

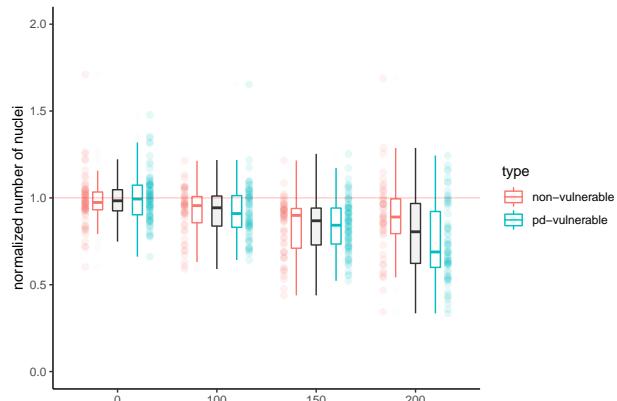
# analysis-manuscript

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## PD-vulnerable neurons are less resilient to cell stress induced by hydrogen peroxide

Nuclei (DAPI) count



## Supplementary Tables 1

Kruskal-Wallis

Kruskal-Wallis rank sum test

```
data: dapi_normalized_by_hydrogen_peroxide
Kruskal-Wallis chi-squared = 91.227, df = 3, p-value < 2.2e-16
```

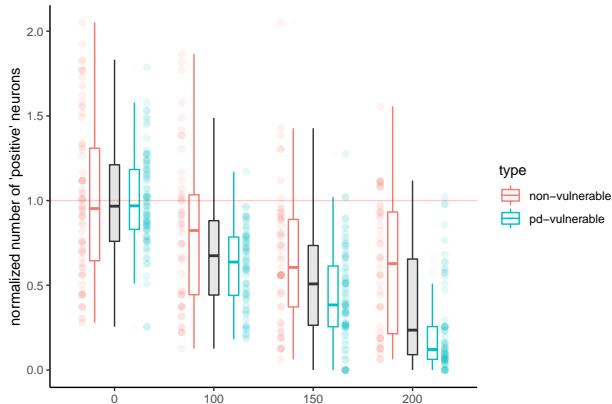
Dunn test

	Comparison	Z	P.unadj	P.adj
1	0 - 100	3.4001879	6.733956e-04	4.040373e-03
2	0 - 150	7.8043915	5.978932e-15	3.587359e-14
3	100 - 150	3.9718484	7.131711e-05	4.279026e-04
4	0 - 200	8.1835348	2.756366e-16	1.653819e-15
5	100 - 200	4.5069337	6.577117e-06	3.946270e-05
6	150 - 200	0.7245953	4.687004e-01	1.000000e+00

PairwiseTtest

```
# A tibble: 4 x 10
hydrogen_peroxide .y.   group1   group2     n1     n2      p p.signif  p.adj
* <fct>       <chr>     <chr>    <chr>  <int>  <int>  <dbl> <chr>    <dbl>
1 0           dapi_n~ non-vu~ pd-vul~    71     86  1  e+0 ns      1  e+0
2 100        dapi_n~ non-vu~ pd-vul~    50     77  9.77e-1 ns      9.77e-1
3 150        dapi_n~ non-vu~ pd-vul~    55     92  8.3  e-1 ns      8.3  e-1
4 200        dapi_n~ non-vu~ pd-vul~    48     72  9.18e-4 ***     9.18e-4
# ... with 1 more variable: p.adj.signif <chr>
```

## Neuron count



## Supplementary Tables 2

Kruskal-Wallis

Kruskal-Wallis rank sum test

```
data: neuron_normalized by hydrogen_peroxide
Kruskal-Wallis chi-squared = 164.32, df = 3, p-value < 2.2e-16
```

Dunn test

	Comparison	Z	P.unadj	P.adj
1	0 - 100	5.867938	4.412478e-09	2.647487e-08

```

2      0 - 150  9.779527 1.378532e-22 8.271193e-22
3  100 - 150  3.408957 6.521186e-04 3.912712e-03
4      0 - 200 11.754230 6.717025e-32 4.030215e-31
5  100 - 200  5.563542 2.643538e-08 1.586123e-07
6  150 - 200  2.386850 1.699342e-02 1.019605e-01

```

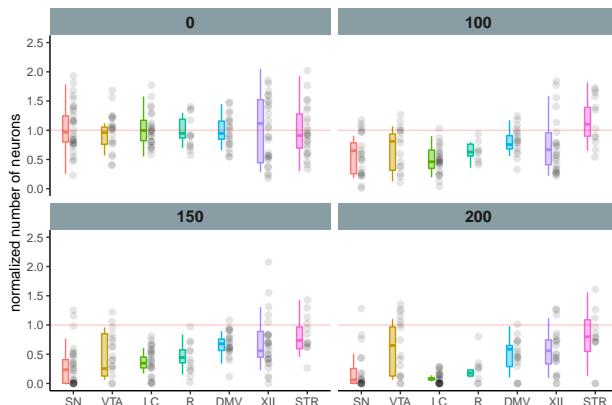
PairwiseTtest

```

# A tibble: 4 x 10
hydrogen_peroxide .y.    group1   group2     n1     n2     p p.signif  p.adj
* <fct>           <chr>    <chr>    <chr>    <int>   <int>   <dbl> <chr>    <dbl>
1 0               neuron~ non-vu~ pd-vul~    71     86 1   e+0 ns      1   e+0
2 100             neuron~ non-vu~ pd-vul~    50     77 1.13e-3 **    1.13e-3
3 150             neuron~ non-vu~ pd-vul~    55     92 7.42e-5 **** 7.42e-5
4 200             neuron~ non-vu~ pd-vul~    48     72 6.43e-9 **** 6.43e-9
# ... with 1 more variable: p.adj.signif <chr>

```

## Differential vulnerability of neurons to hydrogen peroxide



## Supplementary Tables 3

Kruskal-Wallis and Dunn test for each  
0 micromolar

### Kruskal-Wallis rank sum test

```

data: neuron_normalized by neuron
Kruskal-Wallis chi-squared = 0.43515, df = 6, p-value = 0.9985

```

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	0.04600991	0.9633024	1
2	DMV - R	-0.01706684	0.9863833	1
3	LC - R	-0.05702708	0.9545236	1
4	DMV - SN	0.05968455	0.9524069	1
5	LC - SN	0.01204718	0.9903880	1
6	R - SN	0.06868787	0.9452381	1

```

7  DMV - STR  0.38805723 0.6979737      1
8  LC - STR  0.35874226 0.7197879      1
9  R - STR   0.34993891 0.7263845      1
10 SN - STR   0.36610036 0.7142902      1
11 DMV - VTA  0.39298245 0.6943324      1
12 LC - VTA  0.36444688 0.7155243      1
13 R - VTA   0.35739962 0.7207927      1
14 SN - VTA  0.37080616 0.7107819      1
15 STR - VTA 0.02239956 0.9821292      1
16 DMV - XII  0.34198331 0.7323635      1
17 LC - XII  0.30997827 0.7565775      1
18 R - XII   0.30876417 0.7575009      1
19 SN - XII  0.31538169 0.7524719      1
20 STR - XII -0.05916447 0.9528211      1
21 VTA - XII -0.07924845 0.9368350      1

```

100 micromolar

#### Kruskal-Wallis rank sum test

```

data: neuron_normalized by neuron
Kruskal-Wallis chi-squared = 27.496, df = 6, p-value = 0.0001169

```

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	3.05767631	2.230604e-03	4.684268e-02
2	DMV - R	1.34734970	1.778676e-01	1.000000e+00
3	LC - R	-0.98822521	3.230424e-01	1.000000e+00
4	DMV - SN	2.10964597	3.488886e-02	7.326661e-01
5	LC - SN	-0.95978913	3.371614e-01	1.000000e+00
6	R - SN	0.28076187	7.788930e-01	1.000000e+00
7	DMV - STR	-1.83772941	6.610229e-02	1.000000e+00
8	LC - STR	-4.77623845	1.786046e-06	3.750697e-05
9	R - STR	-2.81576290	4.866157e-03	1.021893e-01
10	SN - STR	-3.87390539	1.071050e-04	2.249205e-03
11	DMV - VTA	1.13666428	2.556787e-01	1.000000e+00
12	LC - VTA	-1.75714226	7.889356e-02	1.000000e+00
13	R - VTA	-0.39951133	6.895165e-01	1.000000e+00
14	SN - VTA	-0.86242974	3.884511e-01	1.000000e+00
15	STR - VTA	2.86680545	4.146378e-03	8.707394e-02
16	DMV - XII	1.29462100	1.954510e-01	1.000000e+00
17	LC - XII	-1.93767522	5.266286e-02	1.000000e+00
18	R - XII	-0.39459214	6.931439e-01	1.000000e+00
19	SN - XII	-0.92310331	3.559534e-01	1.000000e+00
20	STR - XII	3.15425423	1.609088e-03	3.379086e-02
21	VTA - XII	0.03899101	9.688976e-01	1.000000e+00

150 micromolar

#### Kruskal-Wallis rank sum test

```

data: neuron_normalized by neuron
Kruskal-Wallis chi-squared = 43.006, df = 6, p-value = 1.163e-07

```

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	3.40923177	6.514611e-04	1.368068e-02
2	DMV - R	1.86033898	6.283758e-02	1.000000e+00
3	LC - R	-0.99814183	3.182106e-01	1.000000e+00
4	DMV - SN	4.59262928	4.376962e-06	9.191620e-05
5	LC - SN	1.12299366	2.614402e-01	1.000000e+00
6	R - SN	1.92817745	5.383306e-02	1.000000e+00
7	DMV - STR	-0.91146407	3.620509e-01	1.000000e+00
8	LC - STR	-3.86084771	1.129943e-04	2.372881e-03
9	R - STR	-2.47917602	1.316863e-02	2.765412e-01
10	SN - STR	-4.86157808	1.164536e-06	2.445526e-05
11	DMV - VTA	2.09242381	3.640062e-02	7.644130e-01
12	LC - VTA	-1.07866488	2.807371e-01	1.000000e+00
13	R - VTA	0.02906247	9.768148e-01	1.000000e+00
14	SN - VTA	-2.12809949	3.332884e-02	6.999055e-01
15	STR - VTA	2.71346613	6.658337e-03	1.398251e-01
16	DMV - XII	0.52063882	6.026184e-01	1.000000e+00
17	LC - XII	-3.09940140	1.939121e-03	4.072154e-02
18	R - XII	-1.50275652	1.329018e-01	1.000000e+00
19	SN - XII	-4.36835989	1.251831e-05	2.628845e-04
20	STR - XII	1.39737195	1.623017e-01	1.000000e+00
21	VTA - XII	-1.71656602	8.605850e-02	1.000000e+00

200 micromolar

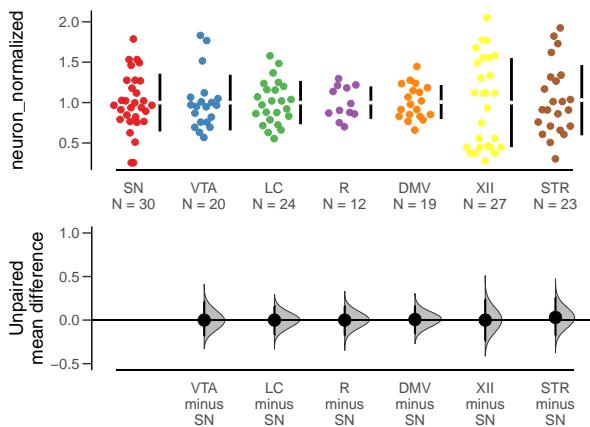
#### Kruskal-Wallis rank sum test

```
data: neuron_normalized by neuron
Kruskal-Wallis chi-squared = 55.538, df = 6, p-value = 3.608e-10
```

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	4.63069760	3.644358e-06	7.653152e-05
2	DMV - R	1.77727430	7.552312e-02	1.000000e+00
3	LC - R	-1.77580383	7.576526e-02	1.000000e+00
4	DMV - SN	3.66003770	2.521781e-04	5.295741e-03
5	LC - SN	-0.88166475	3.779581e-01	1.000000e+00
6	R - SN	1.09490499	2.735583e-01	1.000000e+00
7	DMV - STR	-0.93784904	3.483220e-01	1.000000e+00
8	LC - STR	-5.24022196	1.603836e-07	3.368055e-06
9	R - STR	-2.47073125	1.348371e-02	2.831579e-01
10	SN - STR	-4.34278531	1.406876e-05	2.954440e-04
11	DMV - VTA	0.27340288	7.845435e-01	1.000000e+00
12	LC - VTA	-4.33119975	1.482991e-05	3.114281e-04
13	R - VTA	-1.55404178	1.201745e-01	1.000000e+00
14	SN - VTA	-3.37184576	7.466625e-04	1.567991e-02
15	STR - VTA	1.19097093	2.336650e-01	1.000000e+00
16	DMV - XII	-0.06428897	9.487401e-01	1.000000e+00
17	LC - XII	-5.00756106	5.512407e-07	1.157605e-05
18	R - XII	-1.89119953	5.859771e-02	1.000000e+00
19	SN - XII	-3.95024497	7.807125e-05	1.639496e-03
20	STR - XII	0.92177281	3.566471e-01	1.000000e+00
21	VTA - XII	-0.35248092	7.244776e-01	1.000000e+00

## Estimation statistics

0 micromolar



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0

Good afternoon!

The current time is 15:07 pm on Friday January 28, 2022.

Dataset : .

X Variable : neuron

Y Variable : neuron\_normalized

Unpaired mean difference of VTA (n = 20) minus SN (n = 30)  
0 [95CI -0.179; 0.212]

Unpaired mean difference of LC (n = 24) minus SN (n = 30)  
0 [95CI -0.168; 0.16]

Unpaired mean difference of R (n = 12) minus SN (n = 30)  
-1.11e-16 [95CI -0.175; 0.16]

Unpaired mean difference of DMV (n = 19) minus SN (n = 30)  
0.00684 [95CI -0.155; 0.16]

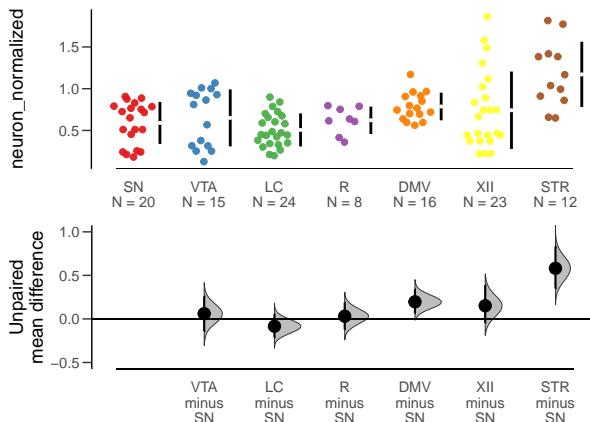
Unpaired mean difference of XII (n = 27) minus SN (n = 30)  
0 [95CI -0.237; 0.238]

Unpaired mean difference of STR (n = 23) minus SN (n = 30)  
0.0303 [95CI -0.174; 0.259]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

100 micromolar



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
=====

Good afternoon!

The current time is 15:07 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable : neuron
Y Variable : neuron_normalized
```

Unpaired mean difference of VTA (n = 15) minus SN (n = 20)  
0.0605 [95CI -0.142; 0.26]

Unpaired mean difference of LC (n = 24) minus SN (n = 20)  
-0.0838 [95CI -0.213; 0.0524]

Unpaired mean difference of R (n = 8) minus SN (n = 20)  
0.0314 [95CI -0.119; 0.187]

Unpaired mean difference of DMV (n = 16) minus SN (n = 20)  
0.197 [95CI 0.0662; 0.34]

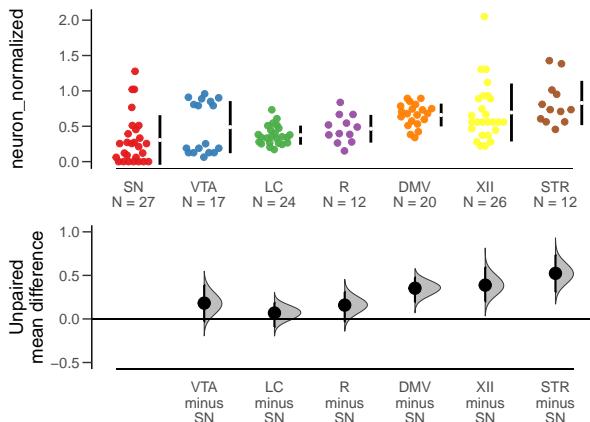
Unpaired mean difference of XII (n = 23) minus SN (n = 20)  
0.152 [95CI -0.0443; 0.388]

Unpaired mean difference of STR (n = 12) minus SN (n = 20)  
0.581 [95CI 0.35; 0.831]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

150 micromolar



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
=====

Good afternoon!

The current time is 15:07 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable : neuron
Y Variable : neuron_normalized
```

Unpaired mean difference of VTA (n = 17) minus SN (n = 27)  
0.182 [95CI -0.0308; 0.39]

Unpaired mean difference of LC (n = 24) minus SN (n = 27)  
0.0681 [95CI -0.0918; 0.188]

Unpaired mean difference of R (n = 12) minus SN (n = 27)  
0.159 [95CI -0.0317; 0.311]

Unpaired mean difference of DMV (n = 20) minus SN (n = 27)  
0.353 [95CI 0.192; 0.478]

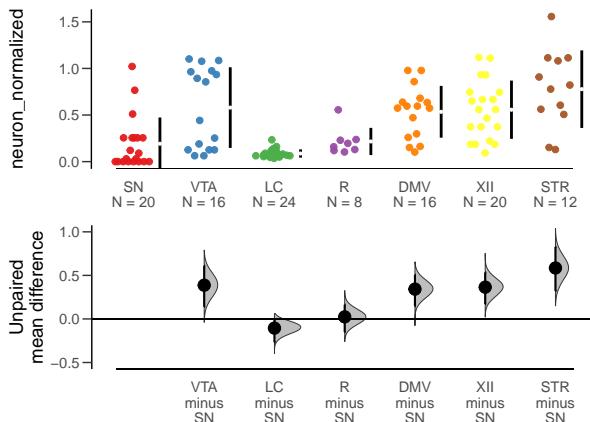
Unpaired mean difference of XII (n = 26) minus SN (n = 27)  
0.388 [95CI 0.2; 0.595]

Unpaired mean difference of STR (n = 12) minus SN (n = 27)  
0.523 [95CI 0.308; 0.734]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

200 micromolar



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
=====

Good afternoon!

The current time is 15:07 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable : neuron
Y Variable : neuron_normalized
```

Unpaired mean difference of VTA (n = 16) minus SN (n = 20)  
0.387 [95CI 0.139; 0.611]

Unpaired mean difference of LC (n = 24) minus SN (n = 20)  
-0.105 [95CI -0.268; -0.0105]

Unpaired mean difference of R (n = 8) minus SN (n = 20)  
0.0239 [95CI -0.151; 0.163]

Unpaired mean difference of DMV (n = 16) minus SN (n = 20)  
0.342 [95CI 0.146; 0.507]

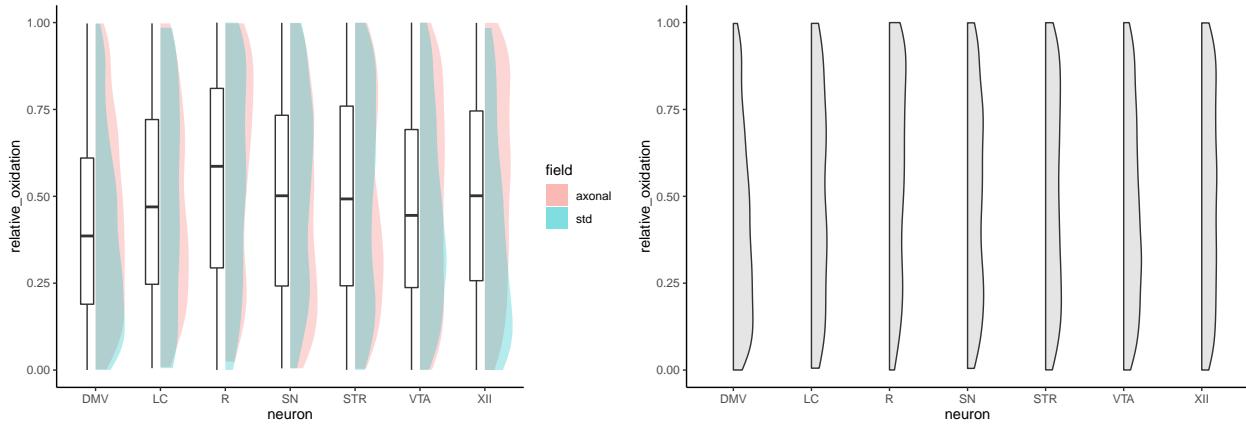
Unpaired mean difference of XII (n = 20) minus SN (n = 20)  
0.365 [95CI 0.17; 0.534]

Unpaired mean difference of STR (n = 12) minus SN (n = 20)  
0.585 [95CI 0.322; 0.827]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

## No overt difference in mitochondrial ROS production is observed between neurons



## Supplementary Tables 4

Kruskal-Wallis

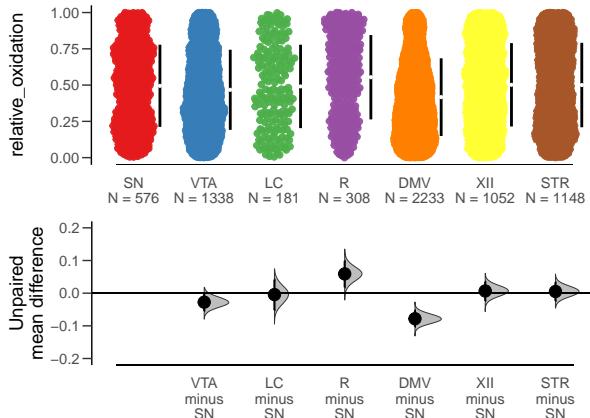
Kruskal-Wallis rank sum test

```
data: relative_oxidation by neuron
Kruskal-Wallis chi-squared = 133.58, df = 6, p-value < 2.2e-16
```

Dunn

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	-3.3231328	8.901252e-04	1.869263e-02
2	DMV - R	-7.8362467	4.642135e-15	9.748483e-14
3	LC - R	-2.3435415	1.910163e-02	4.011343e-01
4	DMV - SN	-5.8719183	4.307810e-09	9.046400e-08
5	LC - SN	-0.2064038	8.364755e-01	1.000000e+00
6	R - SN	2.8602152	4.233536e-03	8.890425e-02
7	DMV - STR	-7.9501041	1.863548e-15	3.913451e-14
8	LC - STR	-0.3988749	6.899854e-01	1.000000e+00
9	R - STR	2.9232967	3.463463e-03	7.273272e-02
10	SN - STR	-0.2802927	7.792529e-01	1.000000e+00
11	DMV - VTA	-5.1989318	2.004370e-07	4.209178e-06
12	LC - VTA	0.9733339	3.303874e-01	1.000000e+00
13	R - VTA	4.6926942	2.696303e-06	5.662237e-05
14	SN - VTA	1.8997528	5.746557e-02	1.000000e+00
15	STR - VTA	2.7090509	6.747598e-03	1.416996e-01
16	DMV - XII	-7.9440379	1.957037e-15	4.109778e-14
17	LC - XII	-0.5001405	6.169762e-01	1.000000e+00
18	R - XII	2.7666535	5.663492e-03	1.189333e-01
19	SN - XII	-0.4371405	6.620094e-01	1.000000e+00
20	STR - XII	-0.1955555	8.449581e-01	1.000000e+00
21	VTA - XII	-2.8474318	4.407354e-03	9.255444e-02

Estimation statistics



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
=====

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable : neuron
Y Variable : relative_oxidation
```

Unpaired mean difference of VTA (n = 1338) minus SN (n = 576)  
-0.0276 [95CI -0.0548; 0.000542]

Unpaired mean difference of LC (n = 181) minus SN (n = 576)  
-0.00436 [95CI -0.0521; 0.0415]

Unpaired mean difference of R (n = 308) minus SN (n = 576)  
0.059 [95CI 0.018; 0.0987]

Unpaired mean difference of DMV (n = 2233) minus SN (n = 576)  
-0.0782 [95CI -0.103; -0.0525]

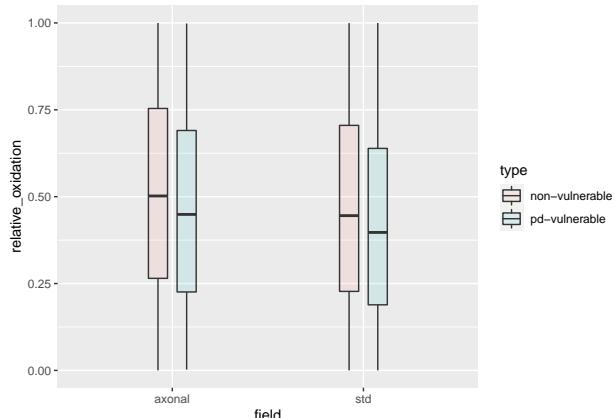
Unpaired mean difference of XII (n = 1052) minus SN (n = 576)  
0.00677 [95CI -0.0235; 0.0352]

Unpaired mean difference of STR (n = 1148) minus SN (n = 576)  
0.00515 [95CI -0.0237; 0.0334]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

## Comparing axonal vs std (note - very small effect - significant)



Supplementary Tables 4

Welch Two Sample t-test - Axonal only

Welch Two Sample t-test

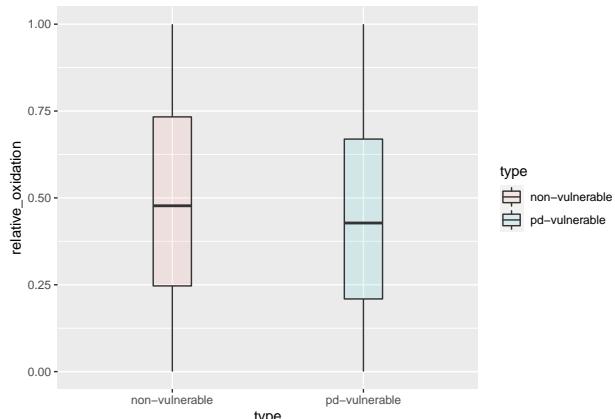
```
data: relative_oxidation by type
t = 4.0736, df = 3485, p-value = 4.732e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.01993059 0.05691848
sample estimates:
mean in group non-vulnerable mean in group pd-vulnerable
      0.5063470                  0.4679225
```

Welch Two Sample t-test - STD only

Welch Two Sample t-test

```
data: relative_oxidation by type
t = 4.0736, df = 3485, p-value = 4.732e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.01993059 0.05691848
sample estimates:
mean in group non-vulnerable mean in group pd-vulnerable
      0.5063470                  0.4679225
```

## Comparing vulnerable vs non-vulnerable - significant by very small effect size

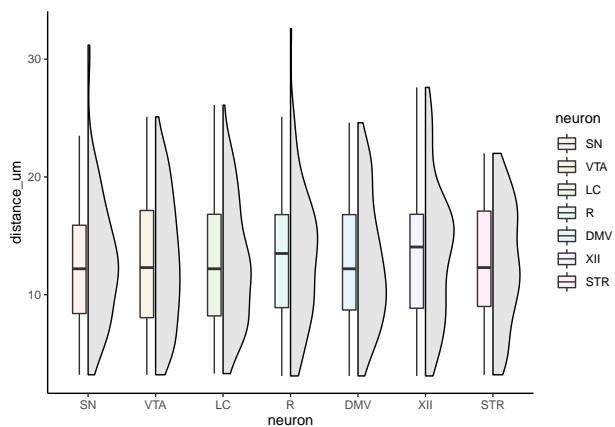


Supplementary Tables 5 Welch Two Sample t-test

Welch Two Sample t-test

```
data: relative_oxidation by type
t = 6.016, df = 6820.1, p-value = 1.881e-09
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.02759581 0.05427272
sample estimates:
mean in group non-vulnerable mean in group pd-vulnerable
          0.4884508           0.4475166
```

## Intermitochondrial distance (roGFP)



### Supplementary Tables 6

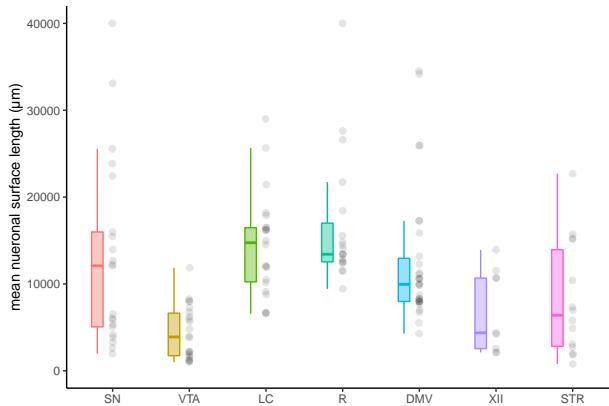
Kruskal-Wallis

Kruskal-Wallis rank sum test

```
data: distance_um by neuron
Kruskal-Wallis chi-squared = 1.4927, df = 6, p-value = 0.96
```

Estimation statistics — not applicable

**PD-vulnerable neurons have large axonal domains, that are globally more complex than PD-resilient neurons**



### Supplementary Tables 7

Kruskal-Wallis

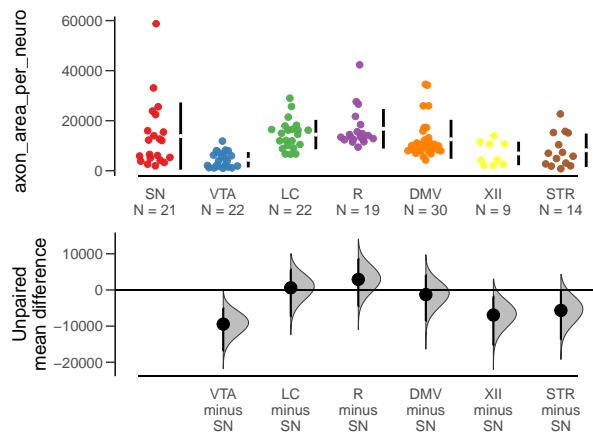
Kruskal-Wallis rank sum test

```
data: axon_area_per_neuron by neuron
Kruskal-Wallis chi-squared = 49.602, df = 6, p-value = 5.649e-09
```

Dunn

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	-1.4910572	1.359465e-01	1.000000e+00
2	DMV - R	-2.1697753	3.002387e-02	6.305013e-01
3	LC - R	-0.6949384	4.870939e-01	1.000000e+00
4	DMV - SN	0.3799178	7.040065e-01	1.000000e+00
5	LC - SN	1.7261794	8.431515e-02	1.000000e+00
6	R - SN	2.3506380	1.874126e-02	3.935664e-01
7	DMV - STR	1.8240271	6.814798e-02	1.000000e+00
8	LC - STR	2.9510478	3.166979e-03	6.650657e-02
9	R - STR	3.4823377	4.970564e-04	1.043819e-02
10	SN - STR	1.3978009	1.621729e-01	1.000000e+00
11	DMV - VTA	4.2860413	1.818852e-05	3.819588e-04
12	LC - VTA	5.3781860	7.524006e-08	1.580041e-06
13	R - VTA	5.8726242	4.289502e-09	9.007953e-08
14	SN - VTA	3.5891017	3.318193e-04	6.968206e-03
15	STR - VTA	1.7920665	7.312232e-02	1.000000e+00
16	DMV - XII	1.8995788	5.748842e-02	1.000000e+00
17	LC - XII	2.8822979	3.947864e-03	8.290513e-02
18	R - XII	3.3562827	7.899777e-04	1.658953e-02
19	SN - XII	1.5407671	1.233735e-01	1.000000e+00
20	STR - XII	0.3079467	7.581229e-01	1.000000e+00
21	VTA - XII	-1.2158840	2.240291e-01	1.000000e+00

### Estimation statistics



```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
```

---

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable  : neuron
Y Variable  : axon_area_per_neuron
```

```
Unpaired mean difference of VTA (n = 22) minus SN (n = 21)
-9450 [95CI -16900; -5080]
```

```
Unpaired mean difference of LC (n = 22) minus SN (n = 21)
595 [95CI -7340; 5640]
```

```
Unpaired mean difference of R (n = 19) minus SN (n = 21)
2920 [95CI -4570; 8600]
```

```
Unpaired mean difference of DMV (n = 30) minus SN (n = 21)
-1290 [95CI -8570; 4100]
```

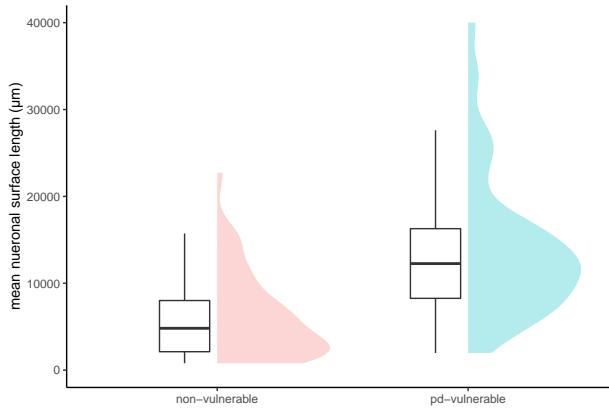
```
Unpaired mean difference of XII (n = 9) minus SN (n = 21)
-6940 [95CI -15300; -1850]
```

```
Unpaired mean difference of STR (n = 14) minus SN (n = 21)
-5660 [95CI -13700; -190]
```

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

Grouped by vulnerable and non-vulnerable



Wilcoxon rank sum test with continuity correction

```
data: data$axon_area_per_neuron by data$type
W = 723, p-value = 6.78e-10
alternative hypothesis: true location shift is not equal to 0

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
The first five rows are:
# A tibble: 5 x 9
  Count `Total Area` `Average Size` `%Area` neuron_number neuron
    <dbl>       <dbl>        <dbl>     <dbl>        <dbl> <fct>
1   1652       63087       38.2    0.394         1 DMV
2     814       53004       65.1    0.331         1 LC
3   1094       46894       42.9    0.293         1 LC
4   2062       77341       37.5    0.483         1 R
5     820       25720       31.4    0.161         1 R
# ... with 3 more variables: axon_area_per_neuron <dbl>,
#   count_per_neuron <dbl>, type <fct>

X Variable : type
Y Variable : axon_area_per_neuron
```

Effect sizes(s) will be computed for:

1. pd-vulnerable minus non-vulnerable

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

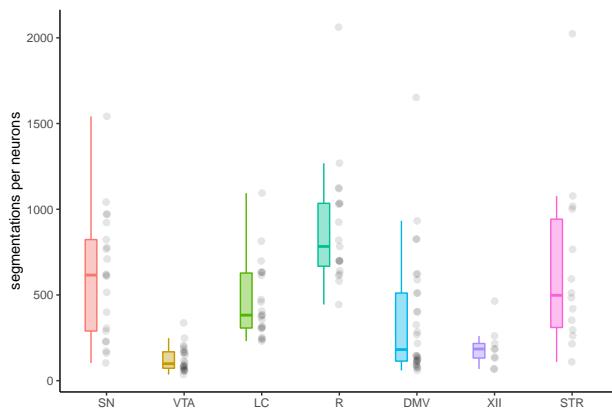
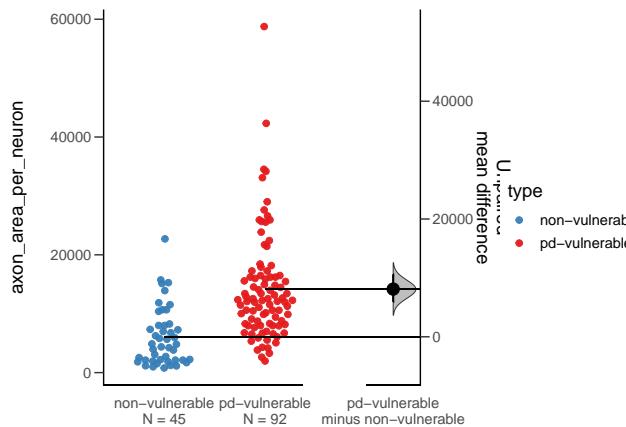
```
Dataset      : .
X Variable : type
```

Y Variable : axon\_area\_per\_neuron

Unpaired mean difference of pd-vulnerable (n = 92) minus non-vulnerable (n = 45)  
 8100 [95CI 5930; 10600]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.



Kruskal-Wallis

Kruskal-Wallis rank sum test

```
data: count_per_neuron by neuron
Kruskal-Wallis chi-squared = 67.386, df = 6, p-value = 1.403e-12
```

Dunn

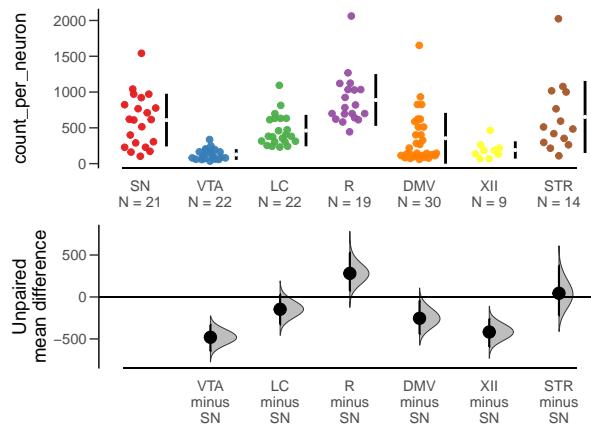
	Comparison	Z	P.unadj	P.adj
1	DMV - LC	-2.1117441	3.470840e-02	7.288765e-01
2	DMV - R	-4.9124144	8.996166e-07	1.889195e-05
3	LC - R	-2.7062408	6.804969e-03	1.429043e-01
4	DMV - SN	-2.8158643	4.864621e-03	1.021570e-01
5	LC - SN	-0.6831796	4.944934e-01	1.000000e+00
6	R - SN	2.0185955	4.352928e-02	9.141149e-01

```

7   DMV - STR -2.4474832 1.438578e-02 3.021014e-01
8   LC - STR -0.5833195 5.596782e-01 1.000000e+00
9   R - STR  1.8401285 6.574937e-02 1.000000e+00
10  SN - STR  0.0260784 9.791948e-01 1.000000e+00
11  DMV - VTA  2.7269895 6.391507e-03 1.342216e-01
12  LC - VTA  4.5046159 6.649311e-06 1.396355e-04
13  R - VTA  7.0429233 1.882478e-12 3.953204e-11
14  SN - VTA  5.1351081 2.819820e-07 5.921621e-06
15  STR - VTA  4.5560173 5.213265e-06 1.094786e-04
16  DMV - XII  1.1254594 2.603944e-01 1.000000e+00
17  LC - XII  2.5790534 9.907147e-03 2.080501e-01
18  R - XII  4.6164416 3.903759e-06 8.197894e-05
19  SN - XII  3.0845492 2.038609e-03 4.281079e-02
20  STR - XII  2.8552967 4.299664e-03 9.029294e-02
21  VTA - XII -0.8534673 3.934002e-01 1.000000e+00

```

#### Estimation statistics



```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
```

---

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable  : neuron
Y Variable  : count_per_neuron
```

Unpaired mean difference of VTA (n = 22) minus SN (n = 21)  
-481 [95CI -647; -330]

Unpaired mean difference of LC (n = 22) minus SN (n = 21)  
-147 [95CI -329; 31]

Unpaired mean difference of R (n = 19) minus SN (n = 21)  
281 [95CI 73.5; 530]

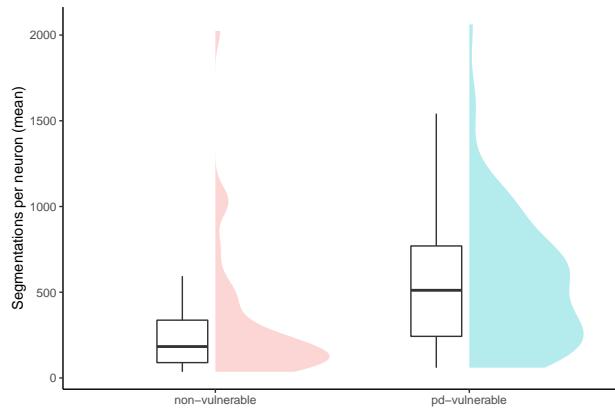
Unpaired mean difference of DMV (n = 30) minus SN (n = 21)  
-254 [95CI -443; -42.9]

Unpaired mean difference of XII (n = 9) minus SN (n = 21)  
-417 [95CI -596; -260]

Unpaired mean difference of STR (n = 14) minus SN (n = 21)  
43.9 [95CI -222; 375]

5000 bootstrap resamples.  
All confidence intervals are bias-corrected and accelerated.

Grouped by type



Wilcoxon rank sum test with continuity correction

```
data: data$count_per_neuron by data$type
W = 1068, p-value = 4.433e-06
alternative hypothesis: true location shift is not equal to 0
```

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
The first five rows are:
# A tibble: 5 x 9
  Count `Total Area` `Average Size` `%Area` neuron_number neuron
    <dbl>       <dbl>        <dbl>   <dbl>        <dbl> <fct>
1   1652        63087       38.2   0.394        1 DMV
2     814        53004       65.1   0.331        1 LC
3   1094        46894       42.9   0.293        1 LC
4   2062        77341       37.5   0.483        1 R
5     820        25720       31.4   0.161        1 R
# ... with 3 more variables: axon_area_per_neuron <dbl>,
#   count_per_neuron <dbl>, type <fct>
```

```
X Variable : type
Y Variable : count_per_neuron
```

Effect sizes(s) will be computed for:  
 1. pd-vulnerable minus non-vulnerable

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
 =====

Good afternoon!

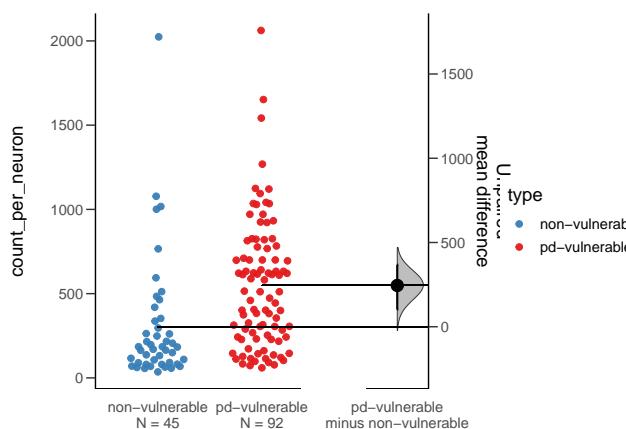
The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .  
 X Variable : type  
 Y Variable : count\_per\_neuron

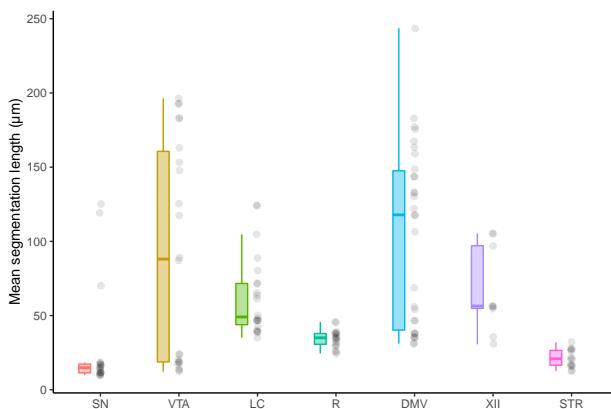
Unpaired mean difference of pd-vulnerable (n = 92) minus non-vulnerable (n = 45)  
 245 [95CI 102; 368]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.



### Average segmentation length ( $\mu\text{m}$ )



Kruskal-Wallis

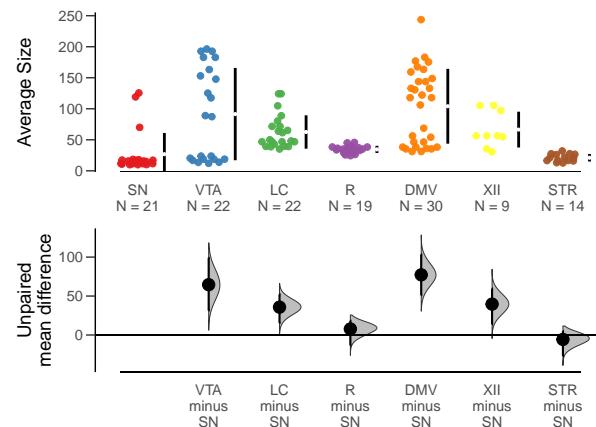
### Kruskal-Wallis rank sum test

```
data: Average Size by neuron
Kruskal-Wallis chi-squared = 63.024, df = 6, p-value = 1.092e-11
```

Dunn

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	1.03059727	3.027297e-01	1.000000e+00
2	DMV - R	3.60998615	3.062134e-04	6.430480e-03
3	LC - R	2.45591123	1.405279e-02	2.951085e-01
4	DMV - SN	6.35795802	2.044533e-10	4.293520e-09
5	LC - SN	4.98130378	6.315730e-07	1.326303e-05
6	R - SN	2.37043094	1.776736e-02	3.731146e-01
7	DMV - STR	5.32207495	1.025903e-07	2.154396e-06
8	LC - STR	4.19242298	2.759908e-05	5.795807e-04
9	R - STR	1.88561118	5.934737e-02	1.000000e+00
10	SN - STR	-0.25035765	8.023108e-01	1.000000e+00
11	DMV - VTA	1.85882864	6.305143e-02	1.000000e+00
12	LC - VTA	0.77104145	4.406824e-01	1.000000e+00
13	R - VTA	-1.71361442	8.659956e-02	1.000000e+00
14	SN - VTA	-4.21928067	2.450830e-05	5.146743e-04
15	STR - VTA	-3.51242834	4.440317e-04	9.324666e-03
16	DMV - XII	0.81906785	4.127477e-01	1.000000e+00
17	LC - XII	0.05563405	9.556333e-01	1.000000e+00
18	R - XII	-1.84639479	6.483490e-02	1.000000e+00
19	SN - XII	-3.75914928	1.704921e-04	3.580334e-03
20	STR - XII	-3.30324274	9.557362e-04	2.007046e-02
21	VTA - XII	-0.53190012	5.947952e-01	1.000000e+00

### Estimation statistics



```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
```

---

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .

X Variable : neuron  
Y Variable : Average Size

Unpaired mean difference of VTA (n = 22) minus SN (n = 21)  
64.6 [95CI 31.4; 99.1]

Unpaired mean difference of LC (n = 22) minus SN (n = 21)  
35.8 [95CI 15.4; 52.3]

Unpaired mean difference of R (n = 19) minus SN (n = 21)  
7.73 [95CI -13.3; 18.4]

Unpaired mean difference of DMV (n = 30) minus SN (n = 21)  
77.3 [95CI 50.9; 104]

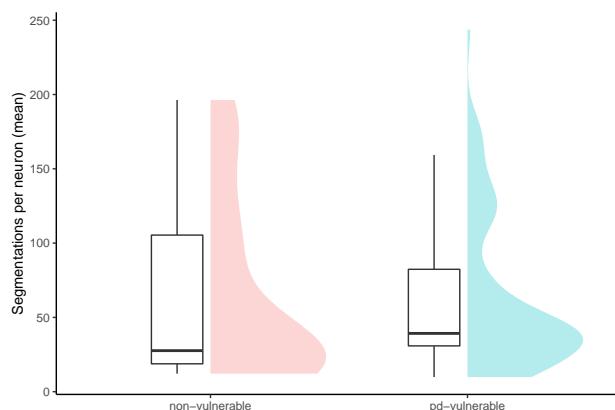
Unpaired mean difference of XII (n = 9) minus SN (n = 21)  
39.6 [95CI 13.6; 59.7]

Unpaired mean difference of STR (n = 14) minus SN (n = 21)  
-5.7 [95CI -27; 5.07]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

Comparing as groups



Wilcoxon rank sum test with continuity correction

```
data: data$'Average Size' by data$type
W = 1887, p-value = 0.4029
alternative hypothesis: true location shift is not equal to 0
```

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```

Dataset      : .
The first five rows are:
# A tibble: 5 x 9
  Count `Total Area` `Average Size` `%Area` neuron_number neuron
  <dbl>      <dbl>        <dbl>    <dbl>       <dbl> <fct>
1   1652       63087       38.2    0.394        1 DMV
2     814       53004       65.1    0.331        1 LC
3   1094       46894       42.9    0.293        1 LC
4   2062       77341       37.5    0.483        1 R
5     820       25720       31.4    0.161        1 R
# ... with 3 more variables: axon_area_per_neuron <dbl>,
#   count_per_neuron <dbl>, type <fct>

X Variable : type
Y Variable : Average Size

```

Effect sizes(s) will be computed for:  
 1. pd-vulnerable minus non-vulnerable

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!  
 The current time is 15:10 pm on Friday January 28, 2022.

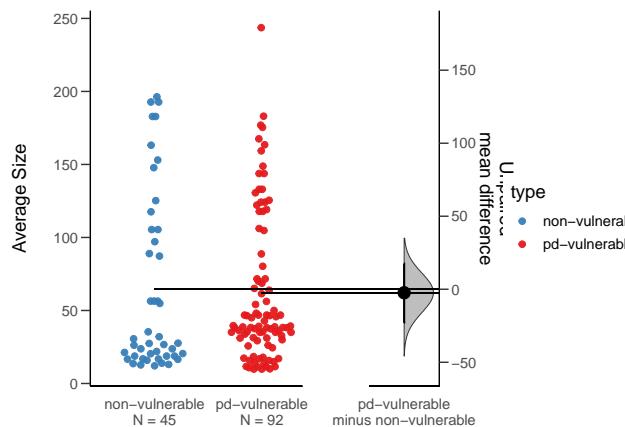
```

Dataset      : .
X Variable : type
Y Variable : Average Size

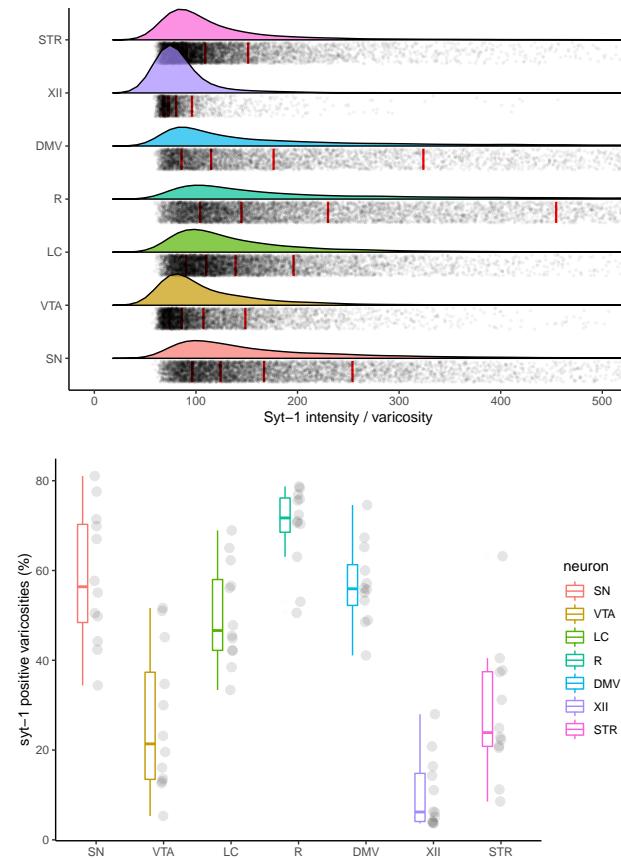
```

Unpaired mean difference of pd-vulnerable (n = 92) minus non-vulnerable (n = 45)  
 -2.4 [95CI -23; 17.6]

5000 bootstrap resamples.  
 All confidence intervals are bias-corrected and accelerated.



**PD-vulnerable neurons have a higher proportion of varicosities that are positive for Syt1**



**Supplimentary Table n.n**

Kruskal-Wallis

Kruskal-Wallis rank sum test

```
data: percentage_syt1_positive by neuron
Kruskal-Wallis chi-squared = 59.589, df = 6, p-value = 5.456e-11
```

Dunn

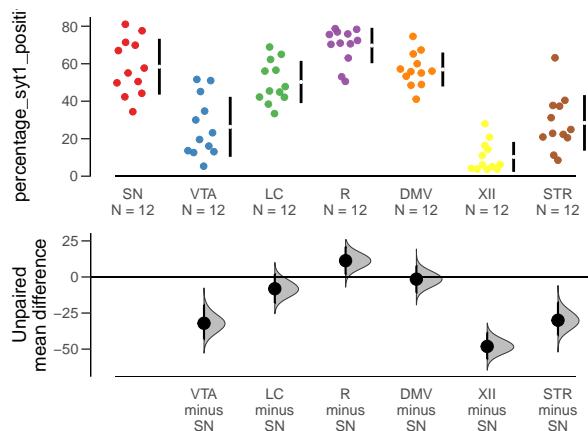
	Comparison	Z	P.unadj	P.adj
1	DMV - LC	0.8368274	4.026896e-01	1.000000e+00
2	DMV - R	-1.5062893	1.319929e-01	1.000000e+00
3	LC - R	-2.3431167	1.912340e-02	4.015914e-01
4	DMV - SN	-0.1422607	8.868741e-01	1.000000e+00
5	LC - SN	-0.9790881	3.275365e-01	1.000000e+00
6	R - SN	1.3640287	1.725585e-01	1.000000e+00
7	DMV - STR	3.0042104	2.662711e-03	5.591694e-02
8	LC - STR	2.1673830	3.020566e-02	6.343189e-01

```

9      R - STR  4.5104997 6.467508e-06 1.358177e-04
10     SN - STR 3.1464711 1.652536e-03 3.470326e-02
11     DMV - VTA 3.1632076 1.560410e-03 3.276861e-02
12     LC - VTA 2.3263802 1.999828e-02 4.199638e-01
13     R - VTA 4.6694969 3.019382e-06 6.340702e-05
14     SN - VTA 3.3054683 9.481784e-04 1.991175e-02
15     STR - VTA 0.1589972 8.736711e-01 1.000000e+00
16     DMV - XII 4.7197066 2.361851e-06 4.959887e-05
17     LC - XII 3.8828792 1.032269e-04 2.167764e-03
18     R - XII 6.2259959 4.785065e-10 1.004864e-08
19     SN - XII 4.8619672 1.162249e-06 2.440722e-05
20     STR - XII 1.7154962 8.625429e-02 1.000000e+00
21     VTA - XII 1.5564990 1.195895e-01 1.000000e+00

```

#### Estimation statistics



```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
```

```
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable   : neuron
Y Variable   : percentage_syt1_positive
```

```
Unpaired mean difference of VTA (n = 12) minus SN (n = 12)
-32.1 [95CI  -43.2; -19.3]
```

```
Unpaired mean difference of LC (n = 12) minus SN (n = 12)
-8.15 [95CI  -18; 2.03]
```

```
Unpaired mean difference of R (n = 12) minus SN (n = 12)
11.3 [95CI  1.79; 20.9]
```

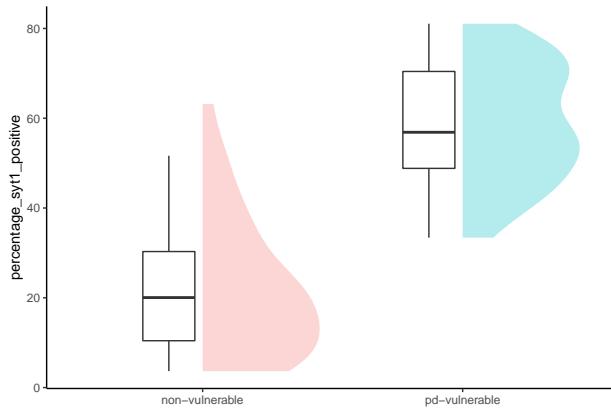
```
Unpaired mean difference of DMV (n = 12) minus SN (n = 12)
-1.49 [95CI  -10.9; 7.75]
```

```
Unpaired mean difference of XII (n = 12) minus SN (n = 12)
-48.1 [95CI  -56.9; -38.5]
```

Unpaired mean difference of STR (n = 12) minus SN (n = 12)  
-30 [95CI -40.4; -17.5]

5000 bootstrap resamples.  
All confidence intervals are bias-corrected and accelerated.

PD vs non-PD



Wilcoxon rank sum exact test

```
data: data_percentage_syt1_positive$percentage_syt1_positive by data_percentage_syt1_positive$type
W = 79, p-value = 2.941e-16
alternative hypothesis: true location shift is not equal to 0
```

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .

The first five rows are:

# A tibble: 5 x 6

```
neuron image negative positive percentage_syt1_positive type
<fct> <chr> <int> <int> <dbl> <fct>
1 SN SN_01 358 439 55.1 pd-vulnerable
2 SN SN_02 244 128 34.4 pd-vulnerable
3 SN SN_03 361 492 57.7 pd-vulnerable
4 SN SN_04 286 210 42.3 pd-vulnerable
5 SN SN_05 141 488 77.6 pd-vulnerable
```

X Variable : type

Y Variable : percentage\_syt1\_positive

Effect sizes(s) will be computed for:

1. pd-vulnerable minus non-vulnerable

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
```

=====

Good afternoon!

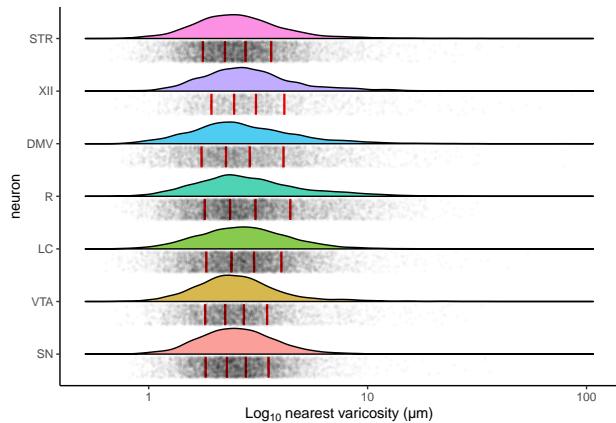
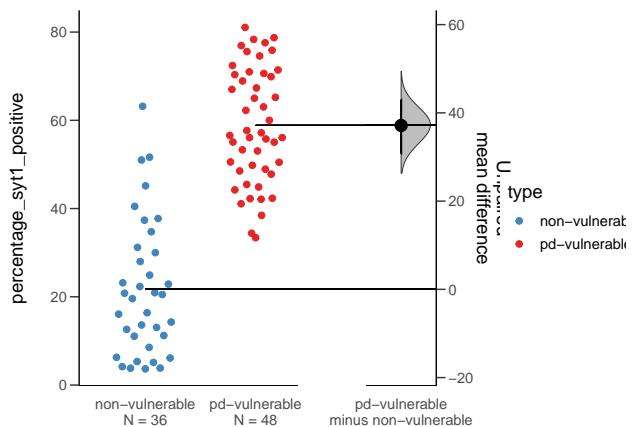
The current time is 15:10 pm on Friday January 28, 2022.

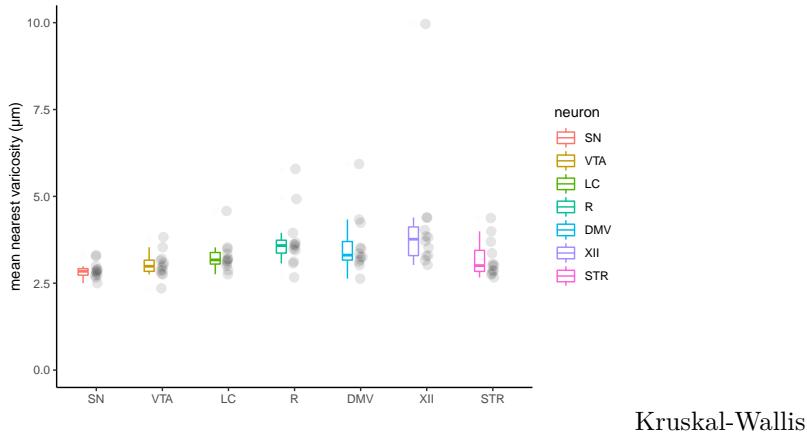
Dataset : .  
X Variable : type  
Y Variable : percentage\_syt1\_positive

Unpaired mean difference of pd-vulnerable (n = 48) minus non-vulnerable (n = 36)  
37.1 [95CI 30.7; 43]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.





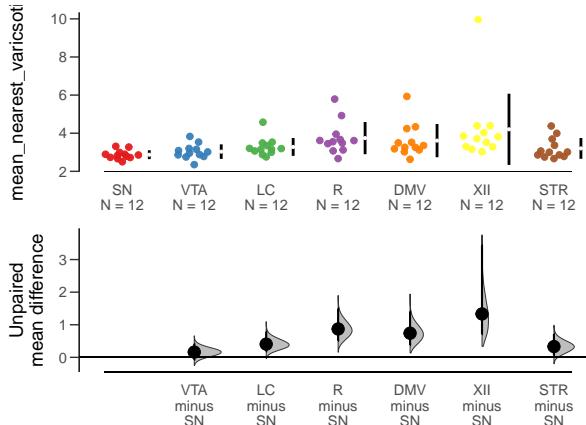
Kruskal-Wallis rank sum test

```
data: mean_nearest_varicsotiey by neuron
Kruskal-Wallis chi-squared = 28.368, df = 6, p-value = 8.011e-05
```

Dunn

	Comparison	Z	P.unadj	P.adj
1	DMV - LC	0.8703005	3.841362e-01	1.00000000000
2	DMV - R	-0.5941475	5.524135e-01	1.00000000000
3	LC - R	-1.4644480	1.430716e-01	1.00000000000
4	DMV - SN	3.1297345	1.749644e-03	0.0367425146
5	LC - SN	2.2594340	2.385640e-02	0.5009844259
6	R - SN	3.7238820	1.961827e-04	0.0041198361
7	DMV - STR	1.5732355	1.156643e-01	1.00000000000
8	LC - STR	0.7029350	4.820962e-01	1.00000000000
9	R - STR	2.1673830	3.020566e-02	0.6343189291
10	SN - STR	-1.5564990	1.195895e-01	1.00000000000
11	DMV - VTA	2.0334906	4.200298e-02	0.8820626214
12	LC - VTA	1.1631901	2.447524e-01	1.00000000000
13	R - VTA	2.6276381	8.597994e-03	0.1805578807
14	SN - VTA	-1.0962439	2.729721e-01	1.00000000000
15	STR - VTA	0.4602551	6.453331e-01	1.00000000000
16	DMV - XII	-1.2133997	2.249770e-01	1.00000000000
17	LC - XII	-2.0837002	3.718744e-02	0.7809362753
18	R - XII	-0.6192523	5.357502e-01	1.00000000000
19	SN - XII	-4.3431343	1.404642e-05	0.0002949749
20	STR - XII	-2.7866353	5.325838e-03	0.1118426079
21	VTA - XII	-3.2468903	1.166733e-03	0.0245013998

Estimation Statistics



dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0  
=====

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```
Dataset      : .
X Variable : neuron
Y Variable : mean_nearest_varicsotiey
```

Unpaired mean difference of VTA (n = 12) minus SN (n = 12)  
0.162 [95CI -0.0767; 0.415]

Unpaired mean difference of LC (n = 12) minus SN (n = 12)  
0.406 [95CI 0.183; 0.789]

Unpaired mean difference of R (n = 12) minus SN (n = 12)  
0.871 [95CI 0.507; 1.5]

Unpaired mean difference of DMV (n = 12) minus SN (n = 12)  
0.74 [95CI 0.375; 1.41]

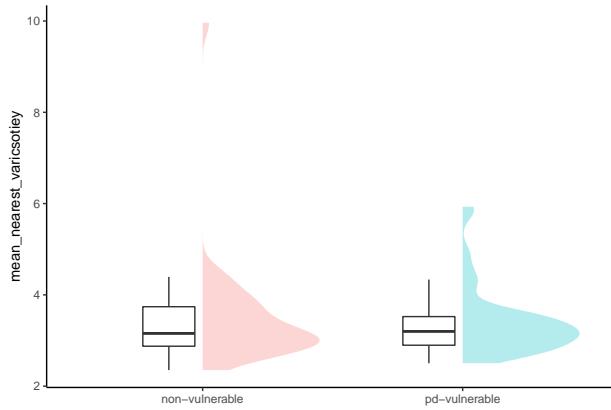
Unpaired mean difference of XII (n = 12) minus SN (n = 12)  
1.33 [95CI 0.708; 3.44]

Unpaired mean difference of STR (n = 12) minus SN (n = 12)  
0.331 [95CI 0.0556; 0.717]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

PD-vulnerable vs Non-vulnerable



Wilcoxon rank sum exact test

```
data: mean_varicosity_nn_length$mean_nearest_varicsotey by mean_varicosity_nn_length$type
W = 875, p-value = 0.9248
alternative hypothesis: true location shift is not equal to 0

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .

The first five rows are:

```
# A tibble: 5 x 5
  neuron image mean_nearest_varicsotey     n type
  <fct>  <chr>                  <dbl> <int> <fct>
1 SN      SN_01                 2.74   797 pd-vulnerable
2 SN      SN_02                 2.72   372 pd-vulnerable
3 SN      SN_03                 2.90   853 pd-vulnerable
4 SN      SN_04                 2.89   496 pd-vulnerable
5 SN      SN_05                 2.99   629 pd-vulnerable
```

X Variable : type

Y Variable : mean\_nearest\_varicsotey

Effect sizes(s) will be computed for:

1. pd-vulnerable minus non-vulnerable

```
dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====
```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .

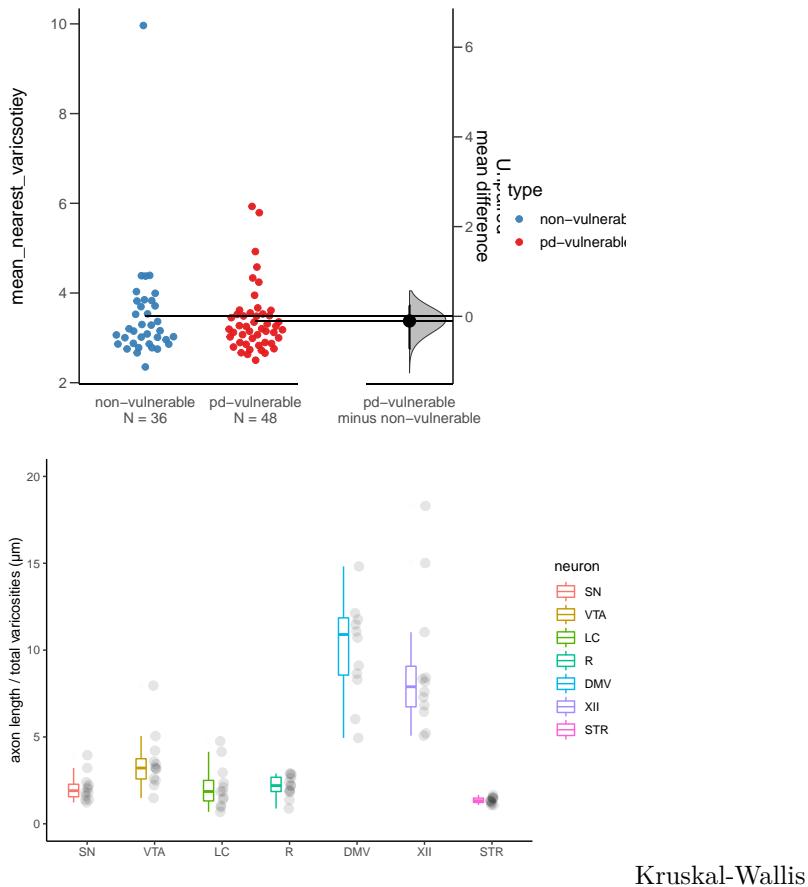
X Variable : type

Y Variable : mean\_nearest\_varicsotey

Unpaired mean difference of pd-vulnerable ( $n = 48$ ) minus non-vulnerable ( $n = 36$ )  
 $-0.104$  [95CI  $-0.725$ ;  $0.242$ ]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.



Kruskal-Wallis rank sum test

```
data: mean_axon_per_var_px by neuron
Kruskal-Wallis chi-squared = 62.576, df = 6, p-value = 1.346e-11
```

Dunn

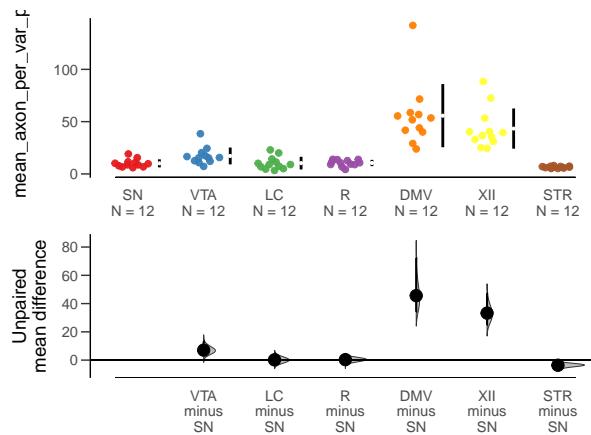
	Comparison	Z	P.unadj	P.adj
1	DMV - LC	4.6611287	3.144800e-06	6.604081e-05
2	DMV - R	4.1506639	3.315122e-05	6.961756e-04
3	LC - R	-0.5104647	6.097259e-01	1.000000e+00
4	DMV - SN	4.4519218	8.510516e-06	1.787208e-04
5	LC - SN	-0.2092069	8.342868e-01	1.000000e+00
6	R - SN	0.3012579	7.632179e-01	1.000000e+00
7	DMV - STR	6.1255766	9.035577e-10	1.897471e-08
8	LC - STR	1.4644480	1.430716e-01	1.000000e+00
9	R - STR	1.9749127	4.827806e-02	1.000000e+00

```

10 SN - STR 1.6736548 9.419846e-02 1.000000e+00
11 DMV - VTA 2.5857967 9.715422e-03 2.040239e-01
12 LC - VTA -2.0753320 3.795578e-02 7.970713e-01
13 R - VTA -1.5648673 1.176140e-01 1.000000e+00
14 SN - VTA -1.8661251 6.202386e-02 1.000000e+00
15 STR - VTA -3.5397799 4.004608e-04 8.409677e-03
16 DMV - XII 0.4602551 6.453331e-01 1.000000e+00
17 LC - XII -4.2008736 2.658870e-05 5.583627e-04
18 R - XII -3.6904089 2.238939e-04 4.701772e-03
19 SN - XII -3.9916667 6.561053e-05 1.377821e-03
20 STR - XII -5.6653216 1.467491e-08 3.081731e-07
21 VTA - XII -2.1255416 3.354145e-02 7.043703e-01

```

### Estimation Statistics



```

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0
=====

```

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

```

Dataset      : .
X Variable  : neuron
Y Variable  : mean_axon_per_var_px

```

Unpaired mean difference of VTA (n = 12) minus SN (n = 12)  
7.05 [95CI 3.24; 13.3]

Unpaired mean difference of LC (n = 12) minus SN (n = 12)  
0.197 [95CI -3.3; 4.45]

Unpaired mean difference of R (n = 12) minus SN (n = 12)  
0.326 [95CI -2.72; 2.68]

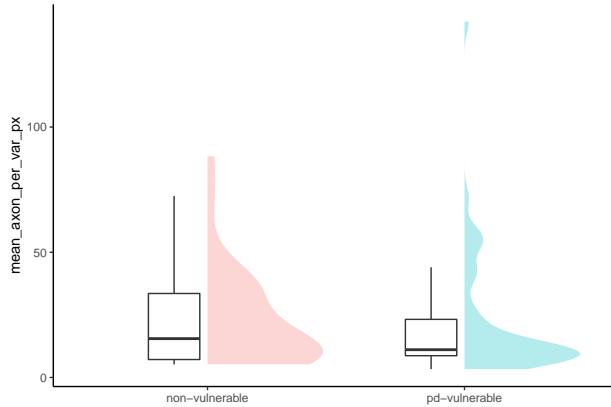
Unpaired mean difference of DMV (n = 12) minus SN (n = 12)  
45.6 [95CI 34.2; 72.2]

Unpaired mean difference of XII (n = 12) minus SN (n = 12)  
33.2 [95CI 24.8; 47.4]

Unpaired mean difference of STR (n = 12) minus SN (n = 12)  
-3.62 [95CI -6.41; -1.89]

5000 bootstrap resamples.  
All confidence intervals are bias-corrected and accelerated.

PD-vulnerable vs Non-vulnerable



Wilcoxon rank sum exact test

```
data: mean_varicosity_lengthpervar_length$mean_axon_per_var_px by mean_varicosity_lengthpervar_length$W
W = 917, p-value = 0.6369
alternative hypothesis: true location shift is not equal to 0
```

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0

=====

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .

The first five rows are:

```
# A tibble: 5 x 5
  neuron image mean_axon_per_var_px     n type
  <fct>  <chr>                <dbl> <int> <fct>
1 SN      SN_01                 10.2    797 pd-vulnerable
2 SN      SN_02                 7.78    372 pd-vulnerable
3 SN      SN_03                 8.71    853 pd-vulnerable
4 SN      SN_04                 5.94    496 pd-vulnerable
5 SN      SN_05                 9.70    629 pd-vulnerable
```

X Variable : type

Y Variable : mean\_axon\_per\_var\_px

Effect sizes(s) will be computed for:

1. pd-vulnerable minus non-vulnerable

dabestr (Data Analysis with Bootstrap Estimation in R) v0.3.0

=====

Good afternoon!

The current time is 15:10 pm on Friday January 28, 2022.

Dataset : .  
X Variable : type  
Y Variable : mean\_axon\_per\_var\_px

Unpaired mean difference of pd-vulnerable (n = 48) minus non-vulnerable (n = 36)  
-0.694 [95CI -9.26; 9.77]

5000 bootstrap resamples.

All confidence intervals are bias-corrected and accelerated.

