Normality results – 2 cluster

```
> normality_results
$pvt_reaction_time

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.82109, p-value = 9.095e-08


$nback_miss_1

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.95694, p-value = 0.01702


$nback_miss_2

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.97487, p-value = 0.1715


$tmt_a_time

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.96891, p-value = 0.07907


$tmt_b_time

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.83599, p-value = 2.481e-07


$tmt_diff

        Shapiro-Wilk normality test

data:  residuals(lm(clean_data[[variable]] ~ as.factor(cluster), data = cle
an_data))
W = 0.8319, p-value = 1.873e-07
```

```
> homogeneity_results
$pvt_reaction_time
Levene's Test for Homogeneity of Variance (center = median)
      Df F value   Pr(>F)
group  1  7.7683 0.006887 **
      68
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

$nback_miss_1
Levene's Test for Homogeneity of Variance (center = median)
      Df F value  Pr(>F)
group  1  3.7301 0.05761 .
      68
```

```
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

$nback_miss_2
Levene's Test for Homogeneity of Variance (center = median)
      Df F value  Pr(>F)
group  1  3.2772 0.07467 .
      68
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

$tmt_a_time
Levene's Test for Homogeneity of Variance (center = median)
      Df F value   Pr(>F)
group  1  10.176 0.002153 **
      68
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

$tmt_b_time
Levene's Test for Homogeneity of Variance (center = median)
      Df F value  Pr(>F)
group  1  5.3301 0.02401 *
      68
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

$tmt_diff
Levene's Test for Homogeneity of Variance (center = median)
      Df F value  Pr(>F)
group  1  4.0407 0.04838 *
      68
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
shapiro_per_cluster
$pvt_reaction_time
$pvt_reaction_time$cluster_1
$pvt_reaction_time$cluster_1$W
     W
0.8264

$pvt_reaction_time$cluster_1$p_value
[1] 0


$pvt_reaction_time$cluster_2
$pvt_reaction_time$cluster_2$W
     W
0.9222

$pvt_reaction_time$cluster_2$p_value
[1] 0.0347



$nback_miss_1
$nback_miss_1$cluster_1
$nback_miss_1$cluster_1$W
     W
0.9412

$nback_miss_1$cluster_1$p_value
[1] 0.0345


$nback_miss_1$cluster_2
$nback_miss_1$cluster_2$W
     W
0.9063
```

```
$nback_miss_1$cluster_2$p_value
[1] 0.0139



$nback_miss_2
$nback_miss_2$cluster_1
$nback_miss_2$cluster_1$W
     W
0.9521

$nback_miss_2$cluster_1$p_value
[1] 0.0828


$nback_miss_2$cluster_2
$nback_miss_2$cluster_2$W
     W
0.9626

$nback_miss_2$cluster_2$p_value
[1] 0.3806



$tmt_a_time
$tmt_a_time$cluster_1
$tmt_a_time$cluster_1$W
     W
0.9604

$tmt_a_time$cluster_1$p_value
[1] 0.163


$tmt_a_time$cluster_2
$tmt_a_time$cluster_2$W
     W
0.9697

$tmt_a_time$cluster_2$p_value
[1] 0.5529



$tmt_b_time
$tmt_b_time$cluster_1
$tmt_b_time$cluster_1$W
     W
0.8246

$tmt_b_time$cluster_1$p_value
[1] 0


$tmt_b_time$cluster_2
$tmt_b_time$cluster_2$W
     W
0.9771

$tmt_b_time$cluster_2$p_value
[1] 0.7608



$tmt_diff
$tmt_diff$cluster_1
$tmt_diff$cluster_1$W
     W
0.8089
```

```
$tmt_diff$cluster_1$p_value
[1] 0


$tmt_diff$cluster_2
$tmt_diff$cluster_2$W
     W
0.9609

$tmt_diff$cluster_2$p_value
[1] 0.3467
```

4-Cluster solution

```
> # Overall Kruskal
> kruskal_results
$pvt_reaction_time

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 47.029, df = 3, p-value = 3.426e-10


$nback_miss_1

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 22.672, df = 3, p-value = 4.726e-05


$nback_miss_2

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 27.642, df = 3, p-value = 4.318e-06


$tmt_a_time

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 38.848, df = 3, p-value = 1.869e-08


$tmt_b_time

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 34.861, df = 3, p-value = 1.303e-07


$tmt_diff

        Kruskal-Wallis rank sum test

data:  clean_data[[variable]] by as.factor(cluster)
Kruskal-Wallis chi-squared = 17.649, df = 3, p-value = 0.0005195
```

```
> effect_sizes
$pvt_reaction_time
[1] 15.6764
```

```
$nback_miss_1
[1] 7.5575

$nback_miss_2
[1] 9.214

$tmt_a_time
[1] 12.9494

$tmt_b_time
[1] 11.6204

$tmt_diff
[1] 5.8831
```

```
> # By group
> kruskal_results_withPCS
$pvt_reaction_time

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 30.167, df = 3, p-value = 1.273e-06


$nback_miss_1

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 7.044, df = 3, p-value = 0.07051


$nback_miss_2

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 15.919, df = 3, p-value = 0.001178


$tmt_a_time

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 22.547, df = 3, p-value = 5.019e-05


$tmt_b_time

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 24.533, df = 3, p-value = 1.933e-05


$tmt_diff

        Kruskal-Wallis rank sum test

data:  withPCS_data[[variable]] by as.factor(withPCS_data$cluster)
Kruskal-Wallis chi-squared = 14.291, df = 3, p-value = 0.002534
```

```
> effect_sizes_withPCS
$pvt_reaction_time
[1] 10.0558
```

```
$nback_miss_1
[1] 2.348

$nback_miss_2
[1] 5.3062

$tmt_a_time
[1] 7.5156

$tmt_b_time
[1] 8.1778

$tmt_diff
[1] 4.7638
```

```
> kruskal_results_withoutPCS
$pvt_reaction_time

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 11.296, df = 3, p-value = 0.01023


$nback_miss_1

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 9.7076, df = 3, p-value = 0.02122


$nback_miss_2

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 9.9672, df = 3, p-value = 0.01885


$tmt_a_time

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 7.876, df = 3, p-value = 0.04864


$tmt_b_time

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 6.3102, df = 3, p-value = 0.09746


$tmt_diff

        Kruskal-Wallis rank sum test

data:  withoutPCS_data[[variable]] by as.factor(withoutPCS_data$cluster)
Kruskal-Wallis chi-squared = 3.4946, df = 3, p-value = 0.3215
```

```
> effect_sizes_withoutPCS
$pvt_reaction_time
[1] 3.7653

$nback_miss_1
[1] 3.2359
```

```
$nback_miss_2
[1] 3.3224

$tmt_a_time
[1] 2.6253

$tmt_b_time
[1] 2.1034

$tmt_diff
[1] 1.1649
```

```
# Dunn post-hoc
> dunn_results
$pvt_reaction_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj        P.adj
1      1 - 2  5.502634 3.741581e-08 2.244949e-07
2      1 - 3  3.315185 9.158248e-04 5.494949e-03
3      2 - 3 -1.689386 9.114557e-02 5.468734e-01
4      1 - 4 -1.045791 2.956577e-01 1.000000e+00
5      2 - 4 -5.331670 9.731369e-08 5.838821e-07
6      3 - 4 -3.702221 2.137205e-04 1.282323e-03

$nback_miss_1
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj       P.adj
1      1 - 2  3.582942 3.397466e-04 0.002038480
2      1 - 3  1.019628 3.079049e-01 1.000000000
3      2 - 3 -2.373948 1.759904e-02 0.105594268
4      1 - 4 -1.147434 2.512025e-01 1.000000000
5      2 - 4 -3.972442 7.113967e-05 0.000426838
6      3 - 4 -1.956317 5.042783e-02 0.302566953

$nback_miss_2
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z      P.unadj        P.adj
1      1 - 2  2.8226171 4.763342e-03 0.0285800516
2      1 - 3 -1.3210439 1.864867e-01 1.0000000000
3      2 - 3 -4.2461507 2.174744e-05 0.0001304846
4      1 - 4 -1.7702442 7.668647e-02 0.4601188136
5      2 - 4 -4.0595290 4.917181e-05 0.0002950308
6      3 - 4 -0.6901557 4.900963e-01 1.0000000000

$tmt_a_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj        P.adj
1      1 - 2  3.186161 1.441745e-03 8.650473e-03
2      1 - 3 -1.501766 1.331576e-01 7.989458e-01
3      2 - 3 -4.804869 1.548527e-06 9.291160e-06
4      1 - 4 -2.455671 1.406220e-02 8.437319e-02
5      2 - 4 -5.073475 3.906152e-07 2.343691e-06
6      3 - 4 -1.223456 2.211574e-01 1.000000e+00

$tmt_b_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z      P.unadj        P.adj
1      1 - 2  0.7671256 4.430068e-01 1.000000e+00
2      1 - 3 -3.2177077 1.292194e-03 7.753165e-03
```

```
3      2 - 3 -4.3513620 1.352945e-05 8.117669e-05
4      1 - 4 -3.8317902 1.272142e-04 7.632852e-04
5      2 - 4 -4.7005873 2.594143e-06 1.556486e-05
6      3 - 4 -1.2057146 2.279275e-01 1.000000e+00

$tmt_diff
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z      P.unadj       P.adj
1      1 - 2 -0.9296137 0.3525711459 1.000000000
2      1 - 3 -2.6902166 0.0071405647 0.042843388
3      2 - 3 -2.0971096 0.0359838737 0.215903242
4      1 - 4 -3.6396211 0.0002730395 0.001638237
5      2 - 4 -3.1964563 0.0013912692 0.008347615
6      3 - 4 -1.4397525 0.1499374281 0.899624568
```

```
dunn_results_withPCS
$pvt_reaction_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj        P.adj
1      1 - 2  4.073680 4.627602e-05 2.776561e-04
2      1 - 3  3.108111 1.882876e-03 1.129726e-02
3      2 - 3 -1.175352 2.398539e-01 1.000000e+00
4      1 - 4 -1.060334 2.889927e-01 1.000000e+00
5      2 - 4 -4.485691 7.267792e-06 4.360675e-05
6      3 - 4 -3.660766 2.514624e-04 1.508775e-03

$nback_miss_2
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj      P.adj
1      1 - 2  1.423425 0.1546129166 0.92767750
2      1 - 3 -1.484052 0.1377951157 0.82677069
3      2 - 3 -2.807311 0.0049956999 0.02997420
4      1 - 4 -2.585591 0.0097212071 0.05832724
5      2 - 4 -3.674611 0.0002382116 0.00142927
6      3 - 4 -1.343944 0.1789663454 1.00000000

$tmt_a_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison         Z      P.unadj        P.adj
1      1 - 2  2.301185 0.0213811718 0.1282870308
2      1 - 3 -1.561865 0.1183198883 0.7099193300
3      2 - 3 -3.757631 0.0001715293 0.0010291761
4      1 - 4 -2.449222 0.0143165075 0.0858990448
5      2 - 4 -4.294074 0.0000175424 0.0001052544
6      3 - 4 -1.142473 0.2532576377 1.0000000000

$tmt_b_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z      P.unadj        P.adj
1      1 - 2  0.4405916 6.595087e-01 1.0000000000
2      1 - 3 -2.8817490 3.954746e-03 0.0237284781
3      2 - 3 -3.1278364 1.760982e-03 0.0105658897
4      1 - 4 -3.8335883 1.262875e-04 0.0007577247
5      2 - 4 -4.0229604 5.747116e-05 0.0003448269
6      3 - 4 -1.4225441 1.548684e-01 0.9292101972

$tmt_diff
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.
```

```
  Comparison           Z       P.unadj       P.adj
1      1 - 2 -0.4398468 0.6600480919 1.000000000
2      1 - 3 -2.0460426 0.0407521764 0.244513058
3      2 - 3 -1.4680978 0.1420776526 0.852465916
4      1 - 4 -3.4815545 0.0004985123 0.002991074
5      2 - 4 -2.9365925 0.0033183982 0.019910389
6      3 - 4 -1.7697124 0.0767750588 0.460650353
```

```
dunn_results_withoutPCS
$pvt_reaction_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z     P.unadj      P.adj
1      1 - 2  2.9169862 0.003534315 0.02120589
2      1 - 3  1.7045579 0.088276902 0.52966141
3      2 - 3 -0.4874180 0.625962171 1.00000000
4      1 - 4 -0.3380617 0.735316691 1.00000000
5      2 - 4 -1.9324538 0.053303522 0.31982113
6      3 - 4 -1.4547859 0.145728533 0.87437120

$nback_miss_1
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z     P.unadj      P.adj
1      1 - 2  2.77915418 0.005450065 0.03270039
2      1 - 3  1.02229063 0.306643368 1.00000000
3      2 - 3 -1.20413183 0.228538629 1.00000000
4      1 - 4  0.01425219 0.988628780 1.00000000
5      2 - 4 -1.47462445 0.140313538 0.84188123
6      3 - 4 -0.66238206 0.507726395 1.00000000

$nback_miss_2
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z    P.unadj      P.adj
1      1 - 2  2.2538313 0.02420678 0.14524071
2      1 - 3 -0.4350091 0.66355583 1.00000000
3      2 - 3 -2.5305324 0.01138896 0.06833374
4      1 - 4  0.8348999 0.40377405 1.00000000
5      2 - 4 -0.2986713 0.76519088 1.00000000
6      3 - 4  1.0961199 0.27302633 1.00000000

$tmt_a_time
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Bonferroni method.

  Comparison          Z    P.unadj     P.adj
1      1 - 2  1.3865944 0.16556547 0.9933928
2      1 - 3 -0.6050279 0.54516049 1.0000000
3      2 - 3 -1.9716205 0.04865294 0.2919177
4      1 - 4 -1.0708557 0.28423434 1.0000000
5      2 - 4 -1.9104163 0.05607963 0.3364778
6      3 - 4 -0.6366632 0.52434424 1.0000000
```