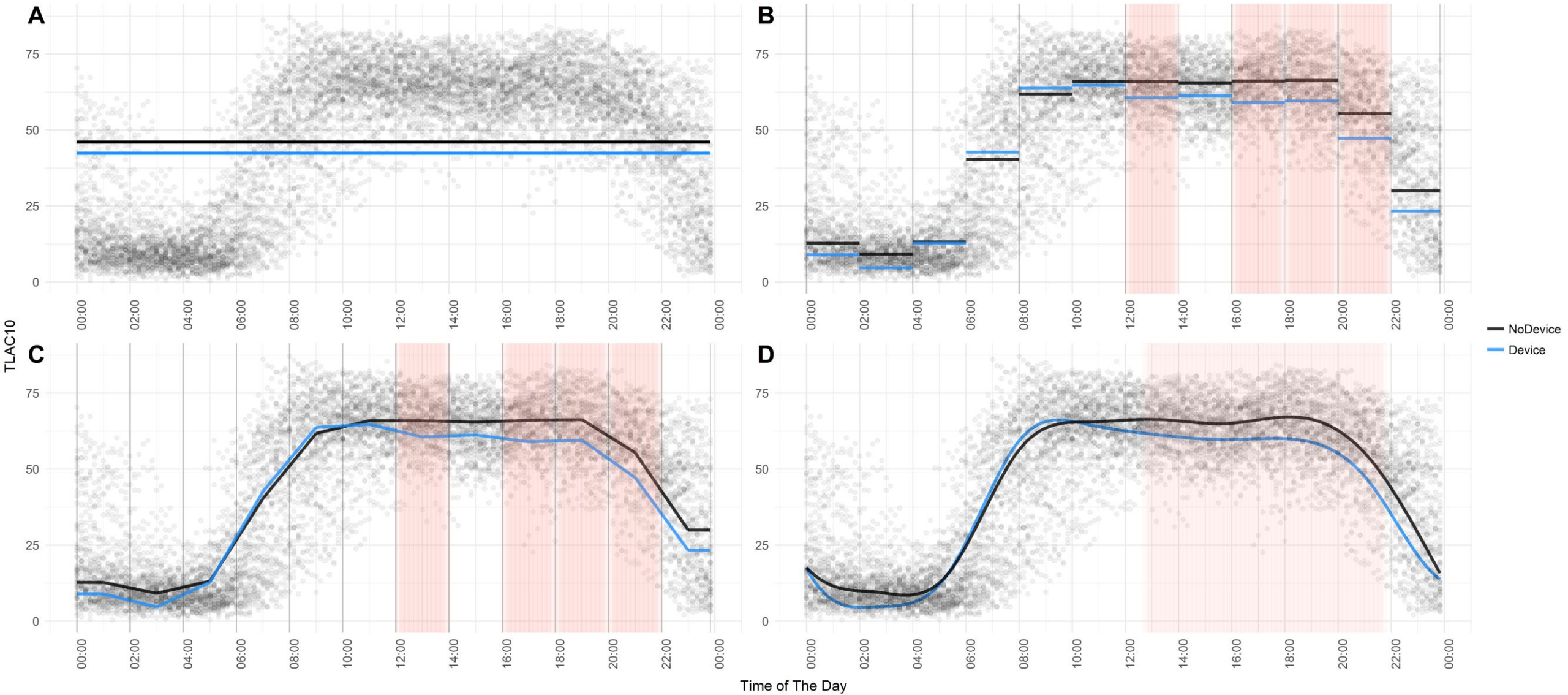
$$y_{tlac10} = \beta_0 + \beta_1 T25fw + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$



Model Type 3 – Plot of Device

Model 2: T25fw+DEVICE

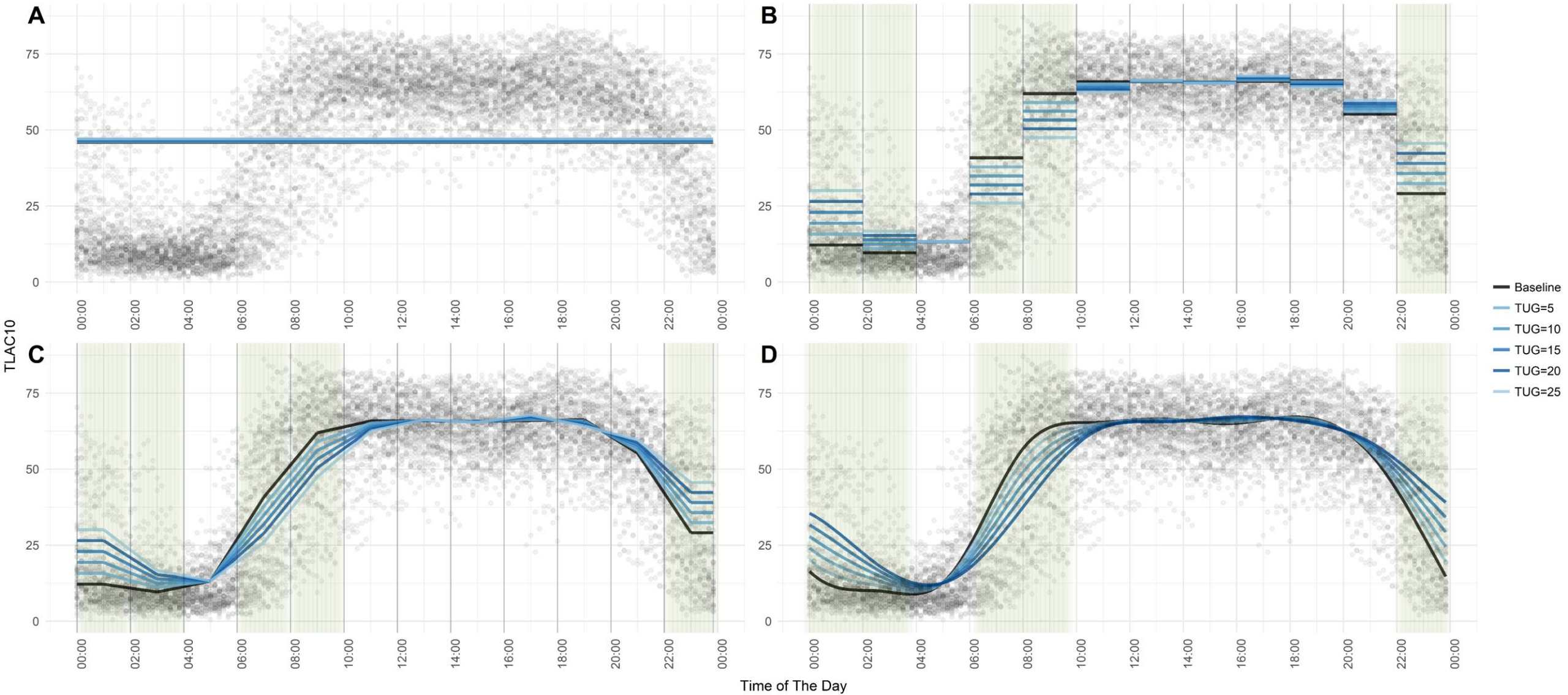
$$y_{tlac10} = \beta_0 + \beta_1 T25fw + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$



Model Type 3 – Plot of TUG

Model 3: TUG+DEVICE

$$y_{tlac10} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$



Model Type 3 – Plot of Device

Model 3: TUG+DEVICE

$$y_{tlac10} = \beta_0 + \beta_1 TUG + \beta_2 Centered.Age + \beta_3 Centered.BMI + \beta_4 Male + \beta_5 \text{Device1}$$