

Advanced Analysis

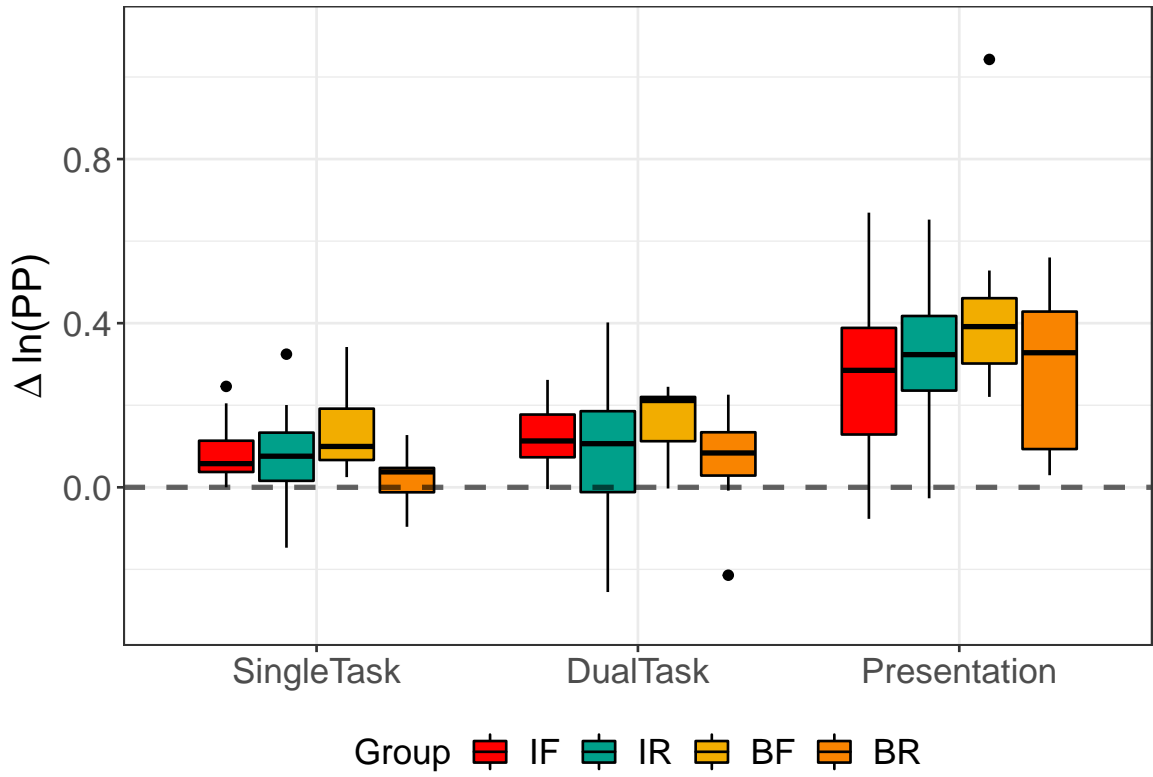
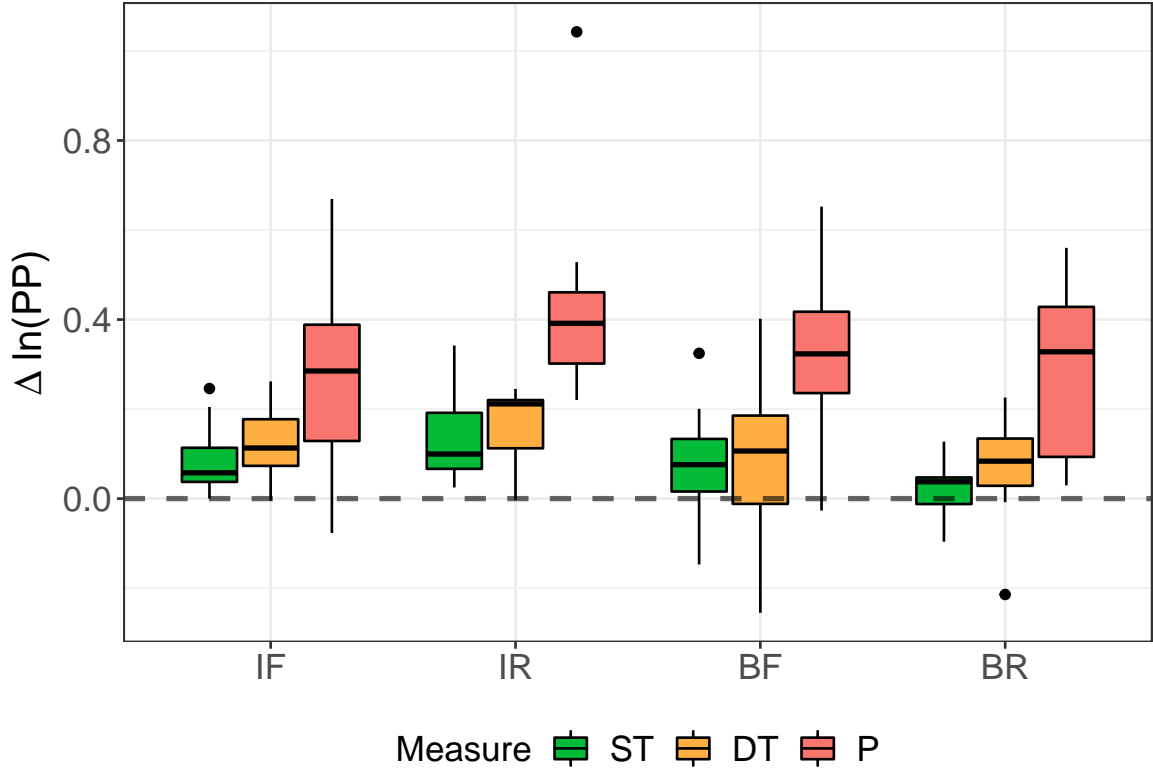
PP, 4 Groups:

Stress Levels Across Activities

Our Linear Model:

$$\Delta \ln(\bar{PP}) = 1 + \text{Group} + \text{Activity} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: diff_df
##           AIC           BIC    logLik
##    -217.9042  -188.0412  117.9521
##
## Random effects:
## Formula: ~1 | Subject
##           (Intercept) Residual
## StdDev:  0.08439434  0.109936
##
## Fixed effects: PP ~ 1 + Group + Session
##               Value Std.Error DF   t-value p-value
## (Intercept)  0.00405522  0.03310891 154   0.122481  0.9027
## GroupIL      0.13736382  0.04148696  50   3.311012  0.0017
## GroupBH      0.06887557  0.04013029  50   1.716299  0.0923
## GroupIH      0.07134866  0.04013029  50   1.777925  0.0815
## SessionSC    -0.02992264  0.02140325 154  -1.398042  0.1641
## SessionDT     0.03060513  0.02115720 154   1.446559  0.1501
## SessionP      0.24887255  0.02153411 154  11.557130  0.0000
## Correlation:
##           (Intr) GropIL GropBH GropIH SssnSC SssnDT
## GroupIL    -0.678
## GroupBH    -0.700  0.558
## GroupIH    -0.700  0.558  0.578
## SessionSC  -0.320  0.000  0.006  0.006
## SessionDT  -0.320  0.000  0.000  0.000  0.494
## SessionP   -0.310  0.005 -0.008 -0.008  0.485  0.491
##
## Standardized Within-Group Residuals:
##           Min           Q1           Med           Q3           Max
## -2.80451618 -0.46110113 -0.05904604  0.49164957  4.97821652
##
## Number of Observations: 211
## Number of Groups: 54
```

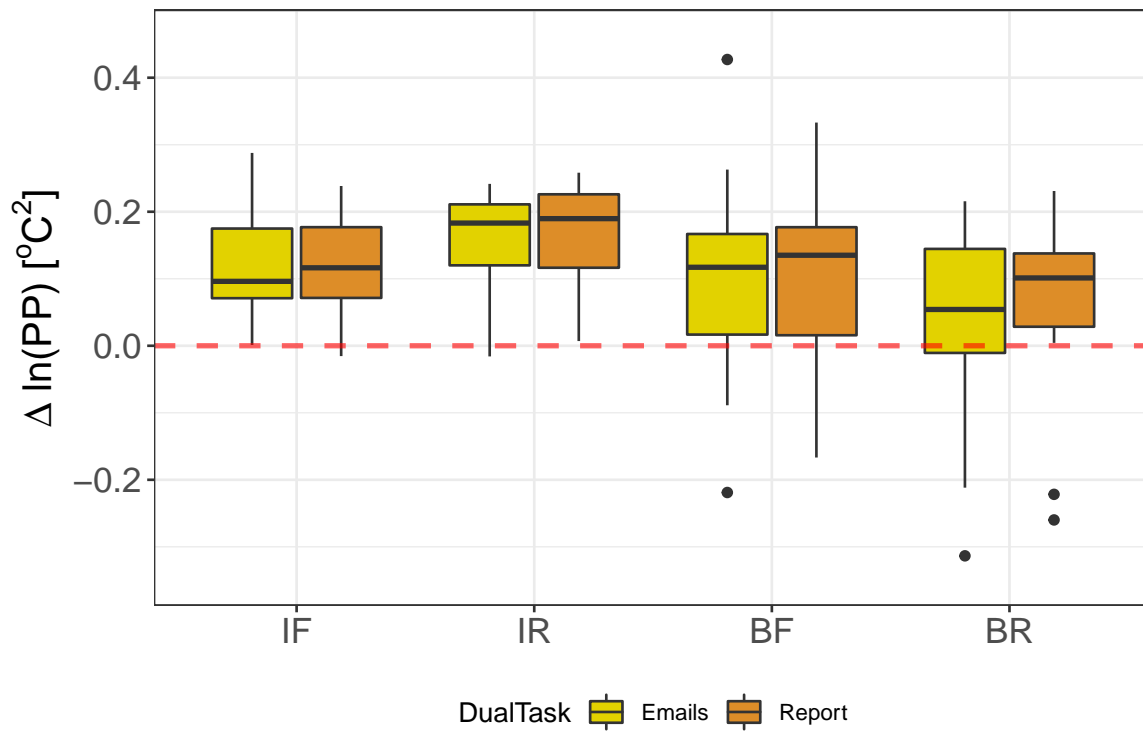


Stress Levels for Dual Task

Our Linear Model:

$$\Delta \ln(\bar{P}P) = 1 + \text{Group} + \text{DualTask} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: total_df
##      AIC      BIC    logLik
##   -220.9205 -202.6146 117.4602
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept)  Residual
## StdDev:    0.1163698 0.03056676
##
## Fixed effects: PP ~ 1 + Group + DualTask
##              Value Std.Error DF   t-value p-value
## (Intercept)  0.03425575 0.03581018 52 0.9565927 0.3432
## GroupIL      0.12279506 0.04848894 49 2.5324346 0.0146
## GroupBH      0.06040041 0.04768862 49 1.2665583 0.2113
## GroupIH      0.08001020 0.04698398 49 1.7029253 0.0949
## DualTaskEssay 0.01111101 0.00593781 52 1.8712288 0.0669
## Correlation:
##      (Intr) GropIL GropBH GropIH
## GroupIL      -0.733
## GroupBH      -0.746 0.551
## GroupIH      -0.757 0.559 0.568
## DualTaskEssay -0.083 0.000 0.000 0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.55629029 -0.34392496 0.01539493 0.29534336 2.62089361
##
## Number of Observations: 106
## Number of Groups: 53
```



```
## Paired t-test
## For IH, p = 0.3643 > 0.05
```

```
## Paired t-test
## For IL, p = 0.0825 > 0.05
```

```
## Paired t-test
## For BH, p = 0.7465 > 0.05
```

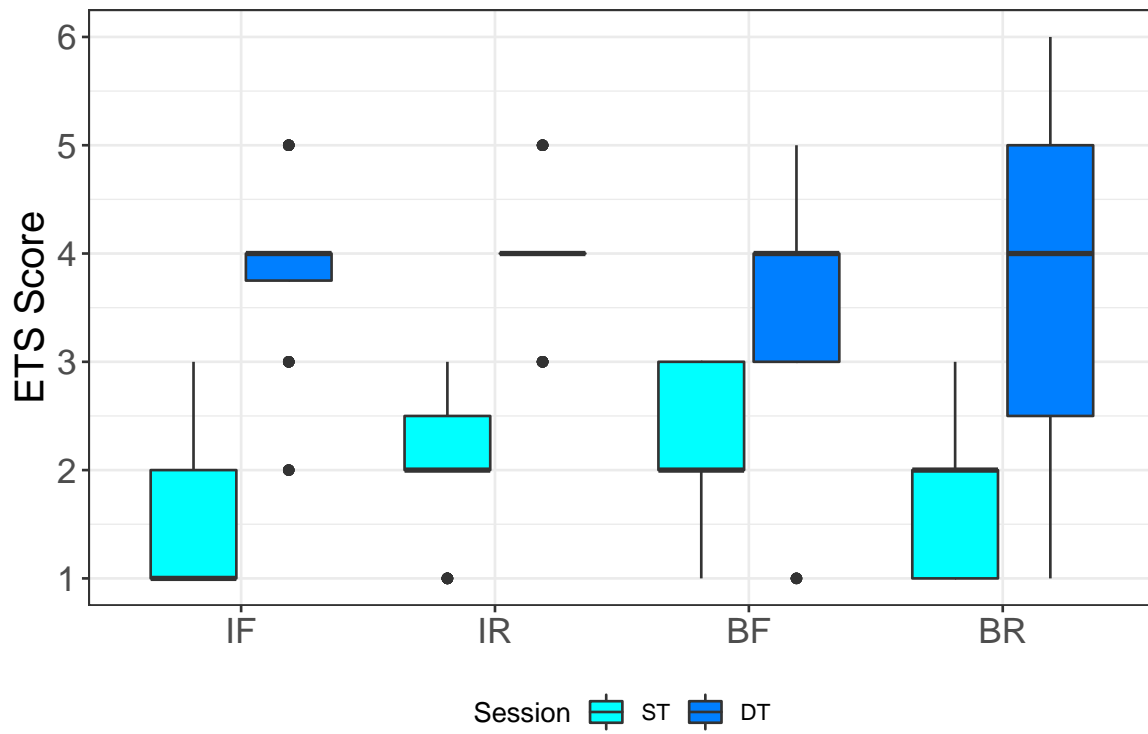
```
## Paired t-test
## For BL, p = 0.2322 > 0.05
```

Linear Modelling for Writing Quality

Our Linear Model:

$$WritingQuality = 1 + Group + Session + 1|Subject$$

```
## Linear mixed-effects model fit by REML
## Data: full_df
##      AIC      BIC    logLik
##  814.222 842.1447 -400.111
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:   0.7368648 0.5461497
##
## Fixed effects: Score ~ 1 + Group + Session
##              Value Std.Error   DF  t-value p-value
## (Intercept) 1.6667483 0.2329475 351   7.15504  0.0000
## GroupIL      0.4034307 0.3040668  48   1.32678  0.1909
## GroupBH      0.3972397 0.3194899  48   1.24336  0.2198
## GroupIH      0.1122665 0.3097909  48   0.36239  0.7186
## SessionDT    1.8663366 0.0543439 351  34.34306  0.0000
## Correlation:
##      (Intr) GropIL GropBH GropIH
## GroupIL   -0.756
## GroupBH   -0.719  0.551
## GroupIH   -0.742  0.568  0.541
## SessionDT -0.117  0.000  0.000  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.72900544 -0.72894866 -0.02674991  0.76816710  2.51925629
##
## Number of Observations: 404
## Number of Groups: 52
```



Session	Group	n
WB	BR	43
WB	IR	59
WB	BF	48
WB	IF	52
DT	BR	43
DT	IR	59
DT	BF	48
DT	IF	52

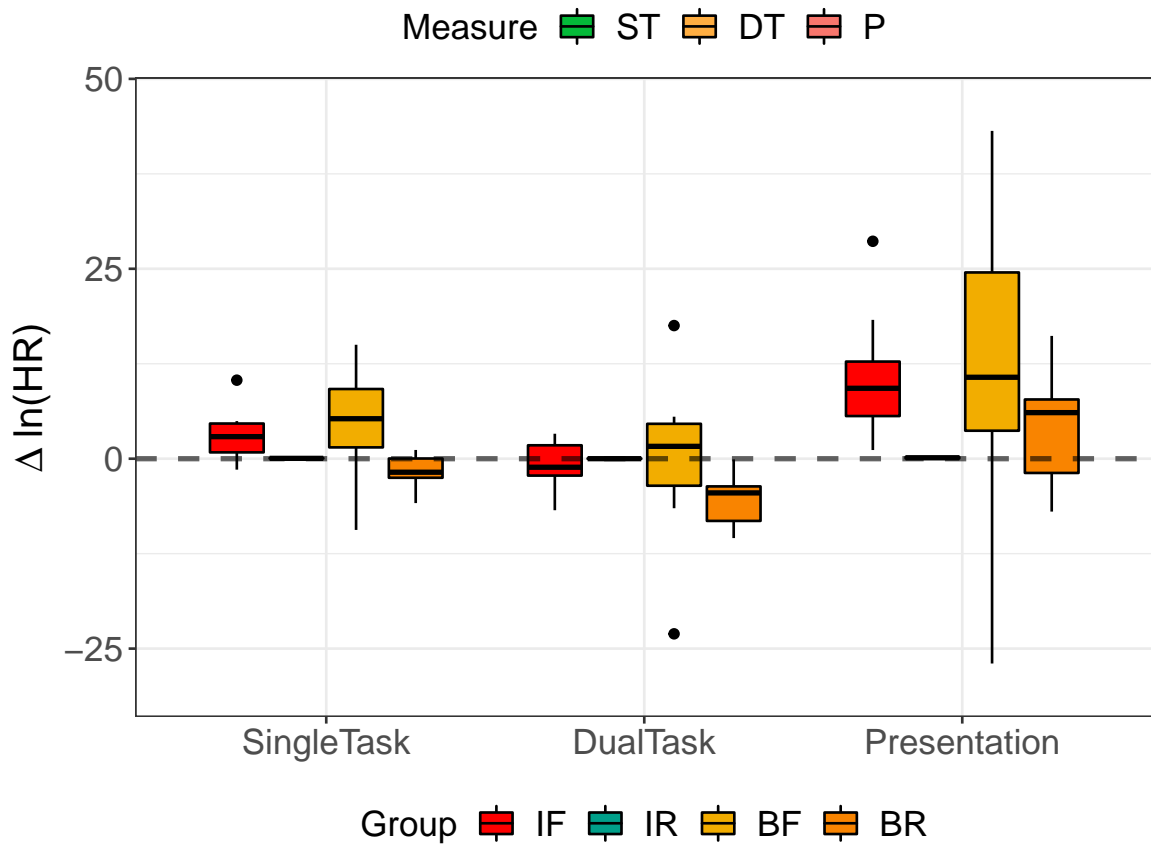
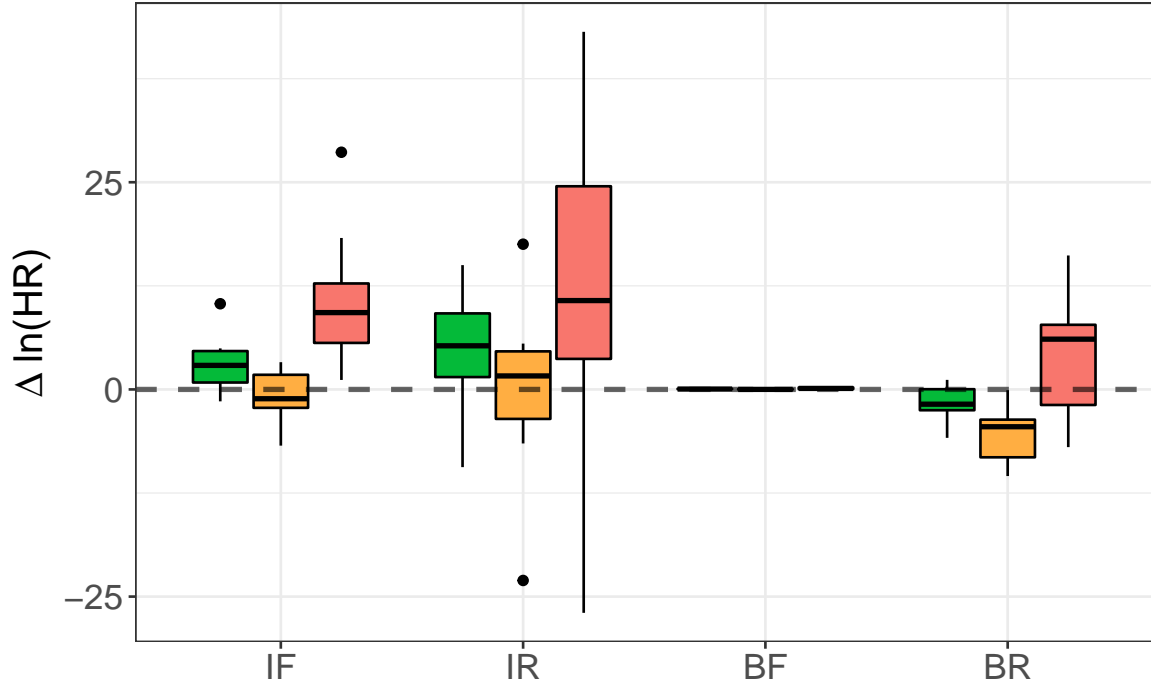
HR, 4 Groups:

Stress Levels Across Activities

Our Linear Model:

$$\Delta \bar{HR} = 1 + \text{Group} + \text{Activity} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: diff_df
##      AIC      BIC    logLik
## 1167.934 1196.314 -574.9671
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:    4.611047  5.27251
##
## Fixed effects: HR ~ 1 + Group + Session
##              Value Std.Error DF   t-value p-value
## (Intercept) -0.460108  2.006015 130 -0.229364  0.8189
## GroupIL      4.116425  2.375528  43  1.732846  0.0903
## GroupBH      0.731044  2.371155  43  0.308307  0.7593
## GroupIH      3.855041  2.491648  43  1.547185  0.1291
## SessionSC    -2.385293  1.095374 130 -2.177606  0.0312
## SessionDT    -2.921984  1.087636 130 -2.686547  0.0082
## SessionP      4.902909  1.145331 130  4.280781  0.0000
## Correlation:
##      (Intr) GropIL GropBH GropIH SssnSC SssnDT
## GroupIL   -0.754
## GroupBH   -0.754  0.638
## GroupIH   -0.719  0.607  0.609
## SessionSC -0.272  0.000  0.000  0.008
## SessionDT -0.271  0.000  0.000  0.000  0.496
## SessionP  -0.248 -0.003 -0.014 -0.010  0.474  0.475
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -3.58925639 -0.50460601 -0.01629113  0.42226149  5.18860807
##
## Number of Observations: 180
## Number of Groups: 47
```

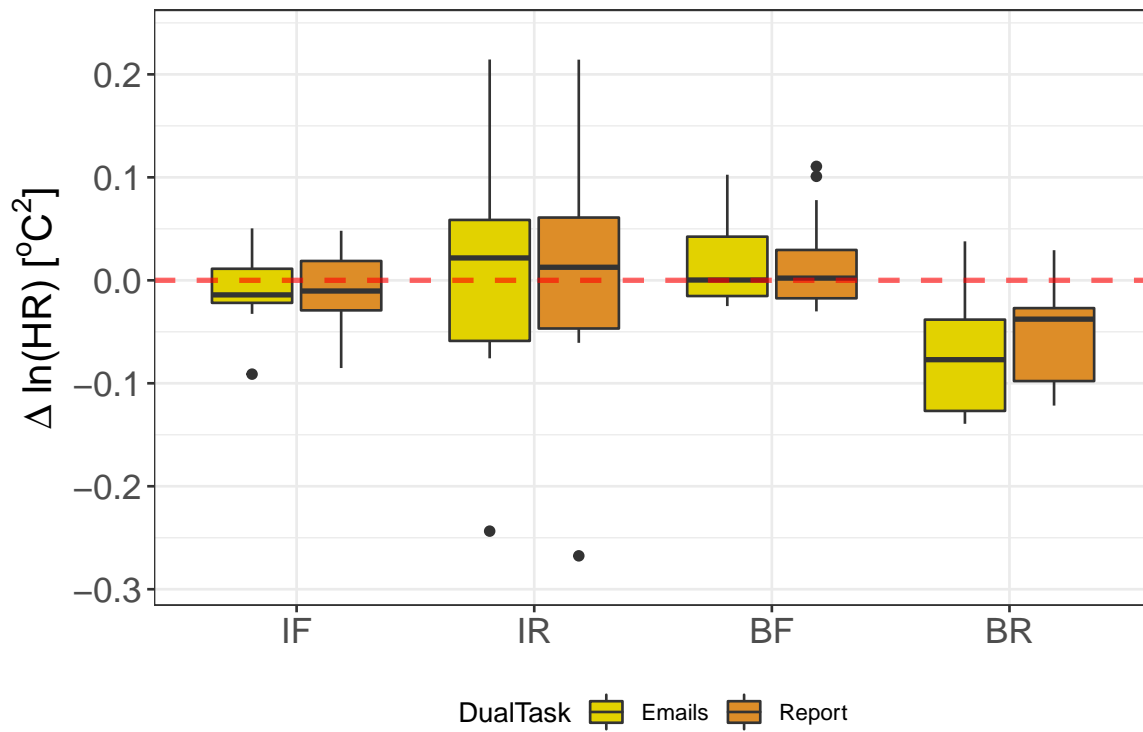


Stress Levels for Dual Task

Our Linear Model:

$$\Delta \bar{HR} = 1 + \text{Group} + \text{DualTask} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: total_df
##      AIC      BIC    logLik
## -297.1249 -279.8636 155.5625
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept)  Residual
## StdDev:  0.06866781 0.01487866
##
## Fixed effects: HR ~ 1 + Group + DualTask
##              Value Std.Error DF   t-value p-value
## (Intercept) -0.06303756 0.02460997 45 -2.561464  0.0138
## GroupIL      0.06463792 0.03078889 42  2.099391  0.0418
## GroupBH      0.07909728 0.03121653 42  2.533827  0.0151
## GroupIH      0.05271283 0.03227952 42  1.633012  0.1099
## DualTaskEssay 0.00378468 0.00310241 45  1.219914  0.2289
## Correlation:
##      (Intr) GropIL GropBH GropIH
## GroupIL      -0.796
## GroupBH      -0.785  0.628
## GroupIH      -0.759  0.607  0.599
## DualTaskEssay -0.063  0.000  0.000  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -1.57573720 -0.44301705 -0.03874386  0.49969482  1.76241874
##
## Number of Observations: 92
## Number of Groups: 46
```



```
## Paired t-test
## For IH, p = 0.7175 > 0.05
```

```
## Paired t-test
## For IL, p = 0.8392 > 0.05
```

```
## Paired t-test
## For BH, p = 0.8956 > 0.05
```

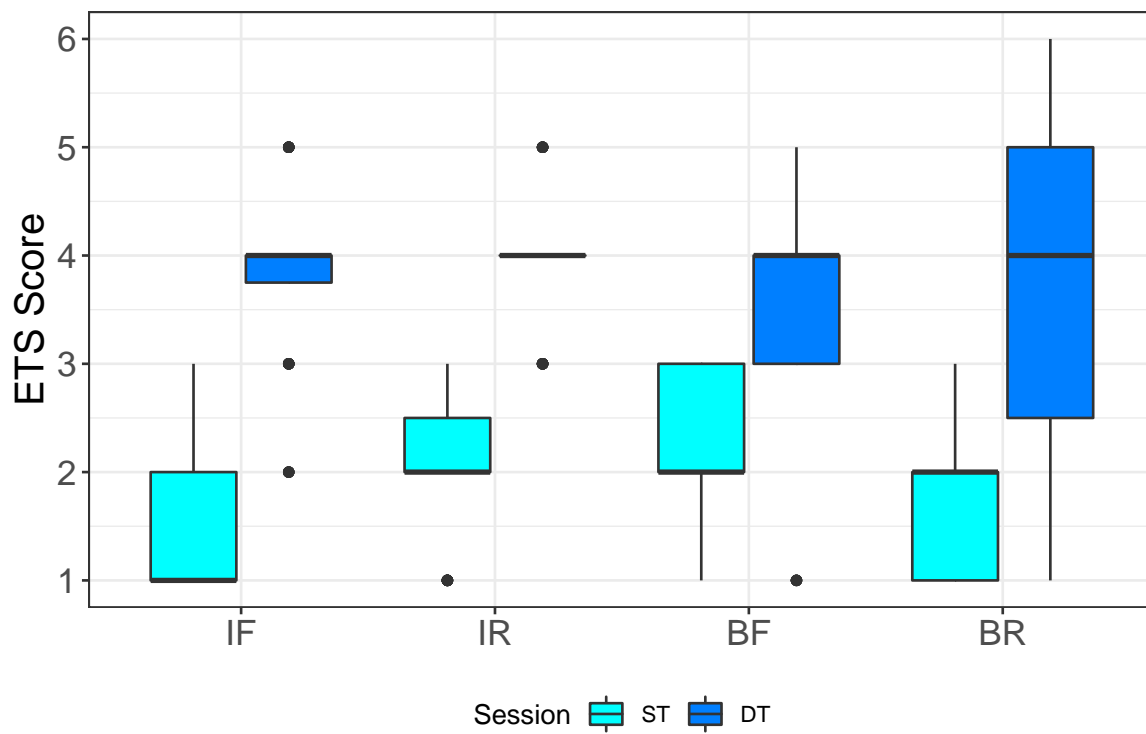
```
## Paired t-test
## For BL, p = 0.1669 > 0.05
```

Linear Modelling for Writing Quality

Our Linear Model:

$$WritingQuality = 1 + Group + Session + 1|Subject$$

```
## Linear mixed-effects model fit by REML
## Data: full_df
##      AIC      BIC    logLik
##  814.222 842.1447 -400.111
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:   0.7368648 0.5461497
##
## Fixed effects: Score ~ 1 + Group + Session
##              Value Std.Error   DF  t-value p-value
## (Intercept) 1.6667483 0.2329475 351   7.15504  0.0000
## GroupIL      0.4034307 0.3040668  48   1.32678  0.1909
## GroupBH      0.3972397 0.3194899  48   1.24336  0.2198
## GroupIH      0.1122665 0.3097909  48   0.36239  0.7186
## SessionDT    1.8663366 0.0543439 351  34.34306  0.0000
## Correlation:
##      (Intr) GropIL GropBH GropIH
## GroupIL   -0.756
## GroupBH   -0.719  0.551
## GroupIH   -0.742  0.568  0.541
## SessionDT -0.117  0.000  0.000  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.72900544 -0.72894866 -0.02674991  0.76816710  2.51925629
##
## Number of Observations: 404
## Number of Groups: 52
```



Session	Group	n
WB	BR	43
WB	IR	59
WB	BF	48
WB	IF	52
DT	BR	43
DT	IR	59
DT	BF	48
DT	IF	52

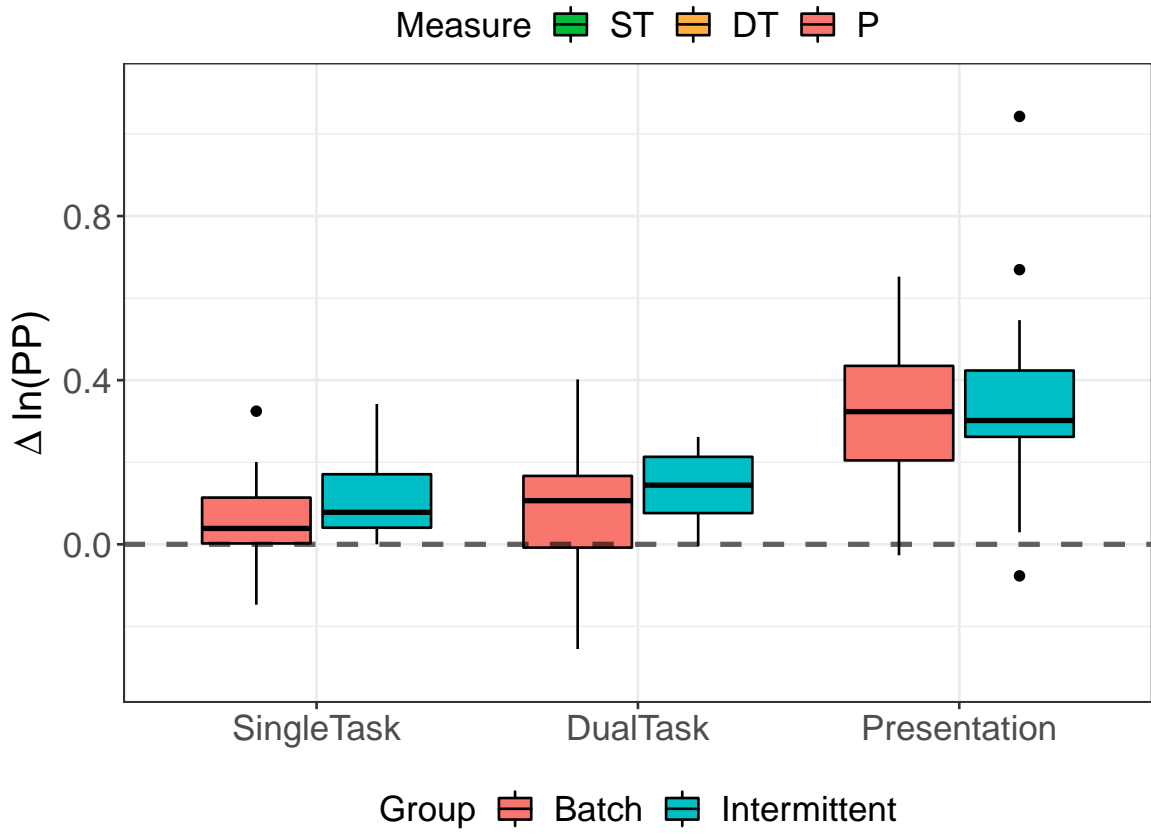
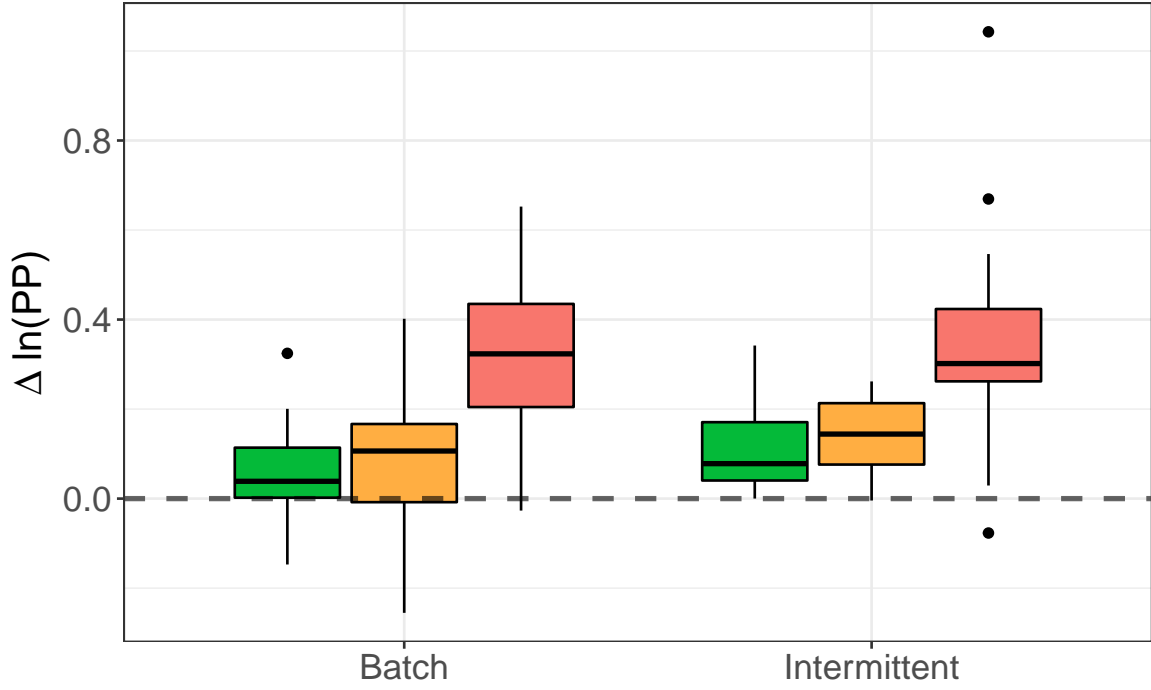
PP, 2 Groups:

Stress Levels Across Activities

Our Linear Model:

$$\Delta \ln(\bar{PP}) = 1 + \text{Group} + \text{Activity} + 1 | \text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: diff_df
##           AIC           BIC    logLik
##    -225.4127  -202.1176  119.7064
##
## Random effects:
## Formula: ~1 | Subject
##           (Intercept) Residual
## StdDev:  0.08889621  0.1099188
##
## Fixed effects: PP ~ 1 + Group + Session
##              Value Std.Error DF   t-value p-value
## (Intercept)  0.04380778 0.02428221 154   1.804110  0.0732
## GroupIntermittent 0.06223053 0.02857538  52   2.177768  0.0340
## SessionSC      -0.02988212 0.02140078 154  -1.396310  0.1646
## SessionDT       0.03060513 0.02115387 154   1.446786  0.1500
## SessionP        0.24849040 0.02153051 154  11.541317  0.0000
## Correlation:
##              (Intr) GrpInt SsnSC SsnDT
## GroupIntermittent -0.610
## SessionSC          -0.430  0.000
## SessionDT          -0.436  0.000  0.494
## SessionP           -0.430  0.004  0.485  0.491
##
## Standardized Within-Group Residuals:
##           Min           Q1           Med           Q3           Max
## -2.85344933 -0.44797216 -0.02754228  0.46481810  5.04181822
##
## Number of Observations: 211
## Number of Groups: 54
```

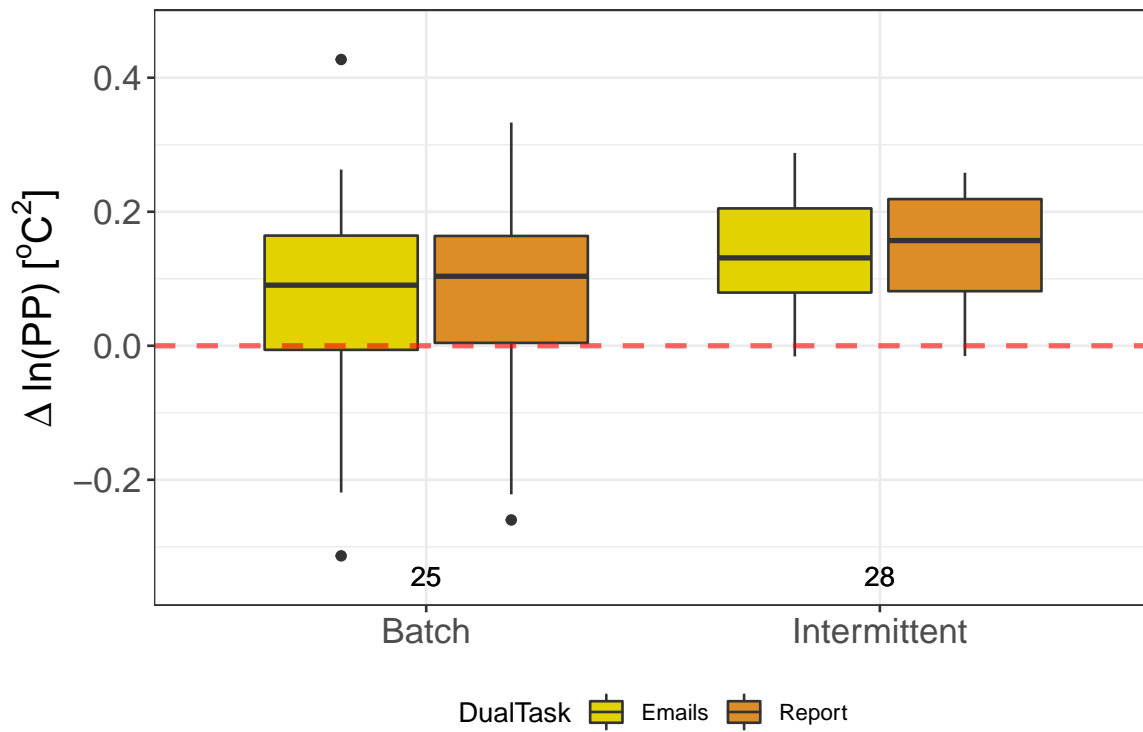


Stress Levels for Dual Task

Our Linear Model:

$$\Delta \ln(\bar{PP}) = 1 + \text{Group} + \text{DualTask} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: total_df
##      AIC      BIC   logLik
## -231.0281 -217.8544 120.514
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept)   Residual
## StdDev:    0.1169751 0.03056676
##
## Fixed effects: PP ~ 1 + Group + DualTask
##              Value Std.Error DF   t-value p-value
## (Intercept)   0.06807999 0.02397557 52  2.839557  0.0064
## GroupIntermittent 0.06605037 0.03273198 51  2.017915  0.0489
## DualTaskEssay    0.01111101 0.00593781 52  1.871229  0.0669
## Correlation:
##              (Intr) GrpInt
## GroupIntermittent -0.721
## DualTaskEssay     -0.124  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.59314553 -0.33039960  0.01480733  0.29152296  2.58403883
##
## Number of Observations: 106
## Number of Groups: 53
```



```
## Paired t-test
## For Batch, p = 0.2825 > 0.05
```

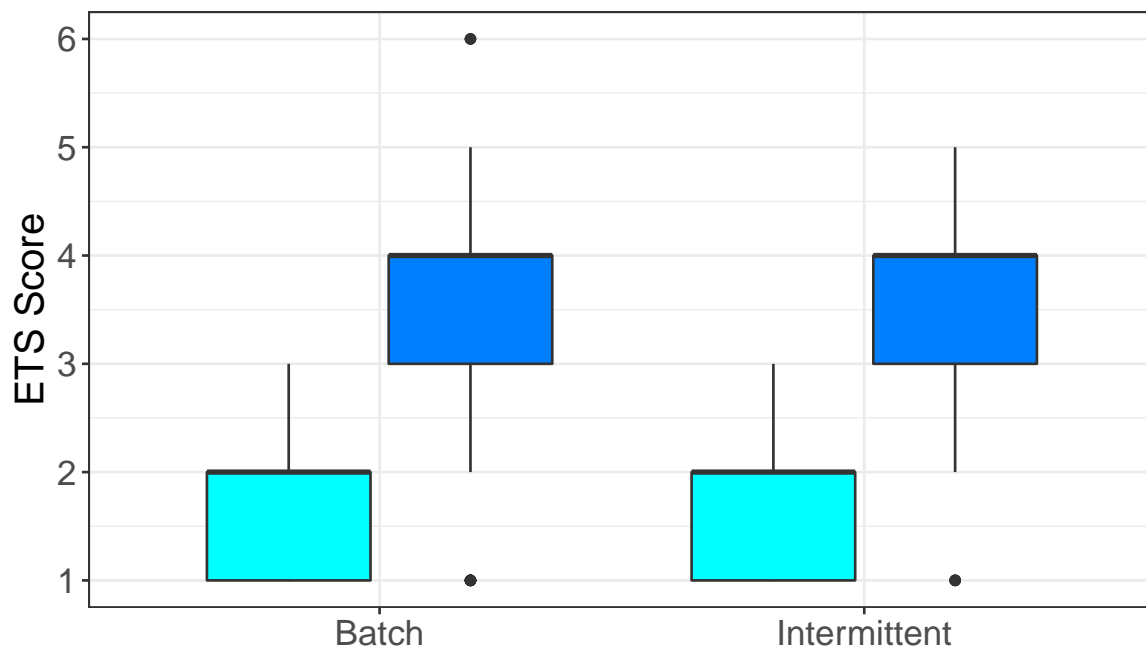
```
## Paired t-test
## For Intermittent, p = 0.0525 > 0.05
```

Linear Modelling for Writing Quality

Our Linear Model:

$$WritingQuality = 1 + Group + Session + 1|Subject$$

```
## Linear mixed-effects model fit by REML
## Data: full_df
##      AIC      BIC    logLik
##  811.7688 831.7386 -400.8844
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:   0.7417761 0.5461764
##
## Fixed effects: Score ~ 1 + Group + Session
##              Value Std.Error DF  t-value p-value
## (Intercept)   1.9002441 0.15348066 351 12.38100  0.0000
## GroupIntermittent 0.0117149 0.21387747  50  0.05477  0.9565
## SessionDT       1.8663366 0.05434659 351 34.34138  0.0000
## Correlation:
##              (Intr) GrpInt
## GroupIntermittent -0.695
## SessionDT        -0.177  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.749554137 -0.731430647 -0.008304264  0.752987193  2.498450738
##
## Number of Observations: 404
## Number of Groups: 52
```



Session ■ ST ■ DT

Session	Group	n
WB	Batch	102
WB	Intermittent	100
DT	Batch	102
DT	Intermittent	100

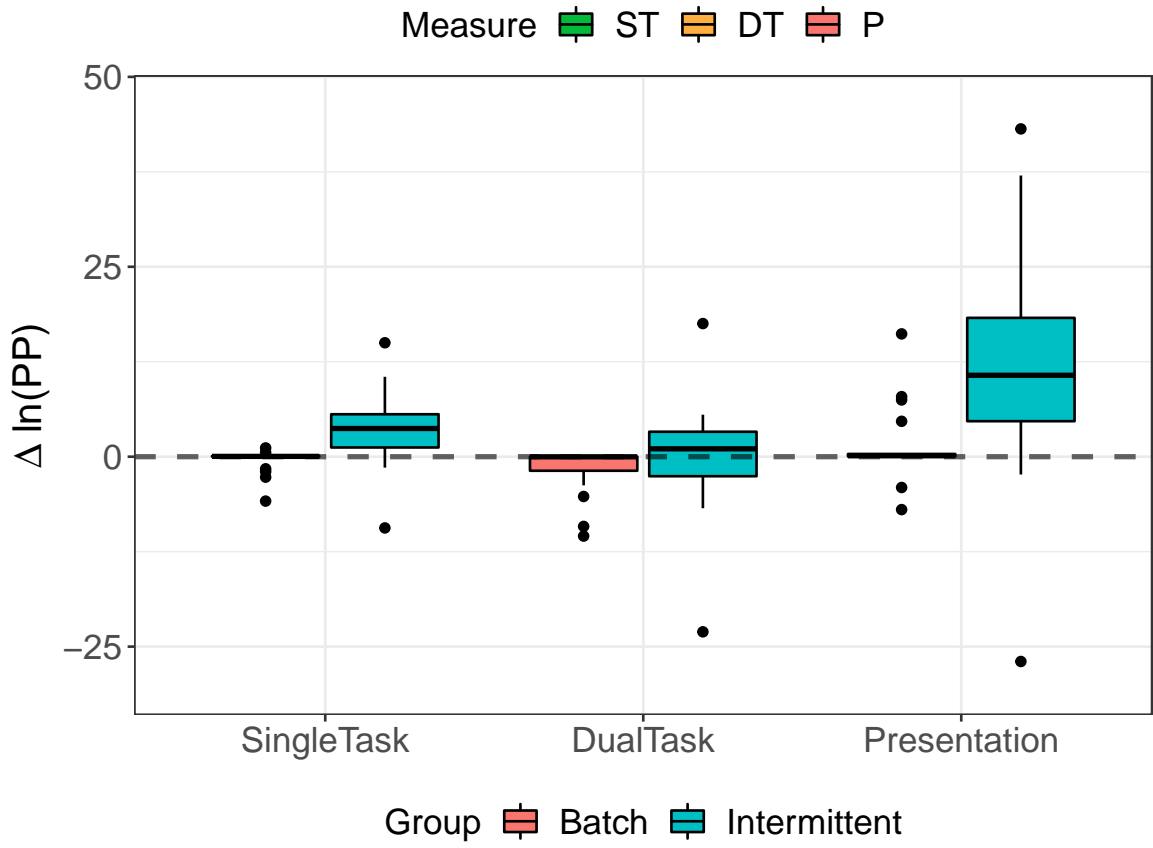
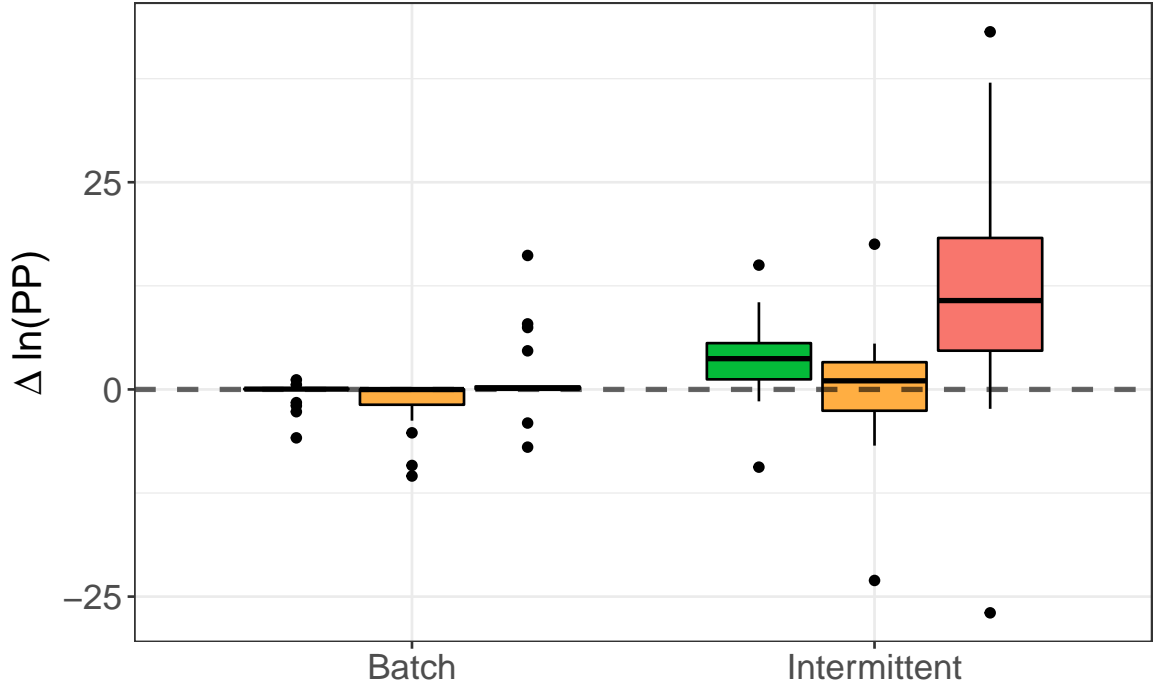
HR, 2 Groups:

Stress Levels Across Activities

Our Linear Model:

$$\Delta \bar{HR} = 1 + \text{Group} + \text{Activity} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: diff_df
##      AIC      BIC    logLik
##  1170.946 1193.099 -578.473
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:      4.481114 5.271894
##
## Fixed effects: HR ~ 1 + Group + Session
##              Value Std.Error DF   t-value p-value
## (Intercept)   0.004958  1.296684 130   0.003824  0.9970
## GroupIntermittent 3.536476  1.530566  45   2.310567  0.0255
## SessionSC      -2.383440  1.095157 130  -2.176345  0.0313
## SessionDT      -2.921984  1.087509 130  -2.686861  0.0082
## SessionP       4.908475  1.144838 130   4.287485  0.0000
## Correlation:
##              (Intr) GrpInt SsnSC SsnDT
## GroupIntermittent -0.628
## SessionSC         -0.420  0.006
## SessionDT         -0.419  0.000  0.497
## SessionP          -0.401  0.004  0.475  0.475
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -3.62964871 -0.49214954 -0.01180449  0.43107110  5.21355141
##
## Number of Observations: 180
## Number of Groups: 47
```

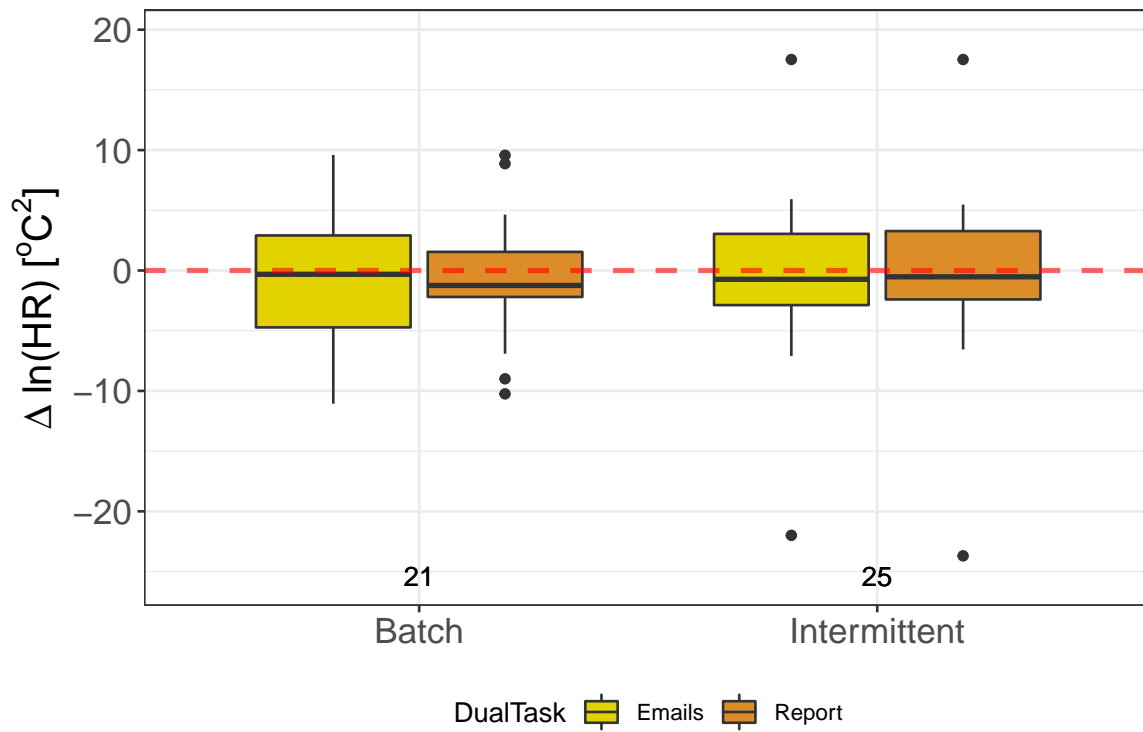



Stress Levels for Dual Task

Our Linear Model:

$$\Delta \bar{HR} = 1 + \text{Group} + \text{DualTask} + 1|\text{Subject}$$

```
## Linear mixed-effects model fit by REML
## Data: total_df
##      AIC      BIC    logLik
##  472.5203 484.9635 -231.2601
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:      5.977237 1.124413
##
## Fixed effects: HR ~ 1 + Group + DualTask
##              Value Std.Error DF   t-value p-value
## (Intercept)  -1.0340572 1.3210404 45 -0.7827597  0.4379
## GroupIntermittent  0.5268177 1.7848769 44  0.2951563  0.7693
## DualTaskEssay     0.3088114 0.2344563 45  1.3171382  0.1945
## Correlation:
##              (Intr) GrpInt
## GroupIntermittent -0.734
## DualTaskEssay     -0.089  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -1.766605064 -0.436180635 -0.005407971  0.509799583  1.997952625
##
## Number of Observations: 92
## Number of Groups: 46
```



```
## Paired t-test
## For Batch, p = 0.2583 > 0.05
```

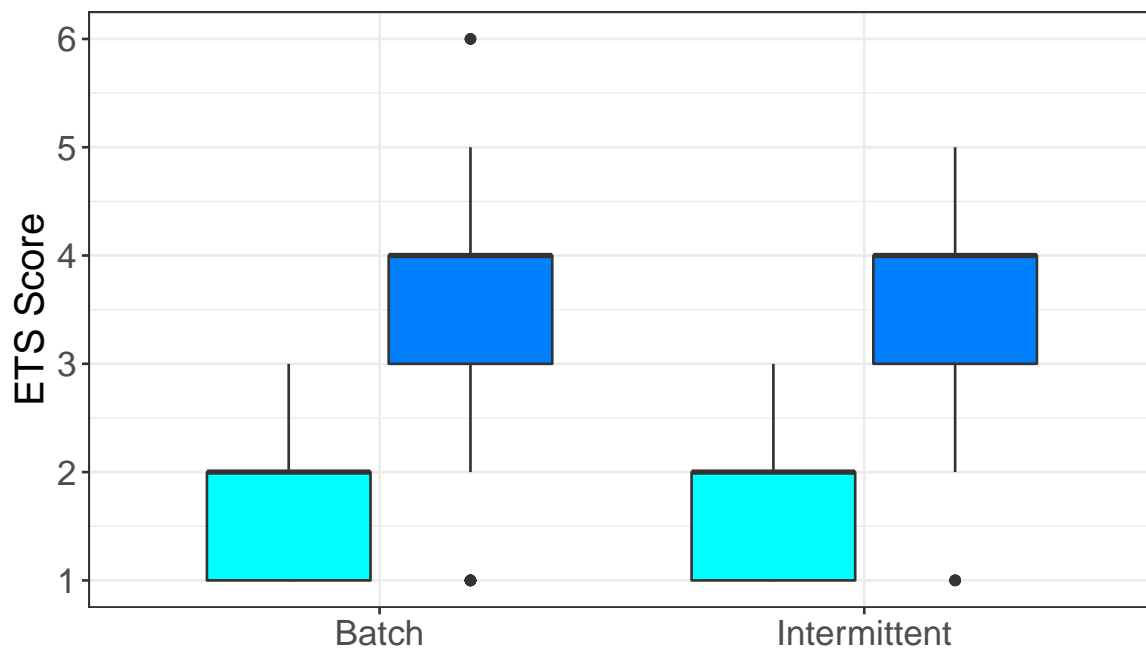
```
## Paired t-test
## For Intermittent, p = 0.5442 > 0.05
```

Linear Modelling for Writing Quality

Our Linear Model:

$$WritingQuality = 1 + Group + Session + 1|Subject$$

```
## Linear mixed-effects model fit by REML
## Data: full_df
##      AIC      BIC    logLik
##  811.7688 831.7386 -400.8844
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept) Residual
## StdDev:   0.7417761 0.5461764
##
## Fixed effects: Score ~ 1 + Group + Session
##              Value Std.Error DF  t-value p-value
## (Intercept)   1.9002441 0.15348066 351 12.38100  0.0000
## GroupIntermittent 0.0117149 0.21387747  50  0.05477  0.9565
## SessionDT       1.8663366 0.05434659 351 34.34138  0.0000
## Correlation:
##              (Intr) GrpInt
## GroupIntermittent -0.695
## SessionDT        -0.177  0.000
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -2.749554137 -0.731430647 -0.008304264  0.752987193  2.498450738
##
## Number of Observations: 404
## Number of Groups: 52
```



Session ■ ST ■ DT

Session	Group	n
WB	Batch	102
WB	Intermittent	100
DT	Batch	102
DT	Intermittent	100

Let's Get to 10 ★ with Four Groups

Our Linear Model:

$$\Delta \ln(\bar{P}P) = 1 + ETSScore + Group + Activity + 1|Subject$$

```
## Linear mixed-effects model fit by REML
## Data: full_df
##      AIC      BIC    logLik
## -148.1437 -127.9694 82.07187
##
## Random effects:
## Formula: ~1 | Subject
##      (Intercept)  Residual
## StdDev:  0.08708762 0.05924682
##
## Fixed effects: PP ~ 1 + ETSScore + Group + Activity
##              Value Std.Error DF   t-value p-value
## (Intercept)  0.01825213 0.03409999 47   0.535253  0.5950
## ETSScore    -0.01143289 0.01002932 47  -1.139946  0.2601
## GroupIL      0.14559723 0.03984458 45   3.654129  0.0007
## GroupBH      0.04423412 0.04054805 45   1.090906  0.2811
## GroupIH      0.07491421 0.03959597 45   1.891965  0.0649
## ActivityDT   0.04942296 0.02214038 47   2.232255  0.0304
## Correlation:
##      (Intr) ETSScr GropIL GropBH GropIH
## ETSScore   -0.489
## GroupIL    -0.570 -0.113
## GroupBH    -0.565 -0.101  0.537
## GroupIH    -0.621 -0.016  0.540  0.530
## ActivityDT  0.316 -0.841  0.095  0.085  0.013
##
## Standardized Within-Group Residuals:
##      Min      Q1      Med      Q3      Max
## -1.82718410 -0.50237965  0.04256535  0.41823819  1.95797921
##
## Number of Observations: 98
## Number of Groups: 49
```