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
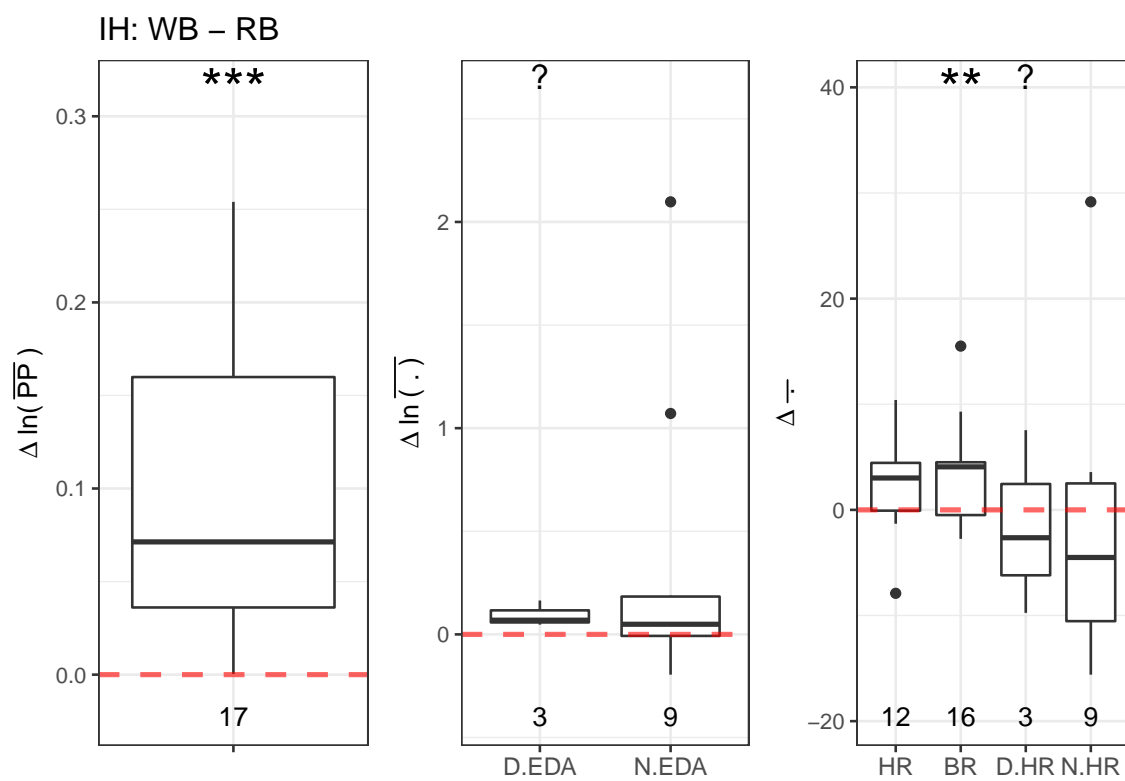
For each of the graphs, let:

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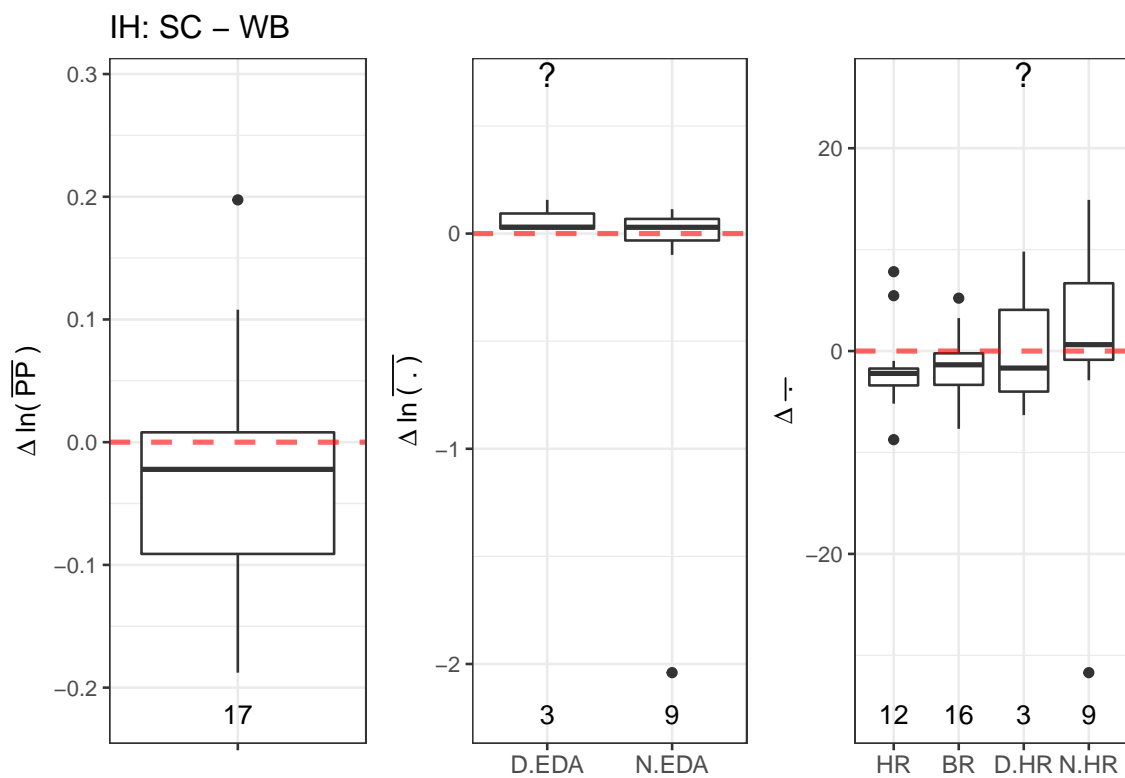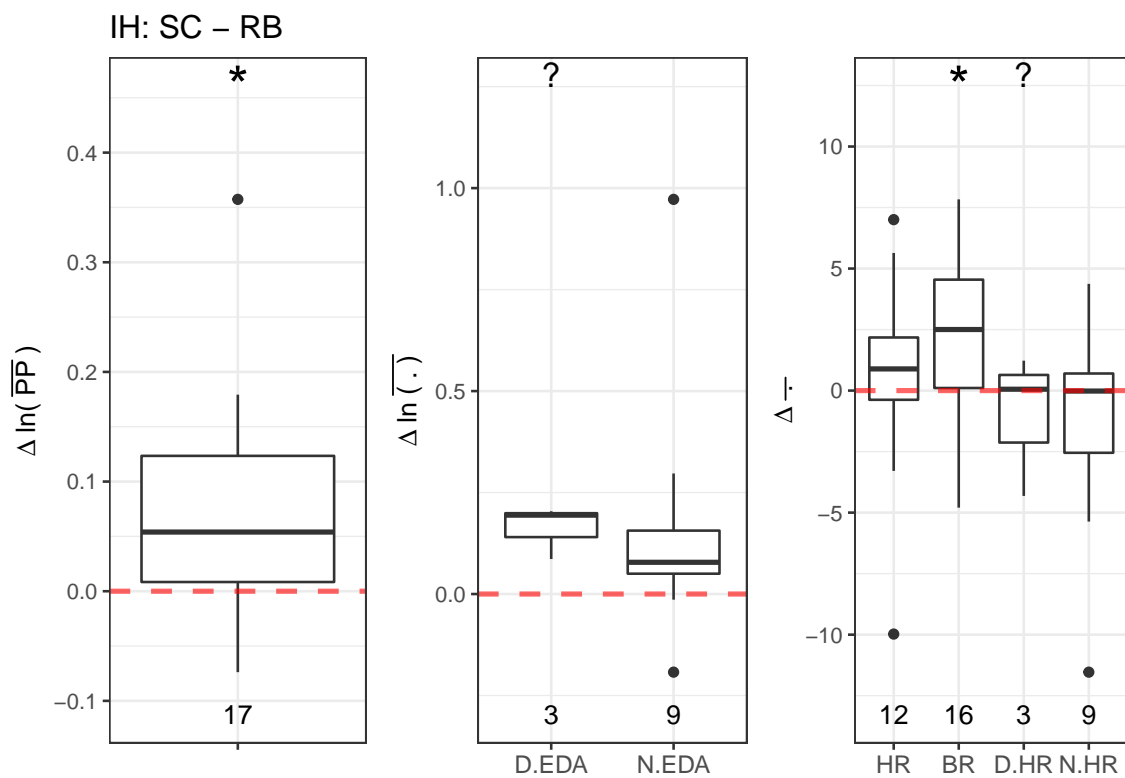****** = 0.001 < p <= 0.01
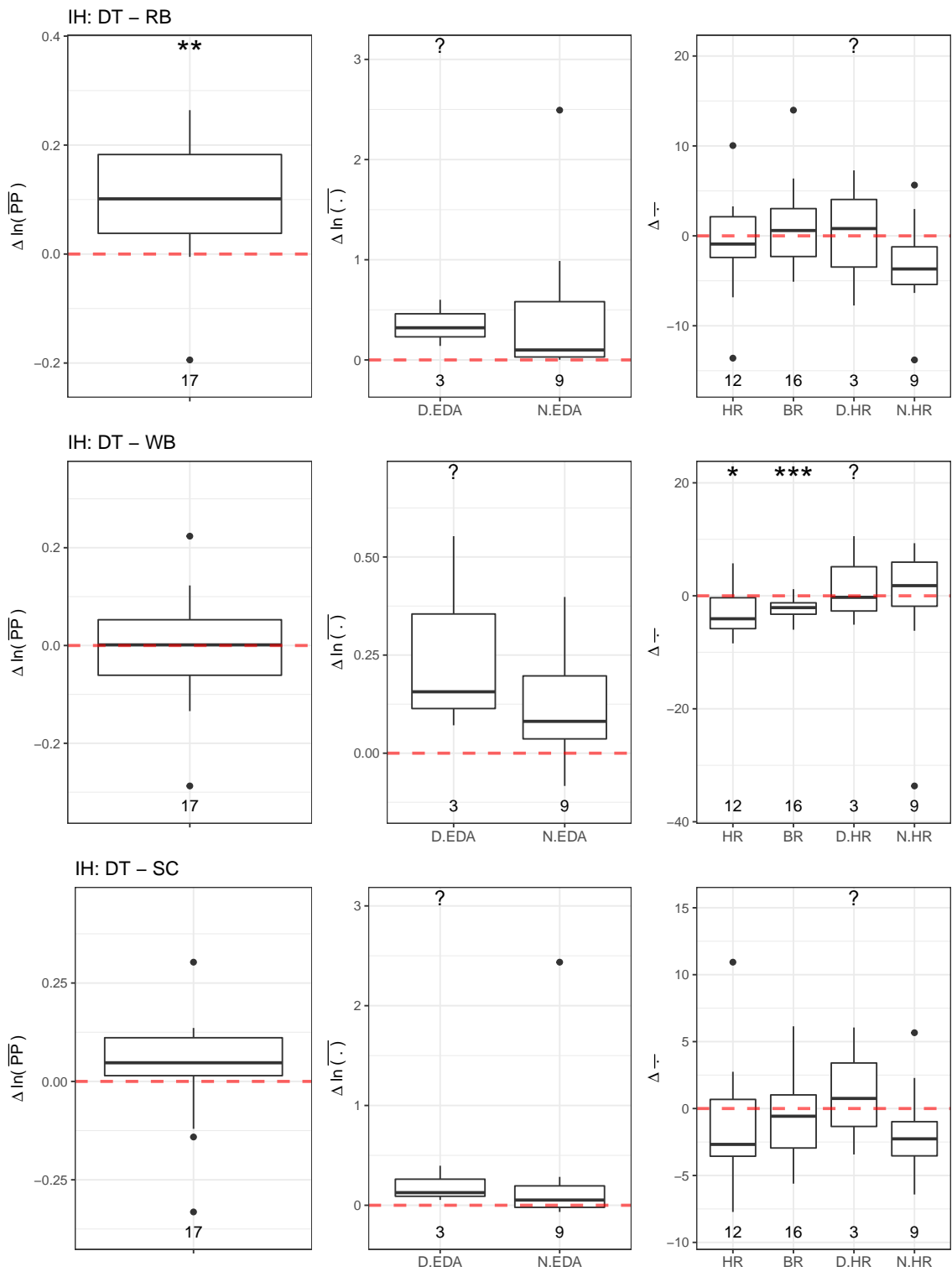******* = p <= 0.001
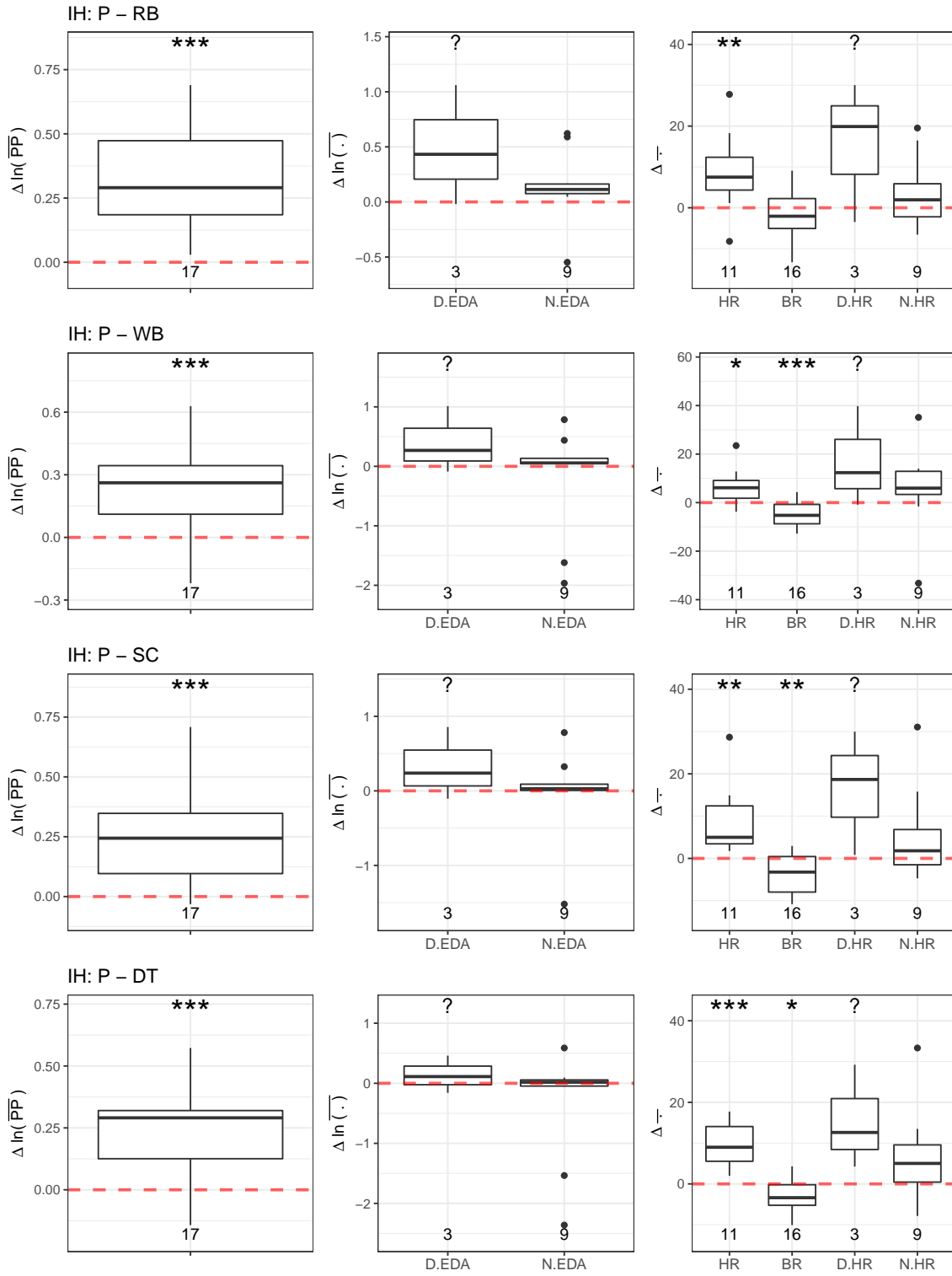**?** = Did not run statistical test ($n < 7$)

Intermittent-High (IH)

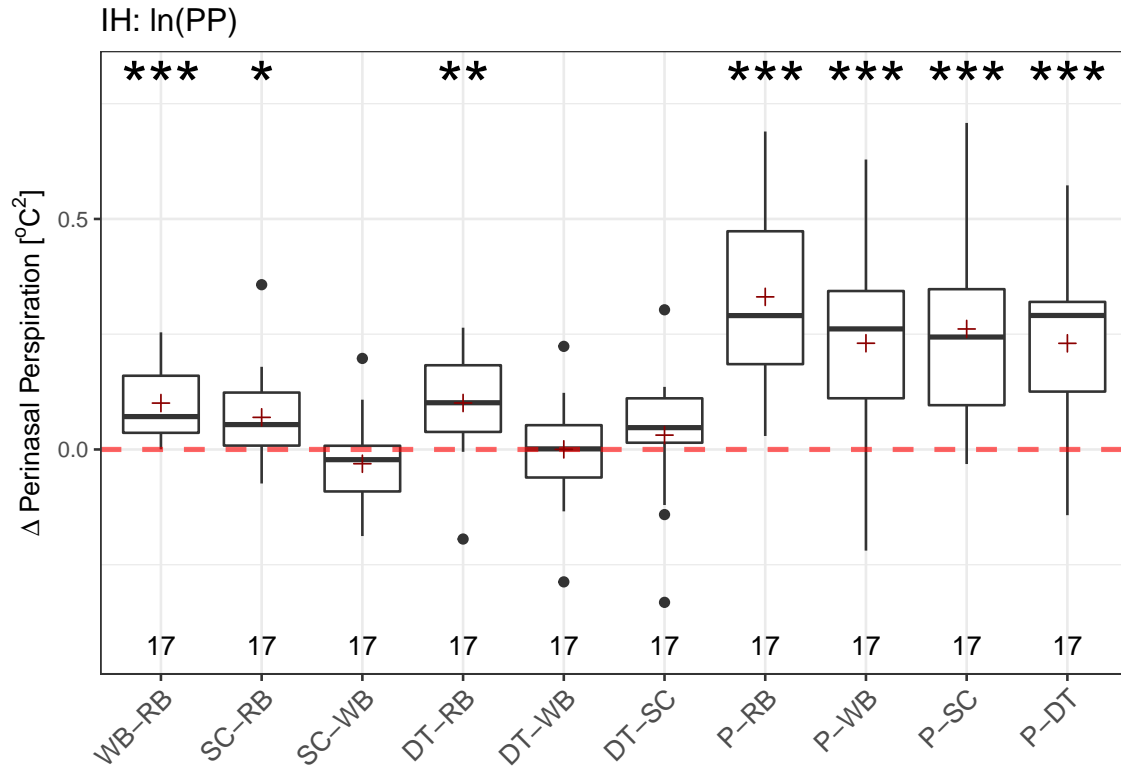# Sensor Channels per Activity

IH: WB − RB

Sensor Channel across Activities

IH: ln(PP)


```
## In the following tests, we applied ln(PP).
##
## Writing Baseline - Resting Baseline
## Transformed t-test p = 1e-04 < 0.001  ***
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.0145 < 0.05  *
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.2084 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.0016 < 0.01  **
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.9946 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.3697 > 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 = 2e-04 < 0.001  ***
```

IH: ln(HR)
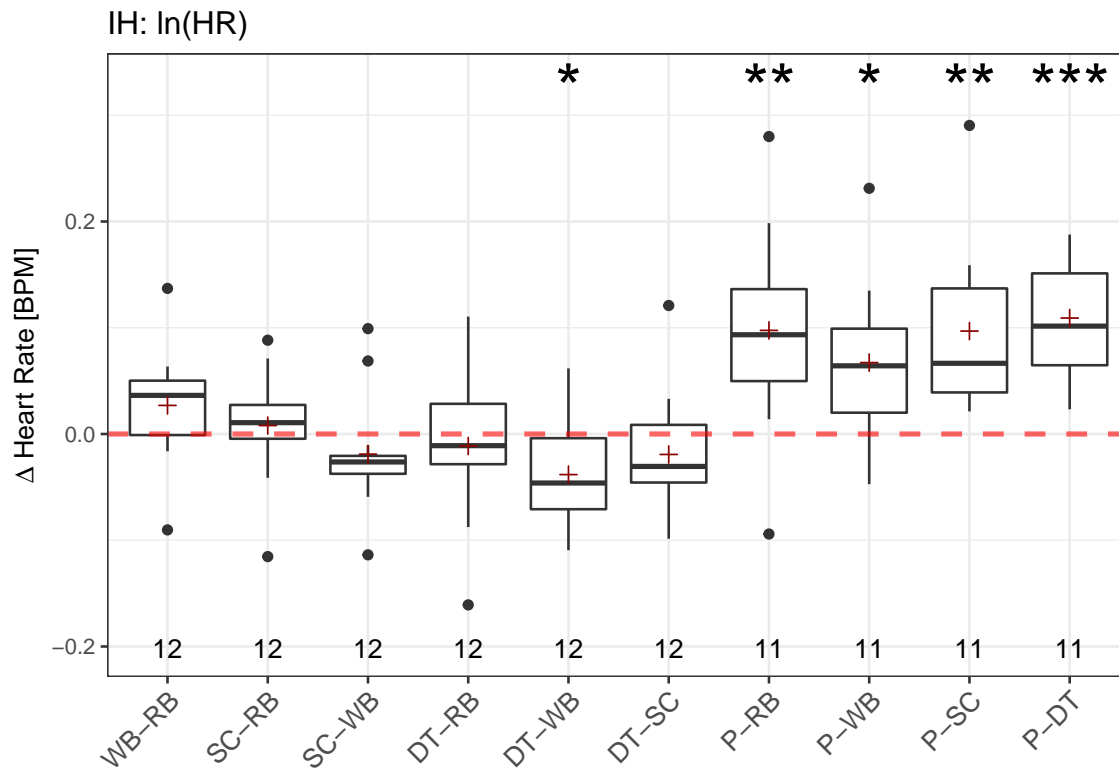
```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.1185 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.6095 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.2597 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.5735 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0172 < 0.05   *
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.2853 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.0079 < 0.01   **
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0153 < 0.05   *
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.0026 < 0.01   **
##
## Presentation - Dual Task
## Transformed t-test p = 0 < 0.001   ***
```

IH: BR
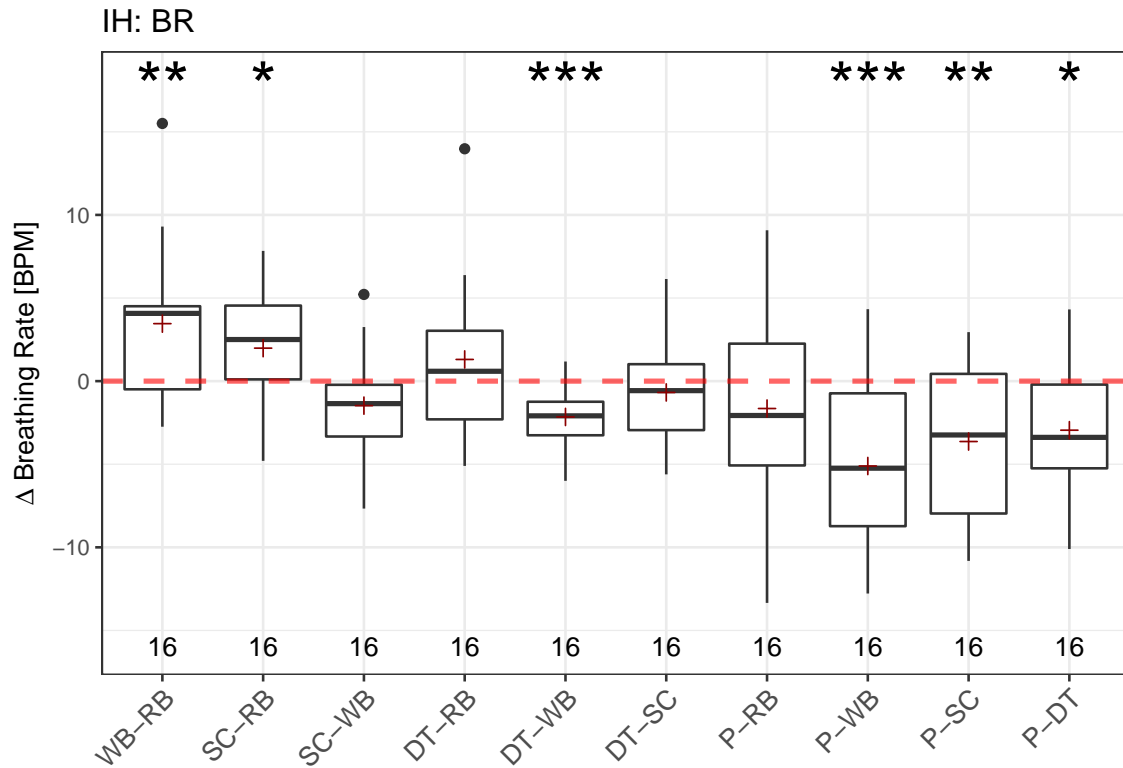
```
## Writing Baseline - Resting Baseline
## t-test p = 0.0086 < 0.01   **
##
## Stress Condition - Resting Baseline
## t-test p = 0.0455 < 0.05   *
##
## StressCondition - Writing Baseline
## t-test p = 0.0933 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.2969 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 5e-04 < 0.001   ***
##
## Dual Task - Stress Condition
## t-test p = 0.3543 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.2723 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 9e-04 < 0.001   ***
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0066 < 0.01   **
##
## Presentation - Dual Task
## t-test p = 0.0132 < 0.05   *
```

```
## IH has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
```
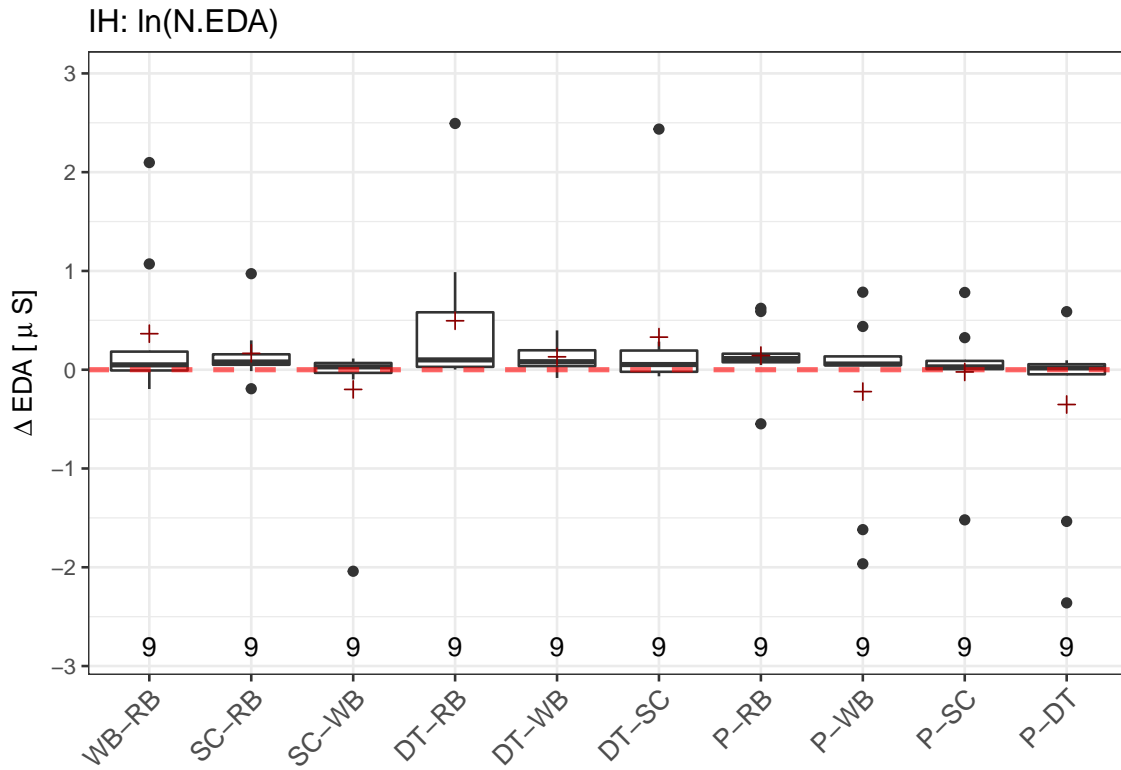
IH: ln(N.EDA)

```
## In the following tests, we applied ln(N.EDA).
##
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.1796 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.1701 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.4137 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.1074 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0502 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.25 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.2412 > 0.05
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.494 > 0.05
```

```
## 
## Presentation - Stress Condition
## Transformed t-test p = 0.9167 > 0.05
## 
## Presentation - Dual Task
## Transformed t-test p = 0.2971 > 0.05
```
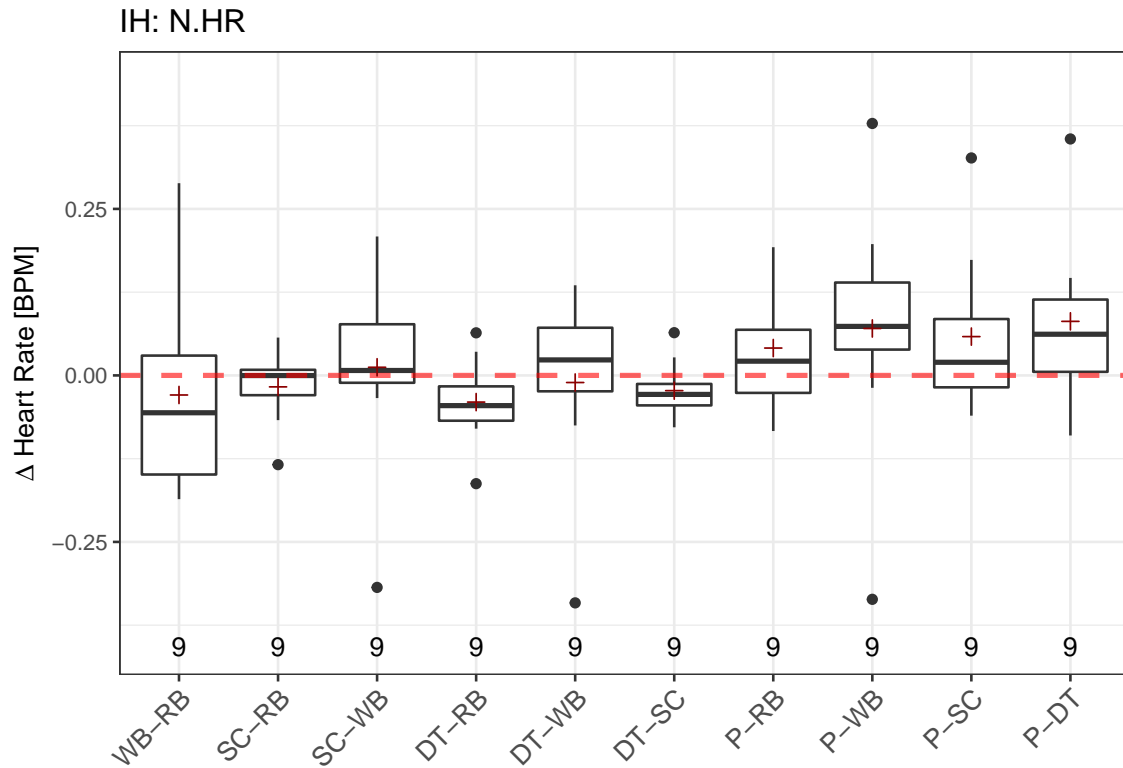
```
## IH has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```

IH: N.HR


```
## In the following tests, we applied ln(N.HR).
##
## Writing Baseline - Resting Baseline
## Wilcoxon p = 0.3594 > 0.05
##
## Stress Condition - Resting Baseline
## Wilcoxon p = 0.6523 > 0.05
##
## StressCondition - Writing Baseline
## Wilcoxon p = 0.4961 > 0.05
##
## Dual Task - Resting Baseline
## Wilcoxon p = 0.1289 > 0.05
##
## Dual Task - Writing Baseline
## Wilcoxon p = 0.7344 > 0.05
##
## Dual Task - Stress Condition
## Wilcoxon p = 0.1641 > 0.05
##
## Presentation - Resting Baseline
## Wilcoxon p = 0.4258 > 0.05
##
## Presentation - Writing Baseline
## Wilcoxon p = 0.1289 > 0.05
```

```
## 
## Presentation - Stress Condition
## Wilcoxon p = 0.3008 > 0.05
## 
## Presentation - Dual Task
## Wilcoxon p = 0.0742 > 0.05
```

Intermittent-Low (IL)

Sensor Channels per Activity
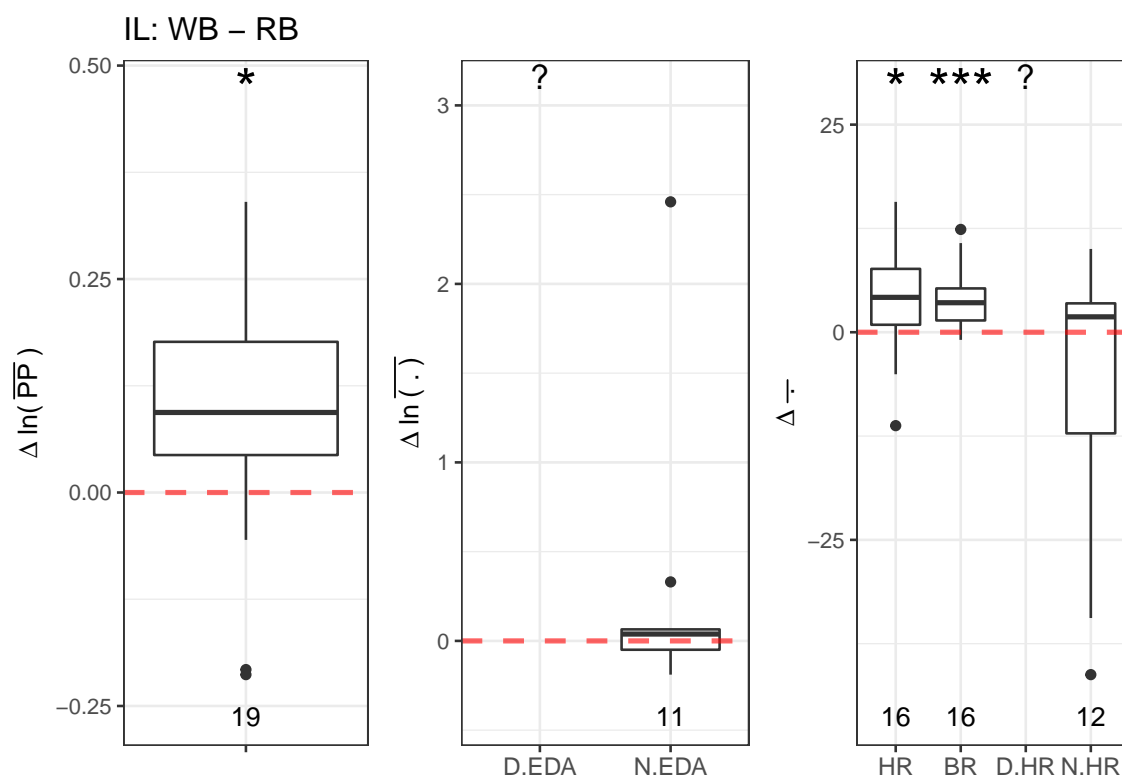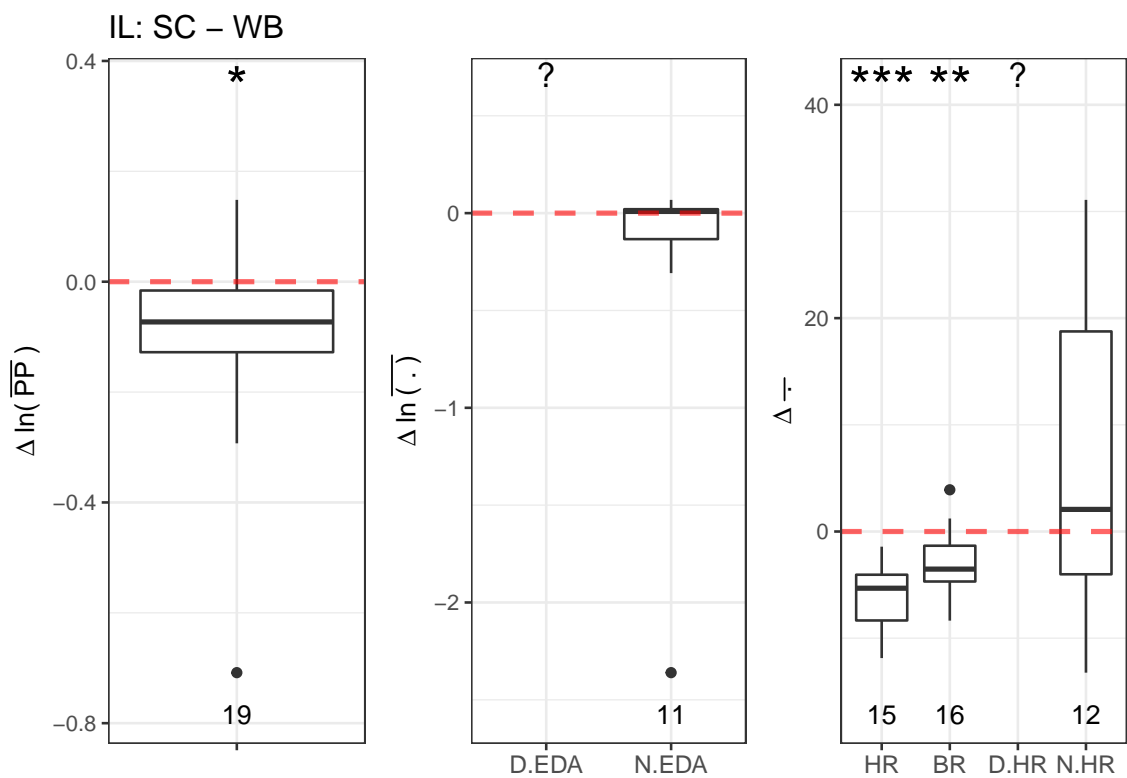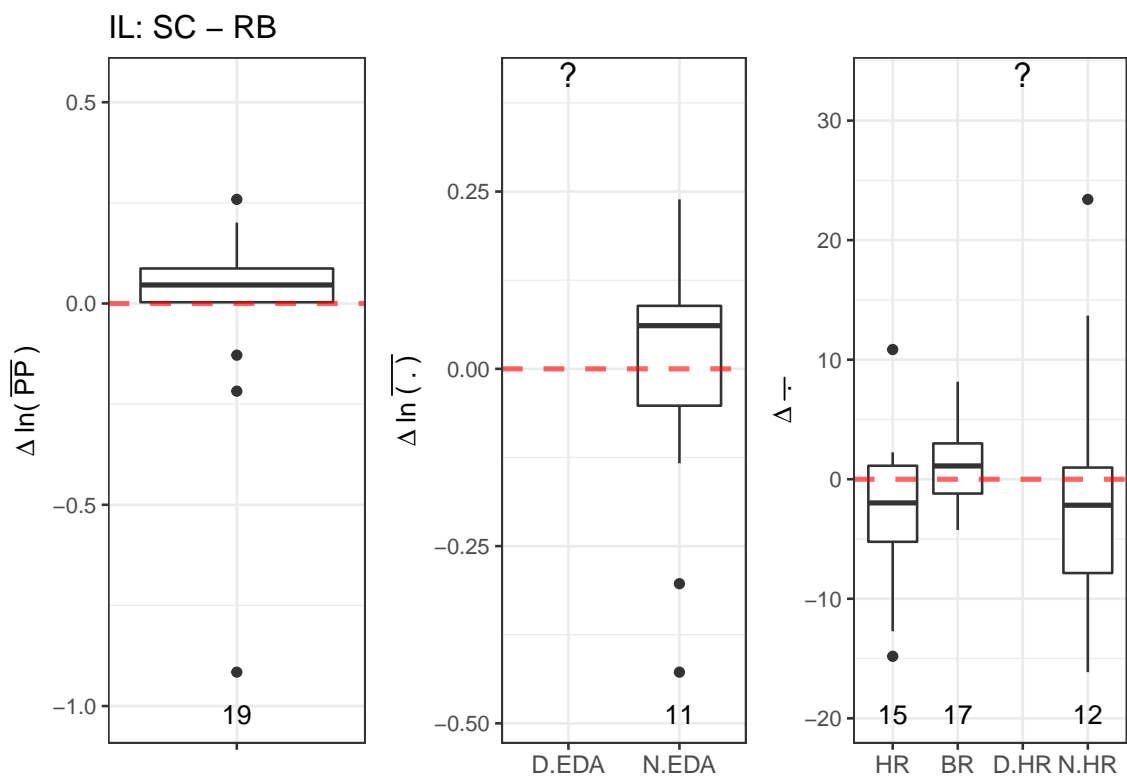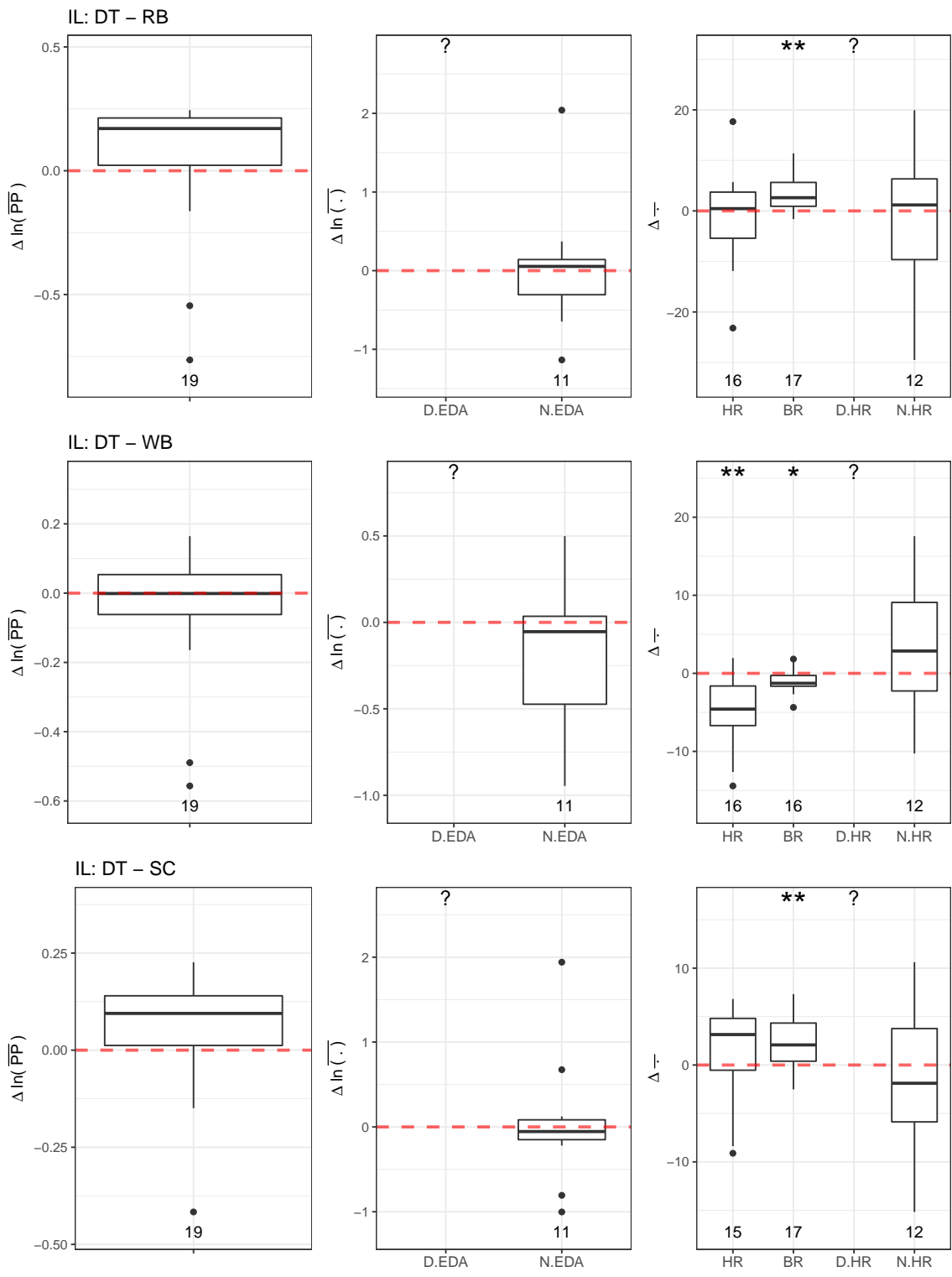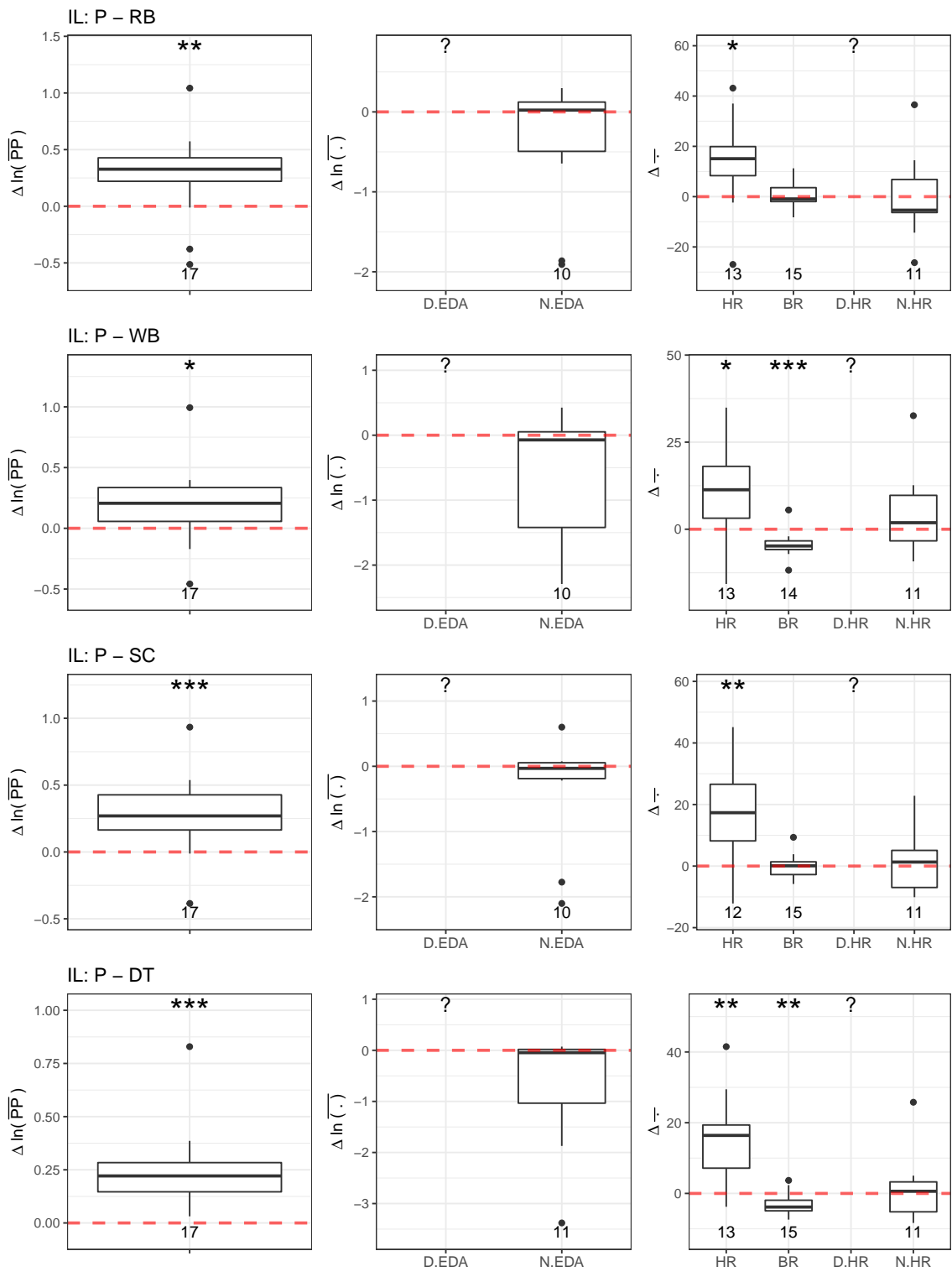
IL: WB – RB

Sensor Channel across Activities

IL: ln(PP)
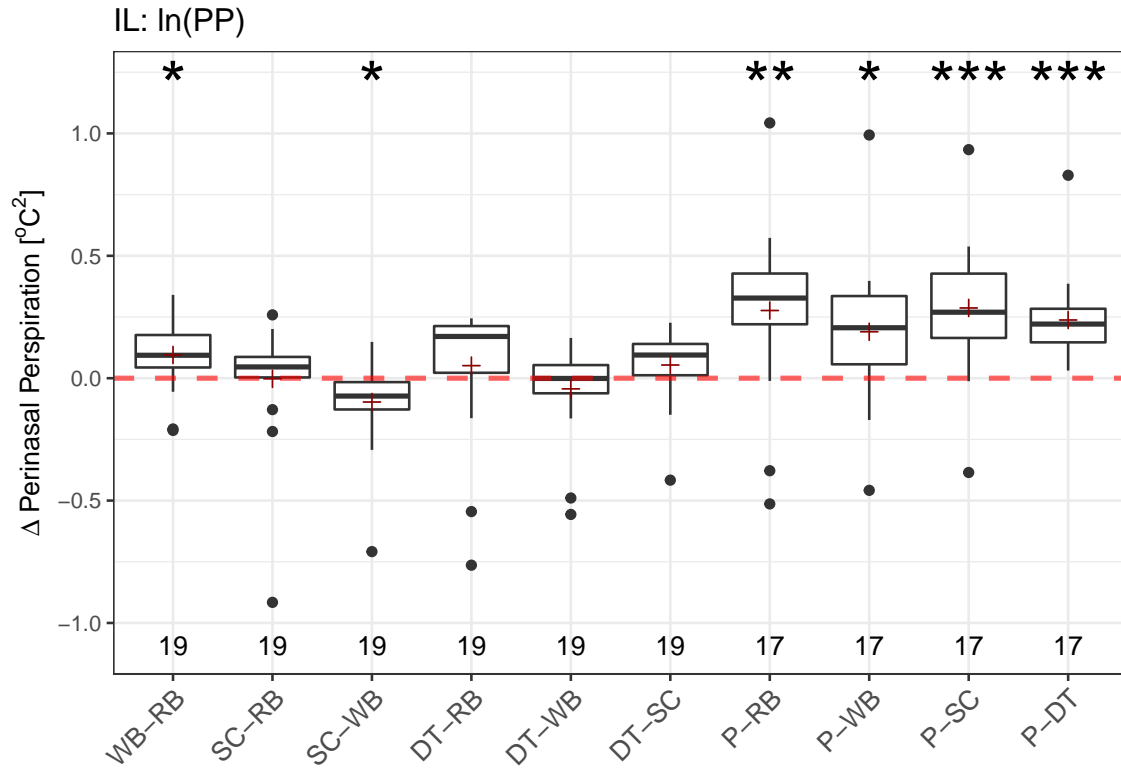

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0111 < 0.05  *
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.9654 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.0291 < 0.05  *
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.4248 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.33 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.1284 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.0059 < 0.01  **
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0204 < 0.05  *
```

```
## 
## Presentation - Stress Condition
## Transformed t-test p = 5e-04 < 0.001  ***
## 
## Presentation - Dual Task
## Transformed t-test p = 1e-04 < 0.001  ***
```

IL: HR
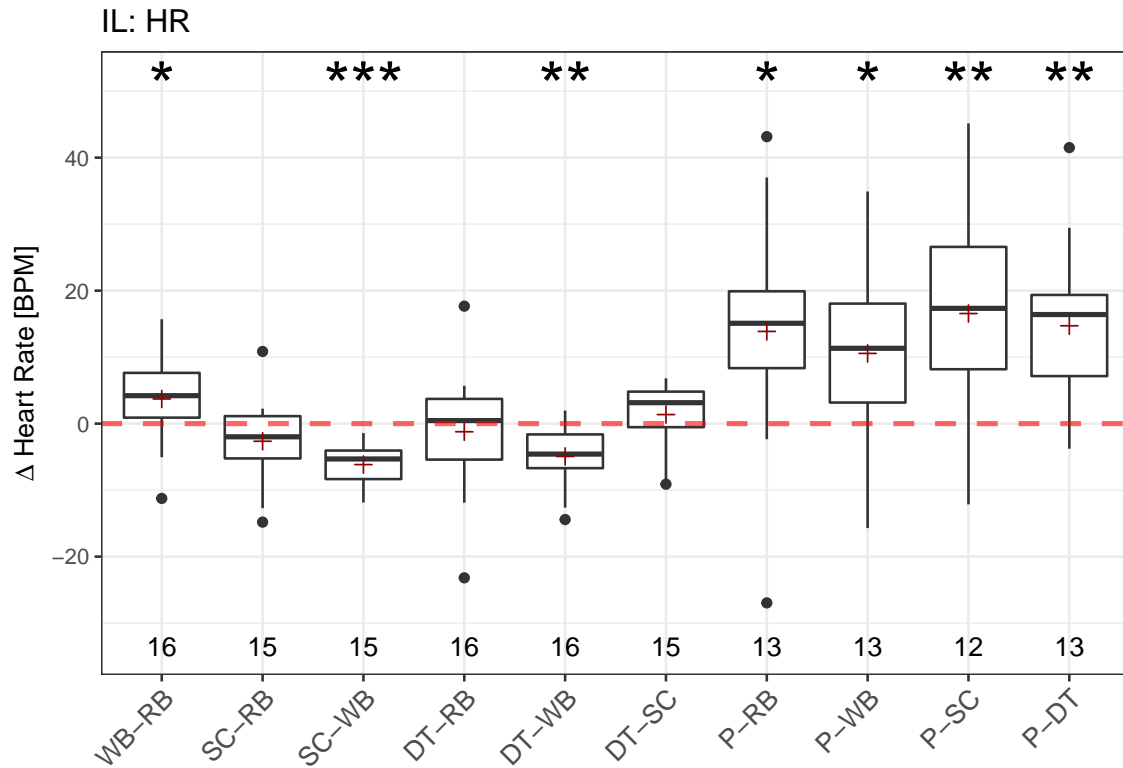
```
## Writing Baseline - Resting Baseline
## t-test p = 0.034 < 0.05  *
##
## Stress Condition - Resting Baseline
## t-test p = 0.1432 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0 < 0.001  ***
##
## Dual Task - Resting Baseline
## t-test p = 0.5956 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0.0013 < 0.01  **
##
## Dual Task - Stress Condition
## t-test p = 0.2937 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.0134 < 0.05  *
##
## Presentation - Writing Baseline
## t-test p = 0.0132 < 0.05  *
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0032 < 0.01  **
##
## Presentation - Dual Task
## t-test p = 0.0012 < 0.01  **
```

IL: BR
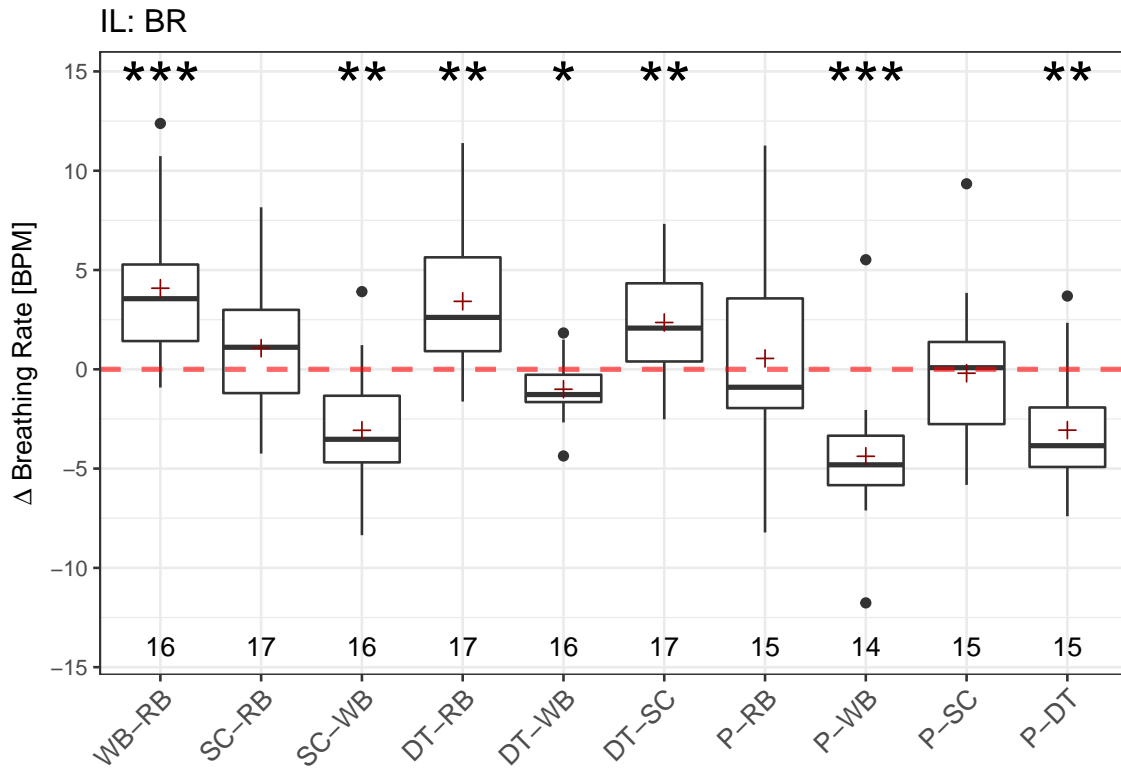
```
## Writing Baseline - Resting Baseline
## t-test p = 5e-04 < 0.001   ***
##
## Stress Condition - Resting Baseline
## t-test p = 0.1932 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0.0015 < 0.01   **
##
## Dual Task - Resting Baseline
## t-test p = 0.0031 < 0.01   **
##
## Dual Task - Writing Baseline
## t-test p = 0.0204 < 0.05   *
##
## Dual Task - Stress Condition
## t-test p = 0.0063 < 0.01   **
##
## Presentation - Resting Baseline
## t-test p = 0.6754 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 7e-04 < 0.001   ***
##
## Presentation - Stress Condition
```

```
## t-test p = 0.8477 > 0.05
##
## Presentation - Dual Task
## t-test p = 0.0015 < 0.01  **
```

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

IL: ln(N.EDA)
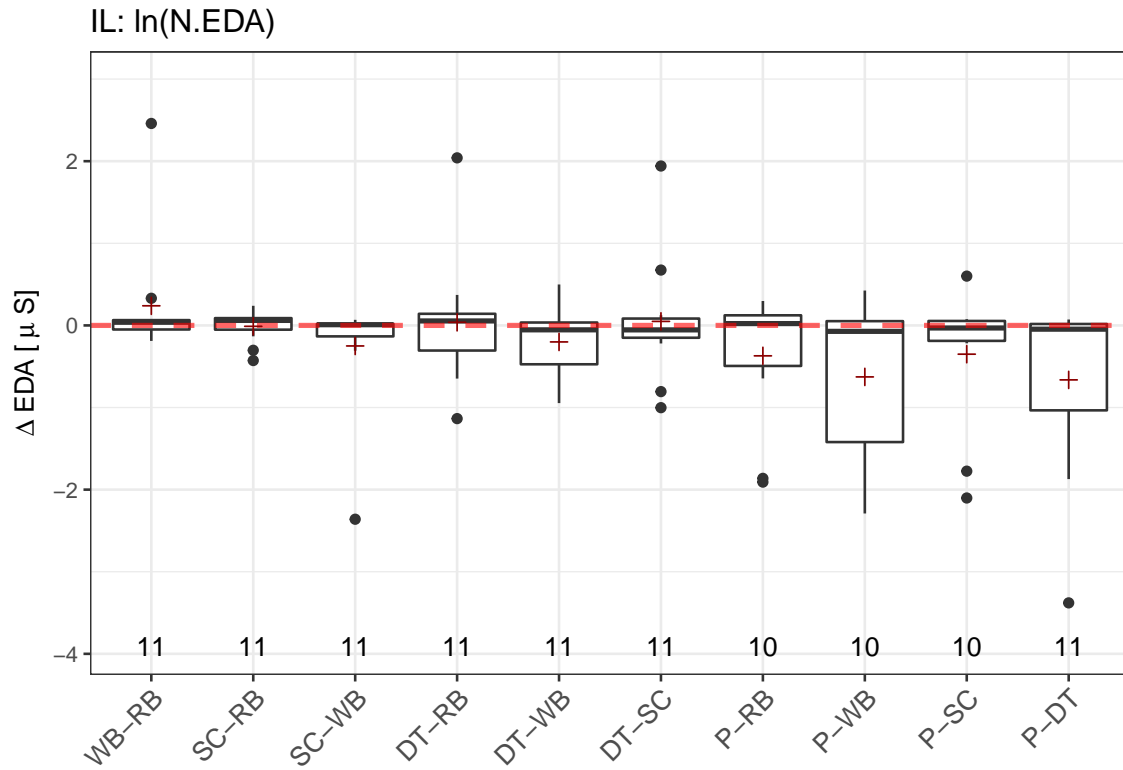

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.315 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.8558 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.2692 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.878 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.1658 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.837 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.1953 > 0.05
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0865 > 0.05
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.2336 > 0.05
##
## Presentation - Dual Task
## Transformed t-test p = 0.0761 > 0.05
```

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

IL: N.HR
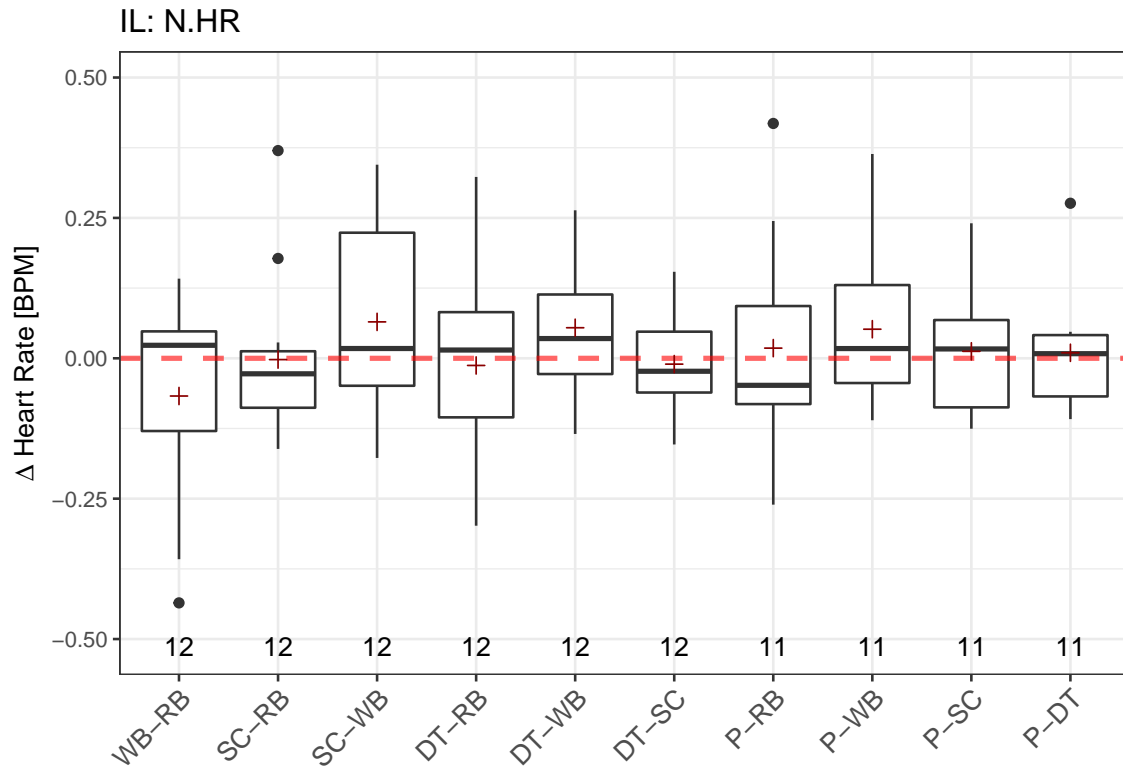

```
## Writing Baseline - Resting Baseline
## Wilcoxon p = 0.8501 > 0.05
##
## Stress Condition - Resting Baseline
## Wilcoxon p = 0.4238 > 0.05
##
## StressCondition - Writing Baseline
## Wilcoxon p = 0.3804 > 0.05
##
## Dual Task - Resting Baseline
## Wilcoxon p = 1 > 0.05
##
## Dual Task - Writing Baseline
## Wilcoxon p = 0.1294 > 0.05
##
## Dual Task - Stress Condition
## Wilcoxon p = 0.791 > 0.05
##
## Presentation - Resting Baseline
## Wilcoxon p = 0.9658 > 0.05
##
## Presentation - Writing Baseline
## Wilcoxon p = 0.3203 > 0.05
##
## Presentation - Stress Condition
```

```
## Wilcoxon p = 0.9658 > 0.05
##
## Presentation - Dual Task
## Wilcoxon p = 0.8311 > 0.05
```

Batch-High (BH)

Sensor Channels per Activity
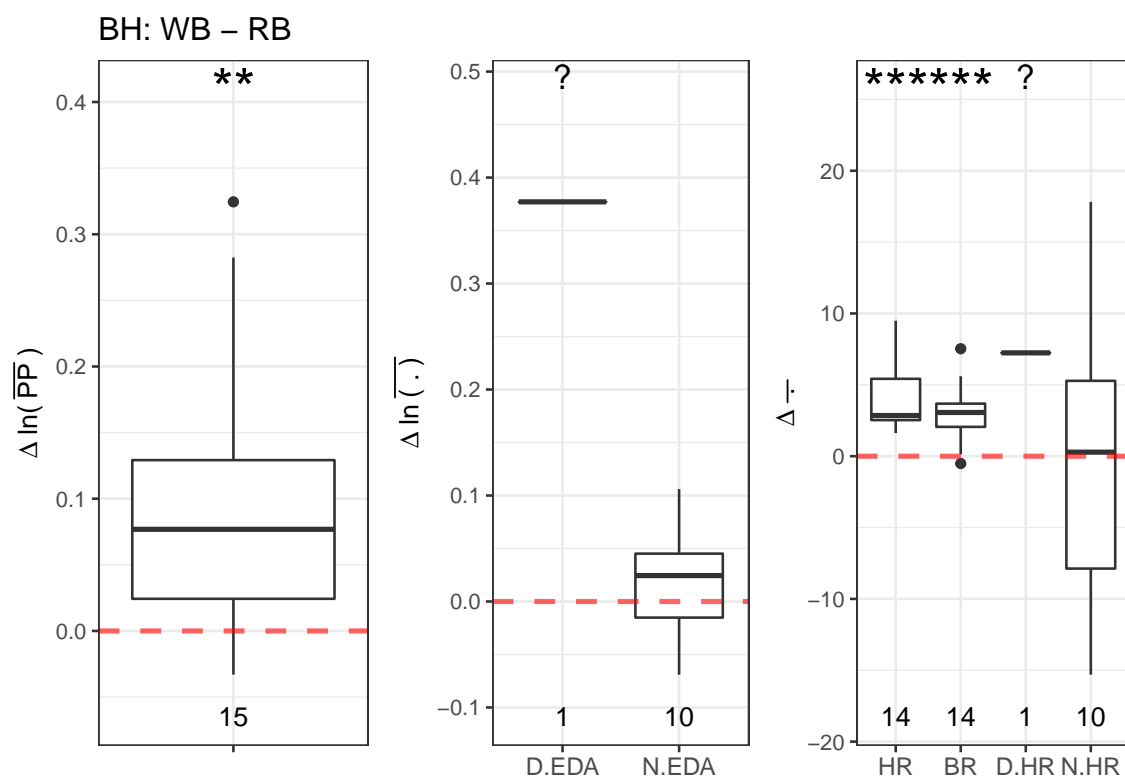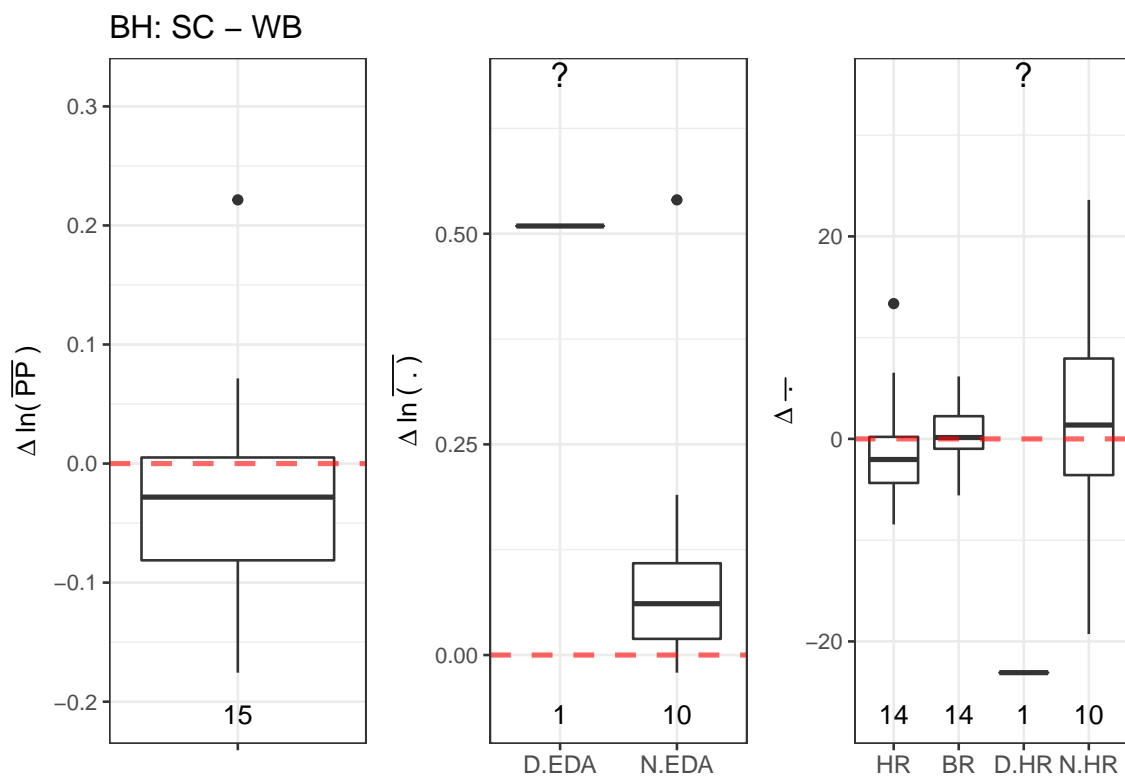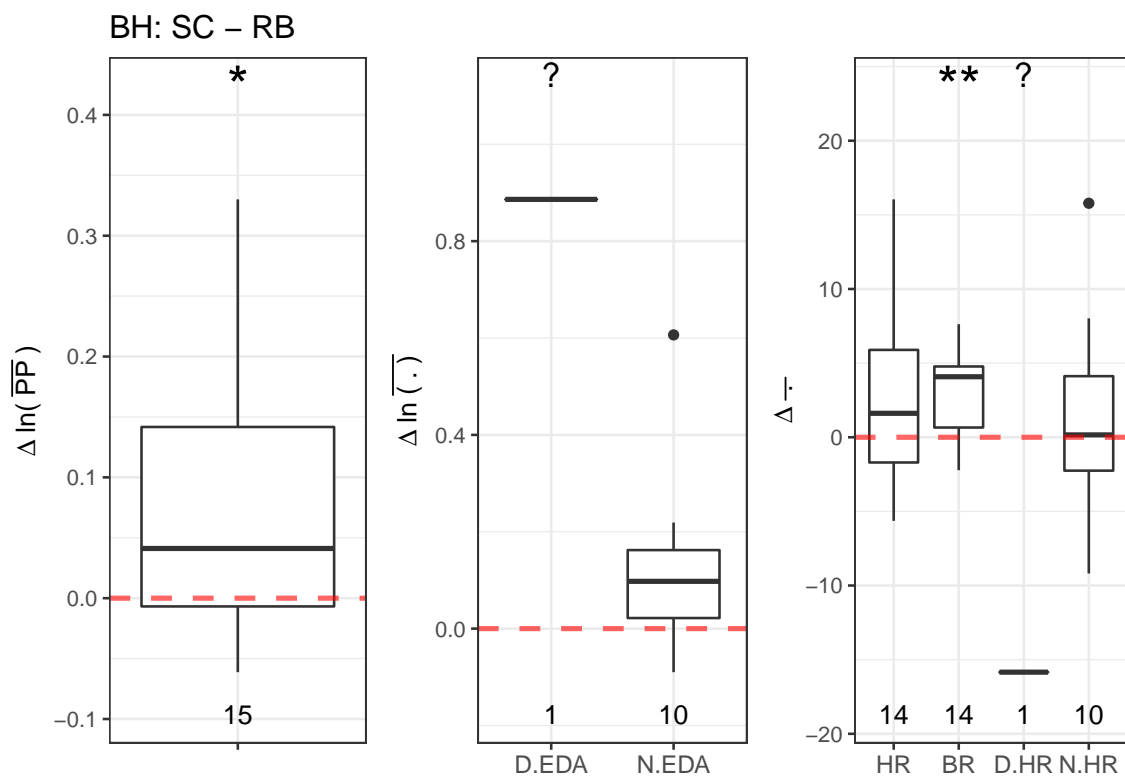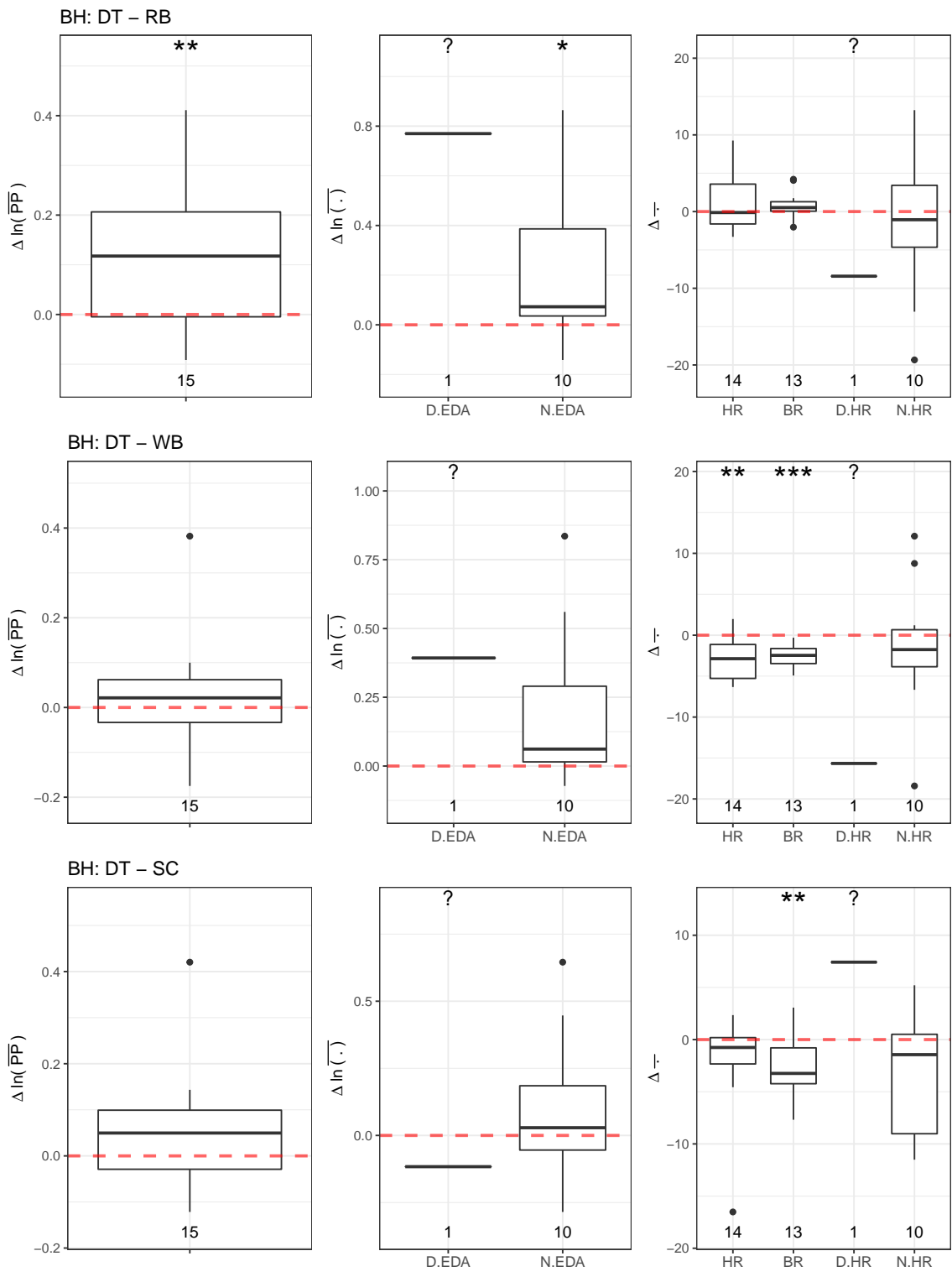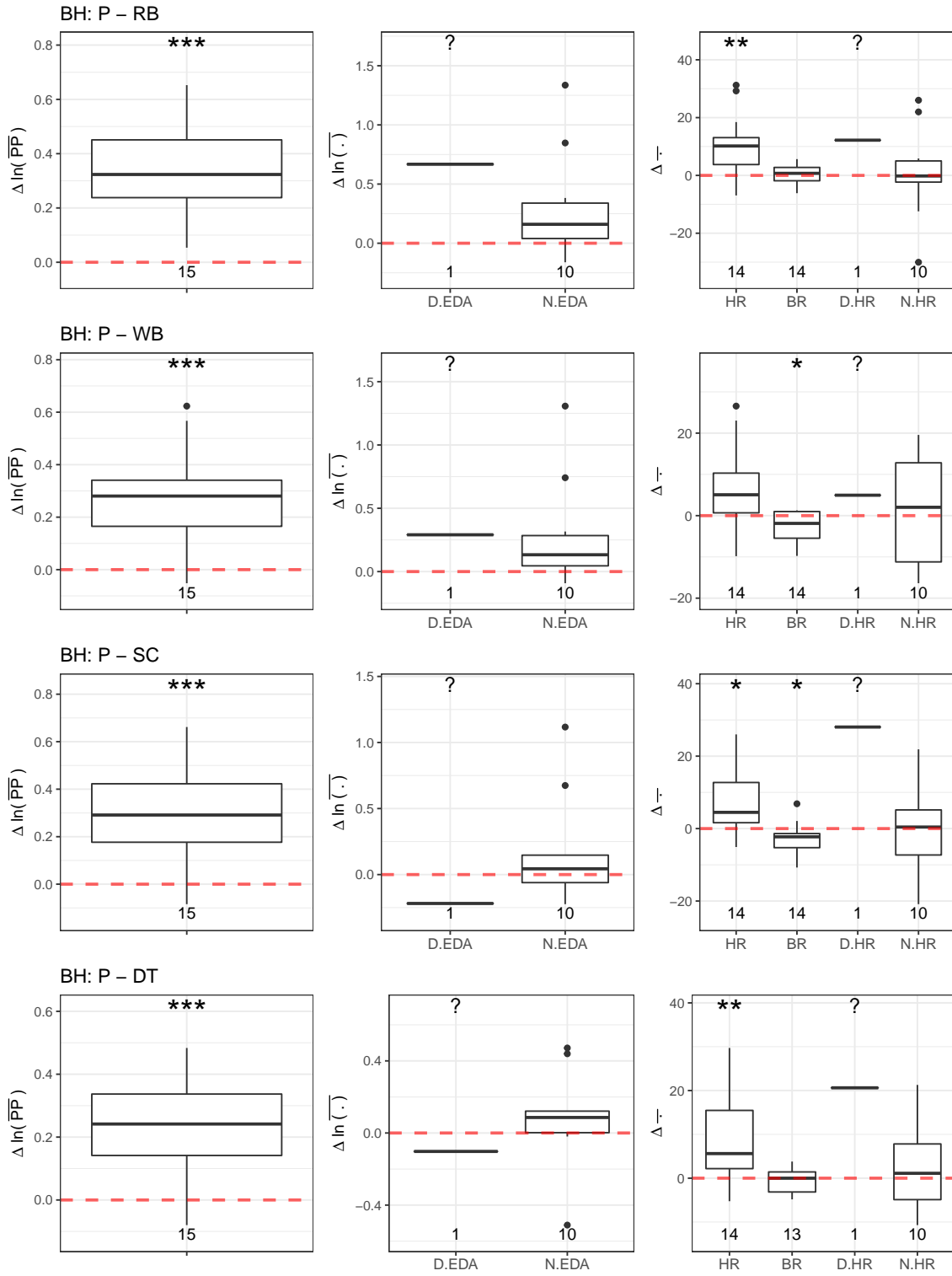
Sensor Channel across Activities

BH: ln(PP)
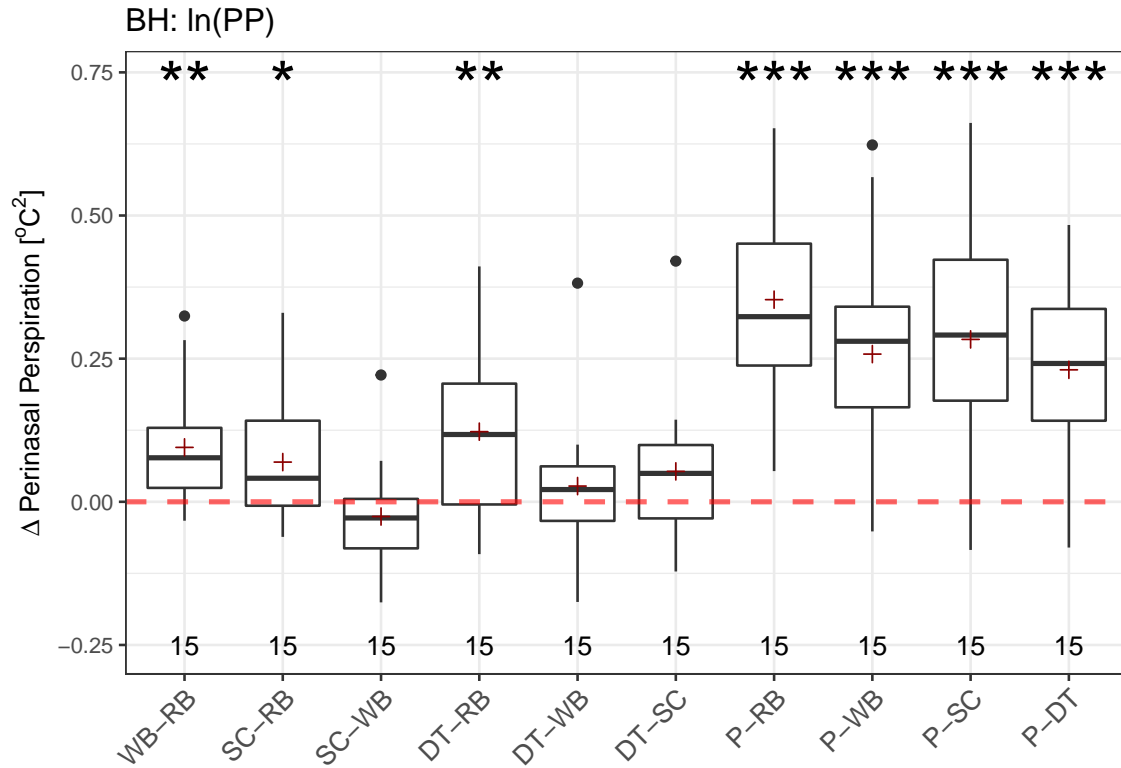

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0039 < 0.01   **
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.0215 < 0.05   *
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.3011 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.0032 < 0.01   **
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.3915 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.1264 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0 < 0.001   ***
##
## Presentation - Writing Baseline
## Transformed t-test p = 1e-04 < 0.001   ***
```

37

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

BH: HR
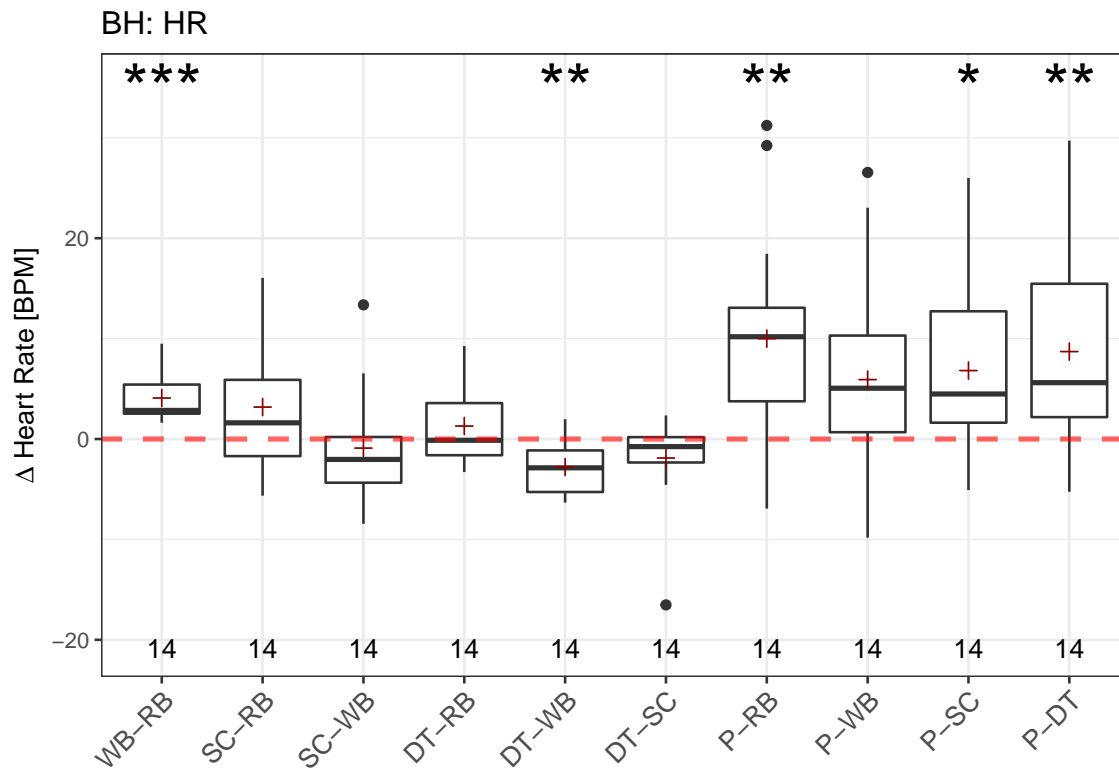

```
## Writing Baseline - Resting Baseline
## t-test p = 0 < 0.001  ***
##
## Stress Condition - Resting Baseline
## t-test p = 0.0805 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0.559 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.2422 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0.0017 < 0.01  **
##
## Dual Task - Stress Condition
## t-test p = 0.1489 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.0051 < 0.01  **
##
## Presentation - Writing Baseline
## t-test p = 0.05 > 0.05
##
## Presentation - Stress Condition
```

```
## t-test p = 0.0136 < 0.05  *
##
## Presentation - Dual Task
## t-test p = 0.0074 < 0.01  **
```

BH: BR
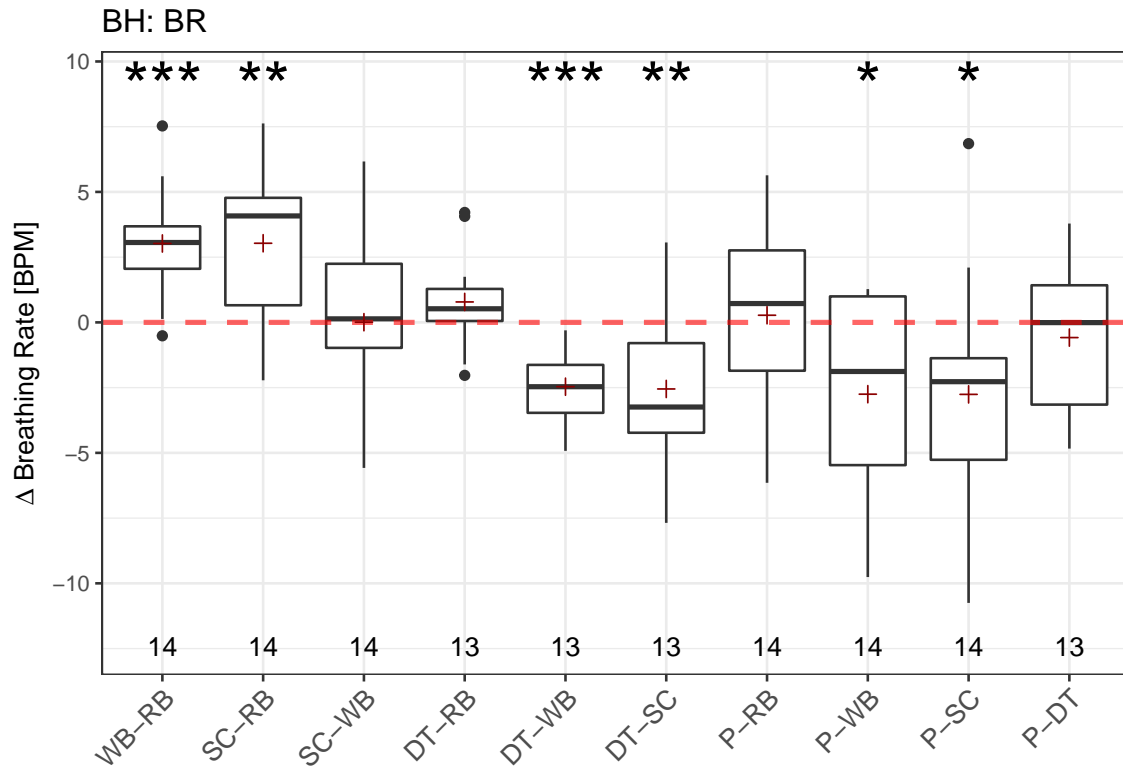
Writing Baseline - Resting Baseline
t-test p = 1e-04 < 0.001   ***
##
Stress Condition - Resting Baseline
t-test p = 0.0026 < 0.01   **
##
StressCondition - Writing Baseline
t-test p = 0.993 > 0.05
##
Dual Task - Resting Baseline
t-test p = 0.1451 > 0.05
##
Dual Task - Writing Baseline
t-test p = 0 < 0.001   ***
##
Dual Task - Stress Condition
t-test p = 0.0096 < 0.01   **
##
Presentation - Resting Baseline
t-test p = 0.774 > 0.05
##
Presentation - Writing Baseline
t-test p = 0.0211 < 0.05   *
##
Presentation - Stress Condition

```
## t-test p = 0.0402 < 0.05  *
##
## Presentation - Dual Task
## t-test p = 0.4905 > 0.05
```

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

BH: ln(N.EDA)
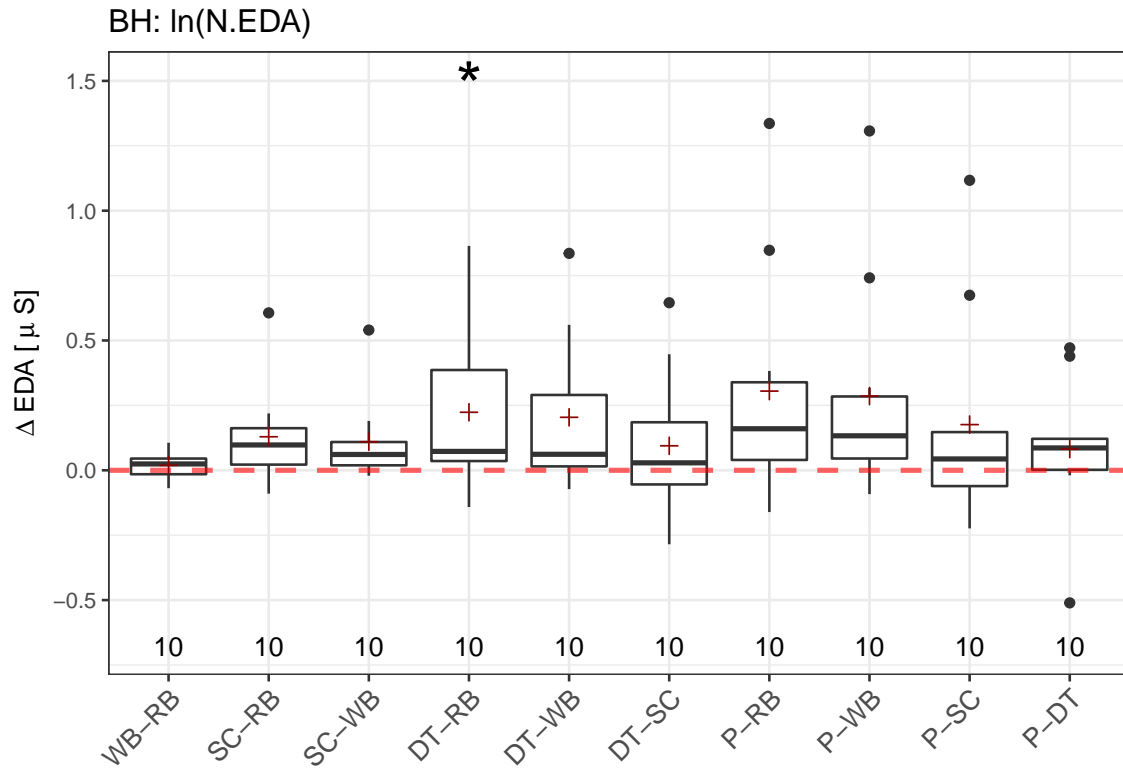

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.2534 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.0609 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.0622 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.0463 < 0.05   *
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0542 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.3059 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.062 > 0.05
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.0625 > 0.05
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.2062 > 0.05
##
## Presentation - Dual Task
## Transformed t-test p = 0.3639 > 0.05
```

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

BH: N.HR


```
## Writing Baseline - Resting Baseline
## t-test p = 0.8962 > 0.05
##
## Stress Condition - Resting Baseline
## t-test p = 0.5287 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 0.6089 > 0.05
##
## Dual Task - Resting Baseline
## t-test p = 0.5231 > 0.05
##
## Dual Task - Writing Baseline
## t-test p = 0.5861 > 0.05
##
## Dual Task - Stress Condition
## t-test p = 0.0955 > 0.05
##
## Presentation - Resting Baseline
## t-test p = 0.8627 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0.7565 > 0.05
##
## Presentation - Stress Condition
```

```
## t-test p = 0.8971 > 0.05
##
## Presentation - Dual Task
## t-test p = 0.4014 > 0.05
```

Batch-Low (BL)

Sensor Channels per Activity
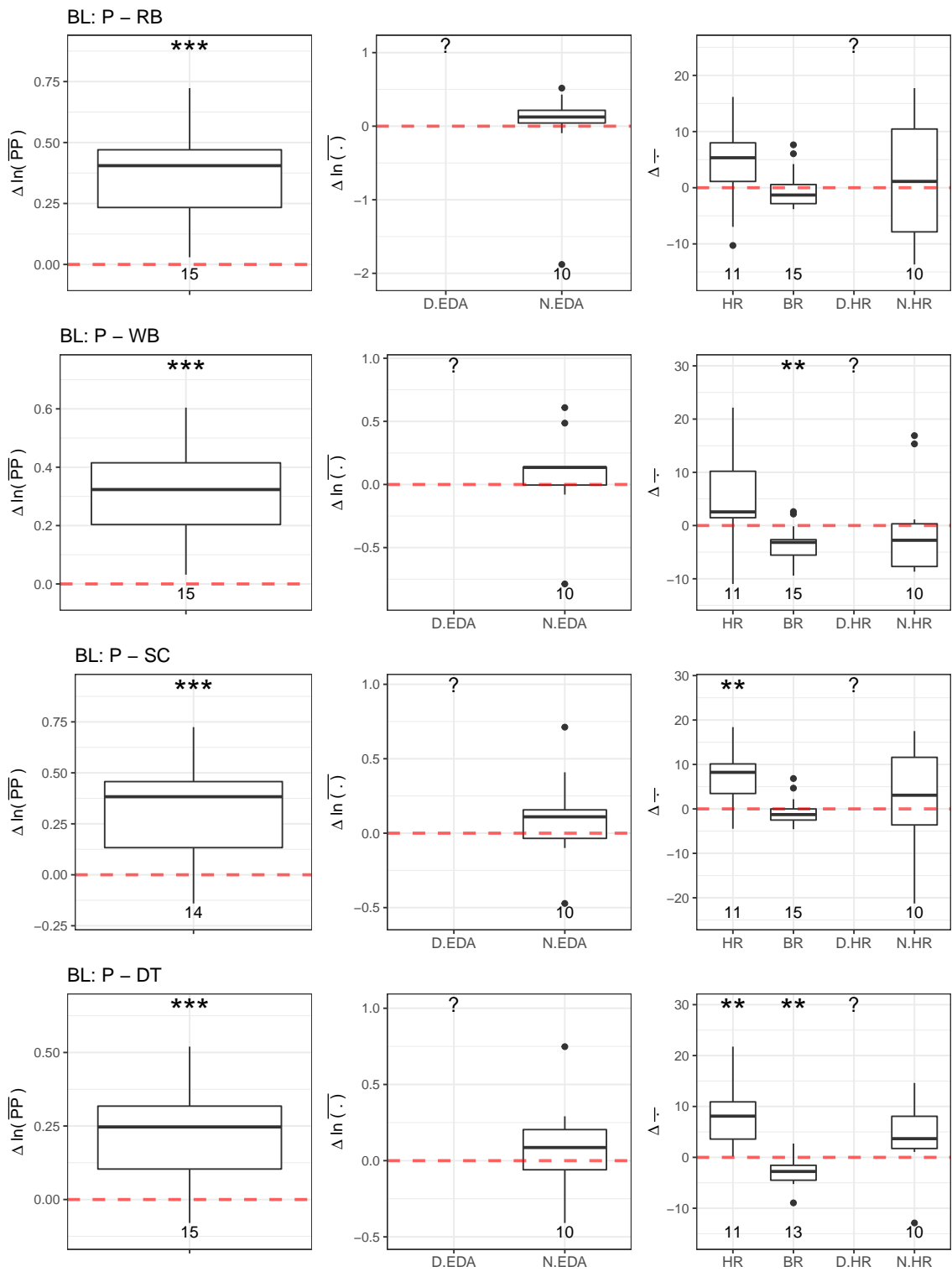
BL: WB – RB

Sensor Channel across Activities

BL: ln(PP)


```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.0524 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.2437 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.7578 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.0068 < 0.01   **
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.0137 < 0.05   *
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.0617 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0 < 0.001   ***
##
## Presentation - Writing Baseline
## Transformed t-test p = 0 < 0.001   ***
```

```
## 
## Presentation - Stress Condition
## Transformed t-test p = 3e-04 < 0.001  ***
## 
## Presentation - Dual Task
## Transformed t-test p = 2e-04 < 0.001  ***
```

BL: HR
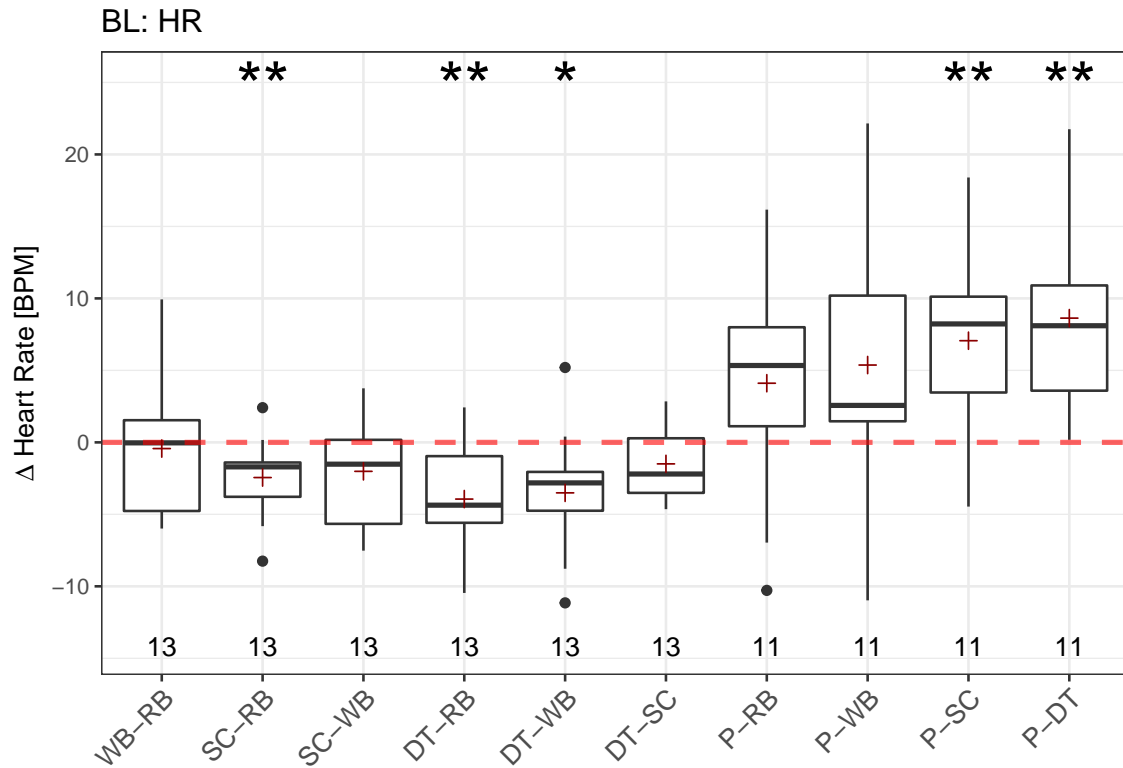
Writing Baseline - Resting Baseline
t-test p = 0.7394 > 0.05
##
Stress Condition - Resting Baseline
t-test p = 0.0068 < 0.01 **
##
StressCondition - Writing Baseline
t-test p = 0.081 > 0.05
##
Dual Task - Resting Baseline
t-test p = 0.0028 < 0.01 **
##
Dual Task - Writing Baseline
t-test p = 0.0103 < 0.05 *
##
Dual Task - Stress Condition
t-test p = 0.0577 > 0.05
##
Presentation - Resting Baseline
t-test p = 0.1093 > 0.05
##
Presentation - Writing Baseline
t-test p = 0.0833 > 0.05
##
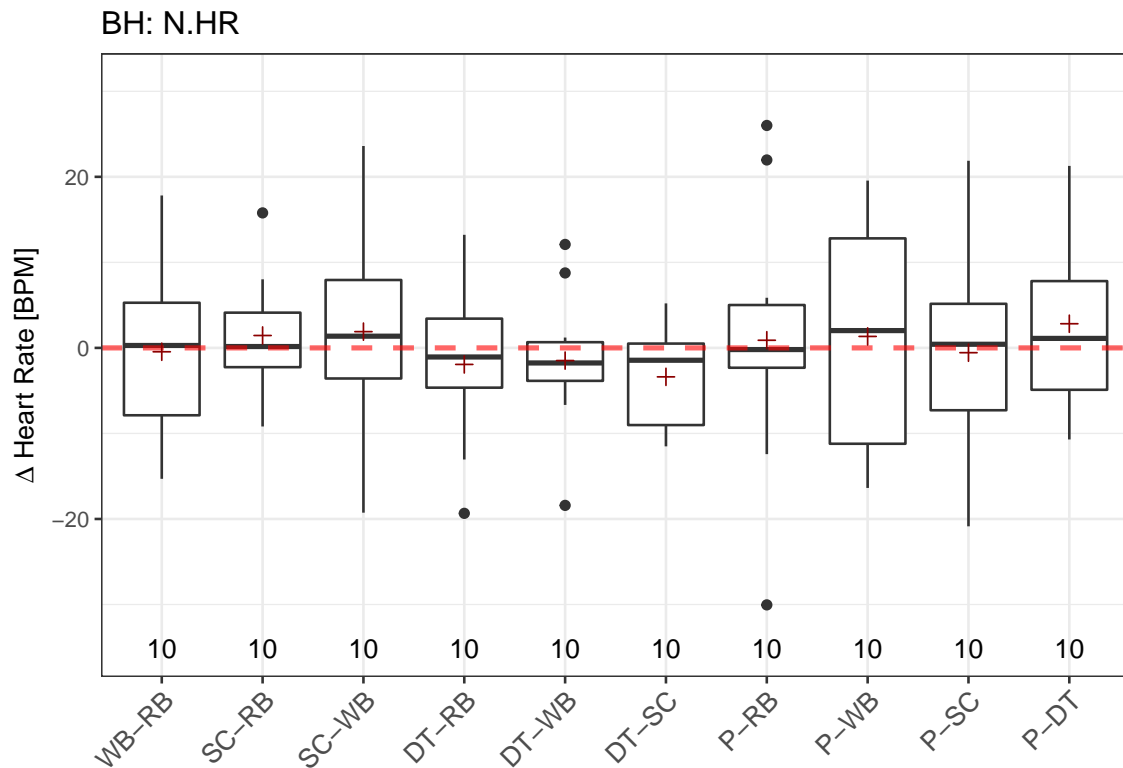## Presentation - Stress Condition

```
## t-test p = 0.0069 < 0.01   **
##
## Presentation - Dual Task
## t-test p = 0.0019 < 0.01   **
```

BL: BR
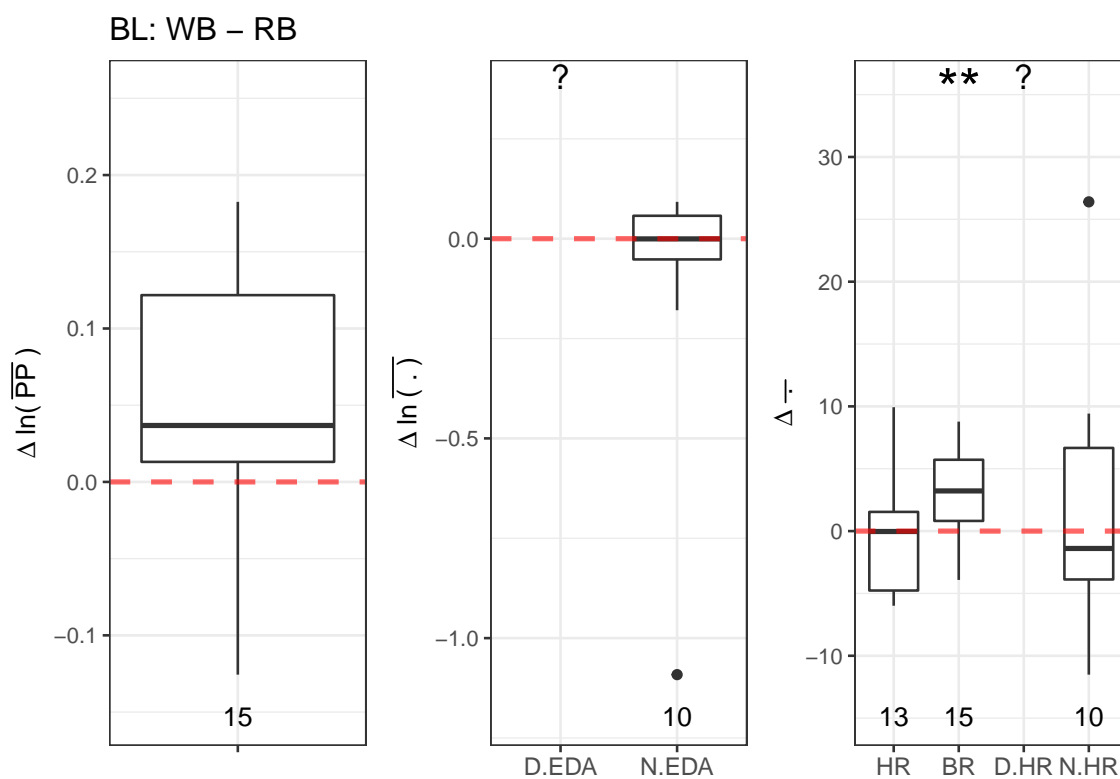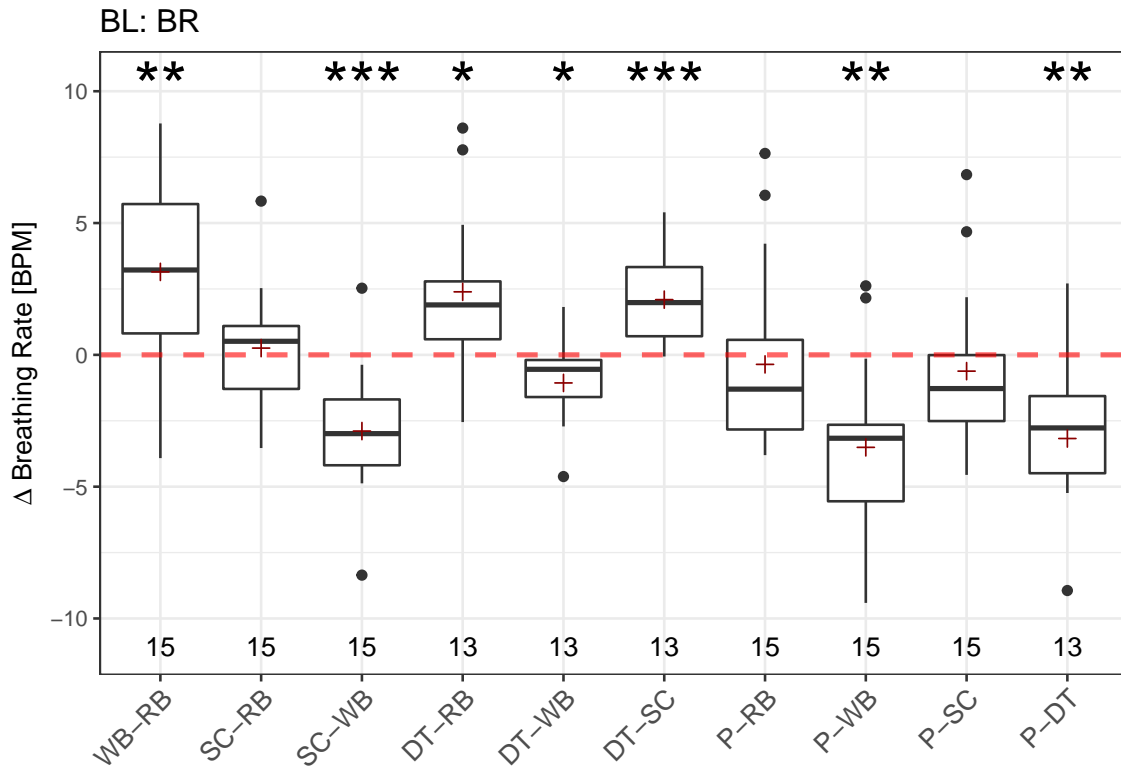


```
## Writing Baseline - Resting Baseline
## t-test p = 0.0022 < 0.01   **
##
## Stress Condition - Resting Baseline
## t-test p = 0.6729 > 0.05
##
## StressCondition - Writing Baseline
## t-test p = 5e-04 < 0.001   ***
##
## Dual Task - Resting Baseline
## t-test p = 0.0179 < 0.05   *
##
## Dual Task - Writing Baseline
## t-test p = 0.0295 < 0.05   *
##
## Dual Task - Stress Condition
## t-test p = 8e-04 < 0.001   ***
##
## Presentation - Resting Baseline
## t-test p = 0.7061 > 0.05
##
## Presentation - Writing Baseline
## t-test p = 0.001 < 0.01   **
##
## Presentation - Stress Condition
```

```
## t-test p = 0.4545 > 0.05
##
## Presentation - Dual Task
## t-test p = 0.0014 < 0.01  **
```

```
## BL has LESS than 7 subjects for D.EDA. Cannot continue with test.
## -----
```
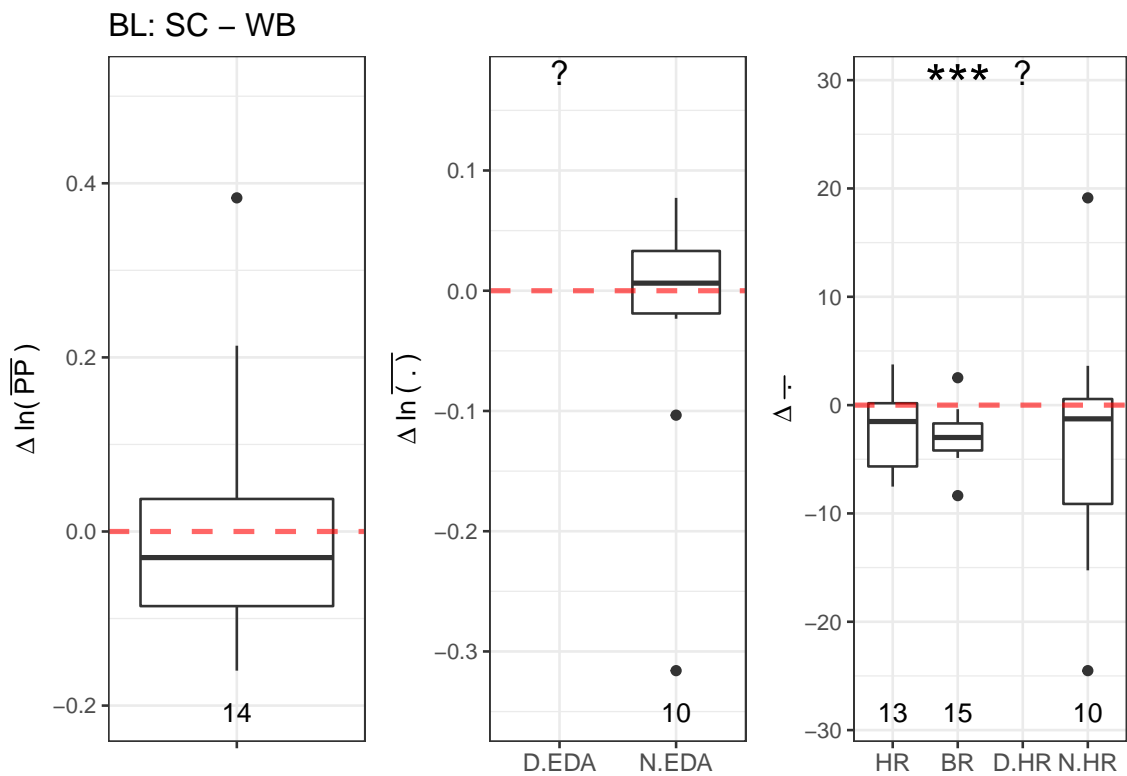
BL: ln(N.EDA)
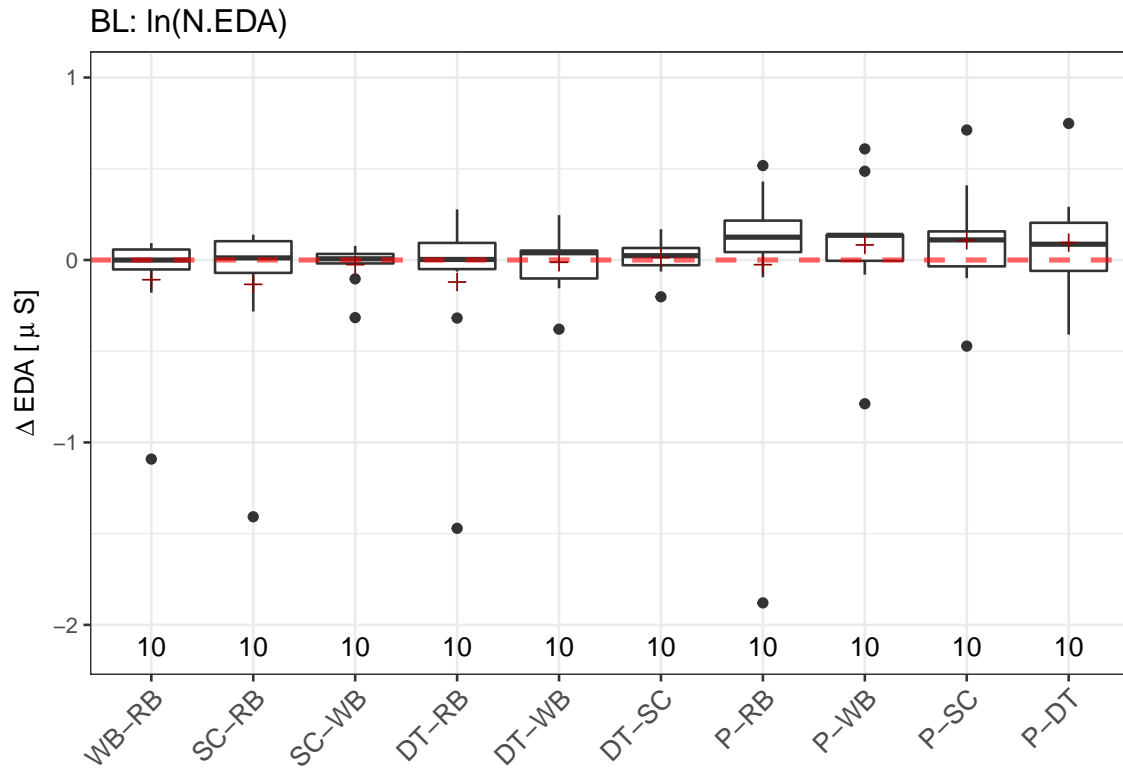

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.36 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.3865 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.4937 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.4649 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.8224 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.6979 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.9064 > 0.05
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.5021 > 0.05
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.3021 > 0.05
##
## Presentation - Dual Task
## Transformed t-test p = 0.3449 > 0.05
```

```
## BL has LESS than 7 subjects for D.HR. Cannot continue with test.
## -----
```
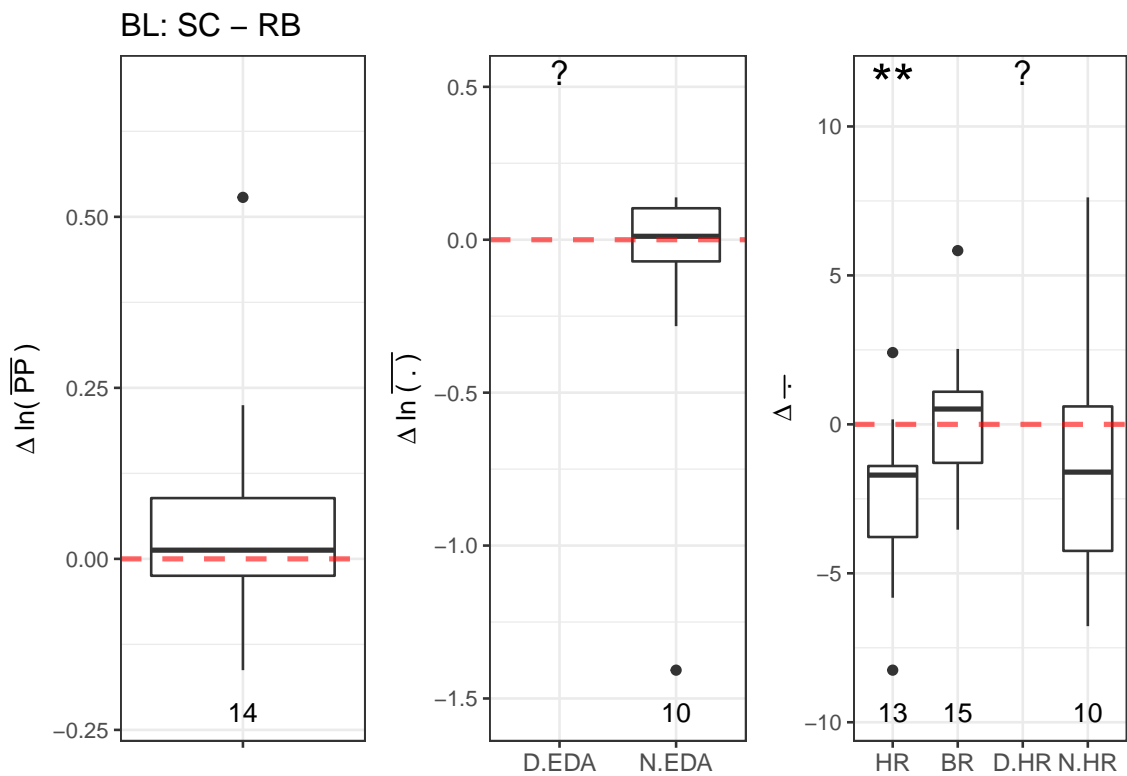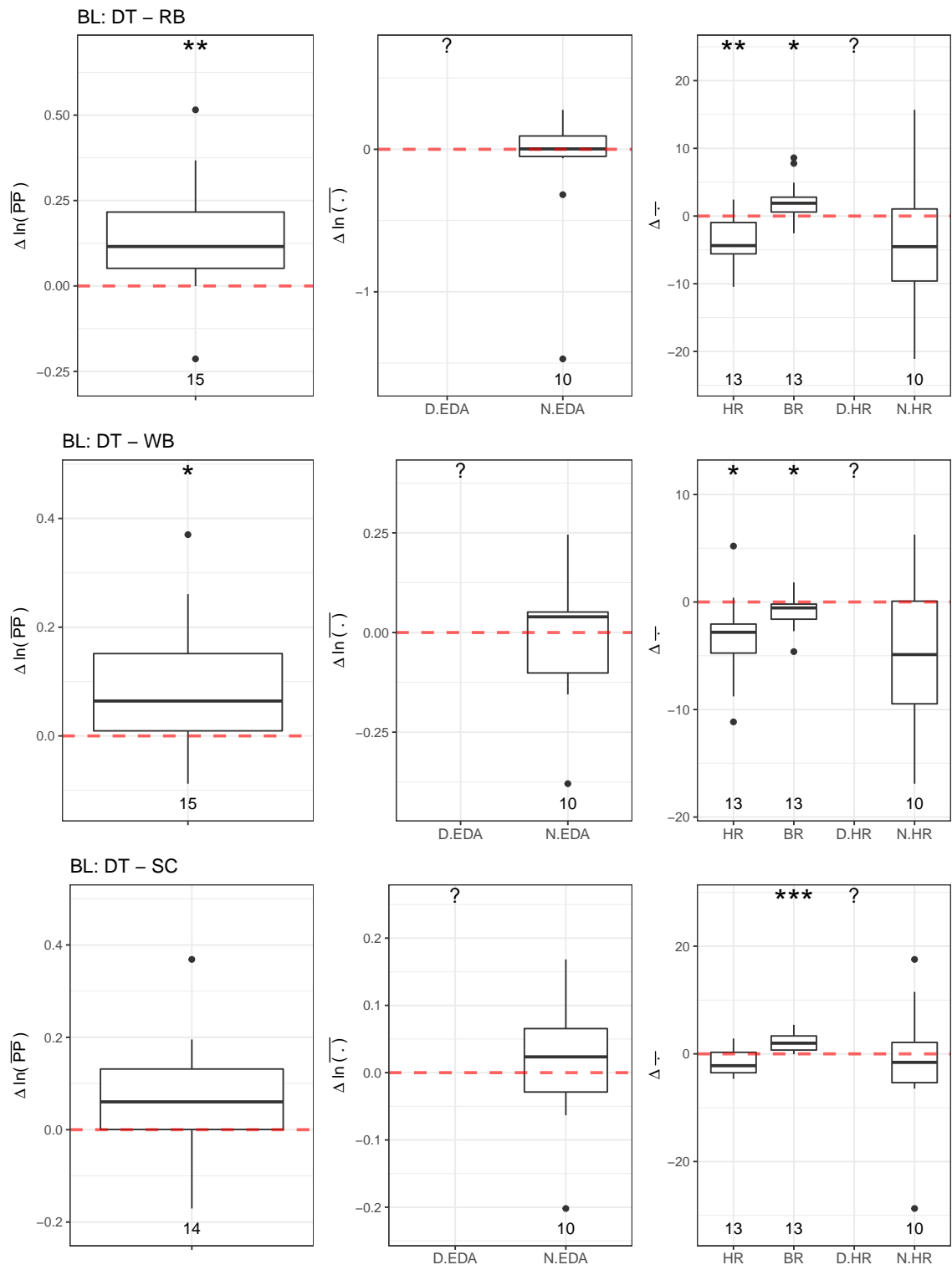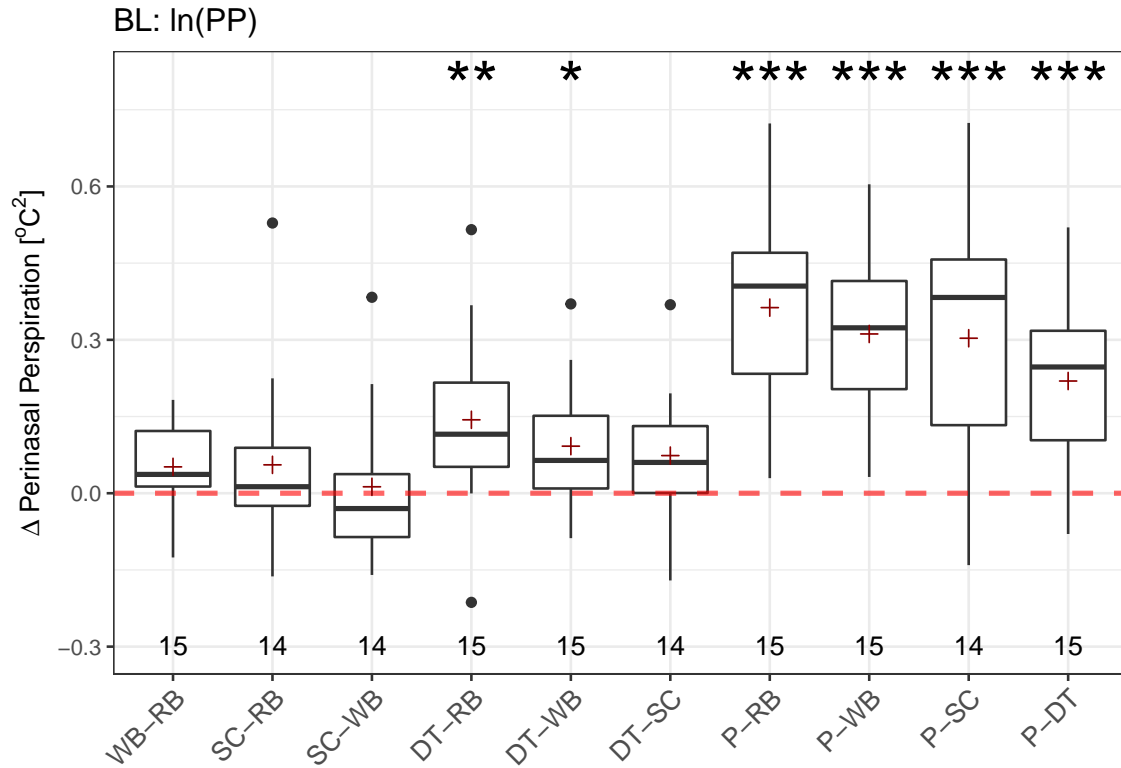
BL: ln(N.HR)
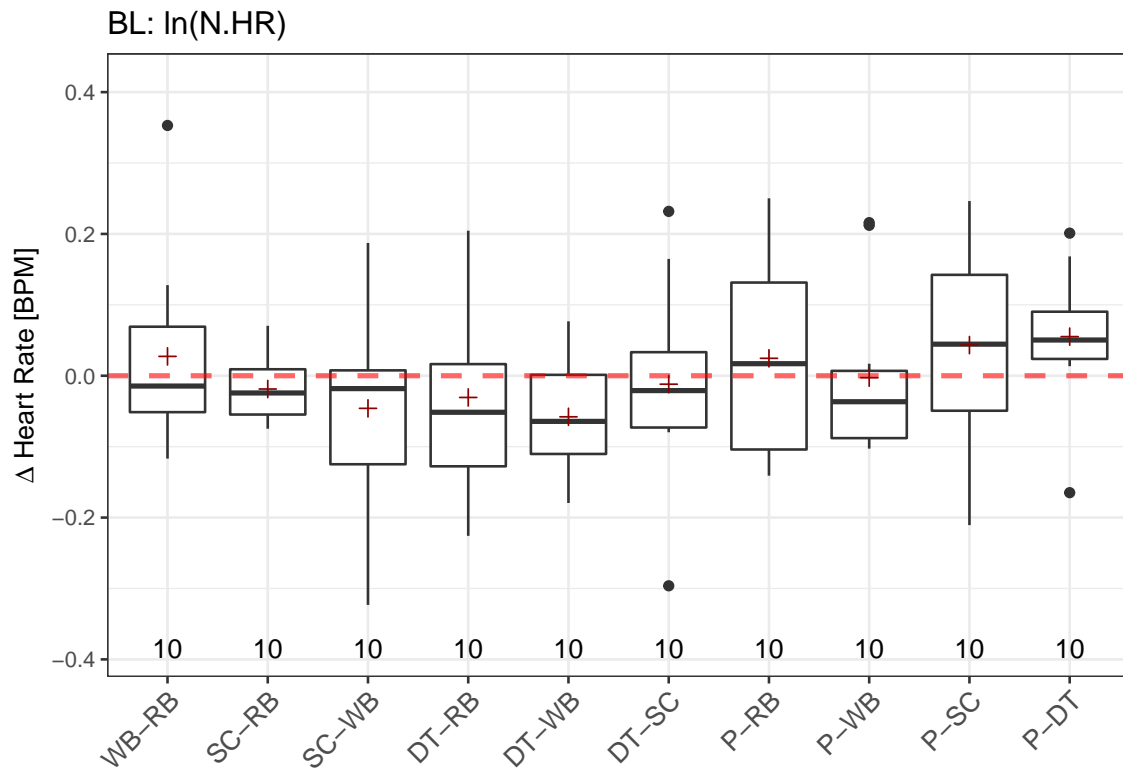

```
## Writing Baseline - Resting Baseline
## Transformed t-test p = 0.5415 > 0.05
##
## Stress Condition - Resting Baseline
## Transformed t-test p = 0.2415 > 0.05
##
## StressCondition - Writing Baseline
## Transformed t-test p = 0.3215 > 0.05
##
## Dual Task - Resting Baseline
## Transformed t-test p = 0.5153 > 0.05
##
## Dual Task - Writing Baseline
## Transformed t-test p = 0.06 > 0.05
##
## Dual Task - Stress Condition
## Transformed t-test p = 0.7994 > 0.05
##
## Presentation - Resting Baseline
## Transformed t-test p = 0.6095 > 0.05
##
## Presentation - Writing Baseline
## Transformed t-test p = 0.9447 > 0.05
##
## Presentation - Stress Condition
```

```
## Transformed t-test p = 0.3598 > 0.05
##
## Presentation - Dual Task
## Transformed t-test p = 0.1119 > 0.05
```

Across Activities

WB – RB for ln(PP)
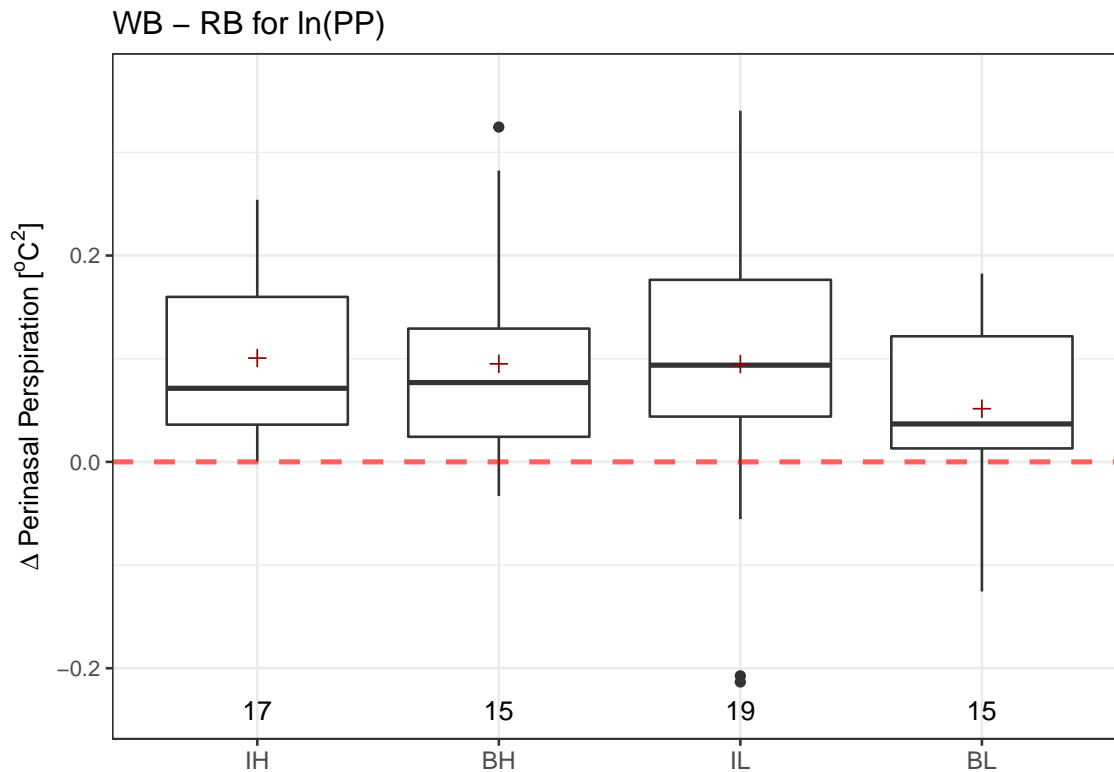
```
## ANOVA:
##            Df Sum Sq  Mean Sq F value Pr(>F)
## Condition   3 0.0241 0.008043   0.647  0.588
## Residuals  62 0.7710 0.012435
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##               diff          lwr        upr     p adj
## BL-BH -0.0435223394 -0.15102371 0.06397904 0.7096171
## IH-BH  0.0055453387 -0.09874631 0.10983699 0.9990022
## IL-BH -0.0002495864 -0.10193571 0.10143653 0.9999999
## IH-BL  0.0490676781 -0.05522397 0.15335933 0.6027724
## IL-BL  0.0432727530 -0.05841337 0.14495887 0.6765392
## IL-IH -0.0057949251 -0.10408160 0.09249175 0.9986420
```

WB – RB for HR
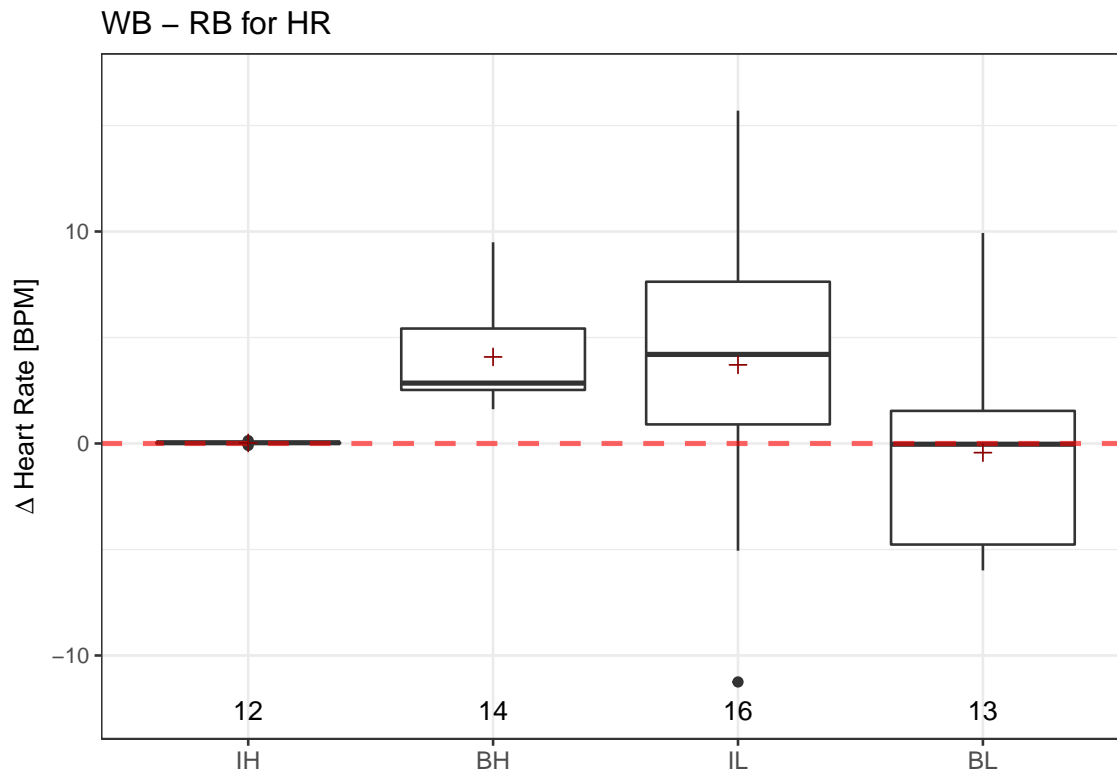
```
## ANOVA:
##              Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3  231.1   77.03   4.167 0.0103 *
## Residuals   51  942.8   18.49
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff        lwr        upr      p adj
## BL-BH -4.5150752 -8.9130882 -0.1170621 0.0421420
## IH-BH -4.0565778 -8.5486049  0.4354492 0.0902238
## IL-BH -0.3737810 -4.5525364  3.8049743 0.9952224
## IH-BL  0.4584973 -4.1125744  5.0295690 0.9933017
## IL-BL  4.1412941 -0.1223177  8.4049059 0.0598664
## IL-IH  3.6827968 -0.6777277  8.0433213 0.1254894
```

WB − RB for BR
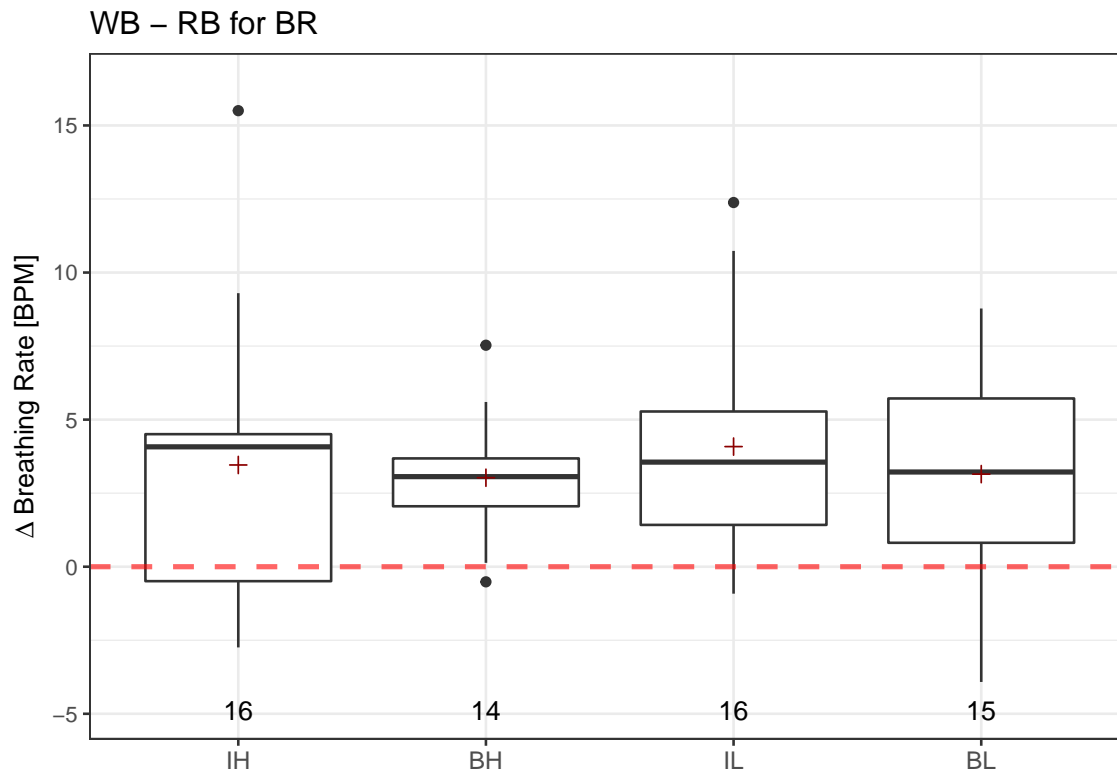
```
## ANOVA:
##            Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3   10.3   3.443   0.271  0.846
## Residuals  57  723.4  12.692
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##            diff       lwr      upr     p adj
## BL-BH 0.1222067 -3.381434 3.625847 0.9997148
## IH-BH 0.4337466 -3.016633 3.884126 0.9871709
## IL-BH 1.0586452 -2.391734 4.509024 0.8485480
## IH-BL 0.3115399 -3.076944 3.700024 0.9948789
## IL-BL 0.9364385 -2.452045 4.324922 0.8840908
## IL-IH 0.6248986 -2.708484 3.958282 0.9596305
```

SC − RB for ln(PP)


```
## [1] "Removed 0 subjects who had Stroop scores less than 0."
##
## ---
##   ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3 0.0636 0.02119   0.729  0.538
## Residuals   61 1.7720 0.02905
##
## ---
##
##     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 -0.0138865234 -0.1811753 0.15340225 0.9962397
## IH-BH  0.0002650717 -0.1592062 0.15973630 1.0000000
## IL-BH -0.0718404652 -0.2273276 0.08364667 0.6164622
## IH-BL  0.0141515951 -0.1483171 0.17662033 0.9956637
## IL-BL -0.0579539418 -0.2165139 0.10060604 0.7694924
## IL-IH -0.0721055369 -0.2223946 0.07818354 0.5870544
```
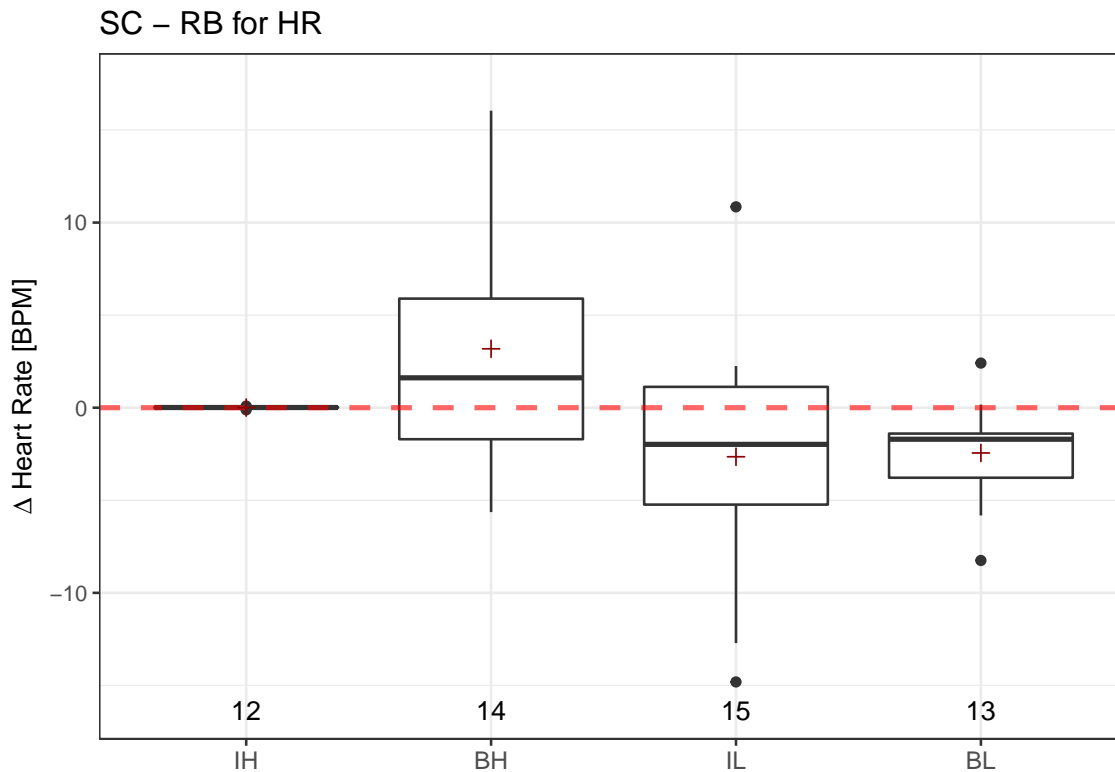
SC – RB for HR

```
## [1] "Removed 0 subjects who had Stroop scores less than 0."
##
## ---
##   ANOVA:
##            Df Sum Sq Mean Sq F value  Pr(>F)
## Condition   3  311.3  103.78   4.277 0.00917 **
## Residuals  50 1213.3   24.27
## ---
## 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 -5.6268272 -10.669112 -0.5845423 0.0231659
## IH-BH -3.1742515  -8.324323  1.9758196 0.3671271
## IL-BH -5.8309016 -10.695764 -0.9660394 0.0128837
## IH-BL  2.4525757  -2.788119  7.6932708 0.6024467
## IL-BL -0.2040744  -5.164774  4.7566249 0.9995259
## IL-IH -2.6566501  -7.726870  2.4135701 0.5098958
```
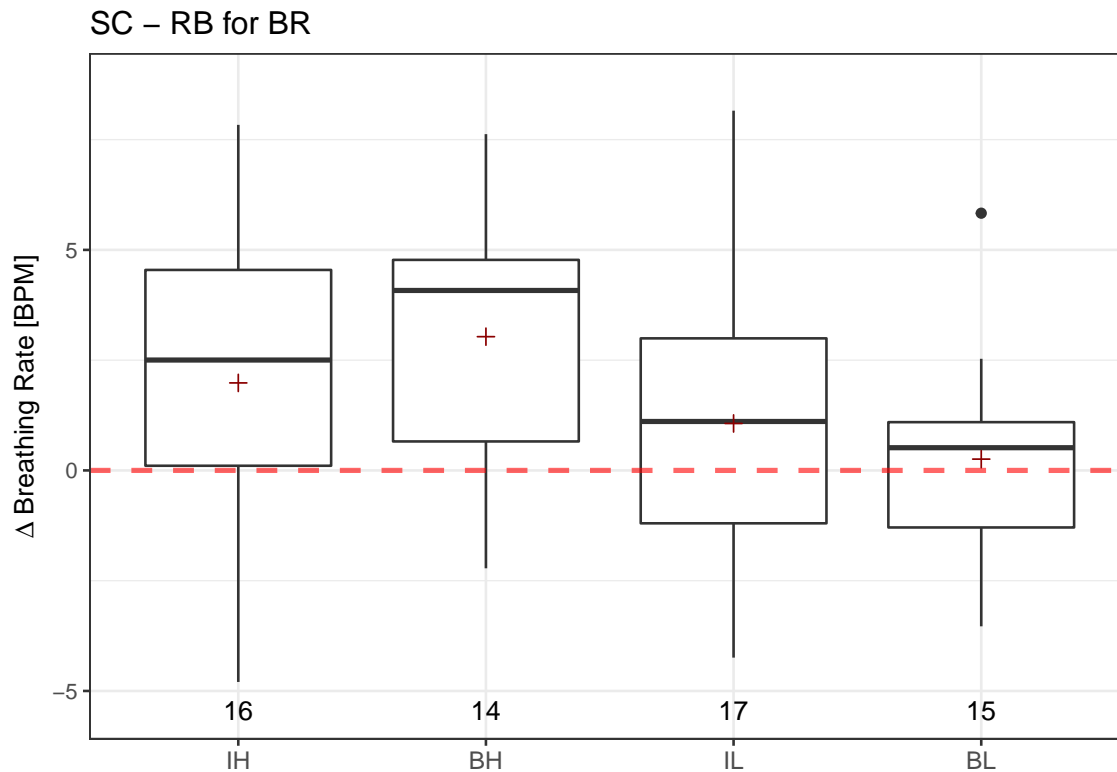
SC – RB for BR


```
## [1] "Removed 0 subjects who had Stroop scores less than 0."
##
## ---
##    ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   62.9  20.966   2.165  0.102
## Residuals   58  561.7   9.684
##
## ---
##
##      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 -2.7764090 -5.835248 0.2824304 0.0881857
## IH-BH -1.0483755 -4.060715 1.9639642 0.7939702
## IL-BH -1.9675514 -4.938258 1.0031548 0.3068896
## IH-BL  1.7280336 -1.230269 4.6863359 0.4177864
## IL-BL  0.8088577 -2.107040 3.7247550 0.8831214
## IL-IH -0.9191759 -3.786256 1.9479043 0.8312418
```

DT − RB for ln(PP)
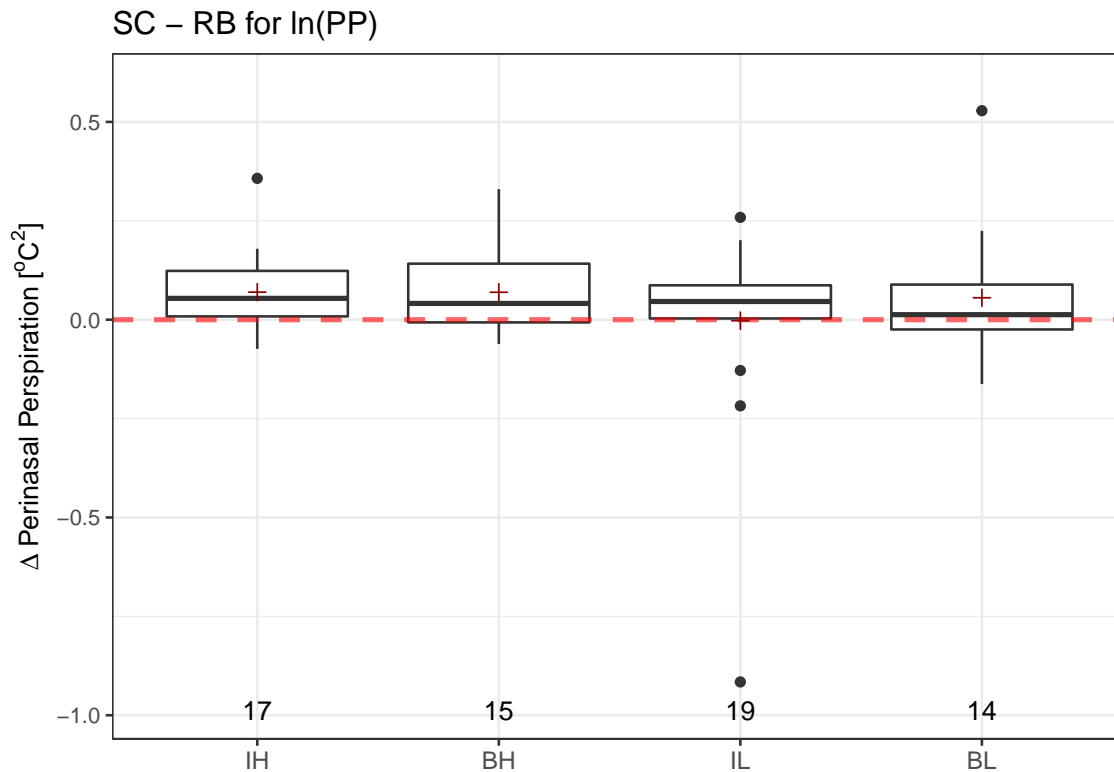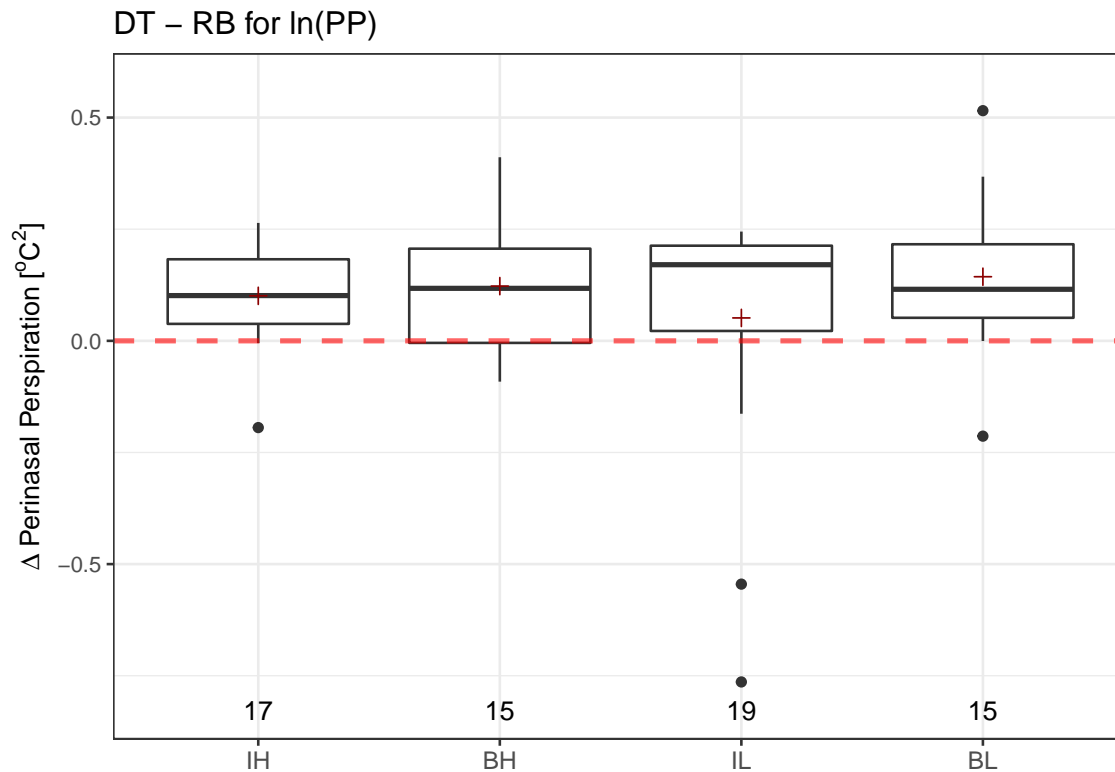
```
## ANOVA:
##           Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3  0.081 0.02701   0.754  0.524
## Residuals  62  2.222 0.03584
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##               diff        lwr        upr       p adj
## BL-BH  0.02105726 -0.1614514 0.20356593 0.9900928
## IH-BH -0.02173941 -0.1987988 0.15532002 0.9881176
## IL-BH -0.07120430 -0.2438402 0.10143163 0.6975664
## IH-BL -0.04279667 -0.2198561 0.13426276 0.9192577
## IL-BL -0.09226156 -0.2648975 0.08037437 0.4974272
## IL-IH -0.04946489 -0.2163295 0.11739968 0.8620509
```

DT − RB for HR
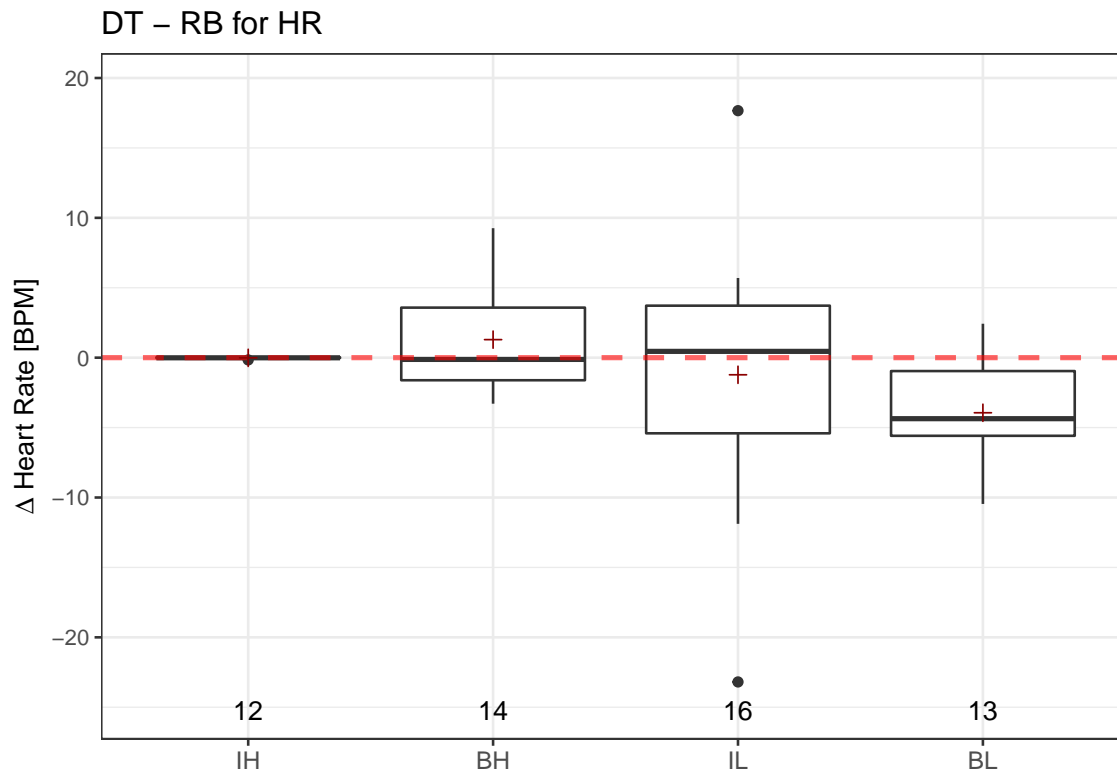
```
## ANOVA:
##            Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3  198.2   66.07   2.109  0.111
## Residuals  51 1597.5   31.32
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##            diff        lwr      upr      p adj
## BL-BH -5.229941 -10.954909 0.495027 0.0848672
## IH-BH -1.302302  -7.149650 4.545046 0.9342030
## IL-BH -2.514618  -7.954175 2.924938 0.6123653
## IH-BL  3.927639  -2.022602 9.877881 0.3076656
## IL-BL  2.715323  -2.834693 8.265339 0.5675874
## IL-IH -1.212316  -6.888485 4.463852 0.9413440
```

DT – RB for BR
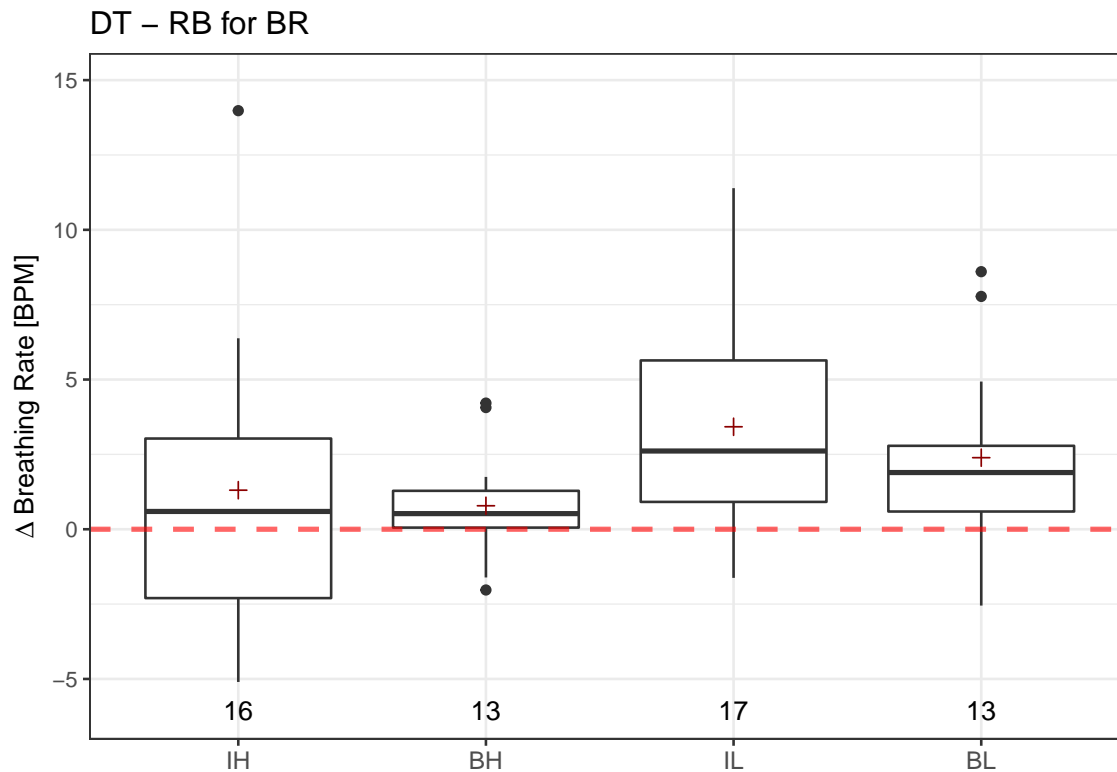

```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   63.3   21.09   1.505  0.223
## Residuals   55  770.5   14.01
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##             diff       lwr      upr      p adj
## BL-BH  1.6064369 -2.282969 5.495843 0.6945016
## IH-BH  0.5202144 -3.182390 4.222819 0.9822184
## IL-BH  2.6386138 -1.014847 6.292075 0.2343805
## IH-BL -1.0862225 -4.788827 2.616382 0.8644195
## IL-BL  1.0321770 -2.621284 4.685638 0.8769147
## IL-IH  2.1183995 -1.335522 5.572321 0.3733521
```

P – RB for ln(PP)
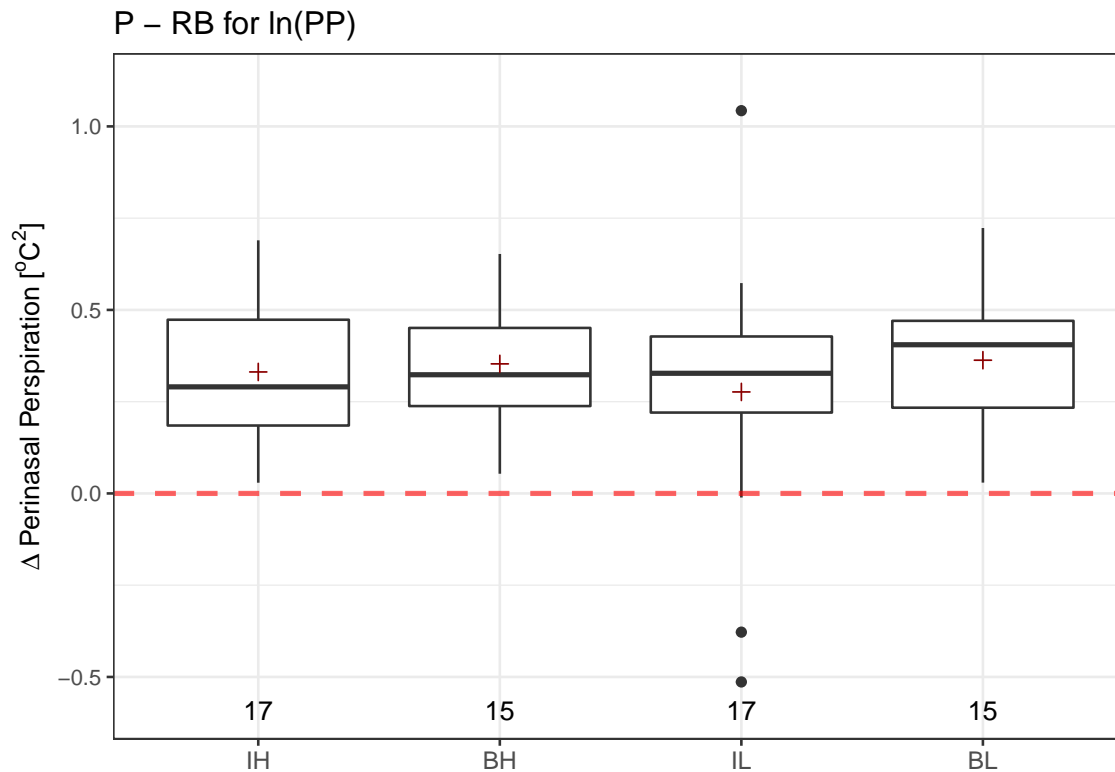

```
## ANOVA:
##            Df Sum Sq Mean Sq F value Pr(>F)
## Condition   3  0.073 0.02428    0.38  0.768
## Residuals  60  3.830 0.06384
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##                 diff         lwr       upr      p adj
## BL-BH   0.009966155 -0.2338316 0.2537639 0.9995437
## IH-BH  -0.022049201 -0.2585678 0.2144694 0.9946916
## IL-BH  -0.076479049 -0.3129976 0.1600395 0.8280576
## IH-BL  -0.032015356 -0.2685339 0.2045032 0.9841704
## IL-BL  -0.086445204 -0.3229638 0.1500734 0.7692651
## IL-IH  -0.054429848 -0.2834380 0.1745783 0.9226342
```

P – RB for HR
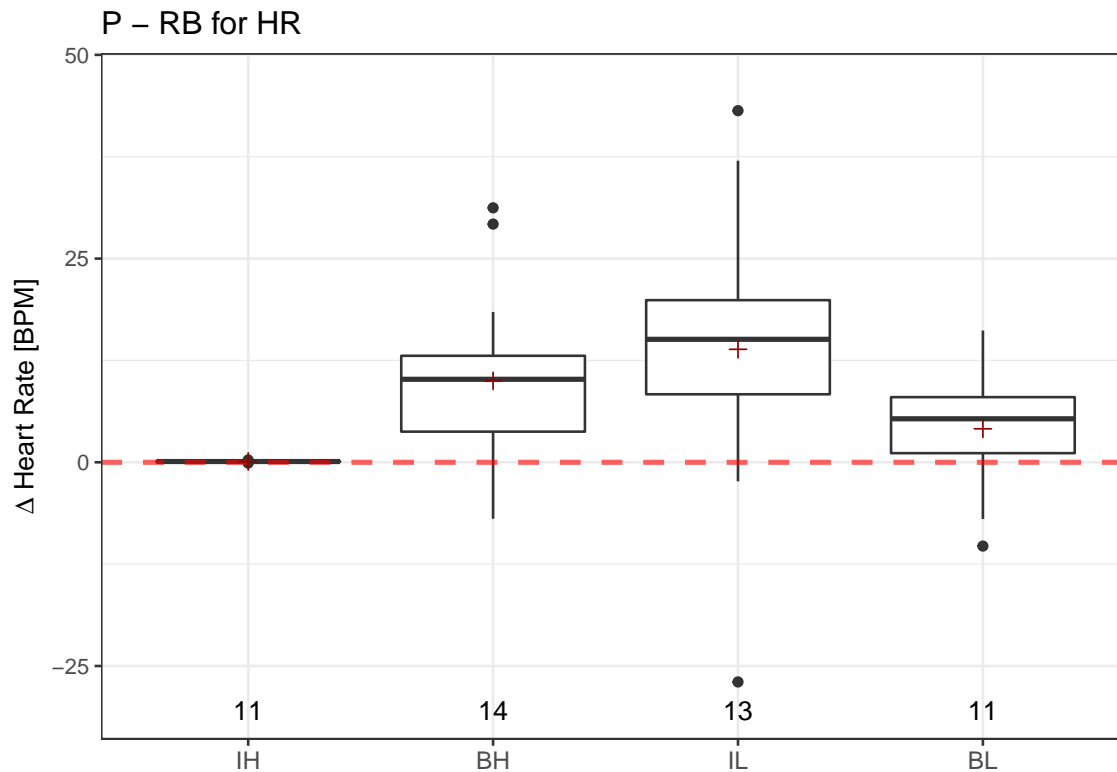

```
## ANOVA:
##             Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3   1343   447.8   3.483 0.0233 *
## Residuals   45   5785   128.6
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## ---
##
##     Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##           diff        lwr        upr      p adj
## BL-BH -5.891227 -18.078140   6.295686 0.5742262
## IH-BH -9.902191 -22.089104   2.284722 0.1480013
## IL-BH  3.865329  -7.784787  15.515445 0.8125616
## IH-BL -4.010964 -16.908380   8.886452 0.8401169
## IL-BL  9.756556  -2.634881  22.147992 0.1685518
## IL-IH 13.767520   1.376083  26.158957 0.0241252
```

P − RB for BR

Δ Breathing Rate [BPM]
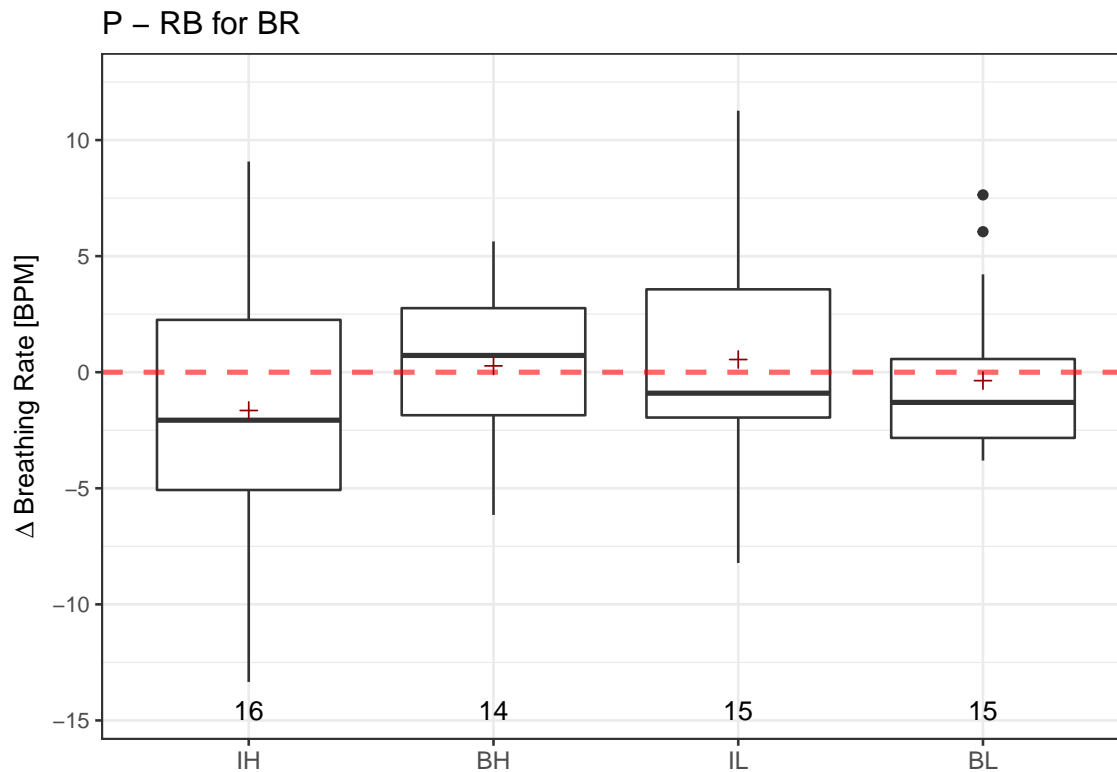
```
## ANOVA:
##              Df Sum Sq Mean Sq F value Pr(>F)
## Condition    3    44.4   14.82   0.697  0.558
## Residuals   56  1189.8   21.25
##
## ---
##
##      Tukey multiple comparisons of means
##      95% family-wise confidence level
##
## Fit: aov(formula = formula(paste(diff, "~ Condition")), data = anova_df)
##
## $Condition
##              diff       lwr      upr      p adj
## BL-BH -0.6359833 -5.171547 3.899580 0.9823516
## IH-BH -1.9220536 -6.388669 2.544561 0.6669421
## IL-BH  0.2727362 -4.262827 4.808300 0.9985454
## IH-BL -1.2860703 -5.672560 3.100419 0.8648273
## IL-BL  0.9087195 -3.547959 5.365398 0.9488644
## IL-IH  2.1947898 -2.191700 6.581280 0.5512450
```

Summary

Condition	Difference	Measure	p	Test	n	Significance
BH	WB - RB	PP	0.0038869	Transformed t-test	15	**
BH	WB - RB	HR	0.0000470	t-test	14	***
BH	WB - RB	BR	0.0000993	t-test	14	***
BH	WB - RB	N.EDA	0.2534179	Transformed t-test	10	
BH	WB - RB	N.HR	0.8962389	t-test	10	
BH	SC - RB	PP	0.0215038	Transformed t-test	15	*
BH	SC - RB	HR	0.0805282	t-test	14	
BH	SC - RB	BR	0.0026189	t-test	14	**
BH	SC - RB	N.EDA	0.0609244	Transformed t-test	10	
BH	SC - RB	N.HR	0.5286897	t-test	10	
BH	SC - WB	PP	0.3011111	Transformed t-test	15	
BH	SC - WB	HR	0.5589881	t-test	14	
BH	SC - WB	BR	0.9929885	t-test	14	
BH	SC - WB	N.EDA	0.0621603	Transformed t-test	10	
BH	SC - WB	N.HR	0.6088627	t-test	10	
BH	DT - RB	PP	0.0031738	Transformed t-test	15	**
BH	DT - RB	HR	0.2421935	t-test	14	
BH	DT - RB	BR	0.1450731	t-test	13	
BH	DT - RB	N.EDA	0.0462830	Transformed t-test	10	*
BH	DT - RB	N.HR	0.5231194	t-test	10	
BH	DT - WB	PP	0.3915045	Transformed t-test	15	
BH	DT - WB	HR	0.0017455	t-test	14	**
BH	DT - WB	BR	0.0000109	t-test	13	***
BH	DT - WB	N.EDA	0.0541748	Transformed t-test	10	
BH	DT - WB	N.HR	0.5861420	t-test	10	
BH	DT - SC	PP	0.1264163	Transformed t-test	15	
BH	DT - SC	HR	0.1489480	t-test	14	
BH	DT - SC	BR	0.0095733	t-test	13	**
BH	DT - SC	N.EDA	0.3059258	Transformed t-test	10	
BH	DT - SC	N.HR	0.0955421	t-test	10	
BH	P - RB	PP	0.0000019	Transformed t-test	15	***
BH	P - RB	HR	0.0051343	t-test	14	**
BH	P - RB	BR	0.7739637	t-test	14	
BH	P - RB	N.EDA	0.0619911	Transformed t-test	10	
BH	P - RB	N.HR	0.8626994	t-test	10	
BH	P - WB	PP	0.0001211	Transformed t-test	15	***
BH	P - WB	HR	0.0500403	t-test	14	
BH	P - WB	BR	0.0210557	t-test	14	*
BH	P - WB	N.EDA	0.0624879	Transformed t-test	10	
BH	P - WB	N.HR	0.7565417	t-test	10	
BH	P - SC	PP	0.0001008	Transformed t-test	15	***
BH	P - SC	HR	0.0135531	t-test	14	*
BH	P - SC	BR	0.0401917	t-test	14	*
BH	P - SC	N.EDA	0.2061865	Transformed t-test	10	
BH	P - SC	N.HR	0.8970905	t-test	10	

(continued)

Condition	Difference	Measure	p	Test	n	Significance
BH	P - DT	PP	0.0000374	Transformed t-test	15	***
BH	P - DT	HR	0.0073807	t-test	14	**
BH	P - DT	BR	0.4905062	t-test	13	
BH	P - DT	N.EDA	0.3638723	Transformed t-test	10	
BH	P - DT	N.HR	0.4013641	t-test	10	
BL	WB - RB	PP	0.0524247	Transformed t-test	15	
BL	WB - RB	HR	0.7393780	t-test	13	
BL	WB - RB	BR	0.0021717	t-test	15	**
BL	WB - RB	N.EDA	0.3600094	Transformed t-test	10	
BL	WB - RB	N.HR	0.5414894	Transformed t-test	10	
BL	SC - RB	PP	0.2437167	Transformed t-test	14	
BL	SC - RB	HR	0.0068419	t-test	13	**
BL	SC - RB	BR	0.6729485	t-test	15	
BL	SC - RB	N.EDA	0.3865046	Transformed t-test	10	
BL	SC - RB	N.HR	0.2414794	Transformed t-test	10	
BL	SC - WB	PP	0.7577805	Transformed t-test	14	
BL	SC - WB	HR	0.0810305	t-test	13	
BL	SC - WB	BR	0.0004782	t-test	15	***
BL	SC - WB	N.EDA	0.4936833	Transformed t-test	10	
BL	SC - WB	N.HR	0.3215454	Transformed t-test	10	
BL	DT - RB	PP	0.0067535	Transformed t-test	15	**
BL	DT - RB	HR	0.0028318	t-test	13	**
BL	DT - RB	BR	0.0179329	t-test	13	*
BL	DT - RB	N.EDA	0.4648969	Transformed t-test	10	
BL	DT - RB	N.HR	0.5152704	Transformed t-test	10	
BL	DT - WB	PP	0.0137203	Transformed t-test	15	*
BL	DT - WB	HR	0.0103391	t-test	13	*
BL	DT - WB	BR	0.0295293	t-test	13	*
BL	DT - WB	N.EDA	0.8223658	Transformed t-test	10	
BL	DT - WB	N.HR	0.0600485	Transformed t-test	10	
BL	DT - SC	PP	0.0617118	Transformed t-test	14	
BL	DT - SC	HR	0.0577026	t-test	13	
BL	DT - SC	BR	0.0008051	t-test	13	***
BL	DT - SC	N.EDA	0.6978977	Transformed t-test	10	
BL	DT - SC	N.HR	0.7994275	Transformed t-test	10	
BL	P - RB	PP	0.0000098	Transformed t-test	15	***
BL	P - RB	HR	0.1092566	t-test	11	
BL	P - RB	BR	0.7060864	t-test	15	
BL	P - RB	N.EDA	0.9064316	Transformed t-test	10	
BL	P - RB	N.HR	0.6094821	Transformed t-test	10	
BL	P - WB	PP	0.0000054	Transformed t-test	15	***
BL	P - WB	HR	0.0833217	t-test	11	
BL	P - WB	BR	0.0010110	t-test	15	**
BL	P - WB	N.EDA	0.5020786	Transformed t-test	10	
BL	P - WB	N.HR	0.9446712	Transformed t-test	10	
BL	P - SC	PP	0.0003035	Transformed t-test	14	***
BL	P - SC	HR	0.0068502	t-test	11	**

(continued)

Condition	Difference	Measure	p	Test	n	Significance
BL	P - SC	BR	0.4544982	t-test	15	
BL	P - SC	N.EDA	0.3020977	Transformed t-test	10	
BL	P - SC	N.HR	0.3598299	Transformed t-test	10	
BL	P - DT	PP	0.0001644	Transformed t-test	15	***
BL	P - DT	HR	0.0019303	t-test	11	**
BL	P - DT	BR	0.0013562	t-test	13	**
BL	P - DT	N.EDA	0.3449199	Transformed t-test	10	
BL	P - DT	N.HR	0.1119367	Transformed t-test	10	
IH	WB - RB	PP	0.0000999	Transformed t-test	17	***
IH	WB - RB	HR	0.1185091	Transformed t-test	12	
IH	WB - RB	BR	0.0086109	t-test	16	**
IH	WB - RB	N.EDA	0.1796233	Transformed t-test	9	
IH	WB - RB	N.HR	0.3593750	Wilcoxon	9	
IH	SC - RB	PP	0.0145060	Transformed t-test	17	*
IH	SC - RB	HR	0.6094900	Transformed t-test	12	
IH	SC - RB	BR	0.0454605	t-test	16	*
IH	SC - RB	N.EDA	0.1701327	Transformed t-test	9	
IH	SC - RB	N.HR	0.6523438	Wilcoxon	9	
IH	SC - WB	PP	0.2084476	Transformed t-test	17	
IH	SC - WB	HR	0.2597084	Transformed t-test	12	
IH	SC - WB	BR	0.0933387	t-test	16	
IH	SC - WB	N.EDA	0.4136931	Transformed t-test	9	
IH	SC - WB	N.HR	0.4960938	Wilcoxon	9	
IH	DT - RB	PP	0.0016239	Transformed t-test	17	**
IH	DT - RB	HR	0.5734584	Transformed t-test	12	
IH	DT - RB	BR	0.2969312	t-test	16	
IH	DT - RB	N.EDA	0.1074189	Transformed t-test	9	
IH	DT - RB	N.HR	0.1289062	Wilcoxon	9	
IH	DT - WB	PP	0.9946474	Transformed t-test	17	
IH	DT - WB	HR	0.0171595	Transformed t-test	12	*
IH	DT - WB	BR	0.0005234	t-test	16	***
IH	DT - WB	N.EDA	0.0501999	Transformed t-test	9	
IH	DT - WB	N.HR	0.7343750	Wilcoxon	9	
IH	DT - SC	PP	0.3697148	Transformed t-test	17	
IH	DT - SC	HR	0.2853287	Transformed t-test	12	
IH	DT - SC	BR	0.3543299	t-test	16	
IH	DT - SC	N.EDA	0.2500363	Transformed t-test	9	
IH	DT - SC	N.HR	0.1640625	Wilcoxon	9	
IH	P - RB	PP	0.0000079	Transformed t-test	17	***
IH	P - RB	HR	0.0079289	Transformed t-test	11	**
IH	P - RB	BR	0.2723250	t-test	16	
IH	P - RB	N.EDA	0.2412087	Transformed t-test	9	
IH	P - RB	N.HR	0.4257812	Wilcoxon	9	
IH	P - WB	PP	0.0002411	Transformed t-test	17	***
IH	P - WB	HR	0.0152592	Transformed t-test	11	*
IH	P - WB	BR	0.0008811	t-test	16	***
IH	P - WB	N.EDA	0.4940290	Transformed t-test	9	

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Condition	Difference	Measure	p	Test	n	Significance
IH	P - WB	N.HR	0.1289062	Wilcoxon	9	
IH	P - SC	PP	0.0000697	Transformed t-test	17	***
IH	P - SC	HR	0.0026035	Transformed t-test	11	**
IH	P - SC	BR	0.0065963	t-test	16	**
IH	P - SC	N.EDA	0.9167294	Transformed t-test	9	
IH	P - SC	N.HR	0.3007812	Wilcoxon	9	
IH	P - DT	PP	0.0001591	Transformed t-test	17	***
IH	P - DT	HR	0.0000458	Transformed t-test	11	***
IH	P - DT	BR	0.0131870	t-test	16	*
IH	P - DT	N.EDA	0.2971289	Transformed t-test	9	
IH	P - DT	N.HR	0.0742188	Wilcoxon	9	
IL	WB - RB	PP	0.0110517	Transformed t-test	19	*
IL	WB - RB	HR	0.0339757	t-test	16	*
IL	WB - RB	BR	0.0005059	t-test	16	***
IL	WB - RB	N.EDA	0.3149969	Transformed t-test	11	
IL	WB - RB	N.HR	0.8500977	Wilcoxon	12	
IL	SC - RB	PP	0.9653604	Transformed t-test	19	
IL	SC - RB	HR	0.1431695	t-test	15	
IL	SC - RB	BR	0.1931501	t-test	17	
IL	SC - RB	N.EDA	0.8558378	Transformed t-test	11	
IL	SC - RB	N.HR	0.4238281	Wilcoxon	12	
IL	SC - WB	PP	0.0291272	Transformed t-test	19	*
IL	SC - WB	HR	0.0000012	t-test	15	***
IL	SC - WB	BR	0.0015261	t-test	16	**
IL	SC - WB	N.EDA	0.2692000	Transformed t-test	11	
IL	SC - WB	N.HR	0.3803711	Wilcoxon	12	
IL	DT - RB	PP	0.4247691	Transformed t-test	19	
IL	DT - RB	HR	0.5956168	t-test	16	
IL	DT - RB	BR	0.0030795	t-test	17	**
IL	DT - RB	N.EDA	0.8780038	Transformed t-test	11	
IL	DT - RB	N.HR	1.0000000	Wilcoxon	12	
IL	DT - WB	PP	0.3300145	Transformed t-test	19	
IL	DT - WB	HR	0.0013141	t-test	16	**
IL	DT - WB	BR	0.0203968	t-test	16	*
IL	DT - WB	N.EDA	0.1658008	Transformed t-test	11	
IL	DT - WB	N.HR	0.1293945	Wilcoxon	12	
IL	DT - SC	PP	0.1283543	Transformed t-test	19	
IL	DT - SC	HR	0.2937107	t-test	15	
IL	DT - SC	BR	0.0062921	t-test	17	**
IL	DT - SC	N.EDA	0.8370137	Transformed t-test	11	
IL	DT - SC	N.HR	0.7910156	Wilcoxon	12	
IL	P - RB	PP	0.0059327	Transformed t-test	17	**
IL	P - RB	HR	0.0133767	t-test	13	*
IL	P - RB	BR	0.6753936	t-test	15	
IL	P - RB	N.EDA	0.1952869	Transformed t-test	10	
IL	P - RB	N.HR	0.9658203	Wilcoxon	11	
IL	P - WB	PP	0.0203817	Transformed t-test	17	*

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Condition	Difference	Measure	p	Test	n	Significance
IL	P - WB	HR	0.0132198	t-test	13	*
IL	P - WB	BR	0.0006932	t-test	14	***
IL	P - WB	N.EDA	0.0864501	Transformed t-test	10	
IL	P - WB	N.HR	0.3203125	Wilcoxon	11	
IL	P - SC	PP	0.0005328	Transformed t-test	17	***
IL	P - SC	HR	0.0032216	t-test	12	**
IL	P - SC	BR	0.8476607	t-test	15	
IL	P - SC	N.EDA	0.2335647	Transformed t-test	10	
IL	P - SC	N.HR	0.9658203	Wilcoxon	11	
IL	P - DT	PP	0.0000890	Transformed t-test	17	***
IL	P - DT	HR	0.0012193	t-test	13	**
IL	P - DT	BR	0.0015221	t-test	15	**
IL	P - DT	N.EDA	0.0760791	Transformed t-test	11	
IL	P - DT	N.HR	0.8310547	Wilcoxon	11	