**Wilcoxon Sum Rank Test with Example**

1. Create a chart to show each subject scores on each condition where XA is their first condition and XB is the second condition score
2. Calculate the difference in a 4th column between XA and XB and include the sign
3. Calculate the mean difference of column XA-XB

|  |  |  |  |
| --- | --- | --- | --- |
| Subj. | **XA** | **XB** | **XA**—**XB** |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16 | 78 24 64 45 64 52 30 50 64 50 78 22 84 40 90 72 | 78 24 62 48 68 56 25 44 56 40 68 36 68 20 58 32 | 0 0 +2 —3 —4 —4 +5 +6 +8 +10 +10 —14 +16 +20 +32 +40 |
| mean difference = +7.75 | | | |

1. Create Column 5 by taking the absolute value of all results in Column 4
2. Create Column 6 by eliminating those with a difference of 0 and rank the remaining values from lowest to highest. If two or more ranks are the same take the mean of the ranks and use that for both (all) of them
3. Create Column 7 using Column 4 & Column 6 to give them Signed Ranks

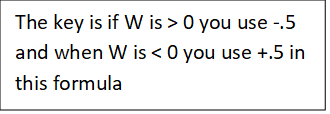
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Subj. | **XA** | **XB** | original **XA**—**XB** | absolute **XA**—**XB** | rank of absolute **XA**—**XB** | signed rank |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16 | 78 24 64 45 64 52 30 50 64 50 78 22 84 40 90 72 | 78 24 62 48 68 56 25 44 56 40 68 36 68 20 58 32 | 0 0 +2 —3 —4 —4 +5 +6 +8 +10 +10 —14 +16 +20 +32 +40 | 0 0 2 3 4 4 5 6 8 10 10 14 16 20 32 40 | --- --- 1 2 3.5 3.5 5 6 7 8.5 8.5 10 11 12 13 14 | --- --- +1 —2 —3.5 —3.5 +5 +6 +7 +8.5 +8.5 —10 +11 +12 +13 +14 |
| **W** = 67.0  **TN** = 14 | | | | | | |

1. Calculate the total of Column 7 to get value **W**
2. Calculate **N** value which is the number of subjects left after eliminating 0 values in Column 7
3. If **N** = 10 or **N**> 10 we can calculate a **Z-ratio**. If **N** < 10 see Burak for guidance
4. If your null hypothesis is that there will not be an effect, then in essence you are saying to accept your null hypothesis -http://vassarstats.net/textbook/mu.gif**W** = 0
5. For any particular value of N, it can be shown that the standard deviation of the sampling distribution of **W** is equal to

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | -http://vassarstats.net/textbook/sigma.gif**W** = **sqrt** | [ | N(N+1)(2N+1)  6 | ] |

which for the present example, with N=14, works out as

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | -http://vassarstats.net/textbook/sigma.gif**W** = **sqrt** | [ | 14(14+1)(28+1)  6 | ] | = ±31.86 |
|  |  |  |  |  |  |

1. Calculate the **Z-Ratio **

|  |  |  |  |
| --- | --- | --- | --- |
|  | **z** | = | **W**—.5  http://vassarstats.net/textbook/sigma.gif**W** |

For the present example, with N=14, **W**=67, and -http://vassarstats.net/textbook/sigma.gif**W**=±31.86, the result is

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **z** | = | 67—.5  31.86 | = +2.09 |

The key is if W is > 0 you use -.5 and when W is < 0 you use -.5 in this formula

1. Use the critical values chart of ±Z to determine significance at the .05 level. In this case, for a one-tailed hypothesis, 2.09 is significant at .025 much less .05 because it falls between 1.960 and 2.326

