

```

1. data time;
    input time @@;
    datalines;
43 90 84 87 116 95 86 99 93 92
121 71 66 98 79 102 60 112 105 98
;
run;

2. ods graphics on;

proc ttest h0=80 plots(showh0) sides=u alpha=0.1;
    var time;
run;

ods graphics off;

```

## The SAS System

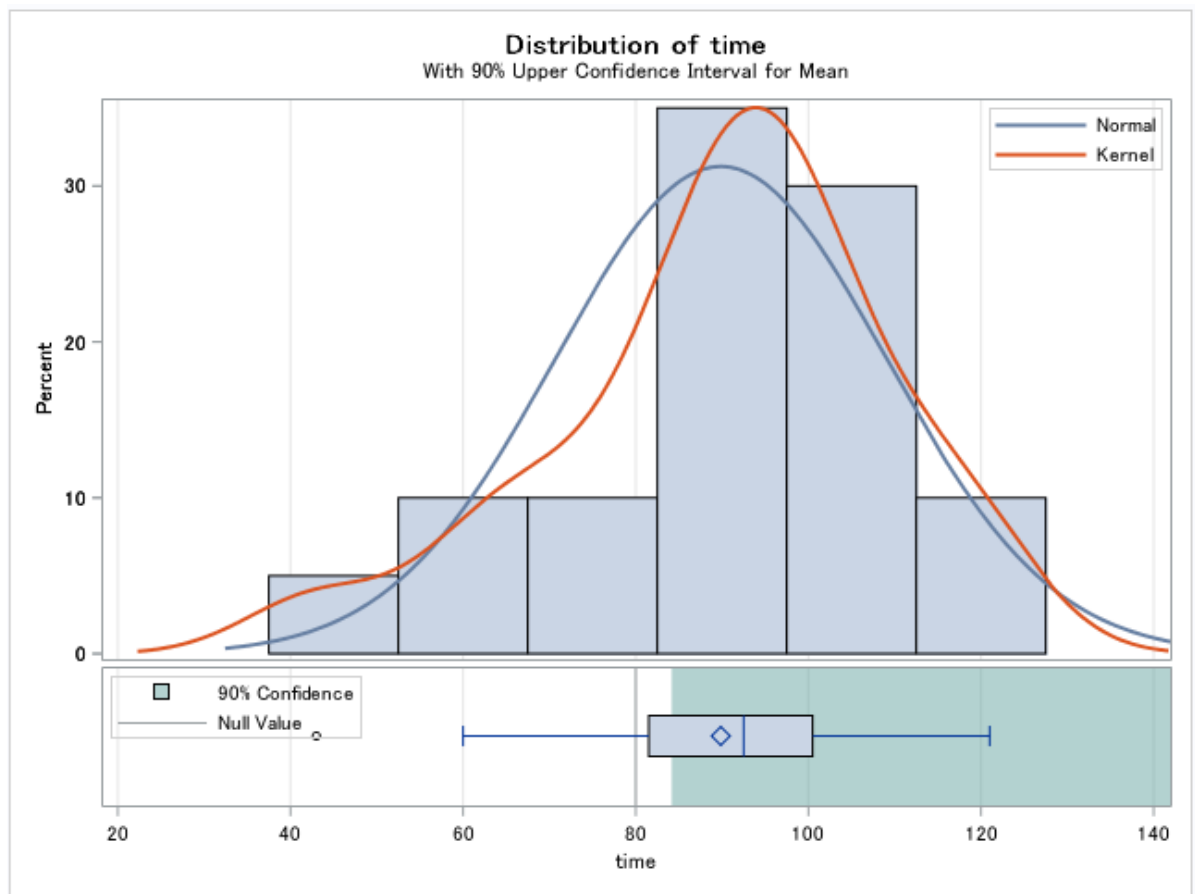
### The TTEST Procedure

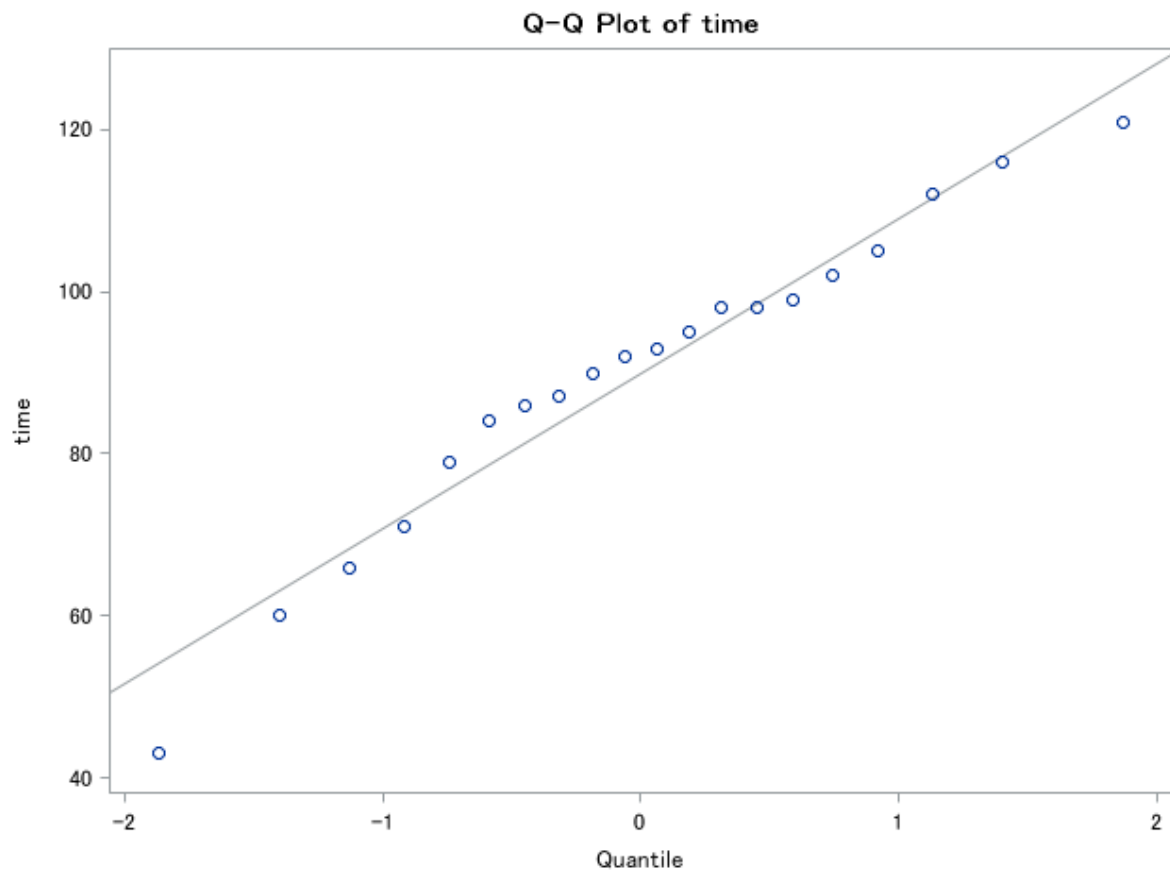
Variable: time

N	Mean	Std Dev	Std Err	Minimum	Maximum
20	89.8500	19.1456	4.2811	43.0000	121.0

Mean	90% CL Mean		Std Dev	90% CL Std Dev	
89.8500	84.1659	Infy	19.1456	15.2002	26.2374

DF	t Value	Pr > t
19	2.30	0.0164





```
3.
proc univariate data=time;
var time;
histogram/normal;
run;
```

Goodness-of-Fit Tests for Normal Distribution				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.12997262	Pr > D	>0.150
Cramer-von Mises	W-Sq	0.05410070	Pr > W-Sq	>0.250
Anderson-Darling	A-Sq	0.31058808	Pr > A-Sq	>0.250

```
4. data scores;
    input Gender $ Score @@;
    datalines;
f 75 f 76 f 80 f 77 f 80 f 77 f 73
m 82 m 80 m 85 m 85 m 78 m 87 m 82
;
```

```
5. ods graphics on;
proc ttest cochrans ci=equal umpu;
class Gender;
var Score;
```

```
run;
```

```
ods graphics off;
```

### The TTEST Procedure

Variable: Score

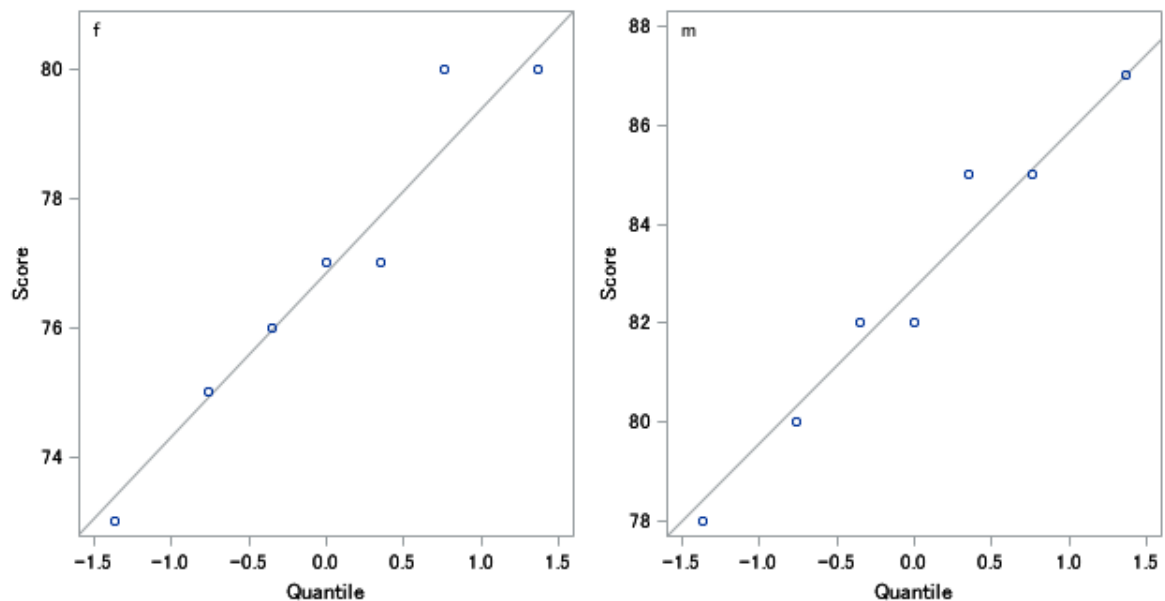
Gender	N	Mean	Std Dev	Std Err	Minimum	Maximum
f	7	76.8571	2.5448	0.9619	73.0000	80.0000
m	7	82.7143	3.1472	1.1895	78.0000	87.0000
Diff (1-2)		-5.8571	2.8619	1.5298		

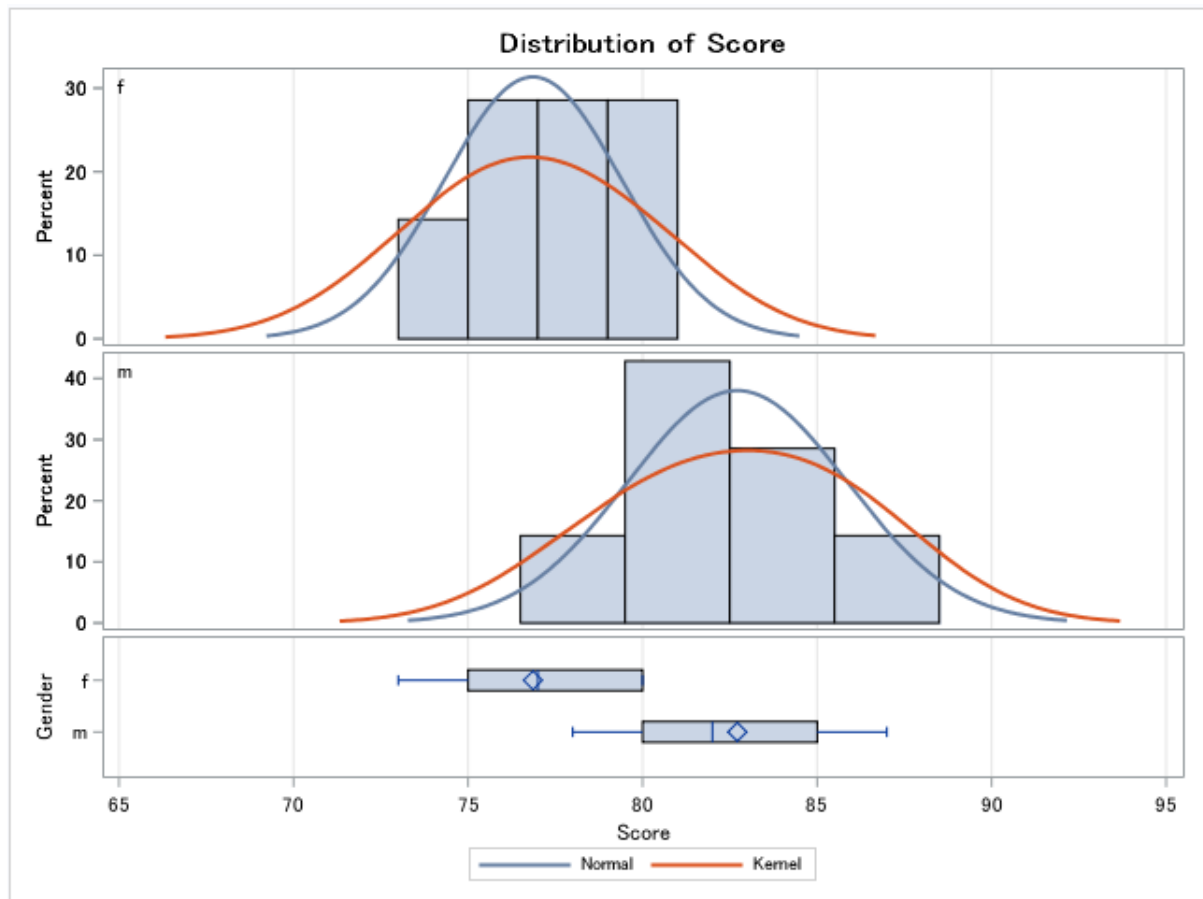
Gender	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev		95% UMPU CL Std Dev	
f		76.8571	74.5036	79.2107	2.5448	1.6399	5.6039	1.5634	5.2219
m		82.7143	79.8036	85.6249	3.1472	2.0280	6.9303	1.9335	6.4579
Diff (1-2)	Pooled	-5.8571	-9.1902	-2.5241	2.8619	2.0522	4.7242	2.0019	4.5727
Diff (1-2)	Satterthwaite	-5.8571	-9.2064	-2.5078					

Method	Variances	DF	t Value	Pr >  t
Pooled	Equal	12	-3.83	0.0024
Satterthwaite	Unequal	11.496	-3.83	0.0026
Cochran	Unequal	6	-3.83	0.0087

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	6	6	1.53	0.6189

### Q-Q Plots of Score





```
6. data pressure;
   input SBPbefore SBPafter @@;
   datalines;
120 128 124 131 130 131 118 127
140 132 128 125 140 141 135 137
126 118 130 132 126 129 127 135
;
run;

7. ods graphics on;

proc ttest;
   paired SBPbefore*SBPafter;
run;

ods graphics off;
```

## The SAS System

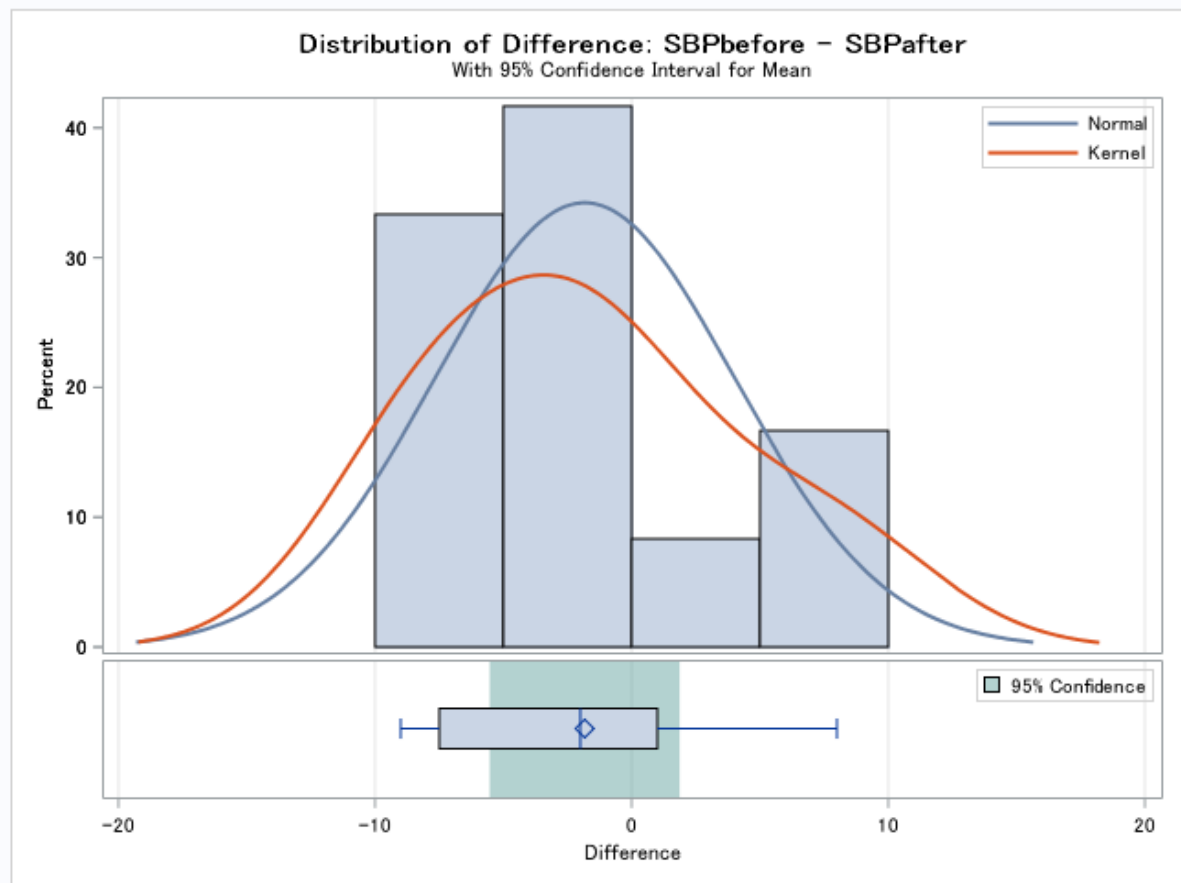
### The TTEST Procedure

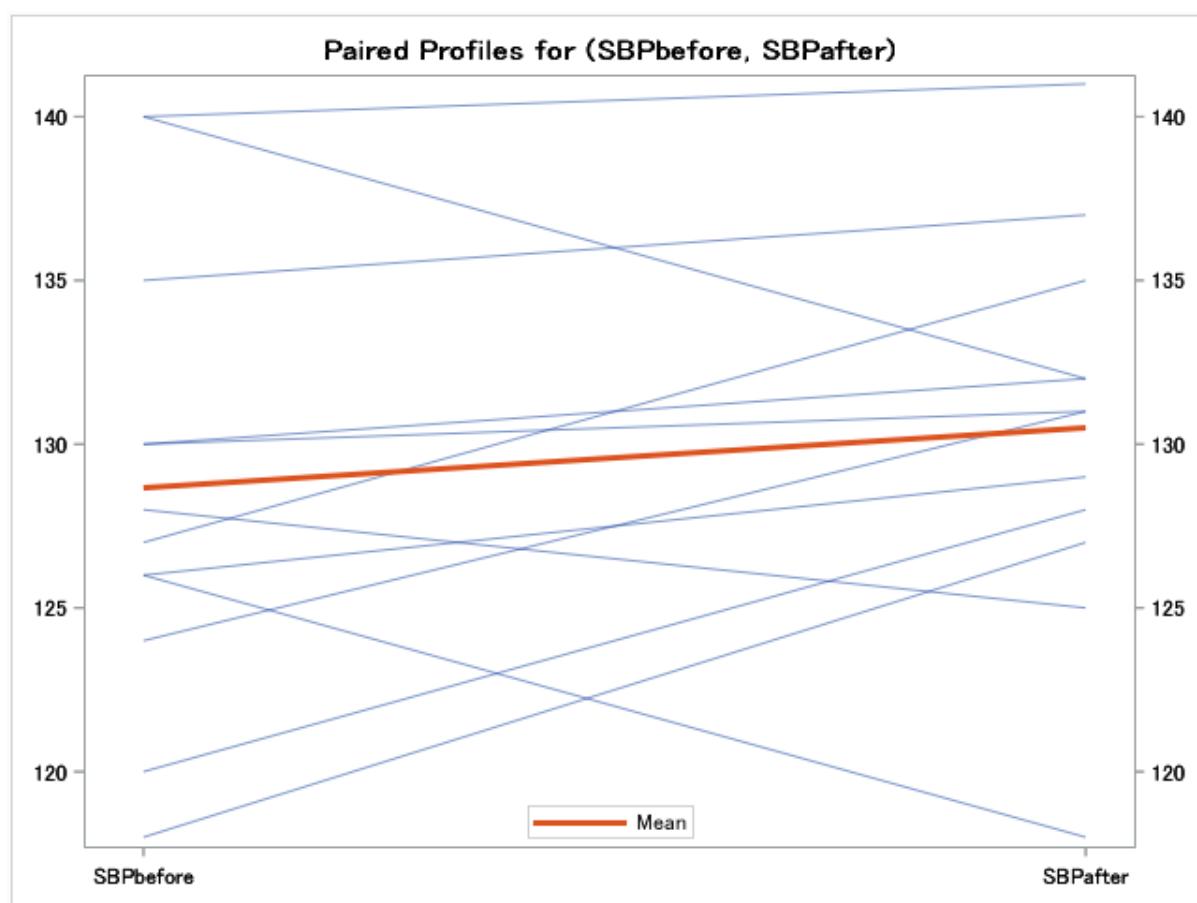
Difference: SBPbefore - SBPafter

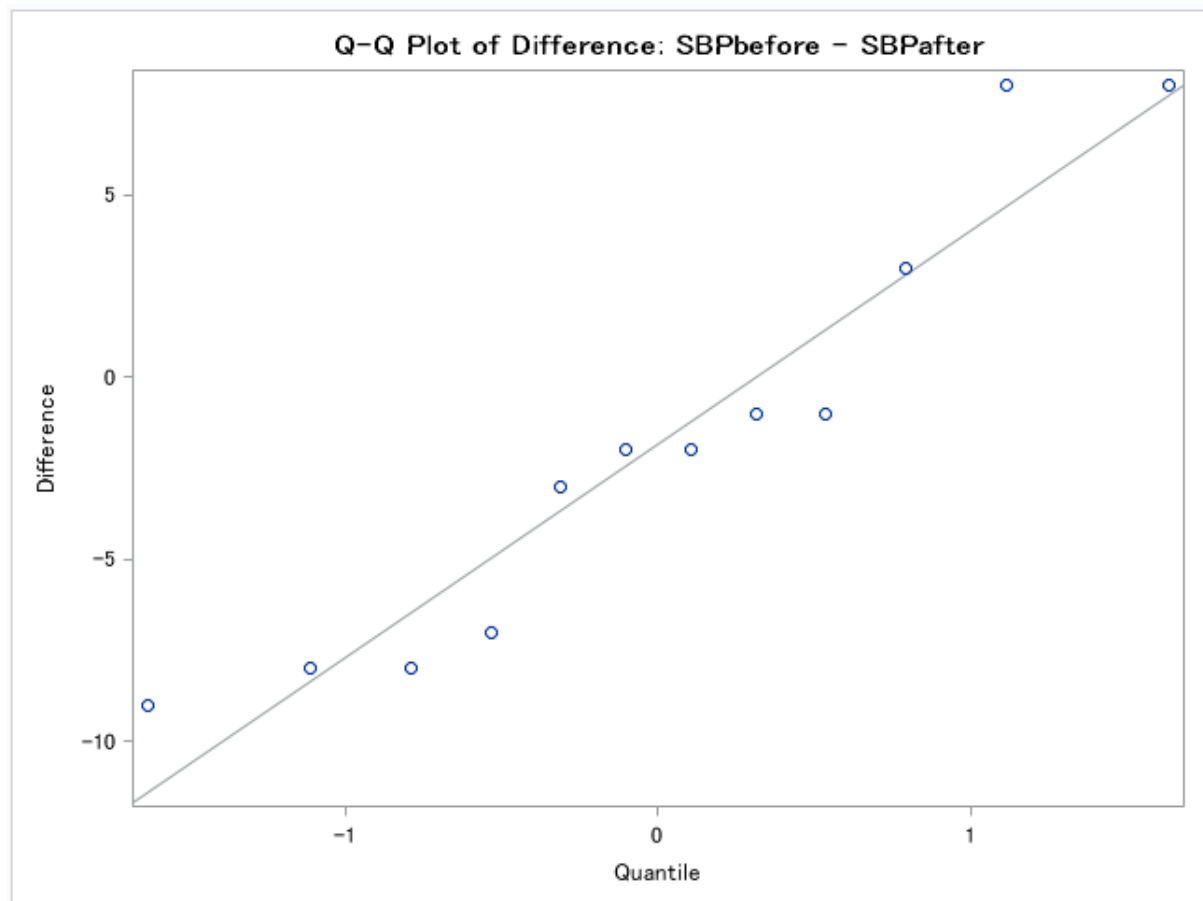
N	Mean	Std Dev	Std Err	Minimum	Maximum
12	-1.8333	5.8284	1.6825	-9.0000	8.0000

Mean	95% CL Mean	Std Dev	95% CL Std Dev
-1.8333	-5.5365 1.8698	5.8284	4.1288 9.8958

DF	t Value	Pr >  t
11	-1.09	0.2992









```

data Gossypol;
input Dose n;
do i=1 to n;
input Gain @@;
output;
end;
datalines;
0 16
228 229 218 216 224 208 235 229 233 219 224 220 232 200 208 232
.04 11
186 229 220 208 228 198 222 273 216 198 213
.07 12
179 193 183 180 143 204 114 188 178 134 208 196
.10 17
130 87 135 116 118 165 151 59 126 64 78 94 150 160 122 110 178
.13 11
154 130 130 118 118 104 112 134 98 100 104
;

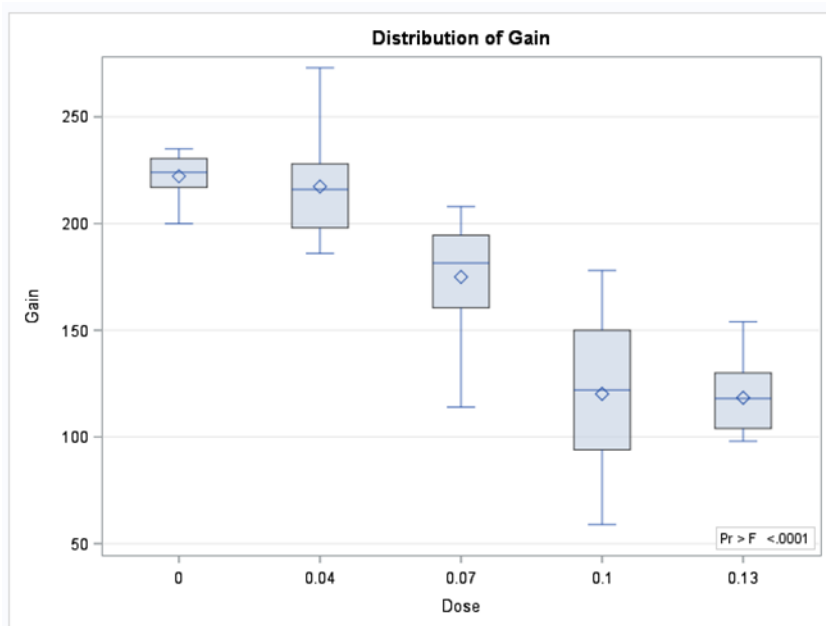
proc npar1way data=Gossypol;
class Dose;
var Gain;
run;

```

#### The NPAR1WAY Procedure

Analysis of Variance for Variable Gain Classified by Variable Dose		
Dose	N	Mean
0	16	222.187500
0.04	11	217.363636
0.07	12	175.000000
0.1	17	120.176471
0.13	11	118.363636

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	4	140082.986077	35020.74652	55.8143	<.0001
Within	62	38901.998997	627.45160		
Average scores were used for ties.					



### The NPAR1WAY Procedure

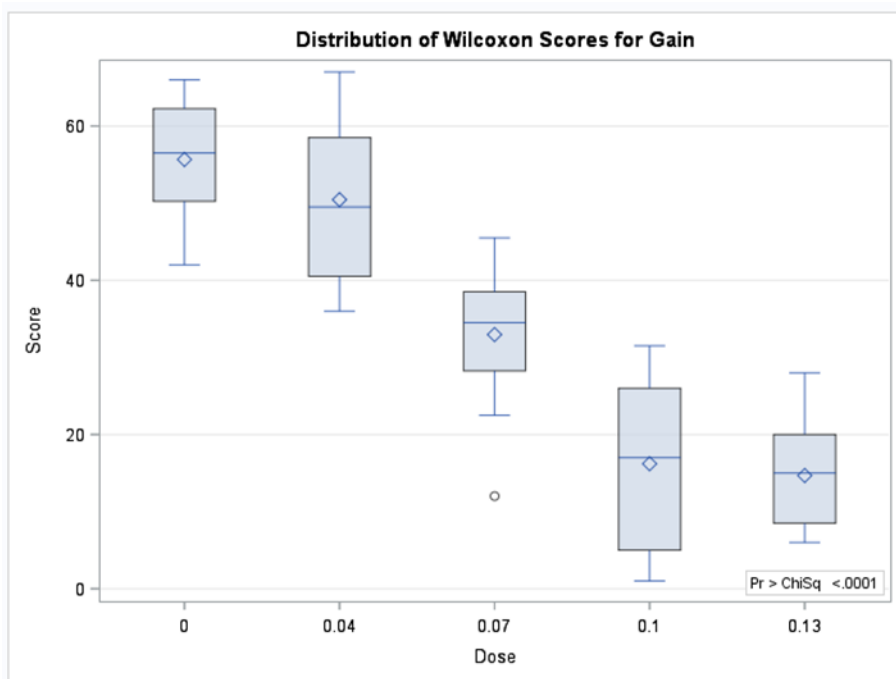
#### Wilcoxon Scores (Rank Sums) for Variable Gain Classified by Variable Dose

Dose	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
0	16	890.50	544.0	67.978966	55.656250
0.04	11	555.00	374.0	59.063588	50.454545
0.07	12	395.50	408.0	61.136622	32.958333
0.1	17	275.50	578.0	69.380741	16.205882
0.13	11	161.50	374.0	59.063588	14.681818

Average scores were used for ties.

#### Kruskal-Wallis Test

Chi-Square	52.6656
DF	4
Pr > Chi-Square	<.0001



### The NPAR1WAY Procedure

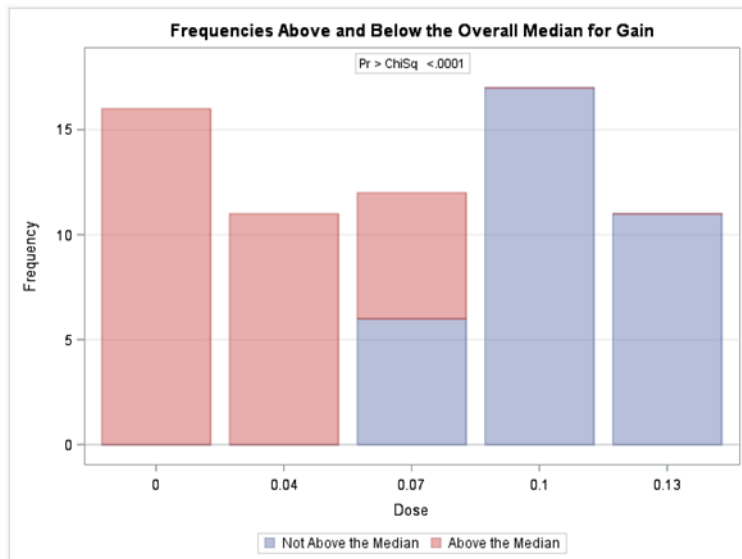
#### Median Scores (Number of Points Above Median) for Variable Gain Classified by Variable Dose

Dose	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
0	16	16.0	7.880597	1.757902	1.00
0.04	11	11.0	5.417910	1.527355	1.00
0.07	12	6.0	5.910448	1.580963	0.50
0.1	17	0.0	8.373134	1.794152	0.00
0.13	11	0.0	5.417910	1.527355	0.00

Average scores were used for ties.

#### Median One-Way Analysis

Chi-Square	54.1765
DF	4
Pr > Chi-Square	<.0001



### The NPAR1WAY Procedure

#### Van der Waerden Scores (Normal) for Variable Gain Classified by Variable Dose

Dose	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
0	16	16.116474	0.0	3.325957	1.007280
0.04	11	8.340899	0.0	2.889761	0.758264
0.07	12	-0.576674	0.0	2.991186	-0.048056
0.1	17	-14.688921	0.0	3.394540	-0.864054
0.13	11	-9.191777	0.0	2.889761	-0.835616

Average scores were used for ties.

#### Van der Waerden One-Way Analysis

Chi-Square	47.2972
DF	4
Pr > Chi-Square	<.0001



### The NPAR1WAY Procedure

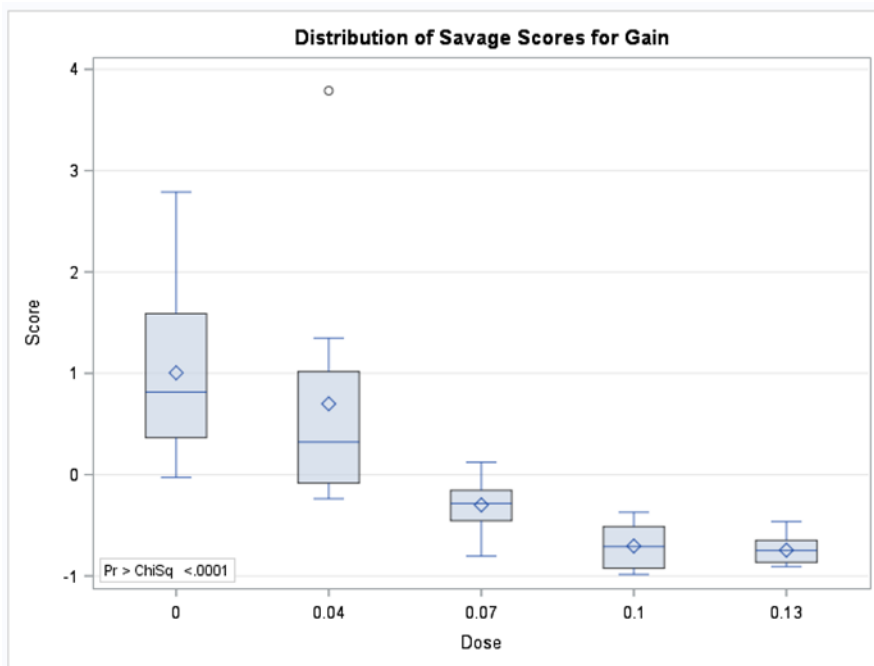
#### Savage Scores (Exponential) for Variable Gain Classified by Variable Dose

Dose	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
0	16	16.074391	0.0	3.385275	1.004649
0.04	11	7.693099	0.0	2.941300	0.699373
0.07	12	-3.584958	0.0	3.044534	-0.298746
0.1	17	-11.979488	0.0	3.455082	-0.704676
0.13	11	-8.203044	0.0	2.941300	-0.745731

Average scores were used for ties.

#### Savage One-Way Analysis

Chi-Square	39.4908
DF	4
Pr > Chi-Square	<.0001



### The NPAR1WAY Procedure

#### Kolmogorov-Smirnov Test for Variable Gain Classified by Variable Dose

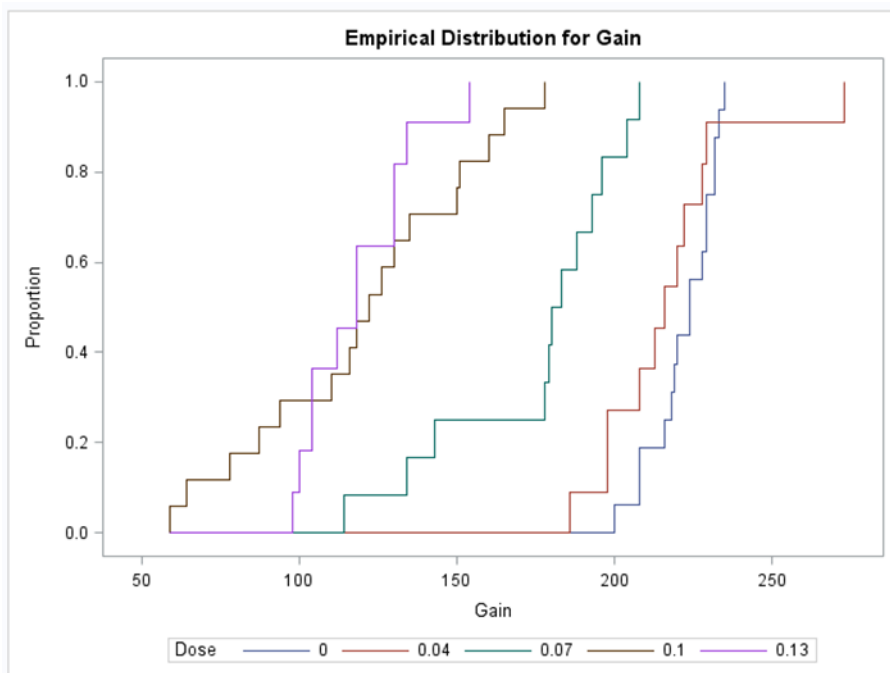
Dose	N	EDF at Maximum	Deviation from Mean at Maximum
0	16	0.000000	-1.910448
0.04	11	0.000000	-1.584060
0.07	12	0.333333	-0.499796
0.1	17	1.000000	2.153861
0.13	11	1.000000	1.732565
Total	67	0.477612	

Maximum Deviation Occurred at Observation 36

Value of Gain at Maximum = 178.0

#### Kolmogorov-Smirnov Statistics (Asymptotic)

KS	0.457928	KSa	3.748300
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### Cramer-von Mises Test for Variable Gain Classified by Variable Dose

Dose	N	Summed Deviation from Mean
0	16	2.165210
0.04	11	0.918280
0.07	12	0.348227
0.1	17	1.497542
0.13	11	1.335745

### Cramer-von Mises Statistics (Asymptotic)

CM	0.093508	CMa	6.265003
----	----------	-----	----------

```

data Arthritis;
input Treatment $ Response Freq @@;
datalines;
Active 5 5 Active 4 11 Active 3 5 Active 2 1 Active 1 5
Placebo 5 2 Placebo 4 4 Placebo 3 7 Placebo 2 7 Placebo 1 12
;

ods graphics on;
proc npar1way data=Arthritis wilcoxon median
      plots=(wilcoxonboxplot medianplot);
  class Treatment;
  var Response;
  freq Freq;
run;
ods graphics off;

```

## The SAS System

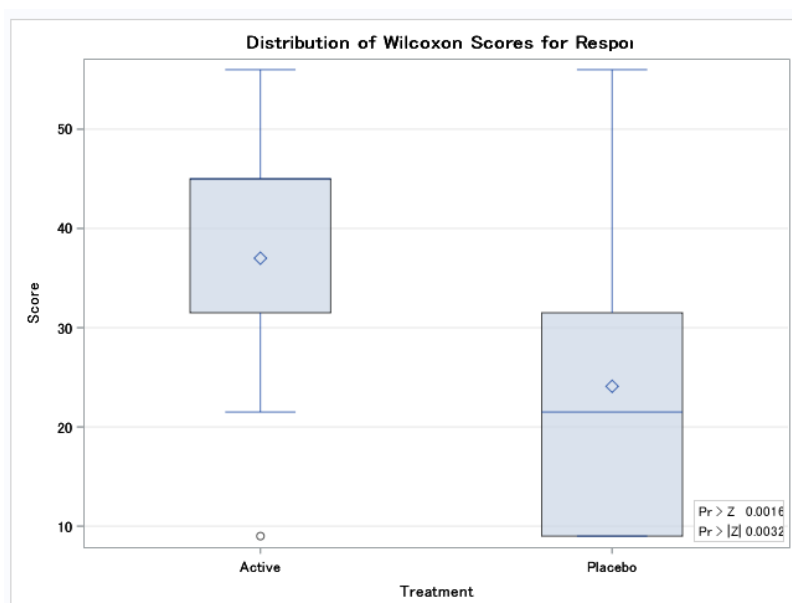
### The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable Response Classified by Variable Treatment					
Treatment	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Active	27	999.0	810.0	63.972744	37.000000
Placebo	32	771.0	960.0	63.972744	24.093750
Average scores were used for ties.					



Wilcoxon Two-Sample Test	
Statistic	999.0000
Normal Approximation	
Z	2.9466
One-Sided Pr > Z	0.0016
Two-Sided Pr >  Z	0.0032
t Approximation	
One-Sided Pr > Z	0.0023
Two-Sided Pr >  Z	0.0046
Z includes a continuity correction of 0.5.	

Kruskal-Wallis Test	
Chi-Square	8.7284
DF	1
Pr > Chi-Square	0.0031



## The SAS System

### The NPAR1WAY Procedure

#### Median Scores (Number of Points Above Median) for Variable Response Classified by Variable Treatment

Treatment	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Active	27	18.916667	13.271186	1.728195	0.700617
Placebo	32	10.083333	15.728814	1.728195	0.315104

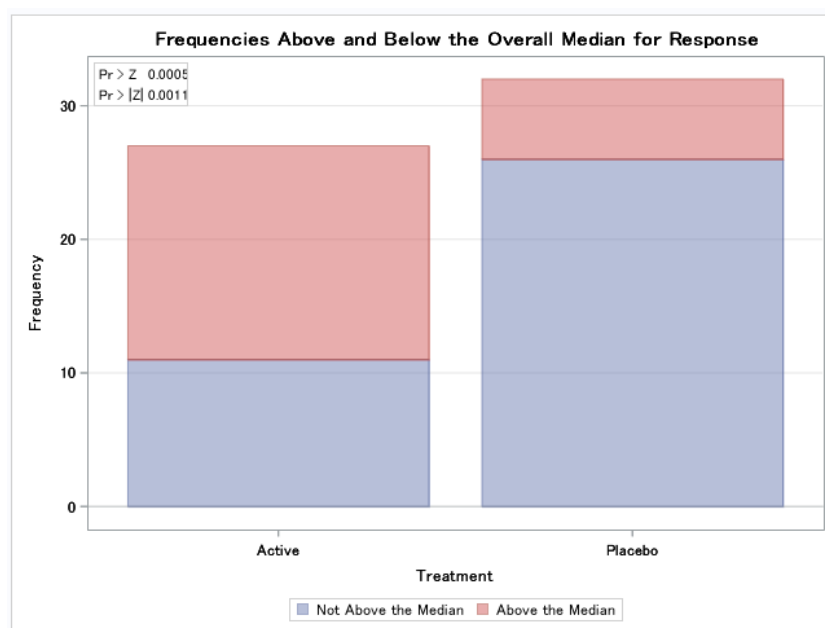
Average scores were used for ties.

#### Median Two-Sample Test

Statistic	18.9167
Z	3.2667
One-Sided Pr > Z	0.0005
Two-Sided Pr >  Z	0.0011

#### Median One-Way Analysis

Chi-Square	10.6713
DF	1
Pr > Chi-Square	0.0011



```
ods graphics on;
proc npar1way edf plots=edfplot data=Arthritis;
  class Treatment;
  var Response;
  freq Freq;
run;
ods graphics off;
```

## The SAS System

### The NPAR1WAY Procedure

#### Kolmogorov-Smirnov Test for Variable Response Classified by Variable Treatment

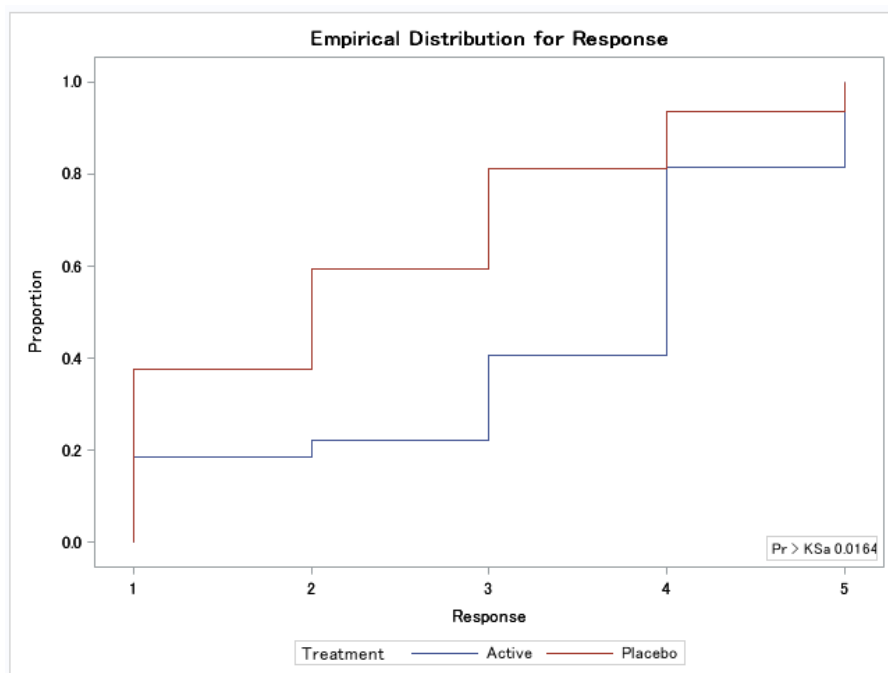
Treatment	N	EDF at Maximum	Deviation from Mean at Maximum
Active	27	0.407407	-1.141653
Placebo	32	0.812500	1.048675
Total	59	0.627119	

Maximum Deviation Occurred at Observation 3

Value of Response at Maximum = 3.0

#### Kolmogorov-Smirnov Two-Sample Test (Asymptotic)

KS	0.201818	D	0.405093
KSa	1.550191	Pr > KSa	0.0164



Cramer-von Mises Test for Variable Response Classified by Variable Treatment		
Treatment	N	Summed Deviation from Mean
Active	27	0.526596
Placebo	32	0.444316

Cramer-von Mises Statistics (Asymptotic)			
CM	0.016456	CMa	0.970912

Kuiper Test for Variable Response Classified by Variable Treatment		
Treatment	N	Deviation from Mean
Active	27	0.000000
Placebo	32	0.405093

Kuiper Two-Sample Test (Asymptotic)					
K	0.405093	Ka	1.550191	Pr > Ka	0.1409

```

data React;
  input Stim Time @@;
  datalines;
1 1.94 1 1.94 1 2.92 1 2.92 1 2.92 1 2.92 1 3.27
1 3.27 1 3.27 1 3.27 1 3.70 1 3.70 1 3.74
2 3.27 2 3.27 2 3.27 2 3.70 2 3.70 2 3.74
;

proc npar1way wilcoxon data=React;
  class Stim;
  var Time;
  exact wilcoxon;
run;

```

## The SAS System

### The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable Time Classified by Variable Stim					
Stim	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
1	13	110.50	130.0	11.004784	8.500
2	6	79.50	60.0	11.004784	13.250
Average scores were used for ties.					

Wilcoxon Two-Sample Test	
Statistic (S)	79.5000
Normal Approximation	
Z	1.7265
One-Sided Pr > Z	0.0421
Two-Sided Pr >  Z	0.0843
t Approximation	
One-Sided Pr > Z	0.0507
Two-Sided Pr >  Z	0.1014
Exact Test	
One-Sided Pr >= S	0.0527
Two-Sided Pr >=  S - Mean	0.1054
Z includes a continuity correction of 0.5.	

Kruskal-Wallis Test	
Chi-Square	3.1398
DF	1
Pr > Chi-Square	0.0764

```
proc npar1way hl alpha=.02 data=React;
  class Stim;
  var Time;
  exact hl;
  ods select WilcoxonScores HodgesLehmann;
run;
```

#### The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable Time Classified by Variable Stim					
Stim	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
1	13	110.50	130.0	11.004784	8.500
2	6	79.50	60.0	11.004784	13.250
Average scores were used for ties.					

Hodges-Lehmann Estimation				
Location Shift (2 - 1) 0.3500				
Type	98% Confidence Limits		Interval Midpoint	Asymptotic Standard Error
Asymptotic (Moses)	0.0000	0.8200	0.4100	0.1762
Exact	0.0000	1.3300	0.6650	

```
data Mice;
  input Treatment $ Days @@;
  datalines;
1 1 1 1 1 3 1 3 1 4
2 3 2 4 2 4 2 4 2 15
3 4 3 4 3 10 3 10 3 26
;
```

```
proc npar1way savage data=Mice;
  class Treatment;
  var Days;
  exact savage;
run;
```

## The SAS System

### The NPAR1WAY Procedure

Savage Scores (Exponential) for Variable Days Classified by Variable Treatment					
Treatment	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
1	5	-3.367980	0.0	1.634555	-0.673596
2	5	0.095618	0.0	1.634555	0.019124
3	5	3.272362	0.0	1.634555	0.654472
Average scores were used for ties.					

Savage One-Way Analysis	
Chi-Square	5.5047
DF	2
Asymptotic Pr > Chi-Square	0.0638
Exact Pr >= Chi-Square	0.0445

