Hypothesis Testing for NSF Office Stress Project - Full Sensor Set

Below are the test results for each of the Conditions that had n >= 7 subjects. Statistical testing can have three different possible outcomes: the data is already normal (t-test), the logarithm of the data is normal (t-test with log data), or the data is NOT normal (Wilcoxon test).

For notation, let:

WB-RB = Writing Baseline - Resting Baseline
SC-RB = Stress Condition - Resting Baseline
SC-WB = Stress Condition - Writing Baseline
DT-RB = Dual Task - Resting Baseline
DT-WB = Dual Task - Writing Baseline
DT-SC = Dual Task - Stress Condition
P-RB = Presentation - Resting Baseline
P-WB = Presentation - Writing Baseline
P-SC = Presentation - Stress Condition
P-DT = Presentation - Dual Task

For each of the graphs, let:

∗ = 0.01 < p <= 0.05
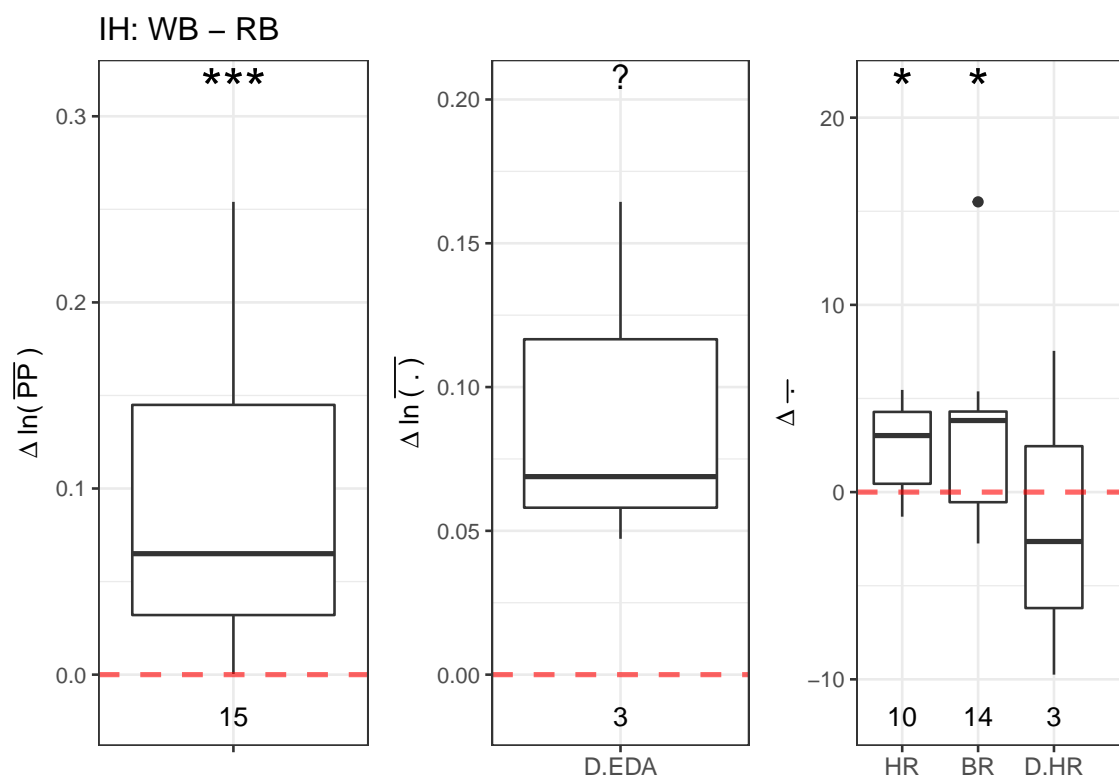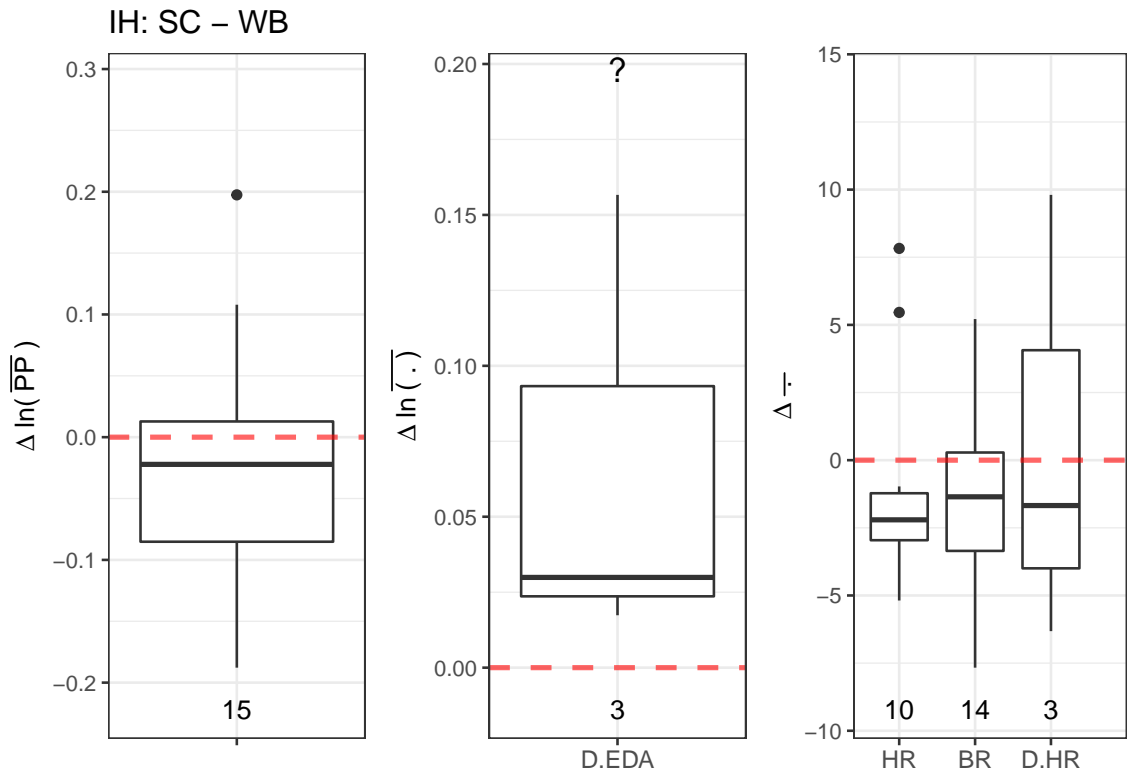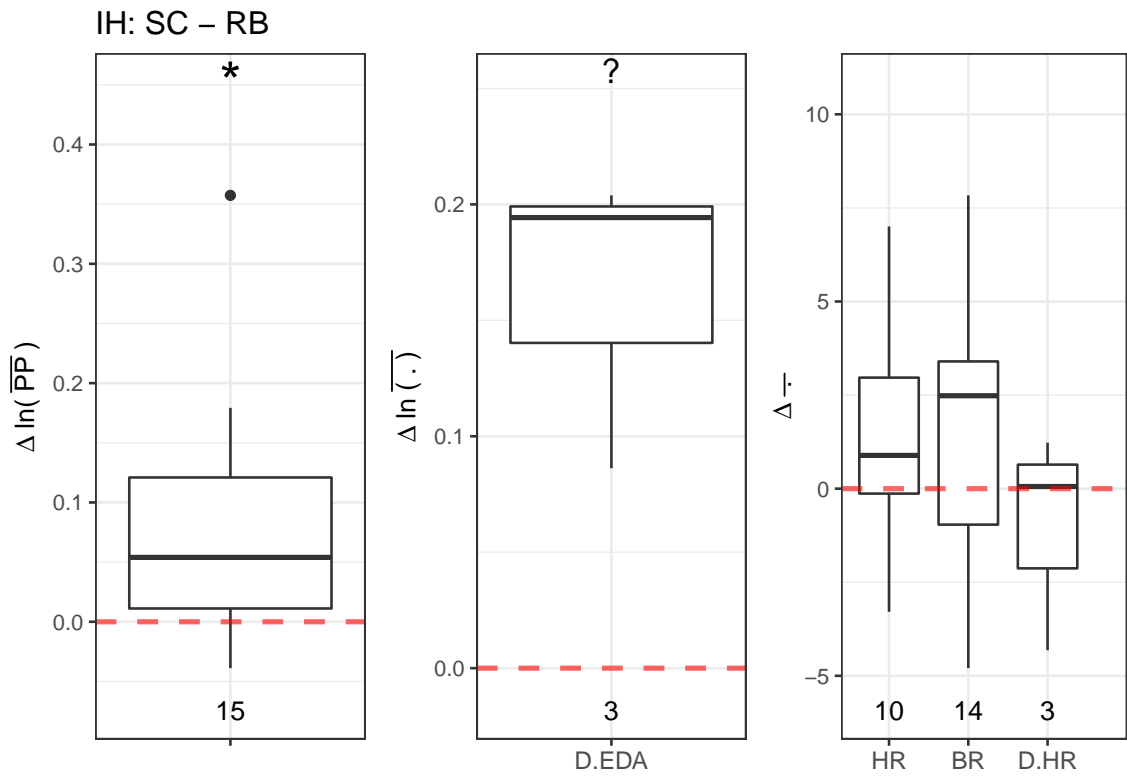∗∗ = 0.001 < p <= 0.01
∗∗∗ = p <= 0.001
? = Did not run statistical test ($n < 7$)

Intermittent-High (IH)

Sensor Channels per Activity

IH: WB − RB

IH: DT − RB

IH: DT − WB

IH: DT − SC

$\Delta \ln(\overline{PP})$

$\Delta \ln(\overline{\cdot})$

$\Delta \overline{\cdot}$

*** ?

15 3

HR BR D.HR
10 14 3
D.EDA

***

15 3

HR BR D.HR
10 14 3
D.EDA

?

15 3

HR BR D.HR
10 14 3
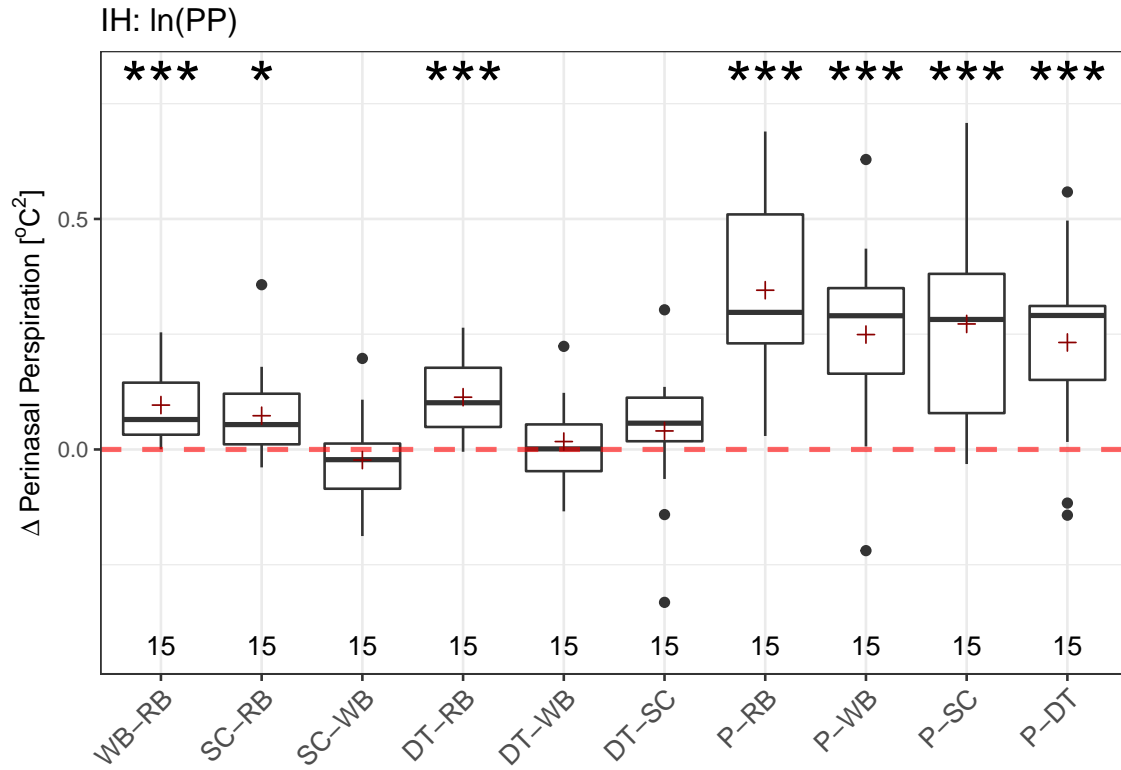D.EDA

Sensor Channel across Activities

IH: ln(PP)
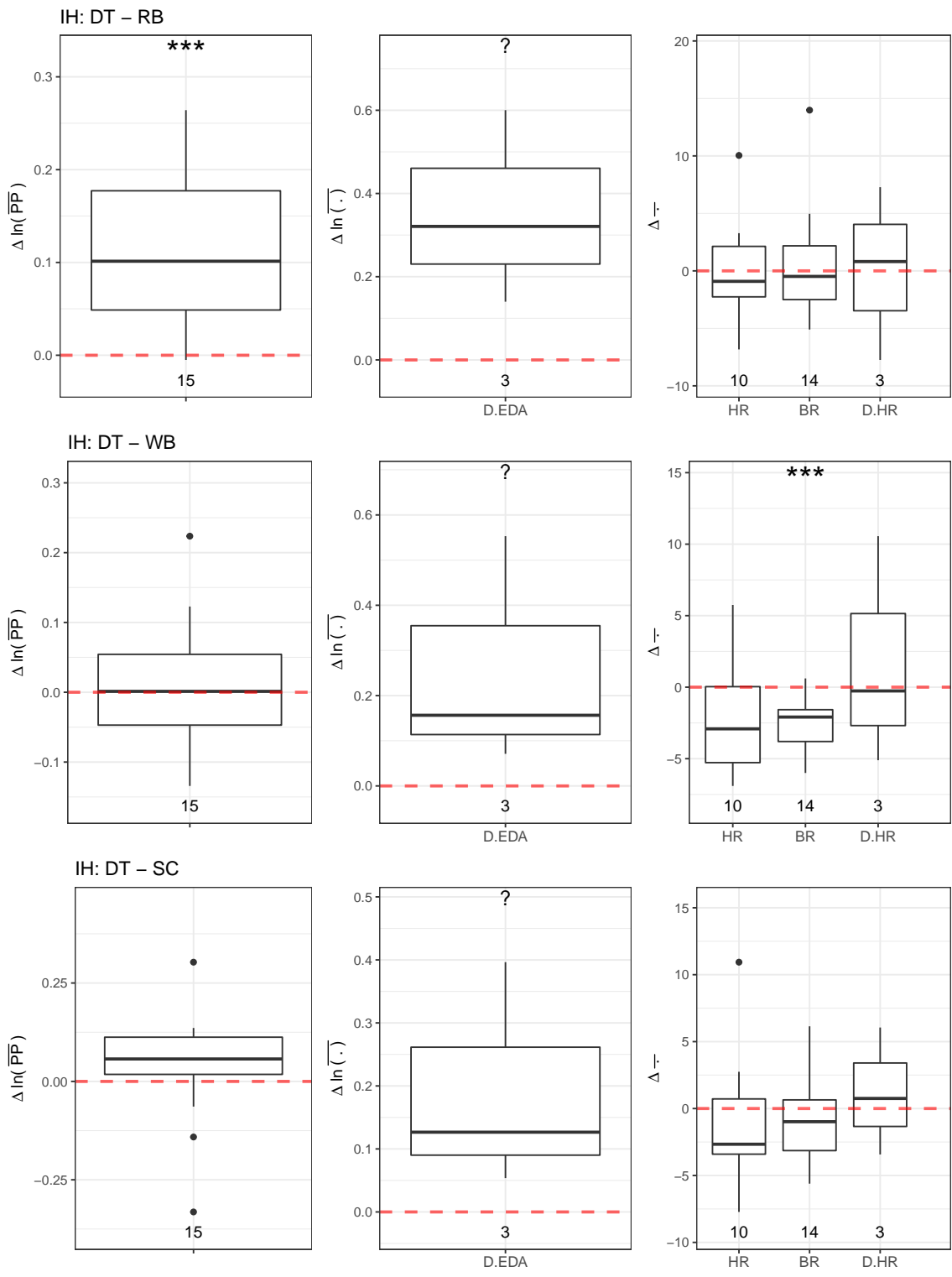

```
## In the following tests, we applied ln(PP).
##
## Writing Baseline - Resting Baseline
## Transformed t-test p = 6e-04 < 0.001   ***
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.0151 < 0.05   *
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.3733 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 1e-04 < 0.001   ***
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.4778 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.2937 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0 < 0.001   ***
##
```
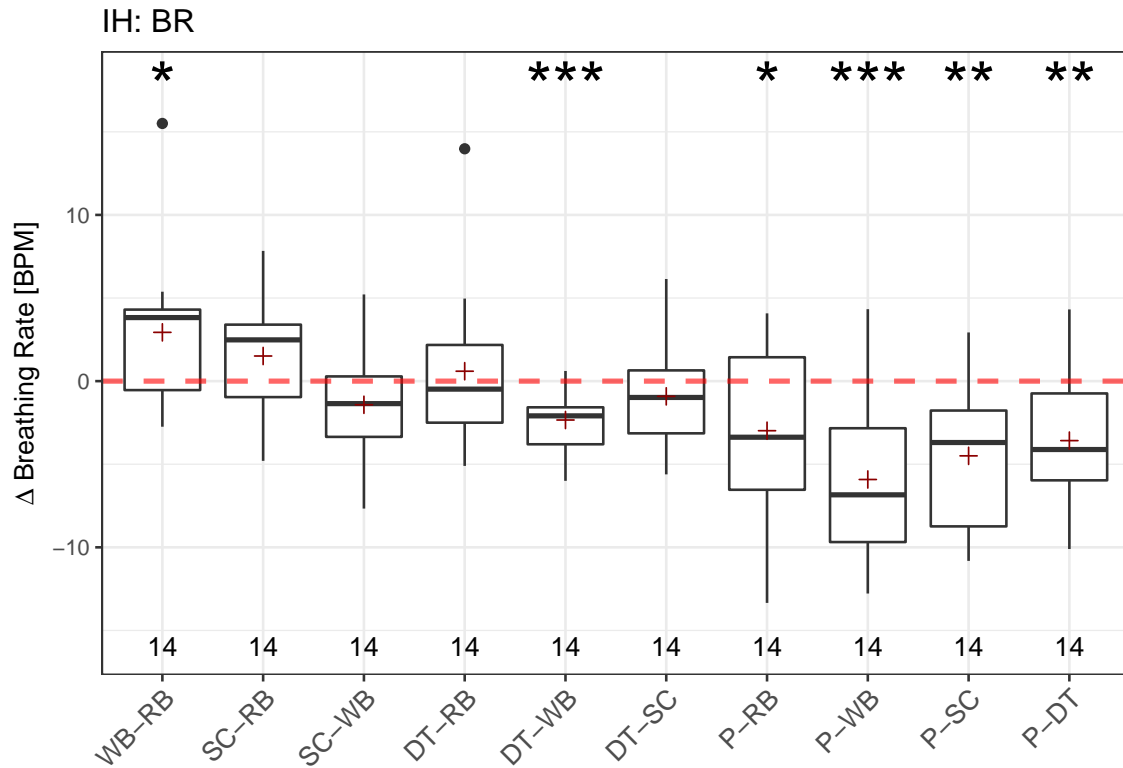
```
## Presentation - Writing Baseline
## Transformed t-test p = 4e-04 < 0.001  ***
##
## Presentation - Stress Condition
## Transformed t-test p = 2e-04 < 0.001  ***
##
## Presentation - Dual Task
## Transformed t-test p = 5e-04 < 0.001  ***
```

IH: ln(HR)
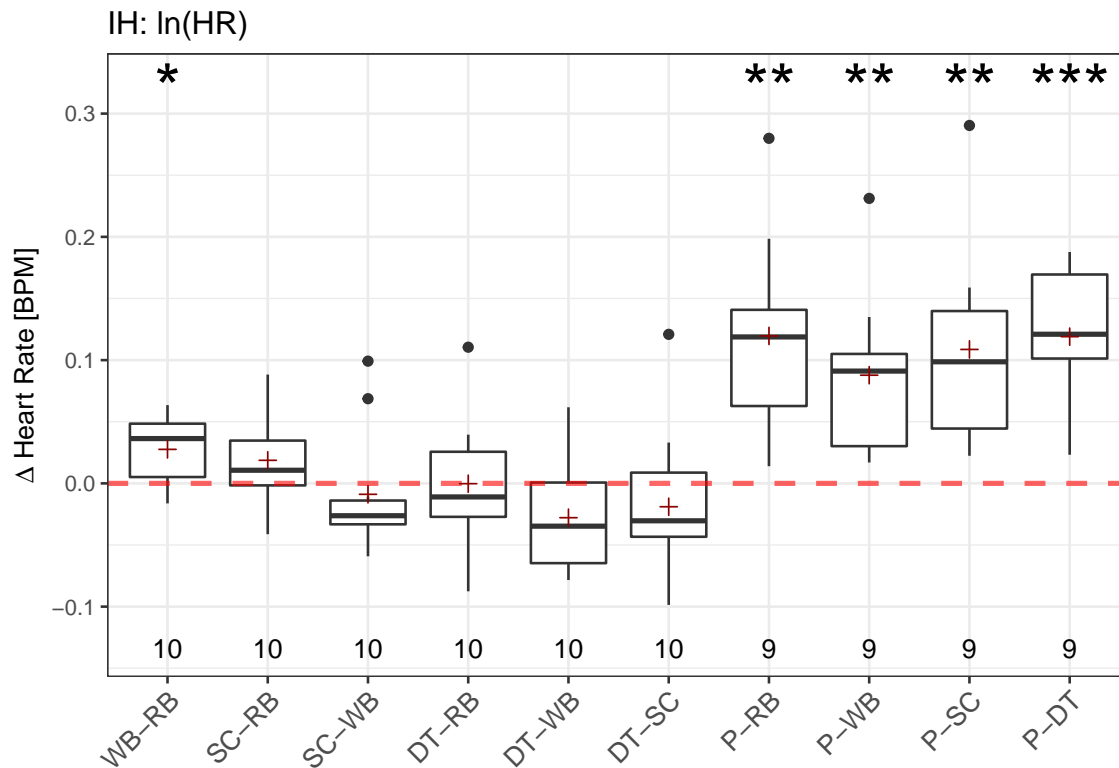

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0141 < 0.05  *
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.1604 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.5965 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.9883 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0757 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.3774 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.0024 < 0.01  **
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0045 < 0.01  **
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.0049 < 0.01   **
##
## Presentation - Dual Task
## Transformed t-test p = 2e-04 < 0.001   ***
```

IH: BR

```
## Writing Baseline - Resting Baseline
## t-test p = 0.0327 < 0.05  *
##
## Stress Condition - Resting Baseline
## t-test p = 0.1441 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0.1515 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.6464 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 4e-04 < 0.001  ***
##
## Dual Task - Stress Condition
## t-test p = 0.2686 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.0463 < 0.05  *
##
## Presentation - Writing Baseline
## t-test p = 6e-04 < 0.001  ***
##
## Presentation - Stress Condition
```
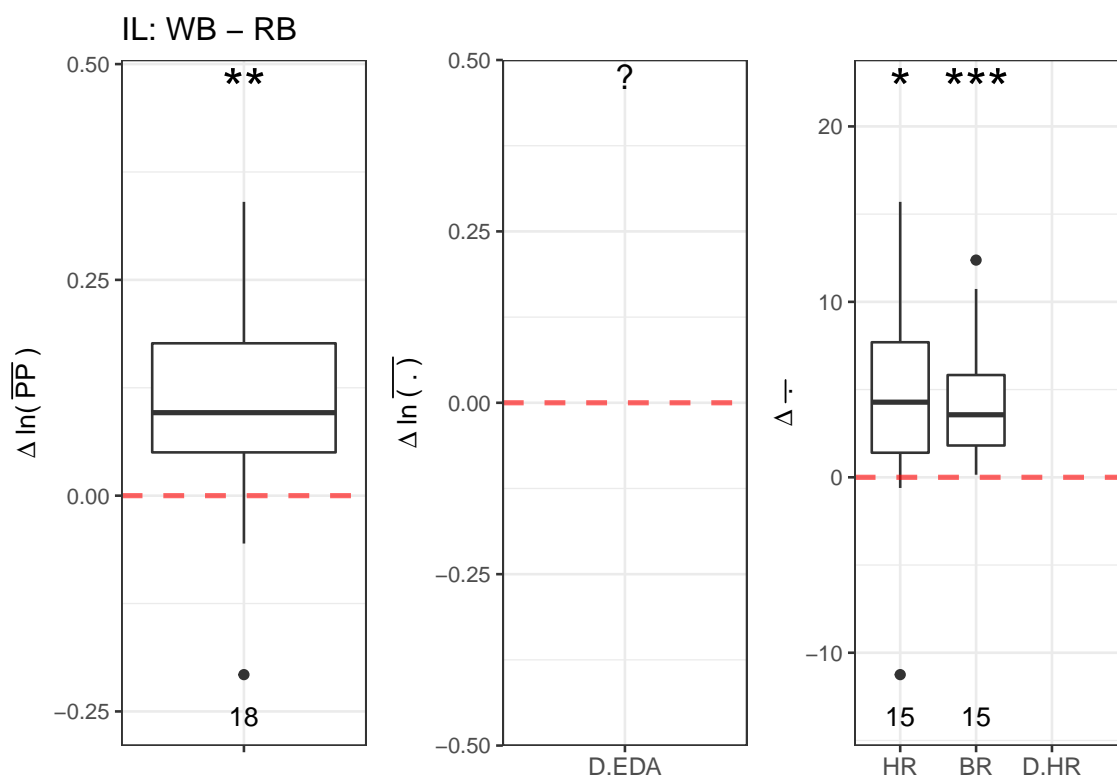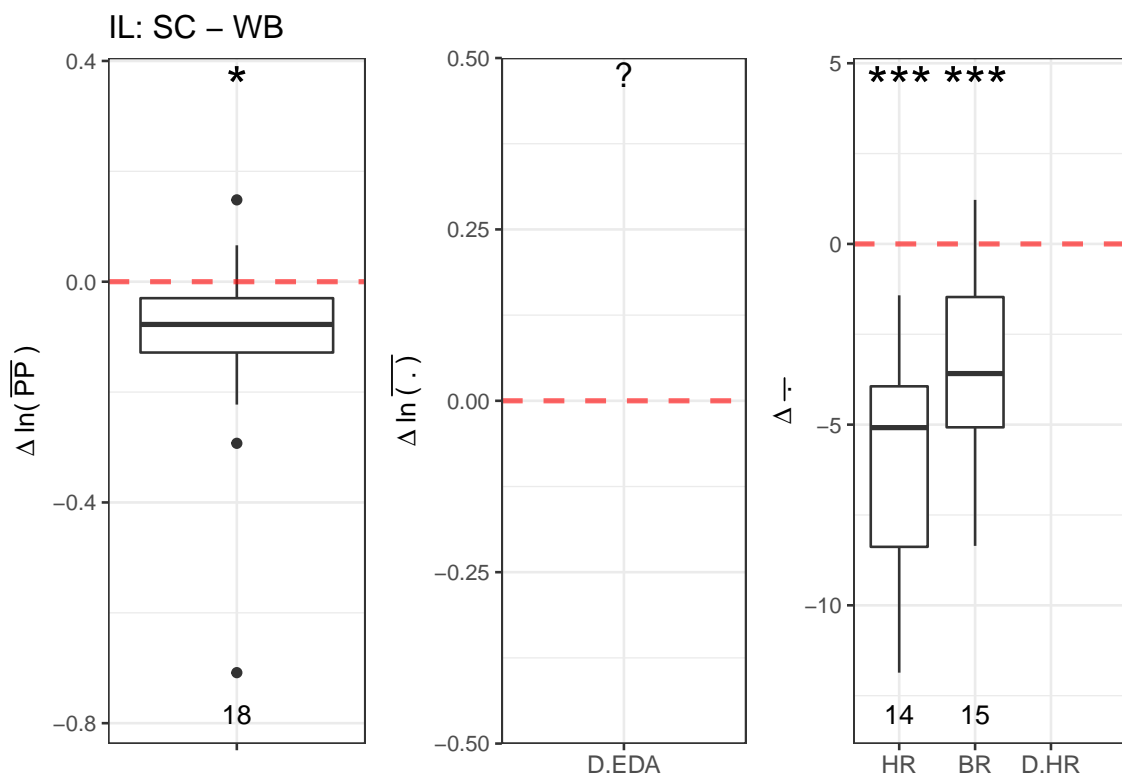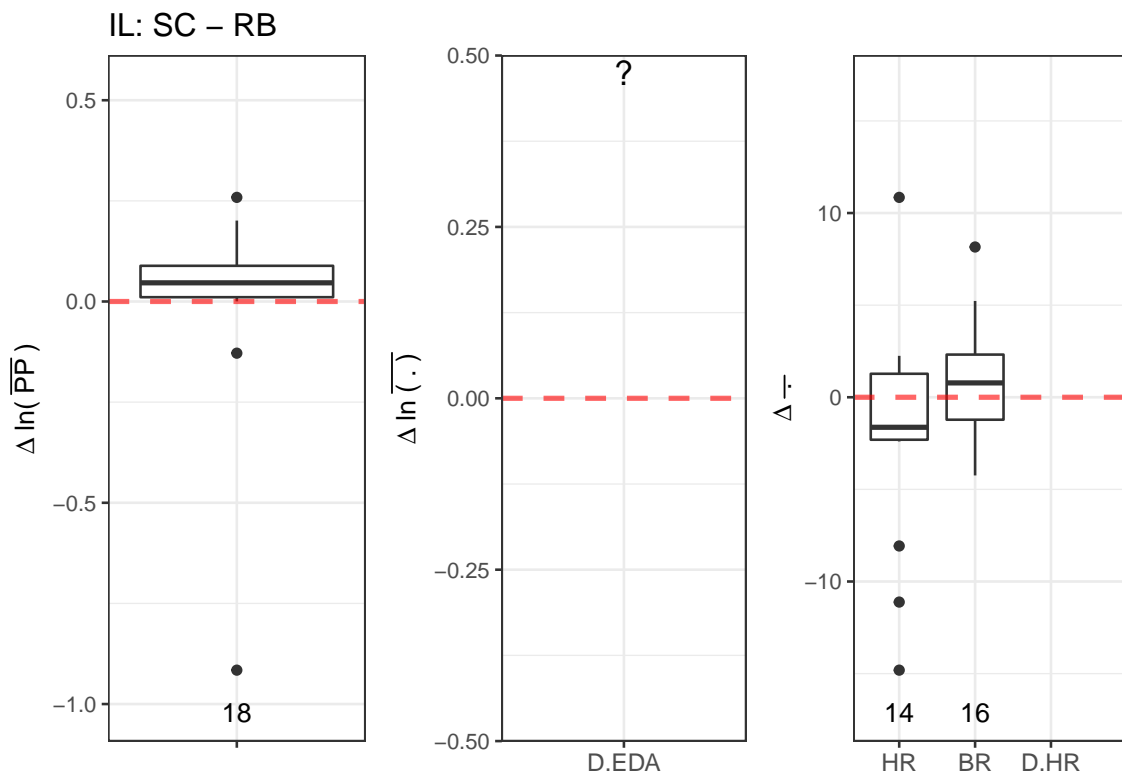
```
## t-test p = 0.0024 < 0.01   **
##
## Presentation - Dual Task
## t-test p = 0.007 < 0.01   **
```

```
## IH has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
## IH has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```

Intermittent-Low (IL)

Sensor Channels per Activity
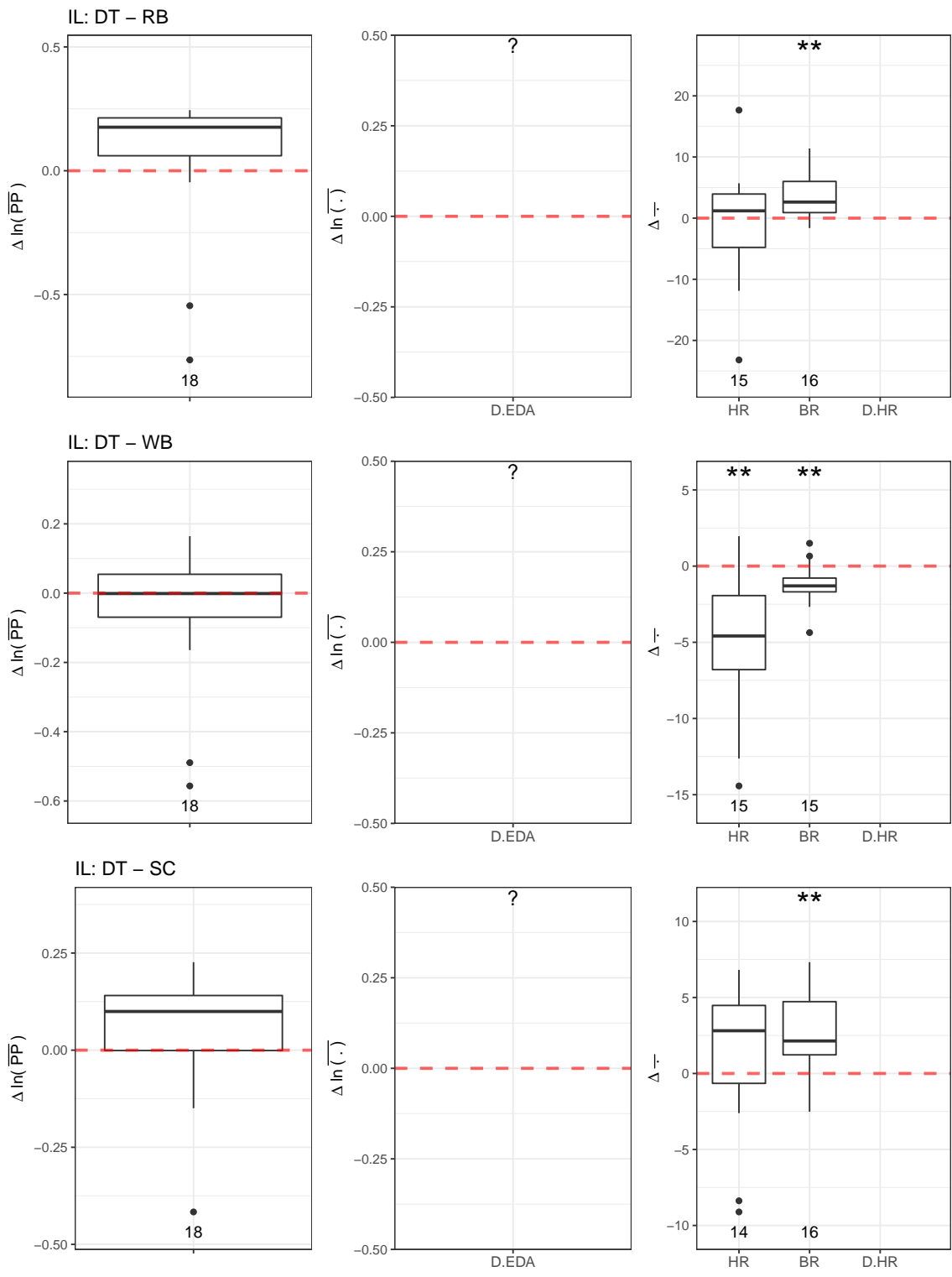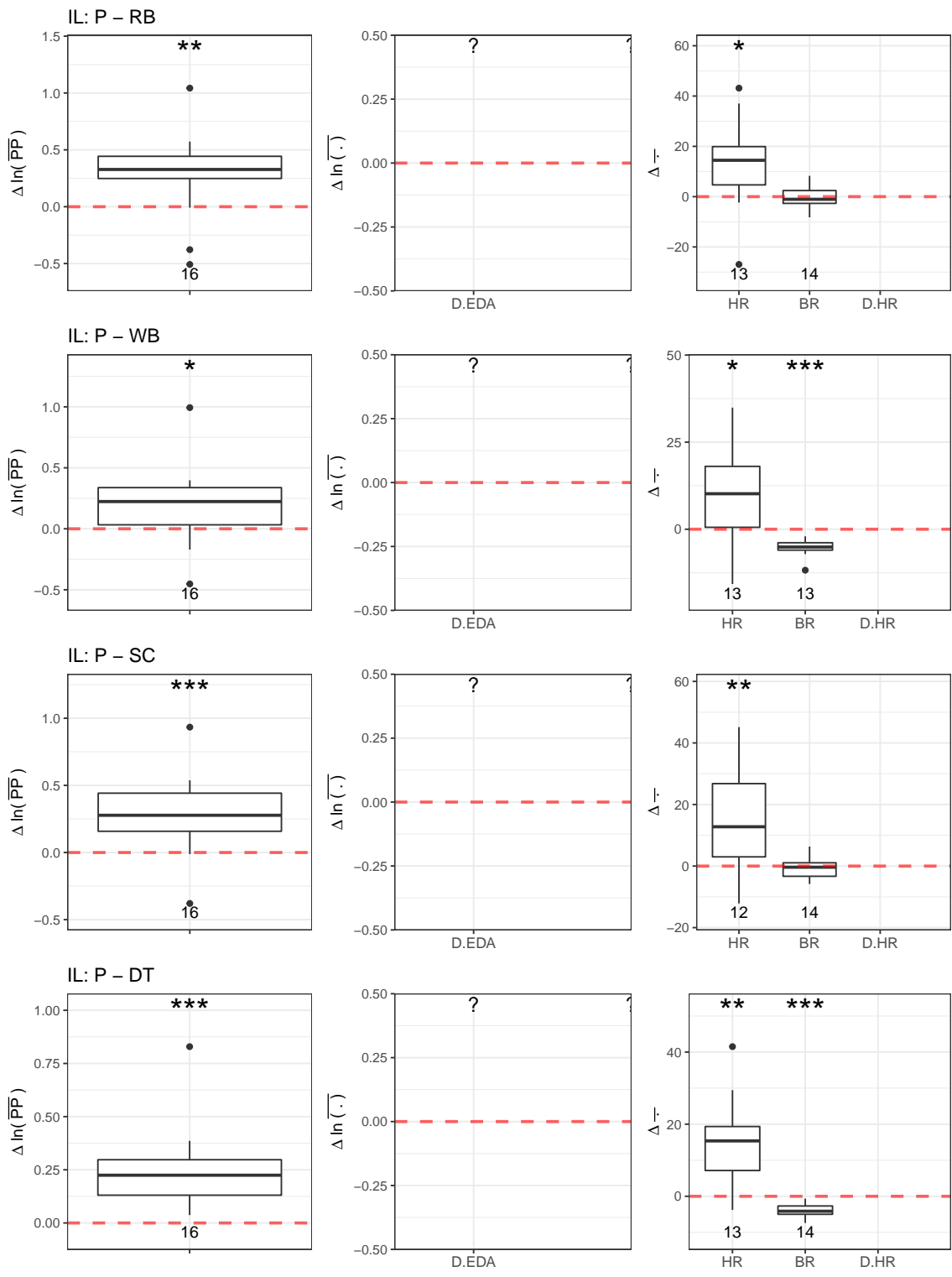
IL: WB – RB

IL: DT − RB

$\Delta \ln(\overline{PP})$

$\Delta \ln(\overline{\cdot})$

?

$\Delta \overline{\cdot}$

**

D.EDA

HR   BR   D.HR

15   16

18

IL: DT − WB

$\Delta \ln(\overline{PP})$

$\Delta \ln(\overline{\cdot})$

?

$\Delta \overline{\cdot}$

**   **

D.EDA

HR   BR   D.HR

15   15

18

IL: DT − SC

$\Delta \ln(\overline{PP})$

$\Delta \ln(\overline{\cdot})$

?

$\Delta \overline{\cdot}$

**

D.EDA

HR   BR   D.HR

14   16

18

Sensor Channel across Activities

IL: ln(PP)


```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0019 < 0.01   **
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.8713 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.0293 < 0.05   *
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.3458 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.3006 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.1503 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.0054 < 0.01   **
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0288 < 0.05   *
```
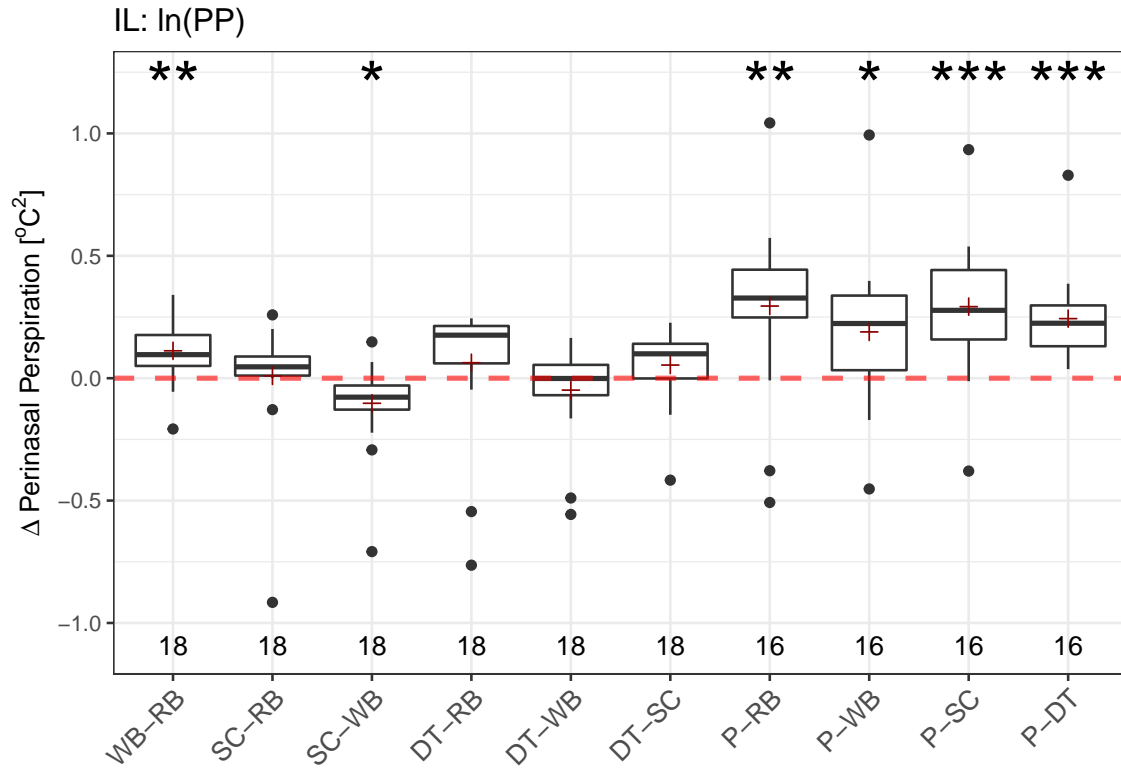
```
## 
## Presentation - Stress Condition
## Transformed t-test p = 8e-04 < 0.001  ***
## 
## Presentation - Dual Task
## Transformed t-test p = 1e-04 < 0.001  ***
```
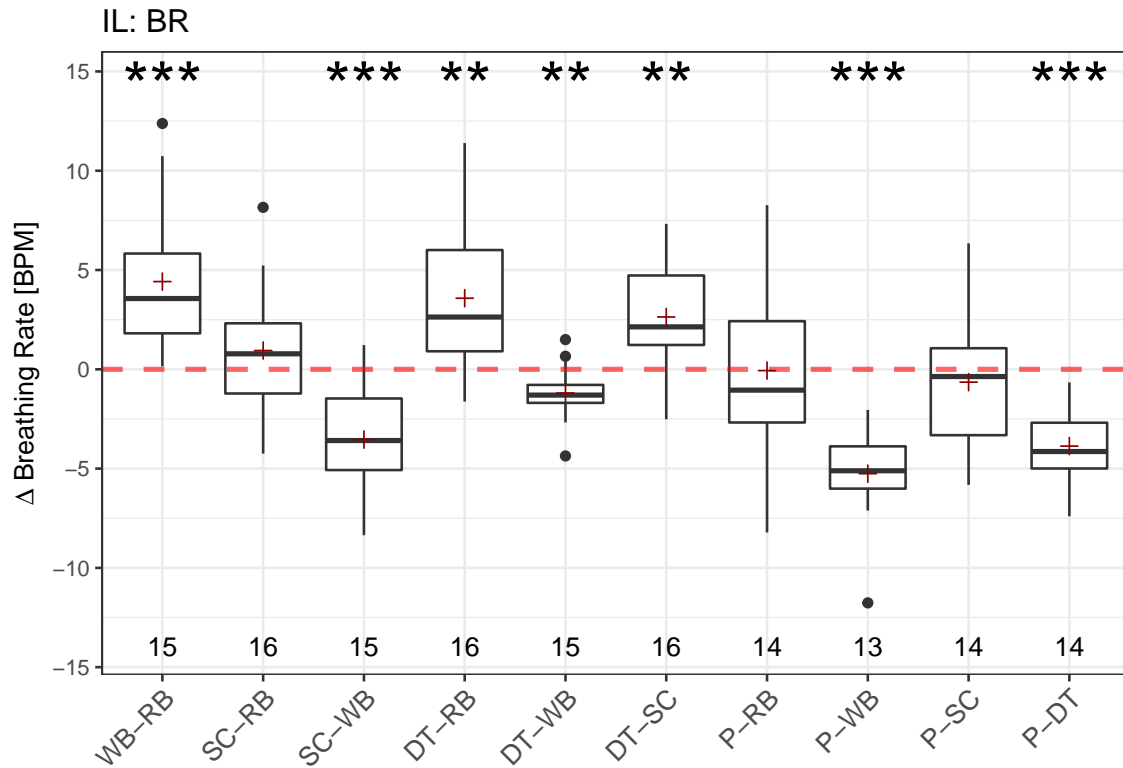
IL: HR
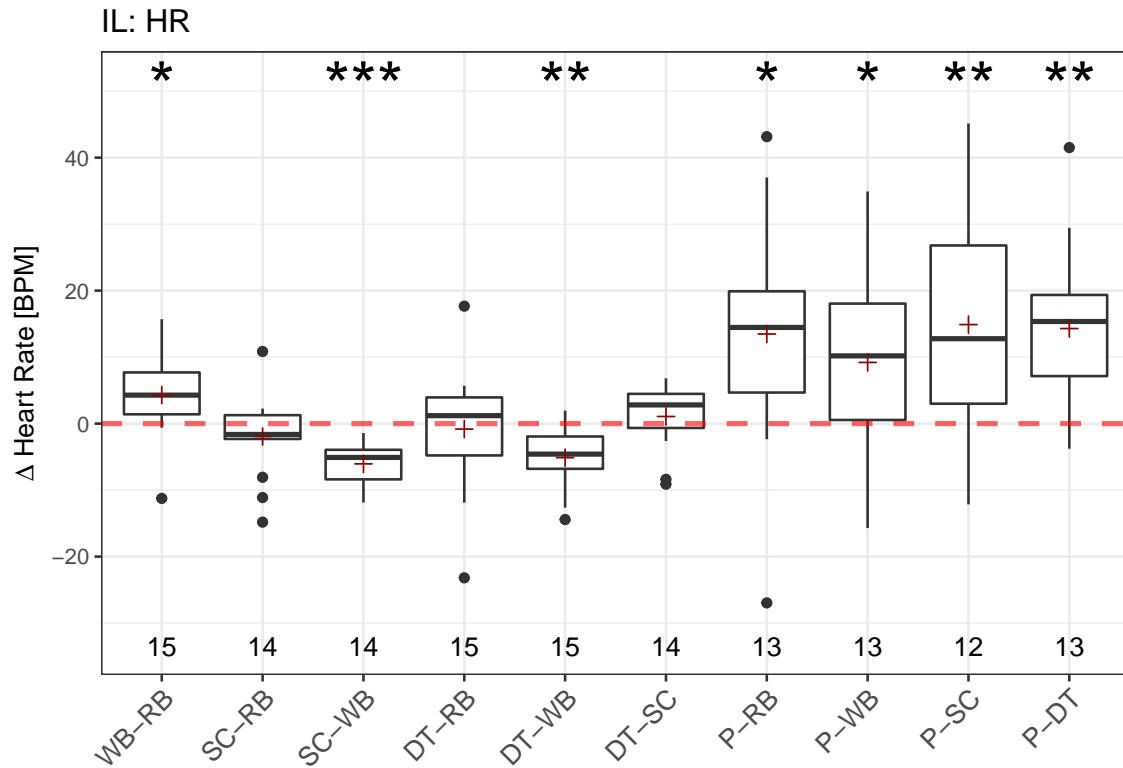

```
## Writing Baseline - Resting Baseline
## t-test p = 0.0167 < 0.05  *
##
## Stress Condition - Resting Baseline
## t-test p = 0.2669 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0 < 0.001  ***
##
## Dual Task - Resting Baseline
## t-test p = 0.7345 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0.0017 < 0.01  **
##
## Dual Task - Stress Condition
## t-test p = 0.4266 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.019 < 0.05  *
##
## Presentation - Writing Baseline
## t-test p = 0.035 < 0.05  *
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0081 < 0.01  **
##
## Presentation - Dual Task
## t-test p = 0.0017 < 0.01  **
```

IL: BR

```
## Writing Baseline - Resting Baseline
## t-test p = 3e-04 < 0.001   ***
##
## Stress Condition - Resting Baseline
## t-test p = 0.27 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 2e-04 < 0.001   ***
##
## Dual Task - Resting Baseline
## t-test p = 0.0035 < 0.01   **
##
## Dual Task - Writing Baseline
## t-test p = 0.0053 < 0.01   **
##
## Dual Task - Stress Condition
## t-test p = 0.0029 < 0.01   **
##
## Presentation - Resting Baseline
## t-test p = 0.9593 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0 < 0.001   ***
##
## Presentation - Stress Condition
```
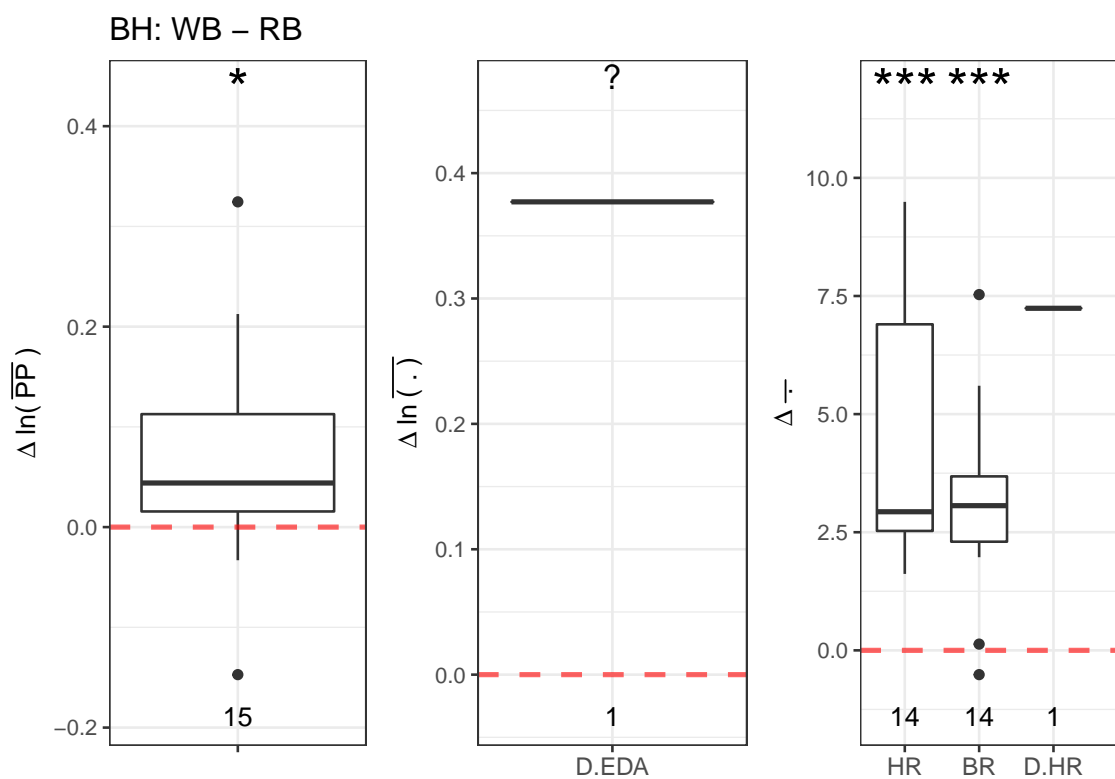
```
## t-test p = 0.5016 > 0.05
##
## Presentation - Dual Task
## t-test p = 0 < 0.001  ***
```
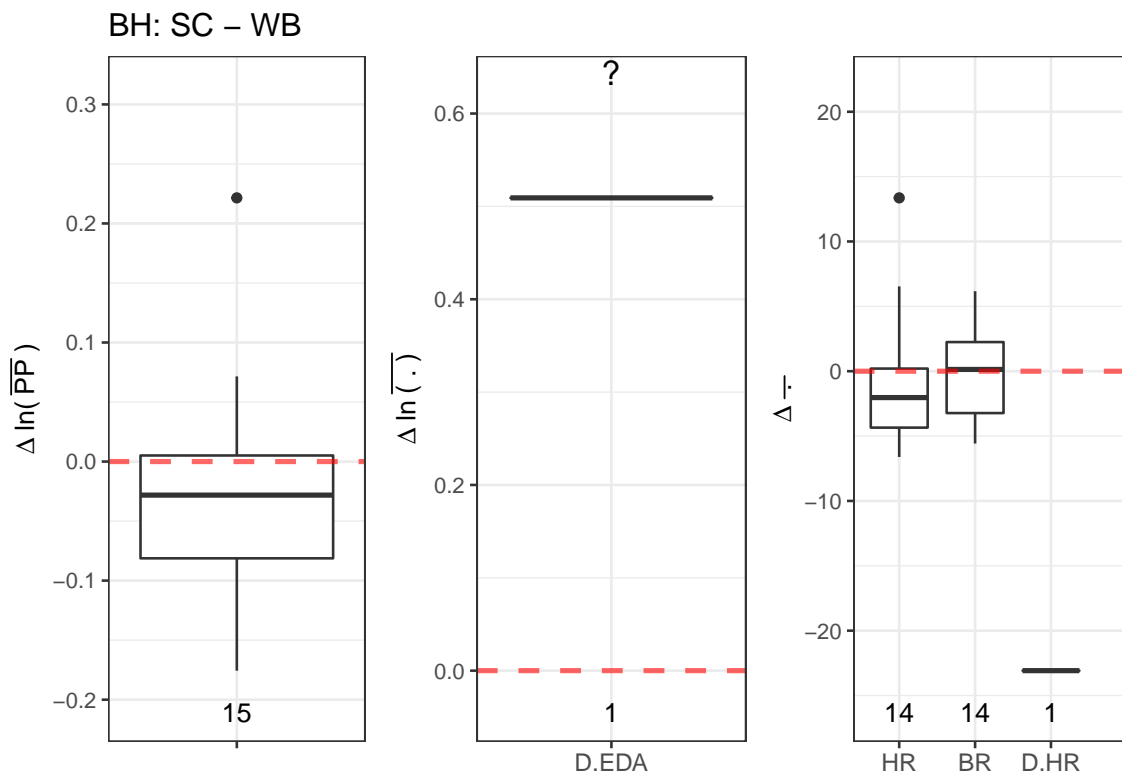
```
## IL has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
## IL has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```

Batch-High (BH)

Sensor Channels per Activity
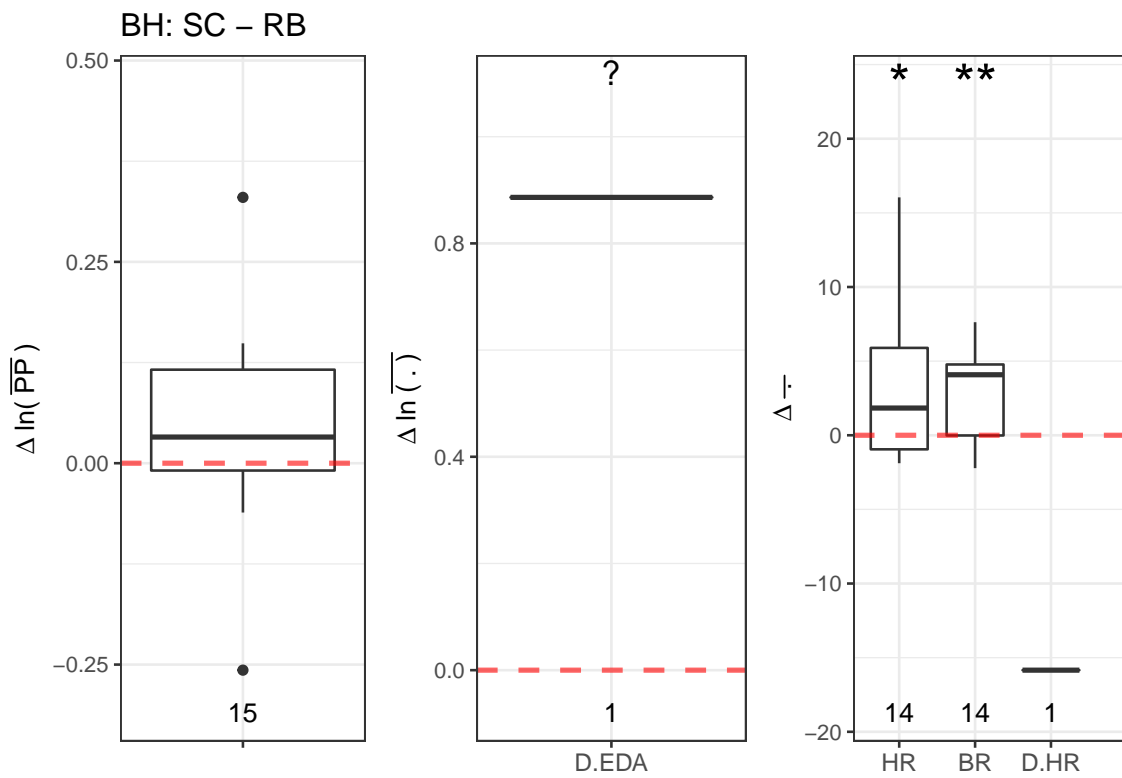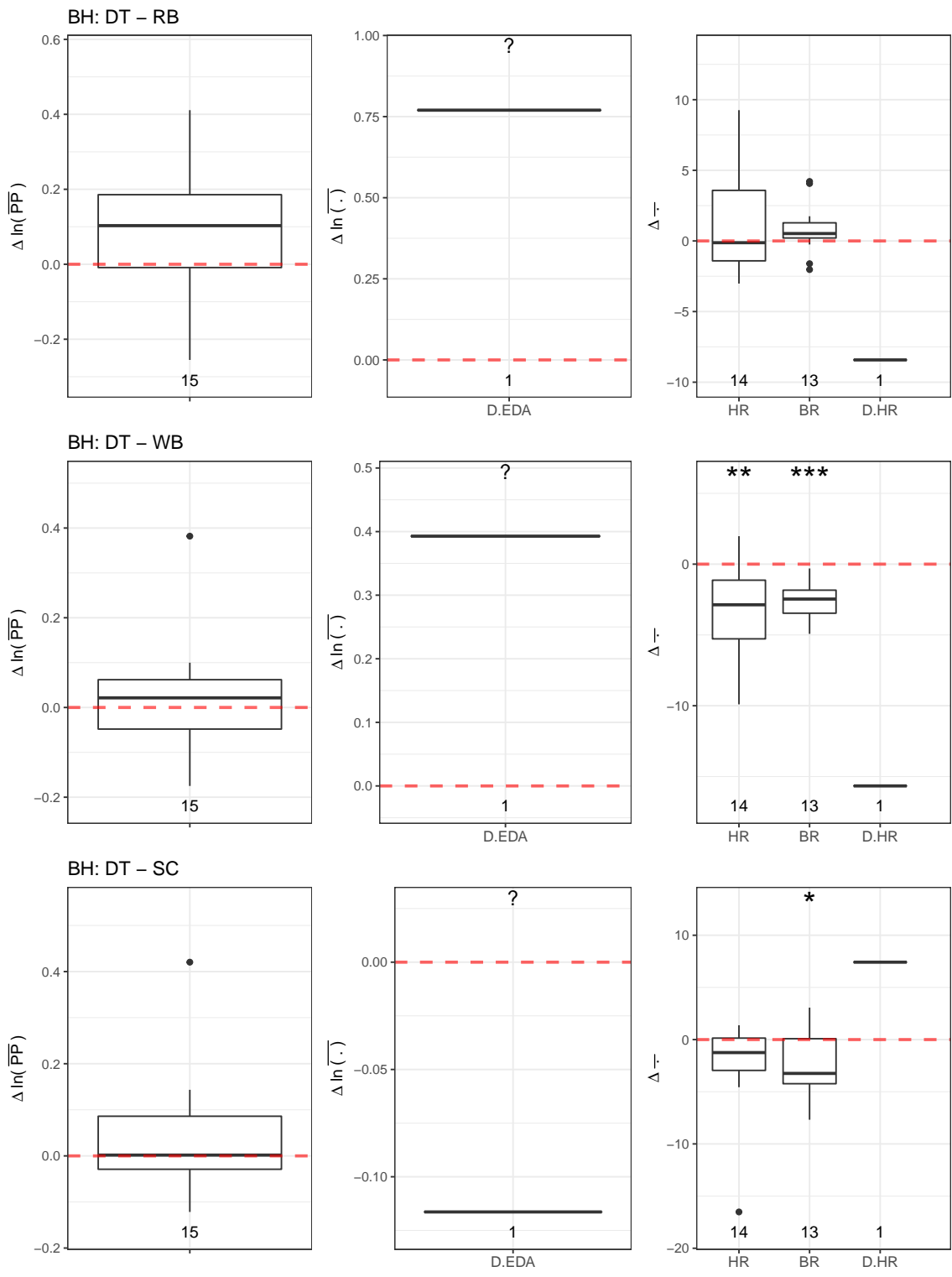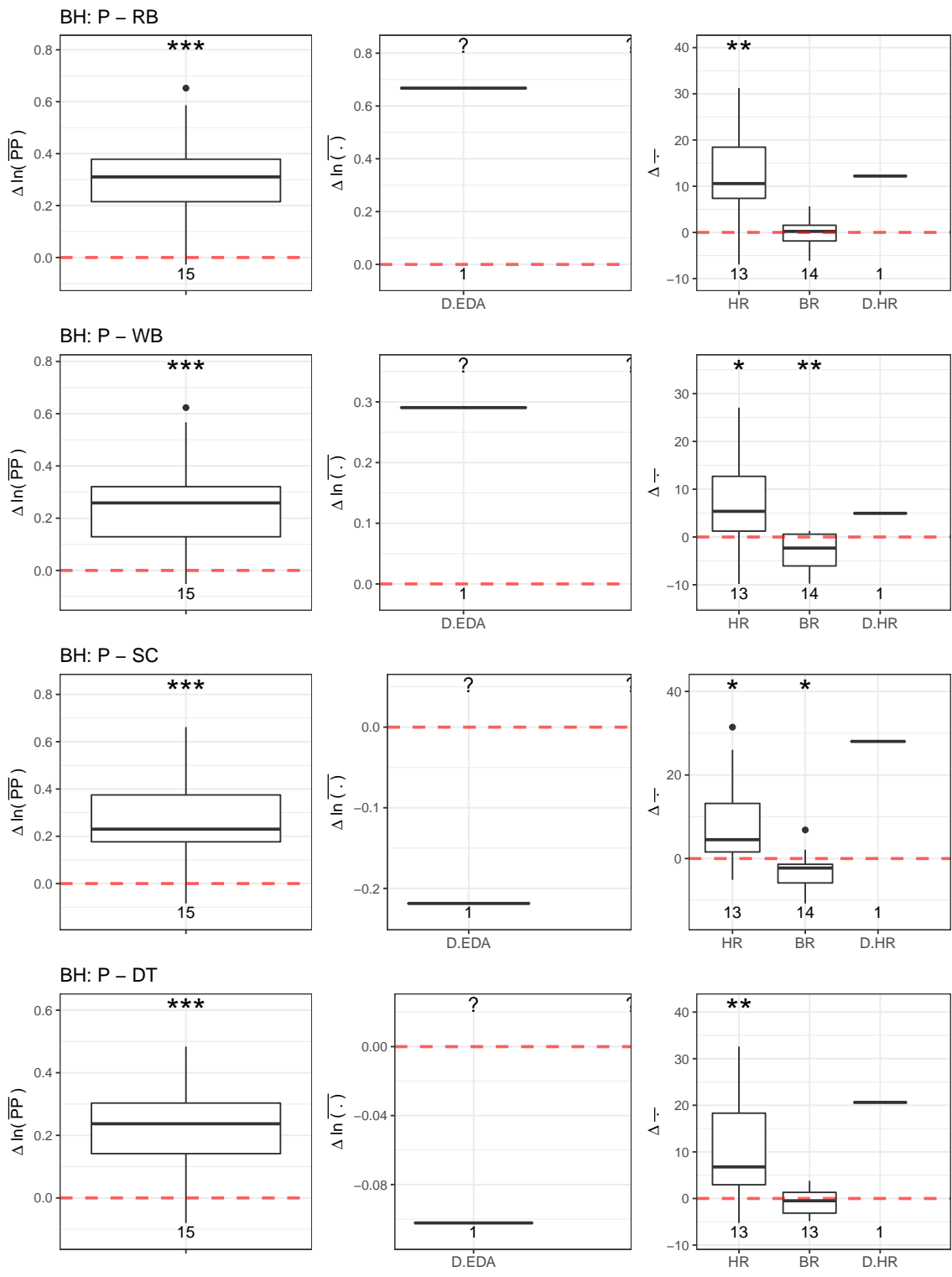
BH: WB − RB

Sensor Channel across Activities

BH: ln(PP)
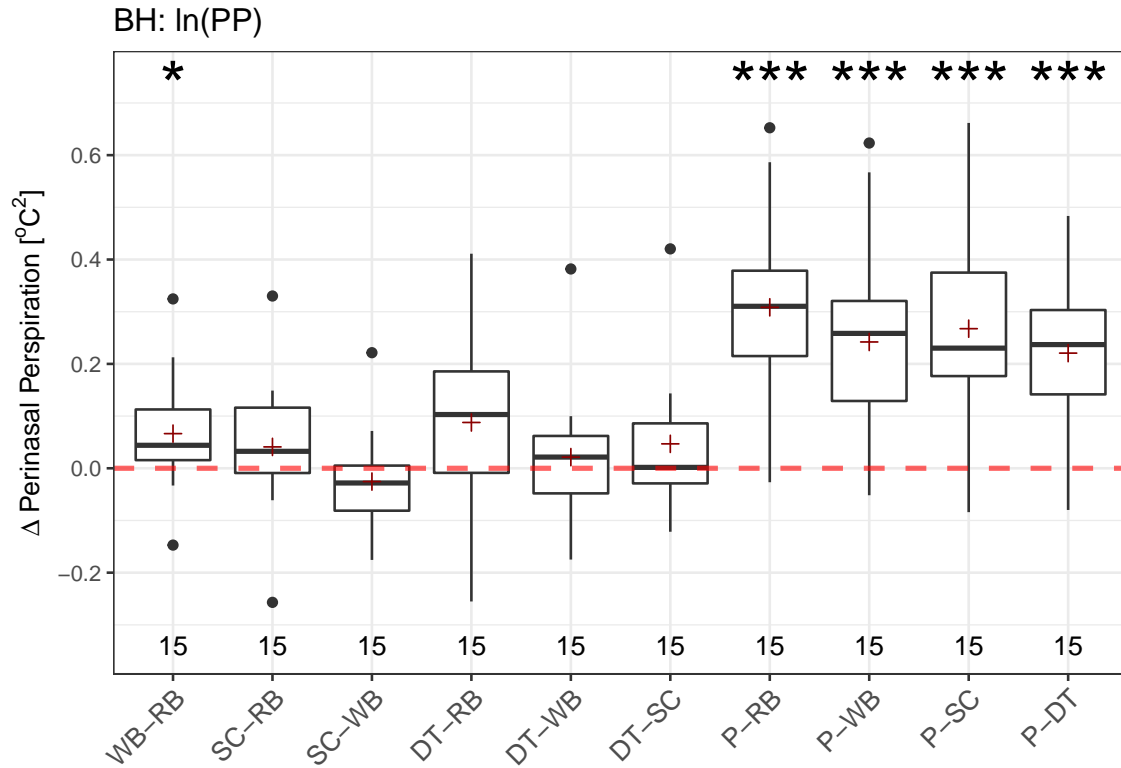

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0352 < 0.05  *
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.2413 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.304 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.0505 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.5187 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.1744 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0 < 0.001  ***
##
## Presentation - Writing Baseline
## Transformed t-test p = 2e-04 < 0.001  ***
```

```
## 
## Presentation - Stress Condition
## Transformed t-test p = 1e-04 < 0.001  ***
## 
## Presentation - Dual Task
## Transformed t-test p = 0 < 0.001  ***
```

BH: HR
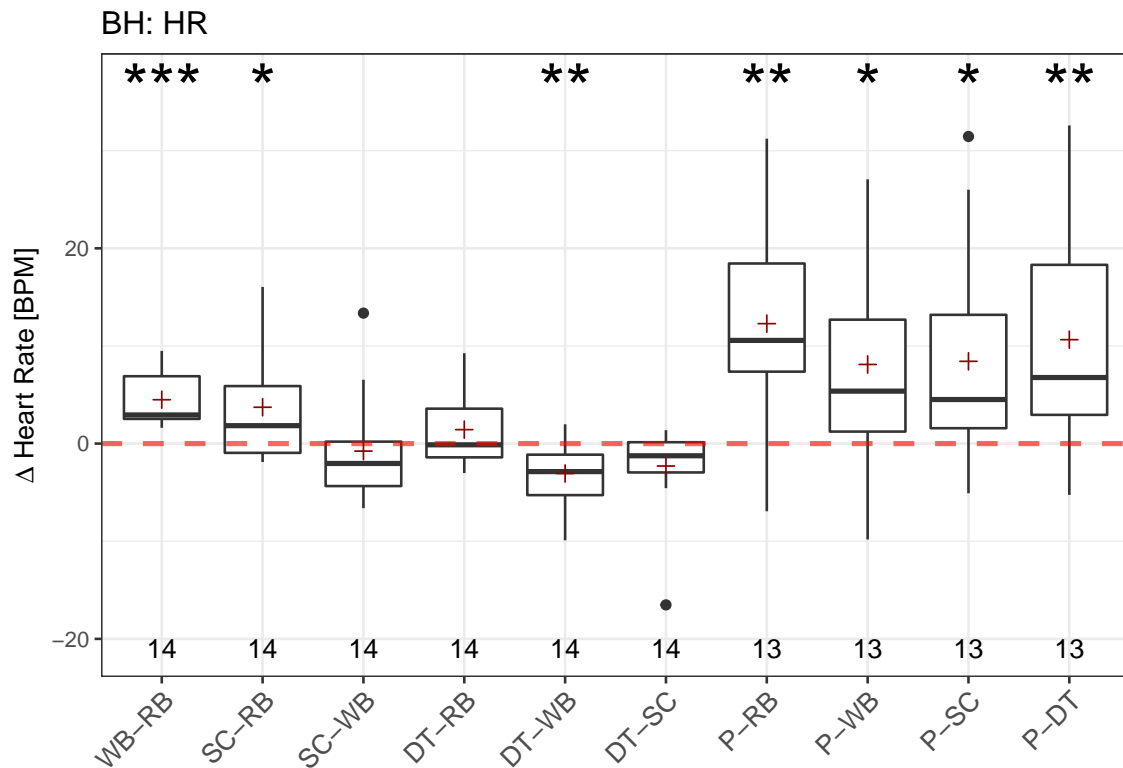

```
## Writing Baseline - Resting Baseline
## t-test p = 0 < 0.001  ***
##
## Stress Condition - Resting Baseline
## t-test p = 0.0312 < 0.05  *
##
## StressCondition - Writing Baseline
## t-test p = 0.606 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.1825 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0.0031 < 0.01  **
##
## Dual Task - Stress Condition
## t-test p = 0.0763 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.003 < 0.01  **
##
## Presentation - Writing Baseline
## t-test p = 0.025 < 0.05  *
##
## Presentation - Stress Condition
```

```
## t-test p = 0.019 < 0.05  *
##
## Presentation - Dual Task
## t-test p = 0.0079 < 0.01  **
```
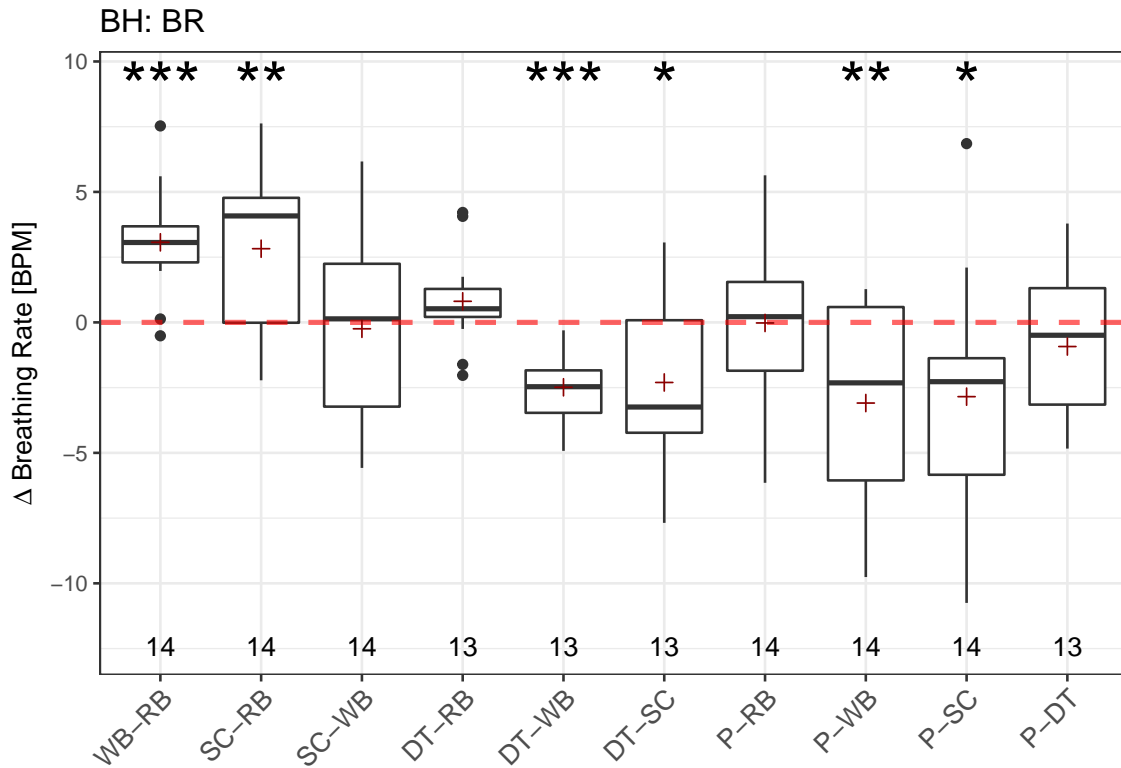
```
## Writing Baseline - Resting Baseline
## t-test p = 1e-04 < 0.001   ***
##
## Stress Condition - Resting Baseline
## t-test p = 0.0071 < 0.01   **
##
## StressCondition - Writing Baseline
## t-test p = 0.7954 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.1324 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0 < 0.001   ***
##
## Dual Task - Stress Condition
## t-test p = 0.026 < 0.05   *
##
## Presentation - Resting Baseline
## t-test p = 0.9812 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0.0098 < 0.01   **
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0368 < 0.05  *
##
## Presentation - Dual Task
## t-test p = 0.2594 > 0.05
```

```
## BH has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
## BH has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```

Batch-Low (BL)

Sensor Channels per Activity
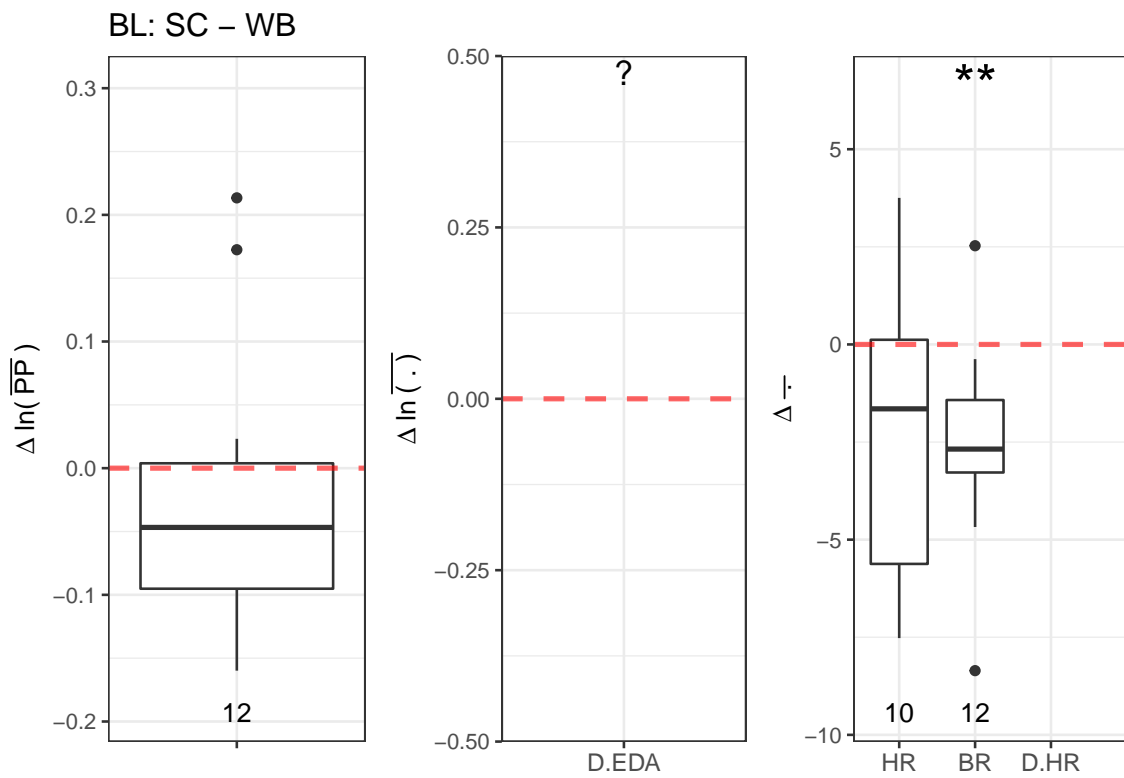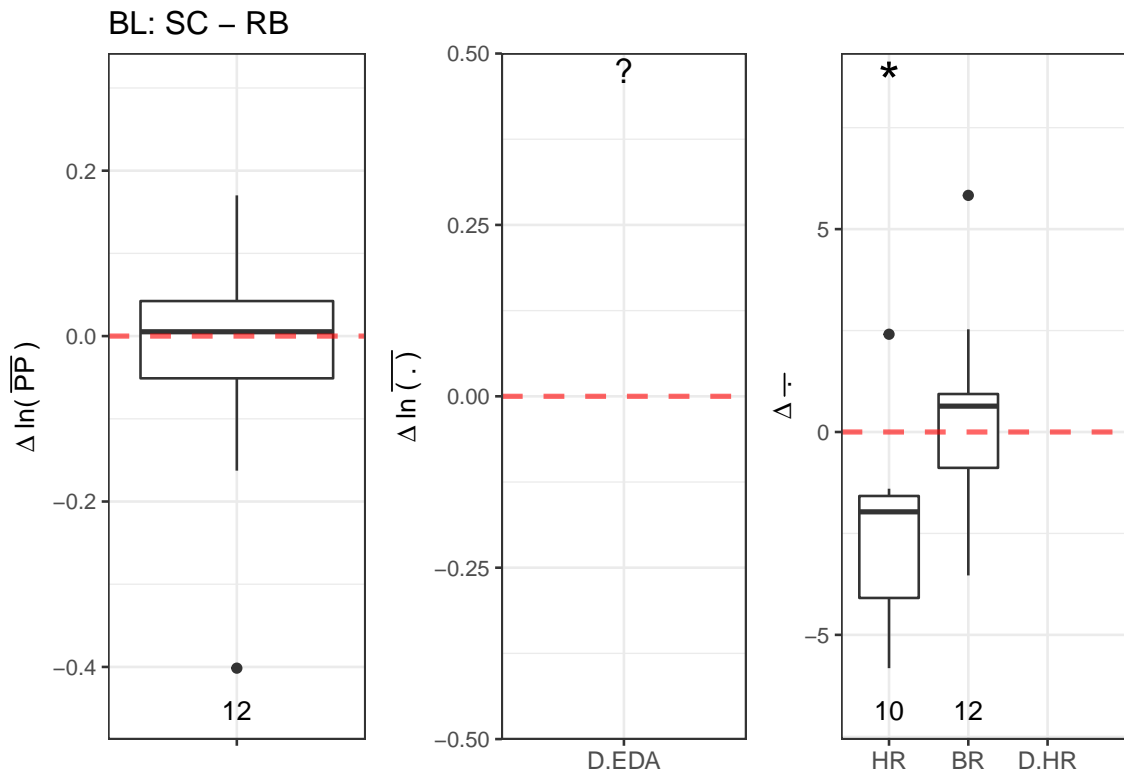
Sensor Channel across Activities

BL: ln(PP)
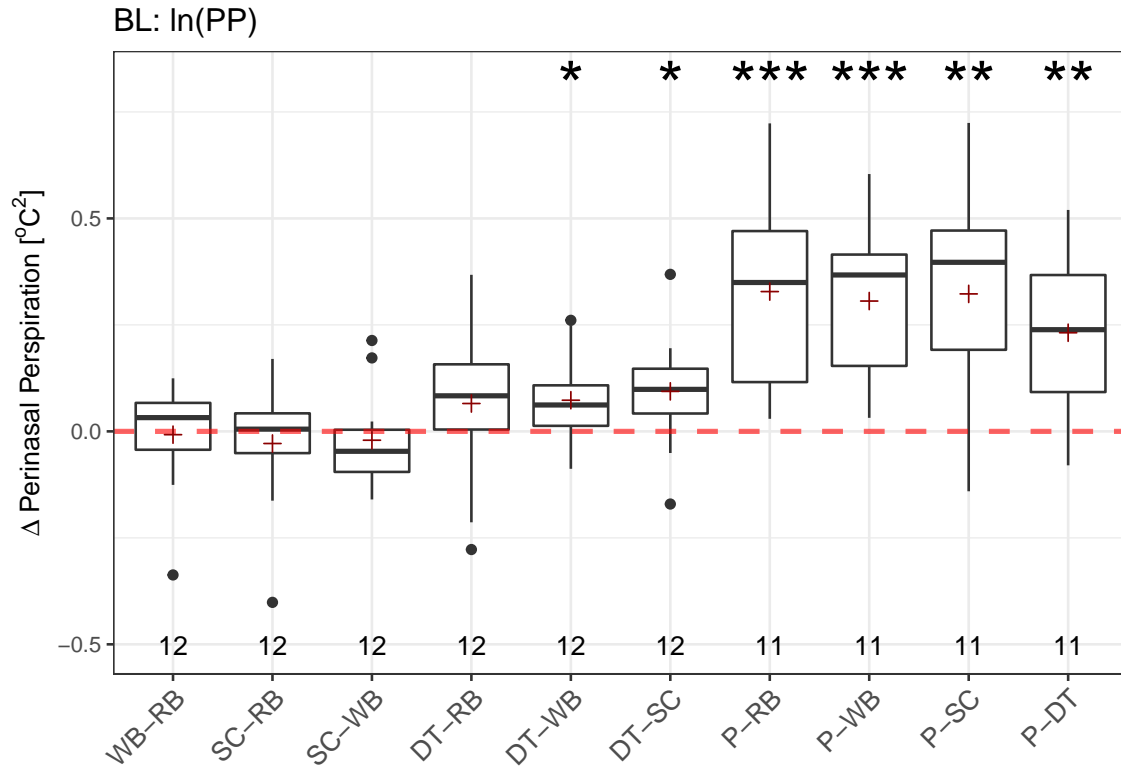

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.8433 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.5174 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.5352 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.2305 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0324 < 0.05  *
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.0339 < 0.05  *
##
## Presentation - Resting Baseline
## Transformed t-test p = 7e-04 < 0.001  ***
##
## Presentation - Writing Baseline
## Transformed t-test p = 3e-04 < 0.001  ***
```

```
## 
## Presentation - Stress Condition
## Transformed t-test p = 0.0018 < 0.01  **
## 
## Presentation - Dual Task
## Transformed t-test p = 0.0022 < 0.01  **
```
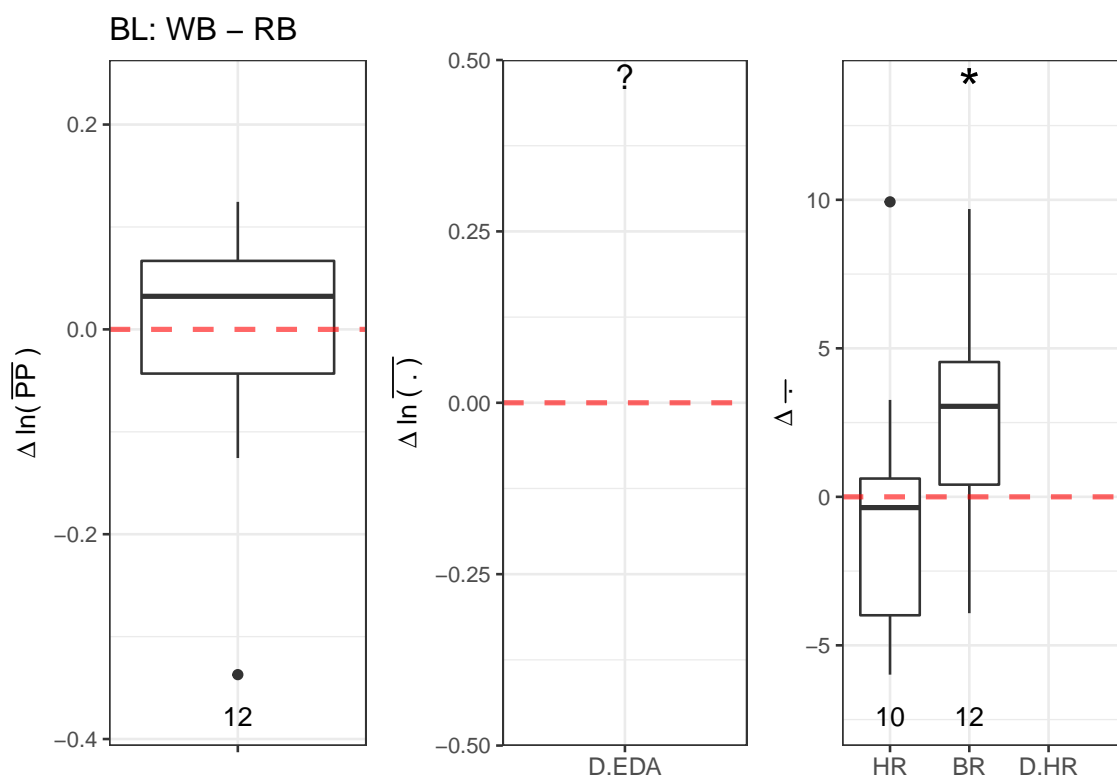
BL: HR
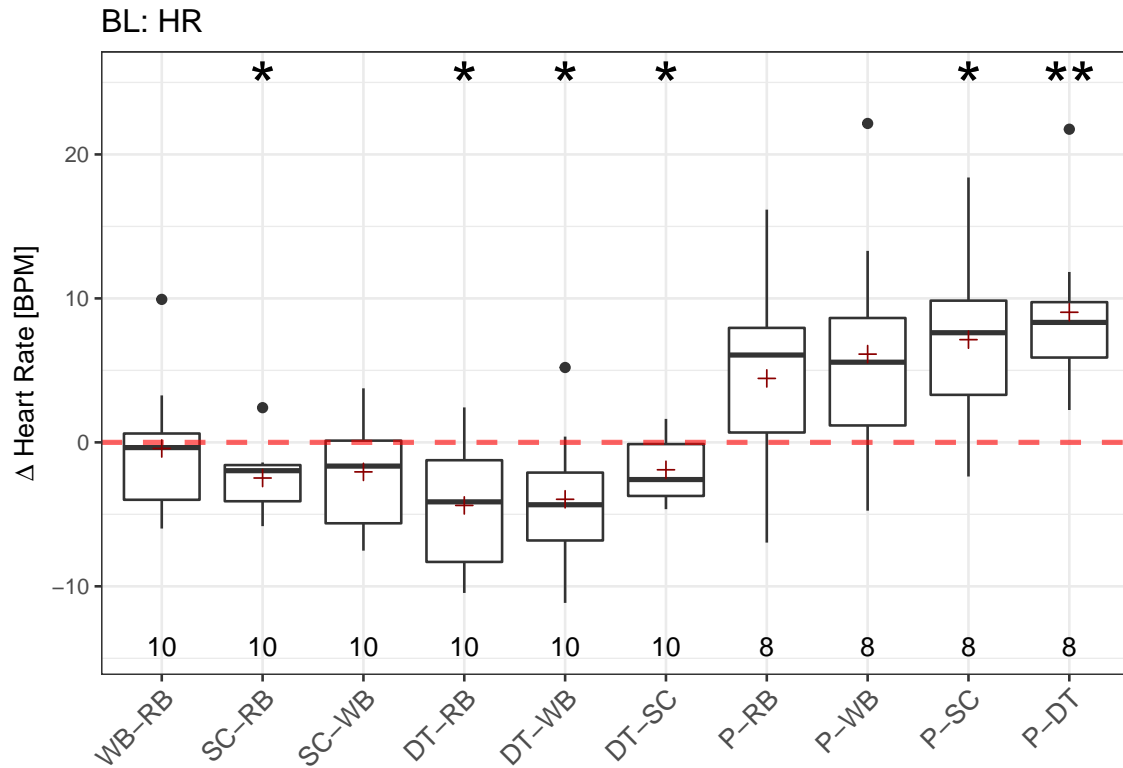

```
## Writing Baseline - Resting Baseline
## t-test p = 0.7812 > 0.05
##
## Stress Condition - Resting Baseline
## t-test p = 0.0103 < 0.05  *
##
## StressCondition - Writing Baseline
## t-test p = 0.1456 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.0108 < 0.05  *
##
## Dual Task - Writing Baseline
## t-test p = 0.0258 < 0.05  *
##
## Dual Task - Stress Condition
## t-test p = 0.0327 < 0.05  *
##
## Presentation - Resting Baseline
## t-test p = 0.1315 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0.0826 > 0.05
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0152 < 0.05  *
##
## Presentation - Dual Task
## t-test p = 0.0035 < 0.01  **
```

BL: BR
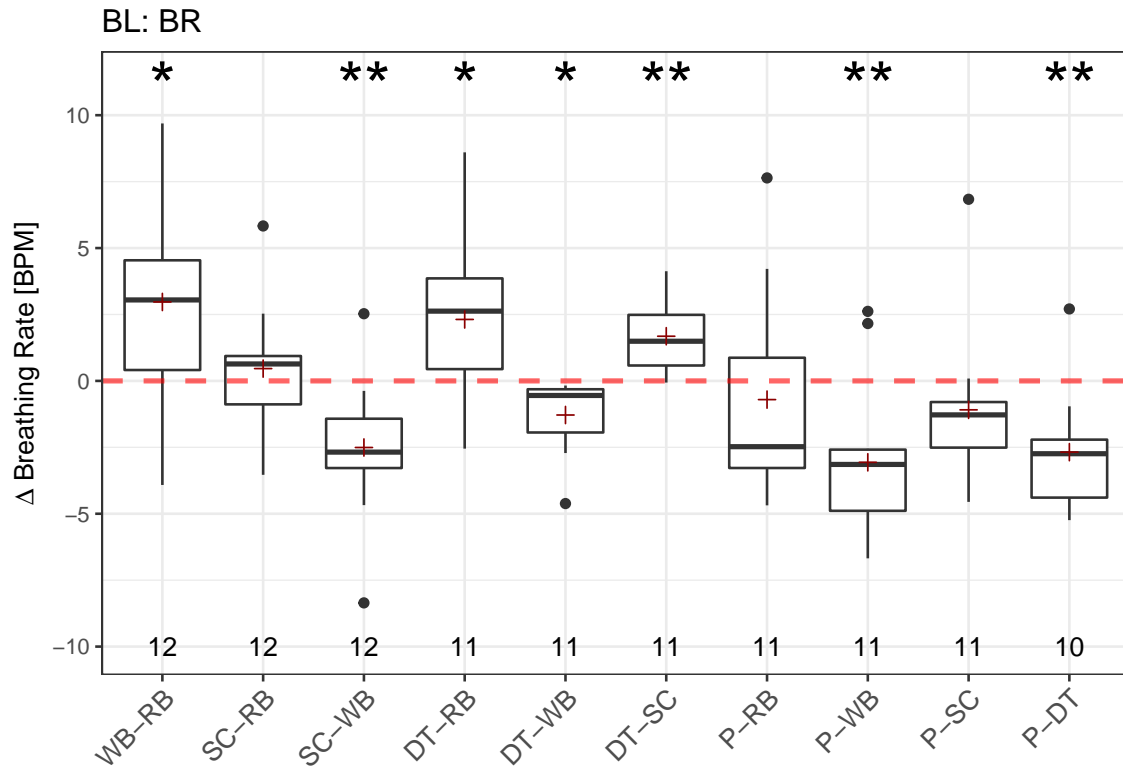
```
## Writing Baseline - Resting Baseline
## t-test p = 0.0213 < 0.05  *
##
## Stress Condition - Resting Baseline
## t-test p = 0.4994 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0.007 < 0.01  **
##
## Dual Task - Resting Baseline
## t-test p = 0.0319 < 0.05  *
##
## Dual Task - Writing Baseline
## t-test p = 0.0131 < 0.05  *
##
## Dual Task - Stress Condition
## t-test p = 0.0029 < 0.01  **
##
## Presentation - Resting Baseline
## t-test p = 0.5548 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0.0073 < 0.01  **
##
## Presentation - Stress Condition
```

```
## t-test p = 0.2515 > 0.05
##
## Presentation - Dual Task
## t-test p = 0.0052 < 0.01  **
```

```
## BL has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
## BL has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```
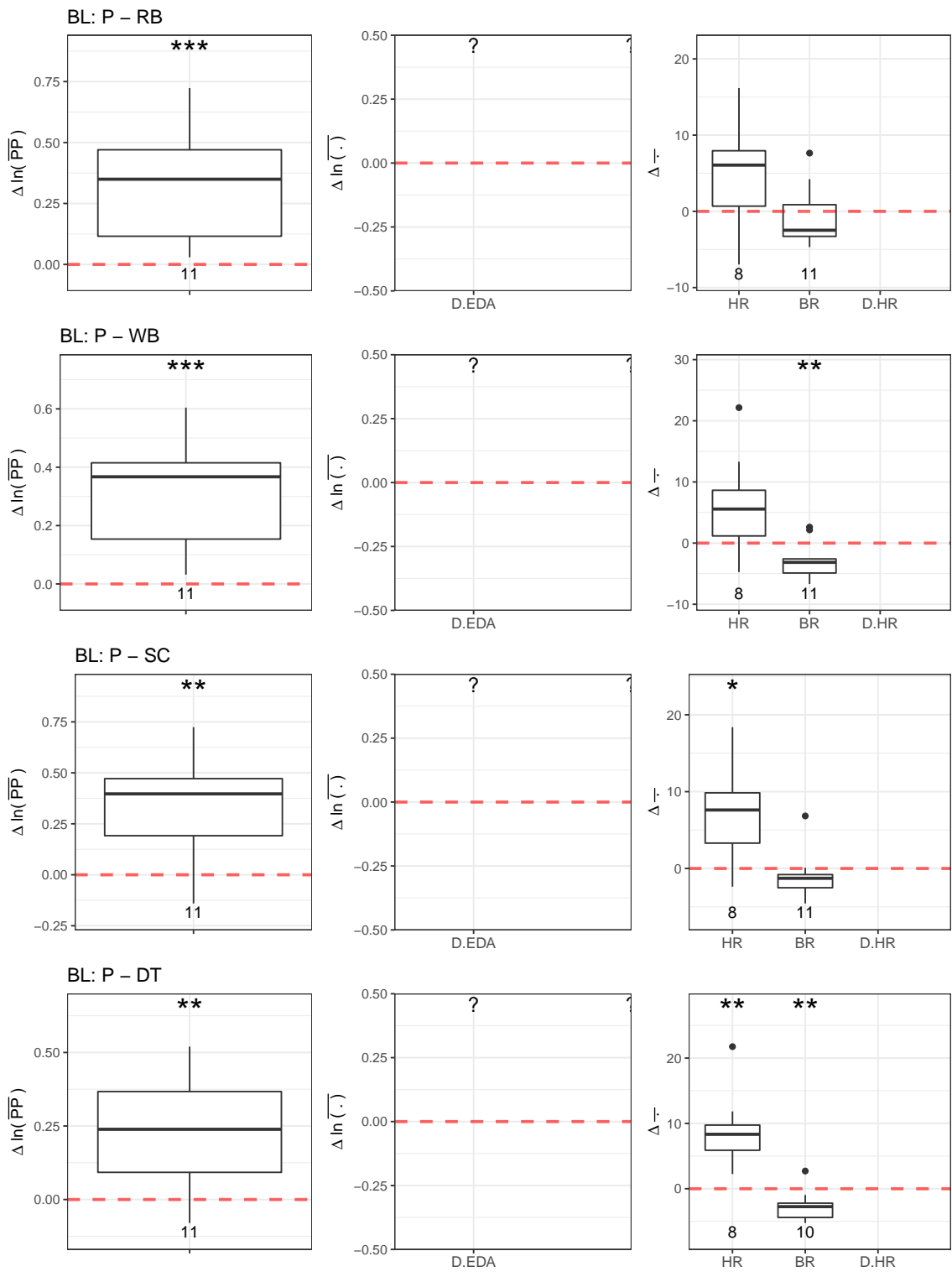
Across Activities

WB – RB for ln(PP)
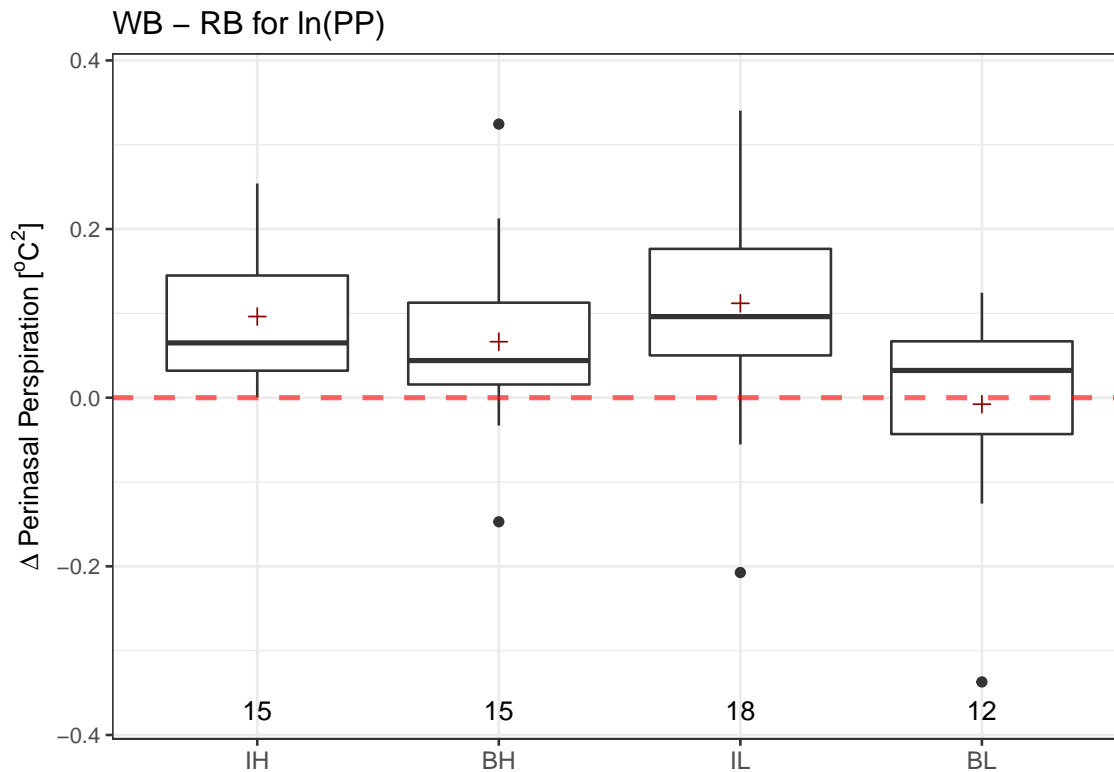

```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3 0.1142 0.03806   2.864 0.0447 *
## Residuals   56 0.7443 0.01329
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff          lwr        upr      p adj
## BL-BH -0.07412879 -0.192355250 0.04409767 0.3541553
## IH-BH  0.02982873 -0.081636244 0.14129370 0.8932791
## IL-BH  0.04550475 -0.061214840 0.15222434 0.6733104
## IH-BL  0.10395752 -0.014268937 0.22218398 0.1037887
## IL-BL  0.11963354  0.005870076 0.23339700 0.0356938
## IL-IH  0.01567602 -0.091043571 0.12239561 0.9798179
```

WB – RB for HR
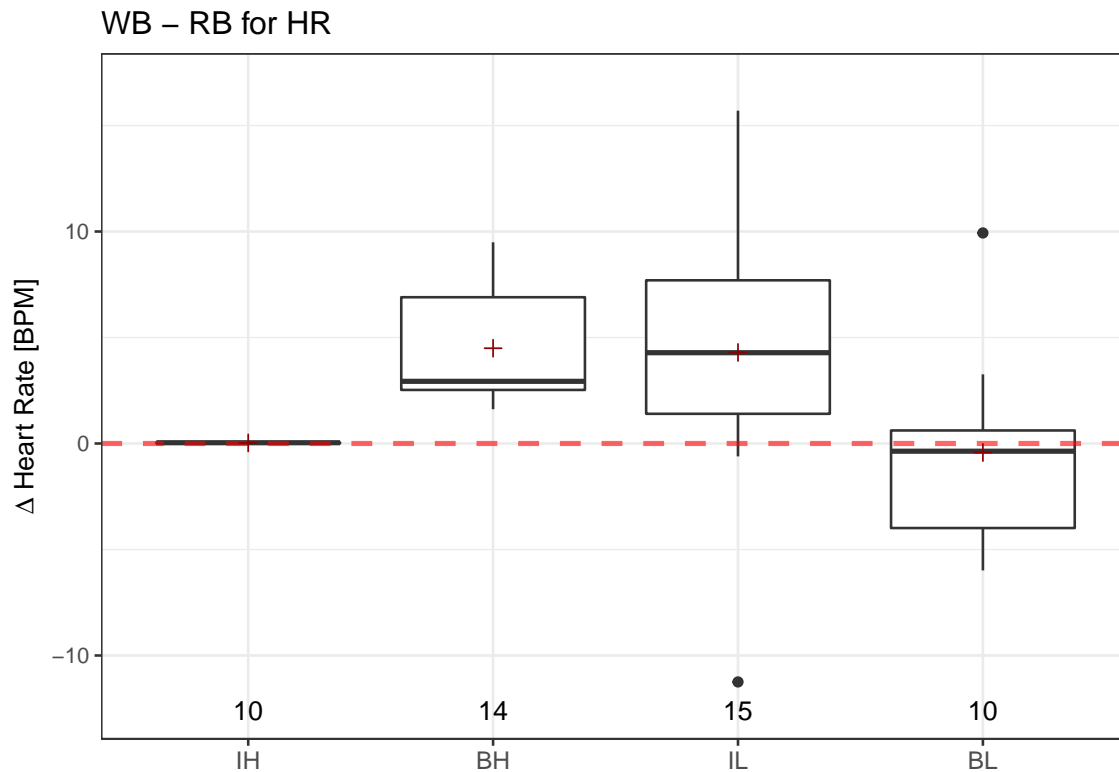

```
## ANOVA:
##              Df Sum Sq Mean Sq F value  Pr(>F)
## Condition    3   250.7   83.55   4.557 0.00716 **
## Residuals   45   825.0   18.33
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff         lwr         upr      p adj
## BL-BH -4.9196532 -9.64900561 -0.1903008 0.0386560
## IH-BH -4.4665106 -9.19586302  0.2628418 0.0703840
## IL-BH -0.1998730 -4.44459667  4.0448507 0.9992808
## IH-BL  0.4531426 -4.65514183  5.5614270 0.9952682
## IL-BL  4.7197802  0.05657588  9.3829846 0.0463062
## IL-IH  4.2666376 -0.39656672  8.9298420 0.0838139
```

WB – RB for BR
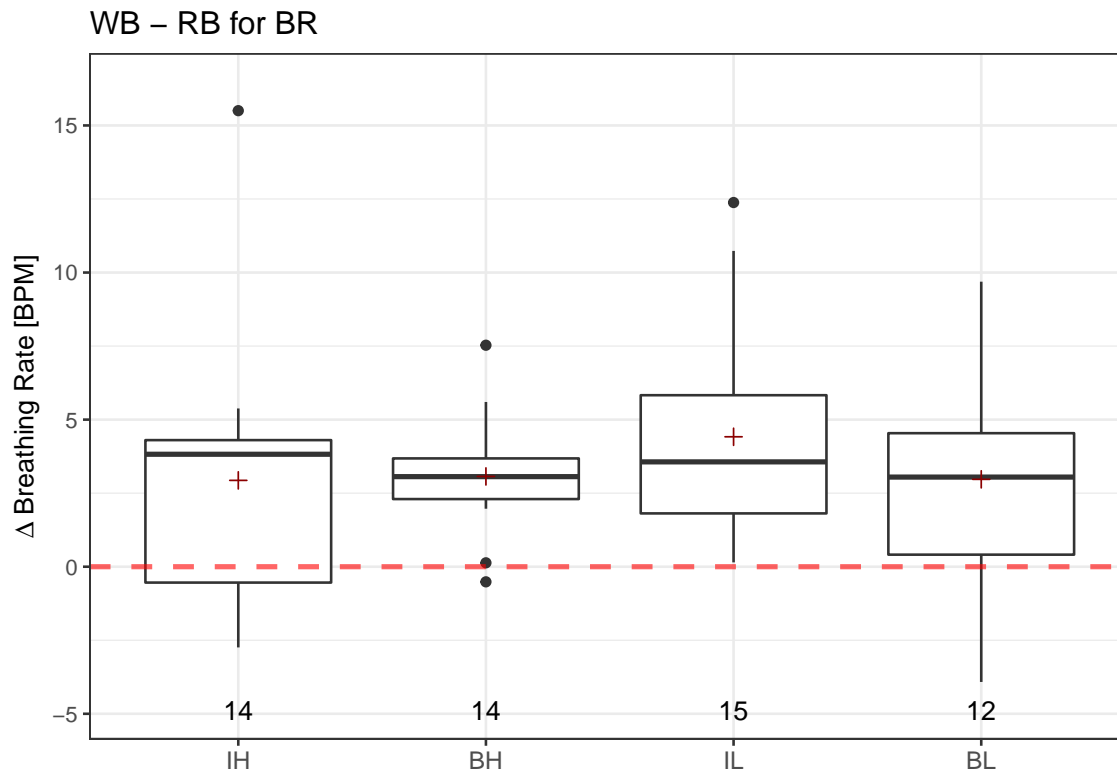
```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   22.3   7.424   0.566   0.64
## Residuals   51  668.8  13.114
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff       lwr       upr     p adj
## BL-BH -0.09813493 -3.881706 3.685436 0.9998811
## IH-BH -0.13430715 -3.769445 3.500830 0.9996570
## IL-BH  1.34805953 -2.225979 4.922098 0.7490775
## IH-BL -0.03617222 -3.819743 3.747399 0.9999940
## IL-BL  1.44619445 -2.278713 5.171102 0.7320995
## IL-IH  1.48236667 -2.091672 5.056405 0.6902268
```

SC − RB for ln(PP)


```
## [1] "Removed 12 subjects who had Stroop scores less than 30."
##
## ---
##   ANOVA:
##            Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3 0.0728 0.02427   0.822  0.489
## Residuals  45 1.3288 0.02953
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##               diff        lwr       upr      p adj
## BL-BH -0.08979869 -0.2860815 0.1064842 0.6173145
## IH-BH  0.01229177 -0.1983367 0.2229203 0.9986356
## IL-BH -0.05181676 -0.2326192 0.1289857 0.8699228
## IH-BL  0.10209046 -0.1000529 0.3042338 0.5383634
## IL-BL  0.03798193 -0.1328604 0.2088242 0.9336536
## IL-IH -0.06410853 -0.2512569 0.1230398 0.7975838
```
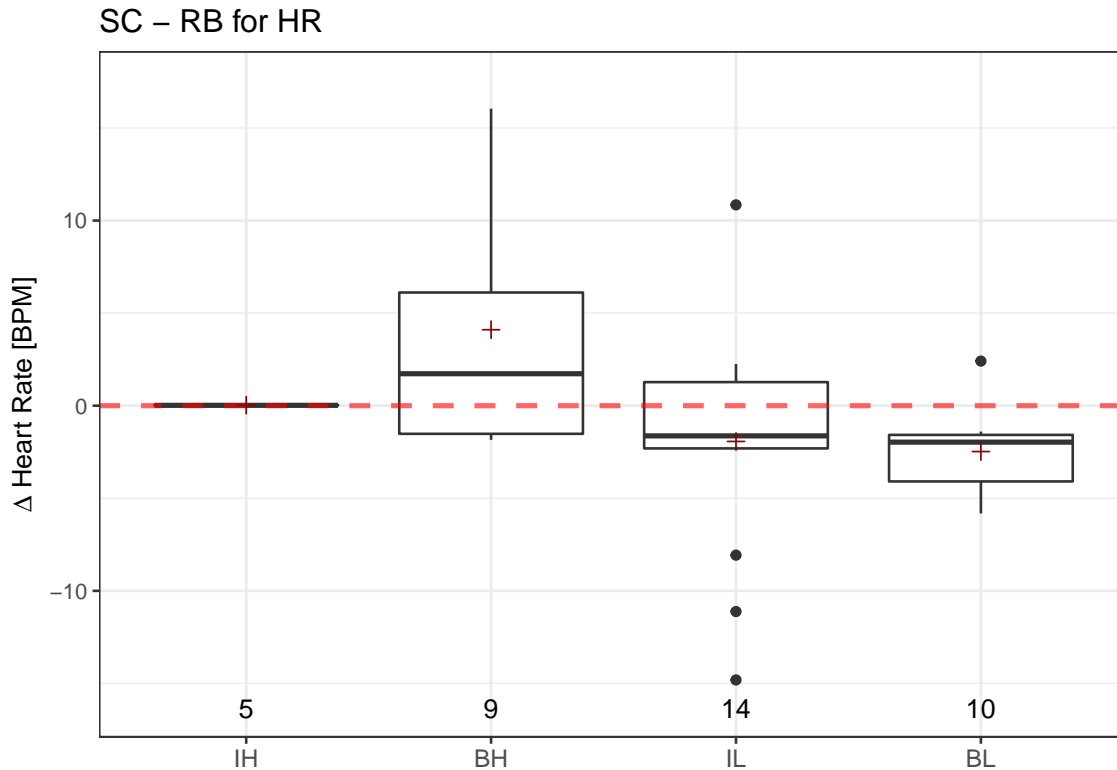
SC – RB for HR


```
## [1] "Removed 12 subjects who had Stroop scores less than 30."
##
## ---
##    ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3  259.4   86.45   3.219 0.0348 *
## Residuals   34  913.0   26.85
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##             diff        lwr         upr       p adj
## BL-BH -6.5799547 -13.010446 -0.14946344 0.0433014
## IH-BH -4.0765265 -11.882847  3.72979389 0.5017524
## IL-BH -6.0340801 -12.013613 -0.05454727 0.0472686
## IH-BL  2.5034283  -5.162226 10.16908268 0.8141242
## IL-BL  0.5458746  -5.248815  6.34056471 0.9941124
## IL-IH -1.9575536  -9.249045  5.33393814 0.8863834
```
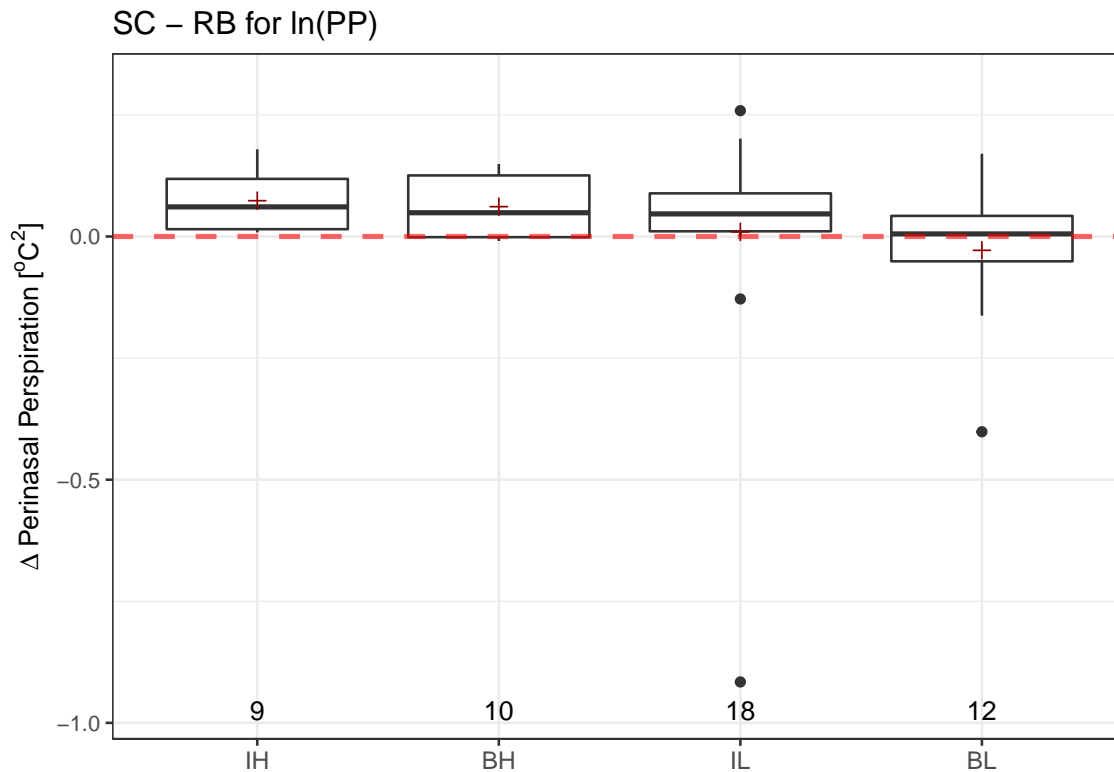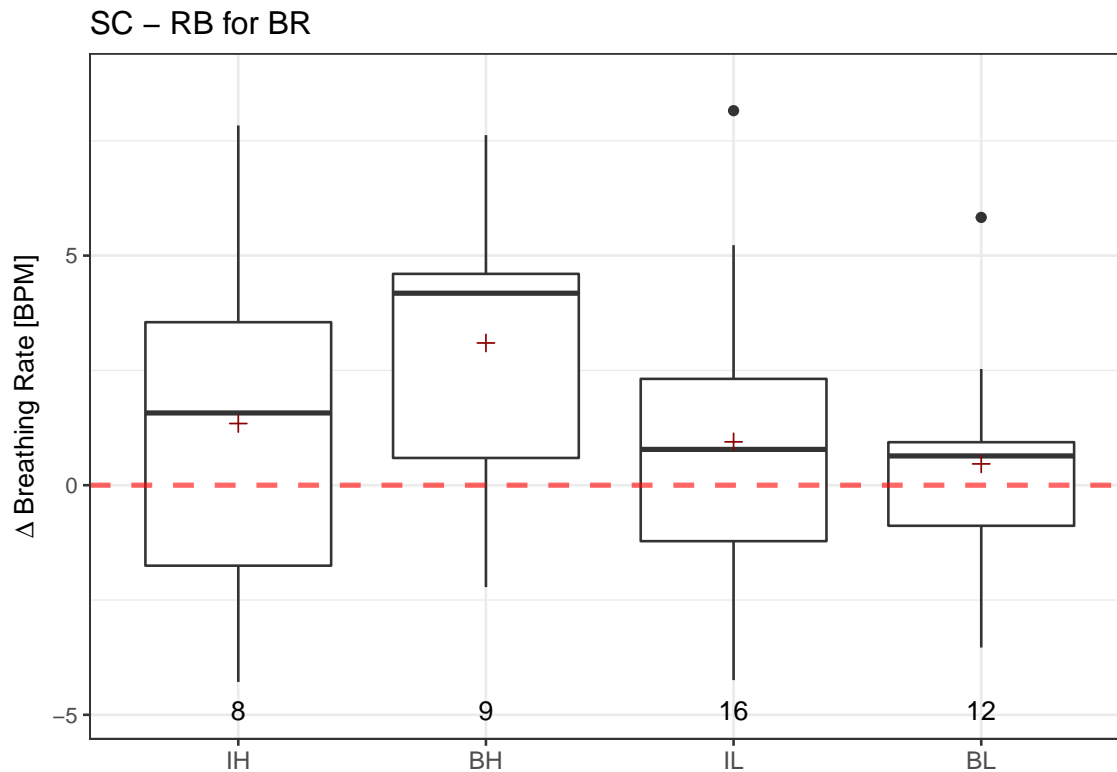
SC – RB for BR


```
## [1] "Removed 12 subjects who had Stroop scores less than 30."
##
## ---
##   ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   39.5   13.16   1.285  0.292
## Residuals   41  419.8   10.24
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##             diff       lwr      upr      p adj
## BL-BH -2.6335190 -6.411679 1.144642 0.2581994
## IH-BH -1.7541503 -5.917480 2.409180 0.6744832
## IL-BH -2.1527332 -5.722759 1.417293 0.3818948
## IH-BL  0.8793687 -3.031399 4.790136 0.9308213
## IL-BL  0.4807858 -2.791197 3.752769 0.9790607
## IL-IH -0.3985828 -4.108663 3.311497 0.9915787
```

DT – RB for ln(PP)
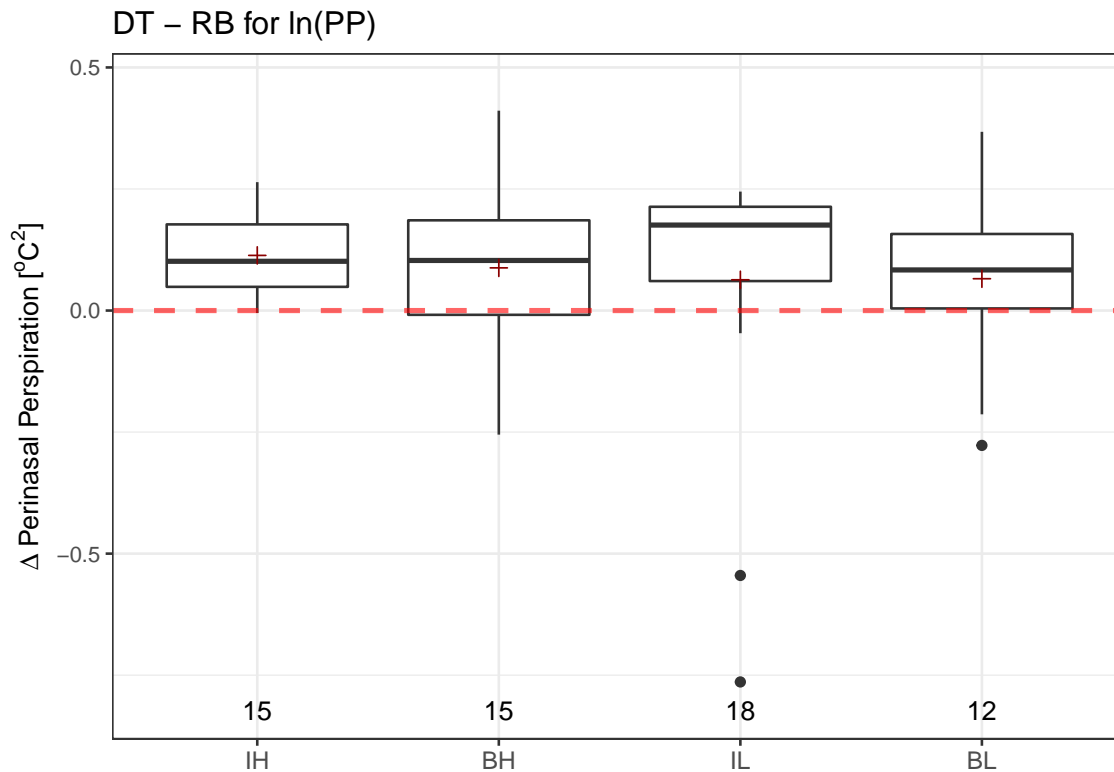
```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3 0.0249 0.00830   0.221  0.881
## Residuals   56 2.0981 0.03747
##
## ---
##
##      Tukey multiple comparisons of means
##      95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##                 diff        lwr       upr     p adj
## BL-BH -0.022326874 -0.2208297 0.1761760 0.9907150
## IH-BH  0.025611581 -0.1615387 0.2127618 0.9835522
## IL-BH -0.024530740 -0.2037135 0.1546520 0.9835337
## IH-BL  0.047938455 -0.1505644 0.2464413 0.9187587
## IL-BL -0.002203866 -0.1932133 0.1888056 0.9999896
## IL-IH -0.050142321 -0.2293251 0.1290404 0.8800917
```

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DT – RB for HR
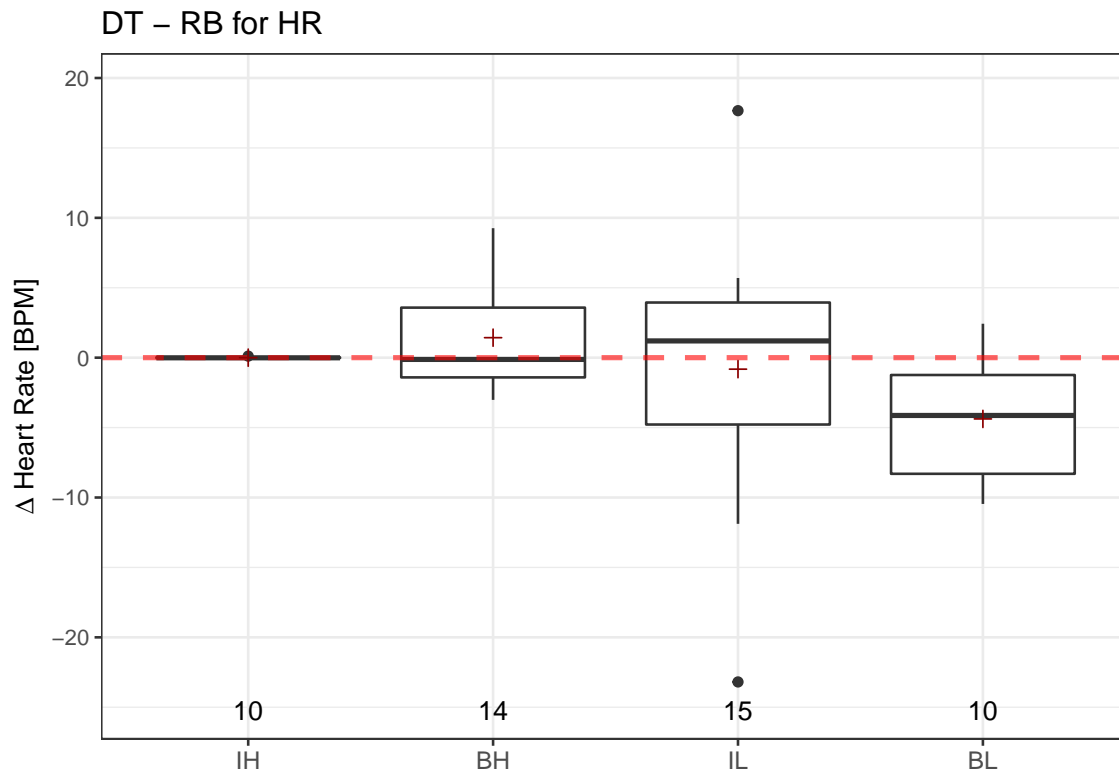

```
## ANOVA:
##              Df Sum Sq Mean Sq F value Pr(>F)
## Condition     3    204   68.01   1.988  0.129
## Residuals    45   1540   34.22
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##               diff        lwr        upr      p adj
## BL-BH -5.8105026 -12.271528   0.6505223 0.0917771
## IH-BH -1.4303330  -7.891358   5.0306920 0.9344190
## IL-BH -2.2513207  -8.050268   3.5476266 0.7295653
## IH-BL  4.3801697  -2.598535  11.3588742 0.3489067
## IL-BL  3.5591819  -2.811475   9.9298384 0.4516232
## IL-IH -0.8209878  -7.191644   5.5496687 0.9858452
```

DT – RB for BR
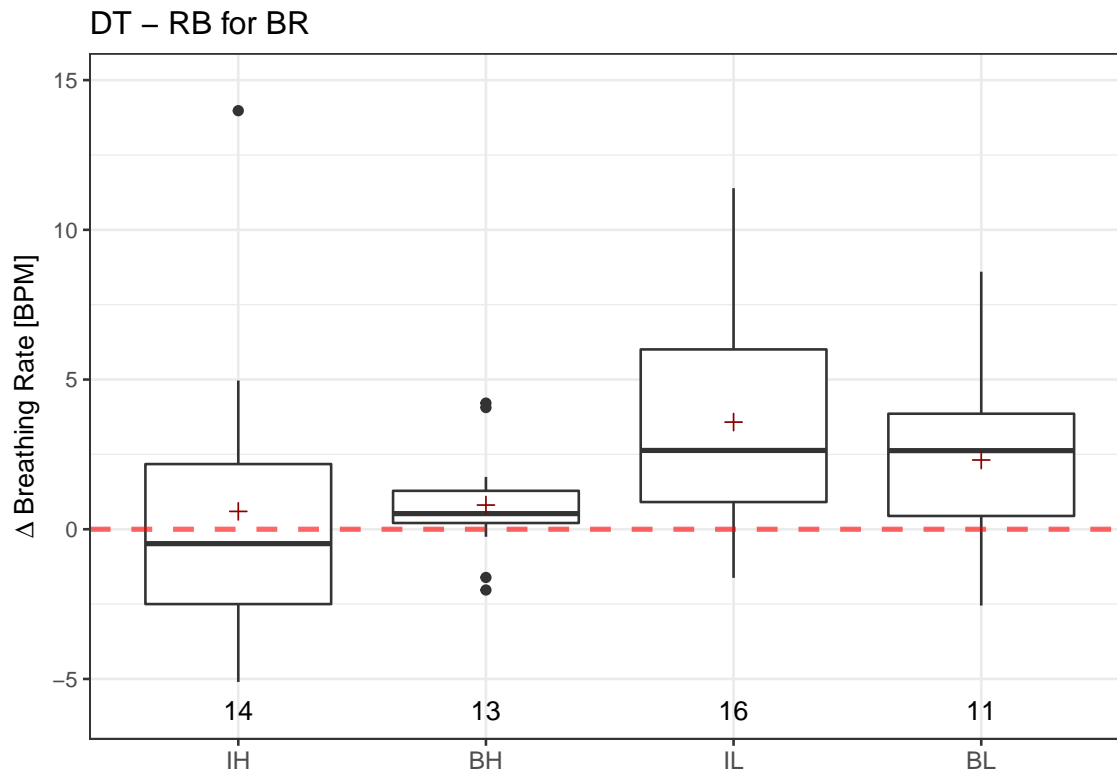
```
## ANOVA:
##              Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3    86.3   28.76   2.104  0.111
## Residuals   50   683.3   13.67
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff        lwr       upr     p adj
## BL-BH   1.5049079 -2.5200424  5.529858 0.7536862
## IH-BH  -0.2119399 -3.9960965  3.572217 0.9988085
## IL-BH   2.7711768 -0.8973377  6.439691 0.1989563
## IH-BL  -1.7168478 -5.6753651  2.241670 0.6590569
## IL-BL   1.2662689 -2.5818498  5.114388 0.8179748
## IL-IH   2.9831167 -0.6123853  6.578619 0.1359019
```

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P – RB for ln(PP)
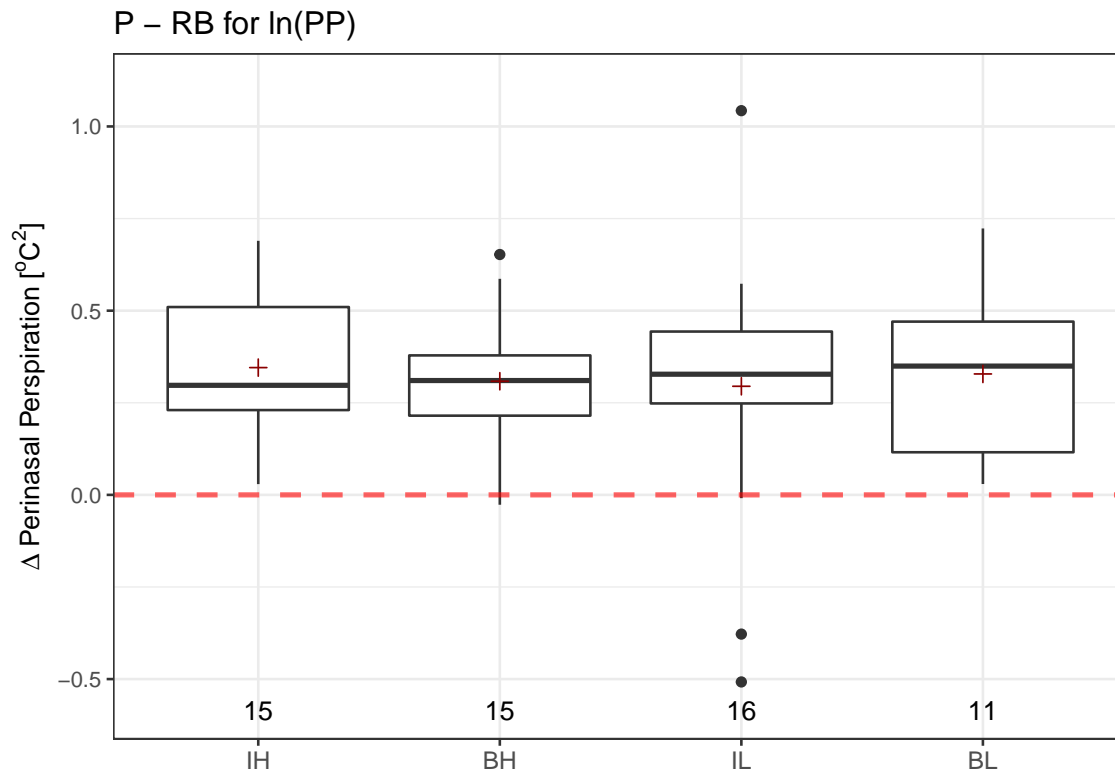


```
## ANOVA:
##            Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3  0.022 0.00748   0.109  0.954
## Residuals  53  3.622 0.06833
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff        lwr       upr     p adj
## BL-BH  0.01981345 -0.2554283 0.2950552 0.9975008
## IH-BH  0.03702630 -0.2161593 0.2902118 0.9799627
## IL-BH -0.01362870 -0.2628268 0.2355694 0.9988974
## IH-BL  0.01721284 -0.2580289 0.2924546 0.9983556
## IL-BL -0.03344215 -0.3050205 0.2381362 0.9878309
## IL-IH -0.05065499 -0.2998531 0.1985431 0.9490357
```

P − RB for HR
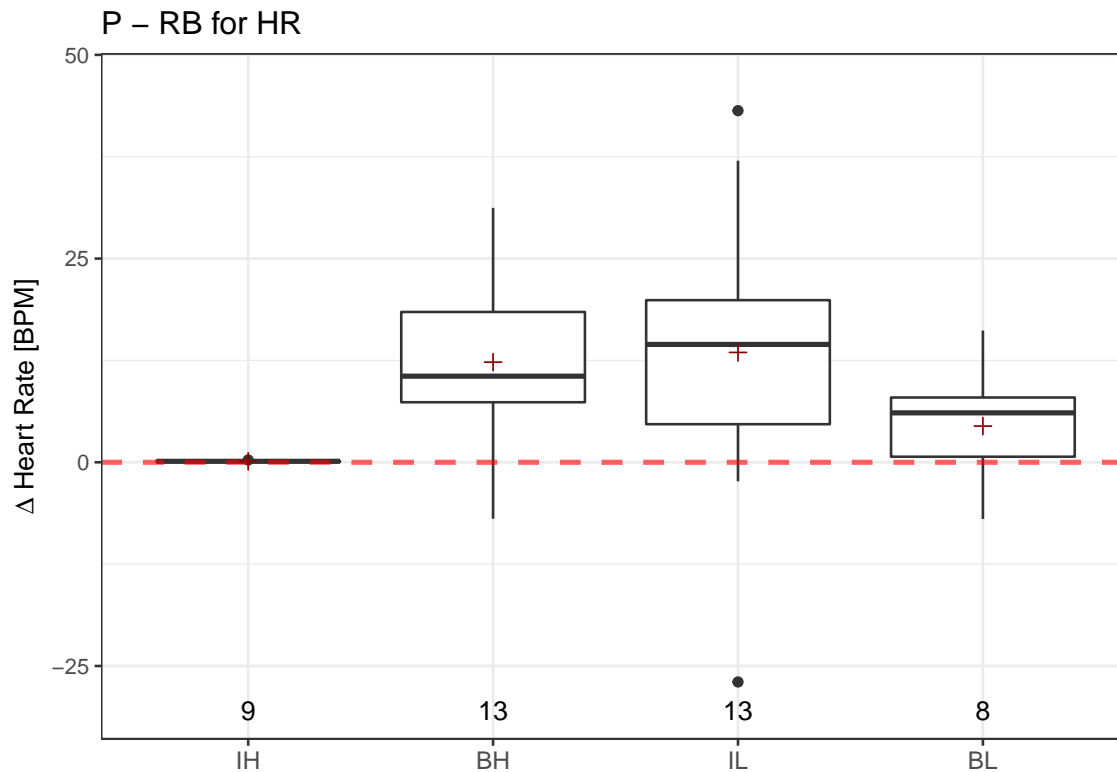
```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   1272   423.9   2.772 0.0543 .
## Residuals   39   5965   152.9
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##             diff       lwr        upr       p adj
## BL-BH  -7.844796 -22.756989   7.067397 0.4998801
## IH-BH -12.166763 -26.556967   2.223441 0.1230886
## IL-BH   1.193799 -11.822630  14.210228 0.9946754
## IH-BL  -4.321966 -20.447227  11.803295 0.8888525
## IL-BL   9.038595  -5.873598  23.950788 0.3760510
## IL-IH  13.360562  -1.029642  27.750766 0.0770635
```

P − RB for BR
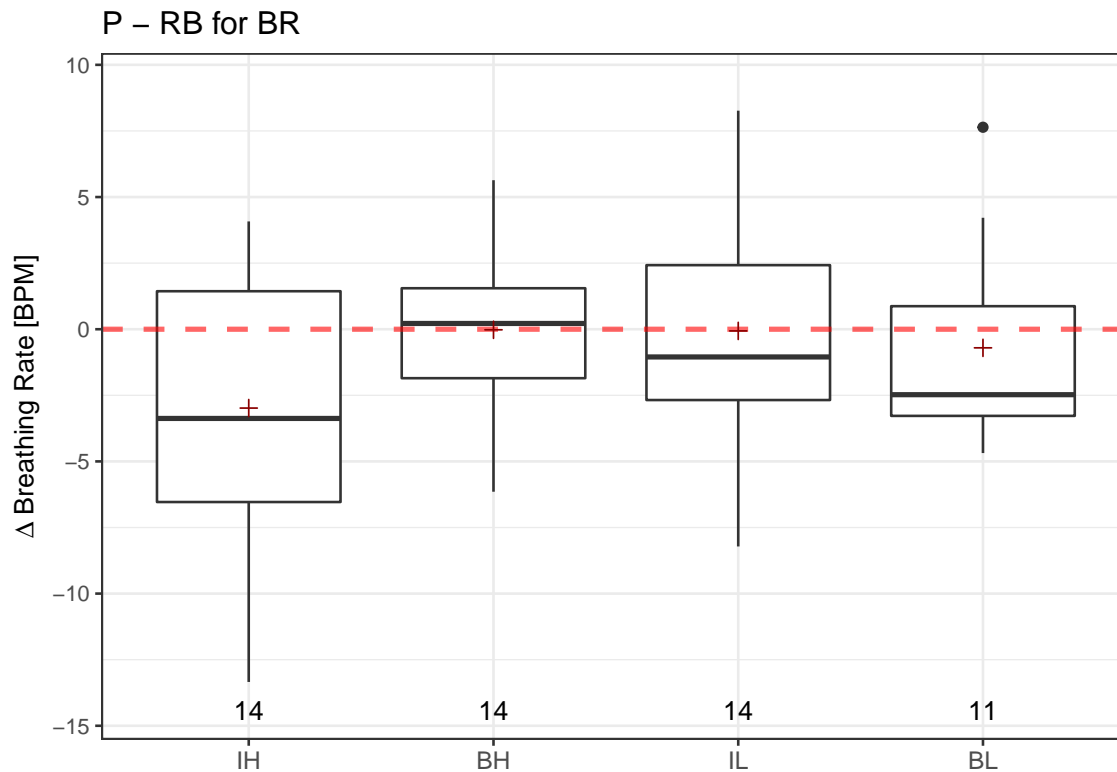

```
## ANOVA:
##              Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3    81.6   27.19   1.479  0.232
## Residuals   49   900.7   18.38
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff        lwr        upr      p adj
## BL-BH -0.68262225 -5.276599 3.911354 0.9788438
## IH-BH -2.96115552 -7.270688 1.348377 0.2730812
## IL-BH -0.04213114 -4.351663 4.267401 0.9999936
## IH-BL -2.27853327 -6.872510 2.315443 0.5554773
## IL-BL  0.64049111 -3.953486 5.234468 0.9823958
## IL-IH  2.91902438 -1.390508 7.228556 0.2850426
```

Summary

Condition	Difference	Measure	p	Test	n	Significance
BH	WB - RB	PP	0.0352153	Transformed t-test	15	*
BH	WB - RB	HR	0.0000428	t-test	14	***
BH	WB - RB	BR	0.0000774	t-test	14	***
BH	SC - RB	PP	0.2413388	Transformed t-test	15	
BH	SC - RB	HR	0.0312037	t-test	14	*
BH	SC - RB	BR	0.0070531	t-test	14	**
BH	SC - WB	PP	0.3040482	Transformed t-test	15	
BH	SC - WB	HR	0.6059893	t-test	14	
BH	SC - WB	BR	0.7954120	t-test	14	
BH	DT - RB	PP	0.0505188	Transformed t-test	15	
BH	DT - RB	HR	0.1825400	t-test	14	
BH	DT - RB	BR	0.1324106	t-test	13	
BH	DT - WB	PP	0.5186918	Transformed t-test	15	
BH	DT - WB	HR	0.0031391	t-test	14	**
BH	DT - WB	BR	0.0000088	t-test	13	***
BH	DT - SC	PP	0.1743711	Transformed t-test	15	
BH	DT - SC	HR	0.0763288	t-test	14	
BH	DT - SC	BR	0.0259816	t-test	13	*
BH	P - RB	PP	0.0000132	Transformed t-test	15	***
BH	P - RB	HR	0.0030488	t-test	13	**
BH	P - RB	BR	0.9811863	t-test	14	
BH	P - WB	PP	0.0002321	Transformed t-test	15	***
BH	P - WB	HR	0.0250320	t-test	13	*
BH	P - WB	BR	0.0097644	t-test	14	**
BH	P - SC	PP	0.0001317	Transformed t-test	15	***
BH	P - SC	HR	0.0190035	t-test	13	*
BH	P - SC	BR	0.0368033	t-test	14	*
BH	P - DT	PP	0.0000409	Transformed t-test	15	***
BH	P - DT	HR	0.0078854	t-test	13	**
BH	P - DT	BR	0.2593952	t-test	13	
BL	WB - RB	PP	0.8433458	Transformed t-test	12	
BL	WB - RB	HR	0.7811862	t-test	10	
BL	WB - RB	BR	0.0212853	t-test	12	*
BL	SC - RB	PP	0.5173705	Transformed t-test	12	
BL	SC - RB	HR	0.0102841	t-test	10	*
BL	SC - RB	BR	0.4994220	t-test	12	
BL	SC - WB	PP	0.5351977	Transformed t-test	12	
BL	SC - WB	HR	0.1456147	t-test	10	
BL	SC - WB	BR	0.0070054	t-test	12	**
BL	DT - RB	PP	0.2305415	Transformed t-test	12	
BL	DT - RB	HR	0.0108477	t-test	10	*
BL	DT - RB	BR	0.0318774	t-test	11	*
BL	DT - WB	PP	0.0323522	Transformed t-test	12	*
BL	DT - WB	HR	0.0257532	t-test	10	*
BL	DT - WB	BR	0.0130720	t-test	11	*

(continued)

Condition	Difference	Measure	p	Test	n	Significance
BL	DT - SC	PP	0.0338649	Transformed t-test	12	*
BL	DT - SC	HR	0.0327077	t-test	10	*
BL	DT - SC	BR	0.0029055	t-test	11	**
BL	P - RB	PP	0.0007263	Transformed t-test	11	***
BL	P - RB	HR	0.1315024	t-test	8	
BL	P - RB	BR	0.5547823	t-test	11	
BL	P - WB	PP	0.0003158	Transformed t-test	11	***
BL	P - WB	HR	0.0825614	t-test	8	
BL	P - WB	BR	0.0072924	t-test	11	**
BL	P - SC	PP	0.0017619	Transformed t-test	11	**
BL	P - SC	HR	0.0151621	t-test	8	*
BL	P - SC	BR	0.2514956	t-test	11	
BL	P - DT	PP	0.0022356	Transformed t-test	11	**
BL	P - DT	HR	0.0035014	t-test	8	**
BL	P - DT	BR	0.0051554	t-test	10	**
IH	WB - RB	PP	0.0005619	Transformed t-test	15	***
IH	WB - RB	HR	0.0141203	Transformed t-test	10	*
IH	WB - RB	BR	0.0327345	t-test	14	*
IH	SC - RB	PP	0.0150718	Transformed t-test	15	*
IH	SC - RB	HR	0.1603922	Transformed t-test	10	
IH	SC - RB	BR	0.1440535	t-test	14	
IH	SC - WB	PP	0.3733040	Transformed t-test	15	
IH	SC - WB	HR	0.5965140	Transformed t-test	10	
IH	SC - WB	BR	0.1515492	t-test	14	
IH	DT - RB	PP	0.0000913	Transformed t-test	15	***
IH	DT - RB	HR	0.9882509	Transformed t-test	10	
IH	DT - RB	BR	0.6464429	t-test	14	
IH	DT - WB	PP	0.4778497	Transformed t-test	15	
IH	DT - WB	HR	0.0756729	Transformed t-test	10	
IH	DT - WB	BR	0.0004343	t-test	14	***
IH	DT - SC	PP	0.2936782	Transformed t-test	15	
IH	DT - SC	HR	0.3773754	Transformed t-test	10	
IH	DT - SC	BR	0.2686204	t-test	14	
IH	P - RB	PP	0.0000262	Transformed t-test	15	***
IH	P - RB	HR	0.0024447	Transformed t-test	9	**
IH	P - RB	BR	0.0462637	t-test	14	*
IH	P - WB	PP	0.0003589	Transformed t-test	15	***
IH	P - WB	HR	0.0044530	Transformed t-test	9	**
IH	P - WB	BR	0.0006351	t-test	14	***
IH	P - SC	PP	0.0002149	Transformed t-test	15	***
IH	P - SC	HR	0.0048671	Transformed t-test	9	**
IH	P - SC	BR	0.0024417	t-test	14	**
IH	P - DT	PP	0.0004837	Transformed t-test	15	***
IH	P - DT	HR	0.0001638	Transformed t-test	9	***
IH	P - DT	BR	0.0070204	t-test	14	**
IL	WB - RB	PP	0.0018573	Transformed t-test	18	**
IL	WB - RB	HR	0.0167069	t-test	15	*

(continued)

Condition	Difference	Measure	p	Test	n	Significance
IL	WB - RB	BR	0.0002914	t-test	15	***
IL	SC - RB	PP	0.8712826	Transformed t-test	18	
IL	SC - RB	HR	0.2669373	t-test	14	
IL	SC - RB	BR	0.2700421	t-test	16	
IL	SC - WB	PP	0.0292817	Transformed t-test	18	*
IL	SC - WB	HR	0.0000048	t-test	14	***
IL	SC - WB	BR	0.0001511	t-test	15	***
IL	DT - RB	PP	0.3458176	Transformed t-test	18	
IL	DT - RB	HR	0.7345132	t-test	15	
IL	DT - RB	BR	0.0034643	t-test	16	**
IL	DT - WB	PP	0.3005530	Transformed t-test	18	
IL	DT - WB	HR	0.0017292	t-test	15	**
IL	DT - WB	BR	0.0052641	t-test	15	**
IL	DT - SC	PP	0.1502612	Transformed t-test	18	
IL	DT - SC	HR	0.4266015	t-test	14	
IL	DT - SC	BR	0.0029021	t-test	16	**
IL	P - RB	PP	0.0053576	Transformed t-test	16	**
IL	P - RB	HR	0.0189996	t-test	13	*
IL	P - RB	BR	0.9592999	t-test	14	
IL	P - WB	PP	0.0287956	Transformed t-test	16	*
IL	P - WB	HR	0.0350368	t-test	13	*
IL	P - WB	BR	0.0000044	t-test	13	***
IL	P - SC	PP	0.0008469	Transformed t-test	16	***
IL	P - SC	HR	0.0080668	t-test	12	**
IL	P - SC	BR	0.5015802	t-test	14	
IL	P - DT	PP	0.0001468	Transformed t-test	16	***
IL	P - DT	HR	0.0016854	t-test	13	**
IL	P - DT	BR	0.0000042	t-test	14	***