

Mice data - Permutation Test

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1 packages

```
library(tidyverse)
library(infer)
```

2 Mice data from Efron and Tibshirani

```
x <- c(94, 197, 16, 38, 99, 141, 23)
x
```

```
[1] 94 197 16 38 99 141 23
```

```
treatment <- tibble(survival_days = x,
                    group = rep('T'))
treatment
```

```
# A tibble: 7 x 2
  survival_days group
      <dbl> <chr>
1          94 T
2         197 T
3          16 T
4          38 T
5          99 T
6         141 T
7          23 T
```

```
y <- c(52, 104, 146, 10, 51, 30, 40, 27, 46)
y
```

```
[1] 52 104 146 10 51 30 40 27 46
```

```
control <- tibble(survival_days = y,
                  group = rep('C'))
control
```

```
# A tibble: 9 x 2
  survival_days group
      <dbl> <chr>
1          52 C
2         104 C
3         146 C
4          10 C
5          51 C
6          30 C
7          40 C
8          27 C
9          46 C
```

Bind data together

```
mice <-
  treatment %>%
  bind_rows(control)

mice
```

```
# A tibble: 16 x 2
  survival_days group
      <dbl> <chr>
1         94 T
2        197 T
3         16 T
4         38 T
5         99 T
6        141 T
7         23 T
8         52 C
9        104 C
10        146 C
11         10 C
12         51 C
13         30 C
14         40 C
15         27 C
16         46 C
```

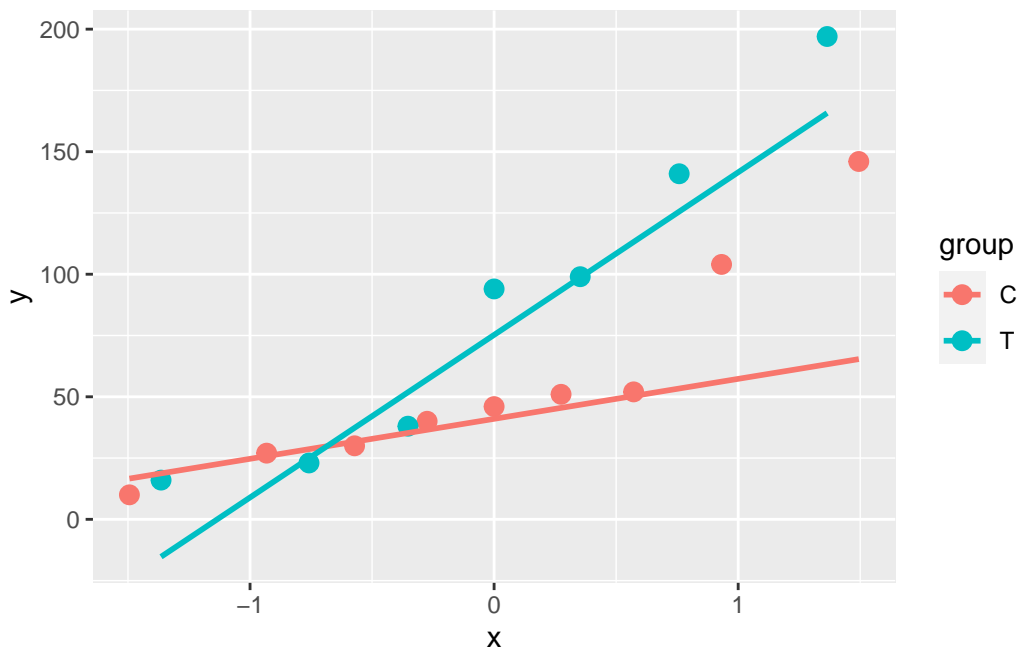
3 summary checks

```
mice %>%
  group_by(group) %>%
  summarise(ave = mean(survival_days))
```

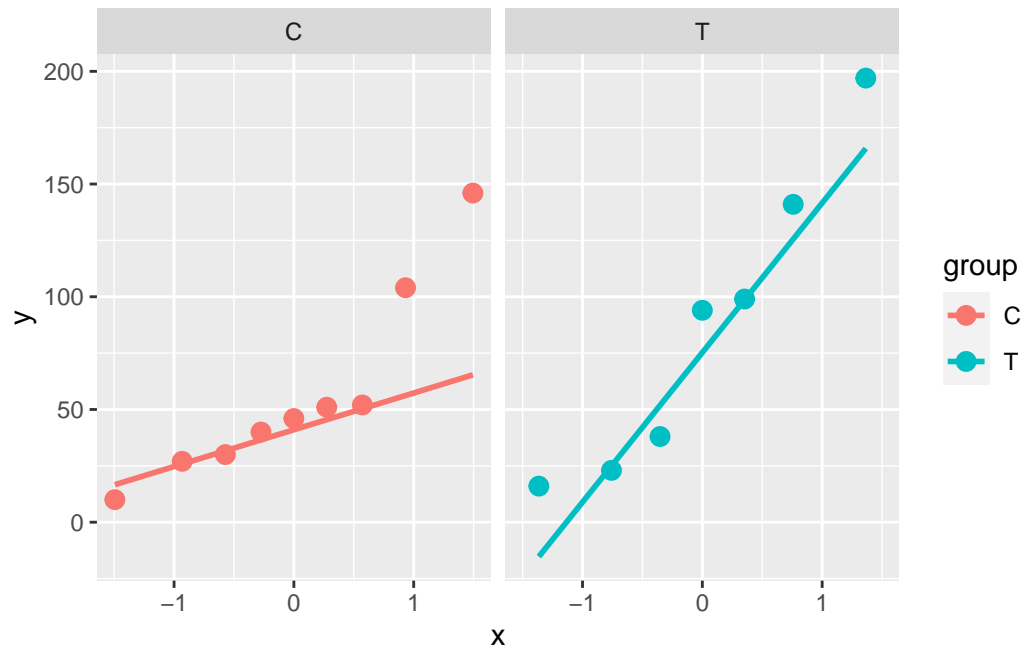
```
# A tibble: 2 x 2
  group    ave
  <chr> <dbl>
1 C     56.2
2 T     86.9
```

4 normality check

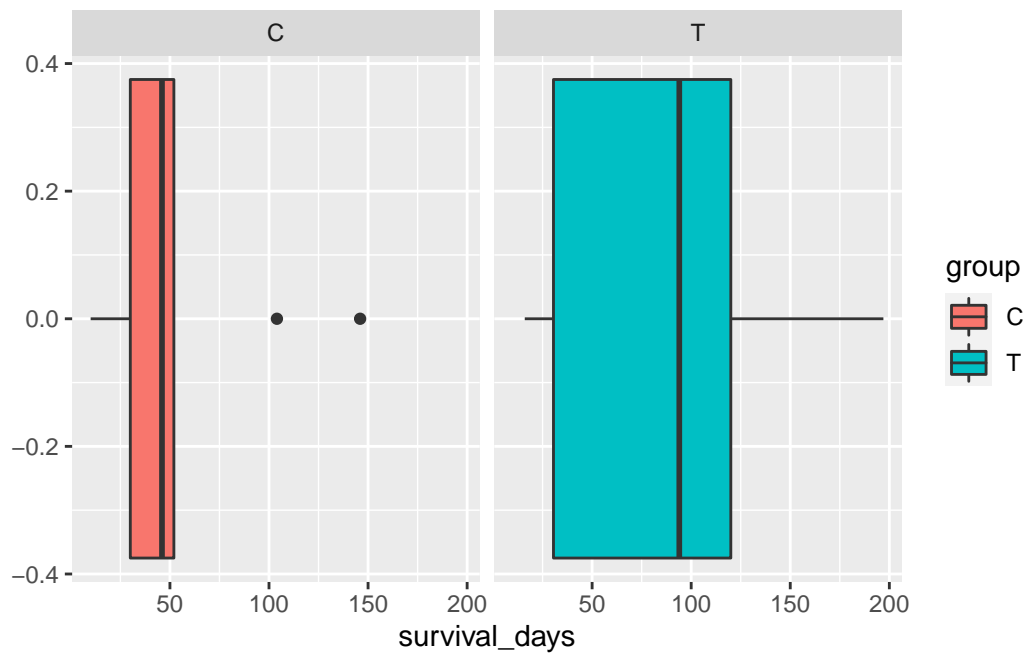
```
mice %>%  
  ggplot(aes(sample = survival_days, color = group)) +  
  stat_qq(size = 3) +  
  stat_qq_line(lwd = 1)
```



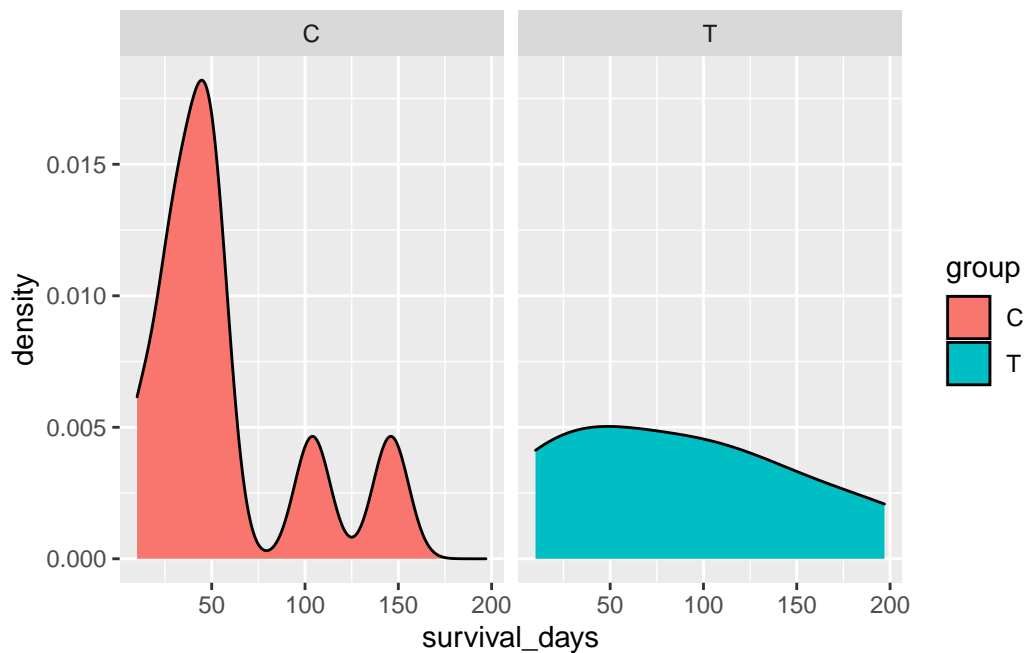
```
mice %>%  
  ggplot(aes(sample = survival_days, color = group)) +  
  stat_qq(size = 3) +  
  stat_qq_line(lwd = 1) +  
  facet_wrap(~group)
```



```
mice %>%
  ggplot(aes(x = survival_days, fill = group)) +
  geom_boxplot() +
  facet_wrap(~group)
```



```
mice %>%
  ggplot(aes(x = survival_days, fill = group)) +
  geom_density() +
  facet_wrap(~group)
```



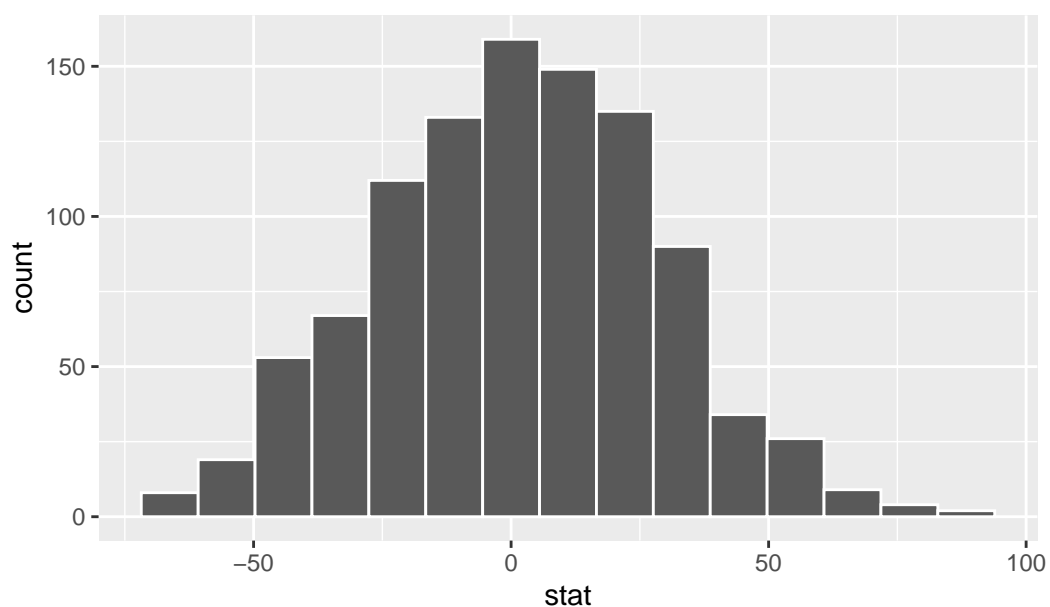
5 not normal, what to do?

Permutation Test!

```
set.seed(987)
perm_dist <-
  mice %>%
  specify(survival_days~group) %>%
  hypothesize(null = 'independence') %>%
  generate(reps = 1000, type = 'permute') %>%
  calculate(stat = 'diff in means',
            order = c("T", "C"))

perm_dist %>%
  visualize()
```

Simulation-Based Null Distribution



```
obs_stat <-
  mice %>%
    specify(survival_days~group) %>%
    calculate(stat = 'diff in means',
              order = c("T", "C"))

obs_stat
```

```
Response: survival_days (numeric)
Explanatory: group (factor)
# A tibble: 1 x 1
  stat
  <dbl>
1  30.6
```

```
set.seed(987)
p_value <-
  perm_dist %>%
  get_p_value(obs_stat = obs_stat,
              direction = 'right')
```

```
p_value
```

```
# A tibble: 1 x 1
  p_value
  <dbl>
1    0.136
```

Shade the p-value

```
perm_dist %>%
  visualise() +
  shade_p_value(obs_stat = obs_stat,
                direction = 'right')
```

