

MANN-WHITNEY U TEST

This test is used to compare the results of a treatment on a randomly assigned group of subjects (from a between groups design)

A researcher wants to know if extensive training will improve a participant's score obtained when firing arrows at a board.

The results are as follows:

Group 1 (No Training)	1	2	3	4	5	6	7	8	9	10		
Score	4	10	12	18	7	13	12	2	9	27		
Group 2 (Training)	1	2	3	4	5	6	7	8	9	10	11	12
Score	21	26	20	22	32	5	12	6	8	24	29	9

1. DETERMINE THAT CONDITIONS FOR TEST ARE ACCEPTABLE:

- Data can be ranked
- Distribution is not normal
- Each participant is allocated at random to one and only one condition

2. STATE NULL AND ALTERNATIVE HYPOTHESES:

H_0 : Training has no effect on performance

H_a : Training improves performance

3. RANK SCORES FROM BOTH GROUPS TOGETHER (Lowest (1) to Highest (n))... USE MEAN OF RANKS FOR TIES:

- 1- 2
- 2- 4
- 3- 5
- 4- 6
- 5- 7
- 6- 8
- 7- 9, 9 } Use 7.5
- 8-
- 9- 10
- 10- 12, 12, 12 } Use 11
- 11
- 12
- 13- 13
- 14- 18
- 15- 20
- 16- 21
- 17- 22
- 18- 24
- 19- 26
- 20- 27
- 21- 29
- 22- 32

Group 1 (No Training)	1	3	3	4	5	6	7	8	9	10		
Score	4	10	12	18	7	13	12	2	9	27		
Rank	2	9	11	14	5	13	11	1	7.5	20		
Group 2 (Training)	1	2	3	4	5	6	7	8	9	10	11	12
Score	21	26	20	22	32	5	12	6	8	24	29	9
Rank	16	19	15	17	22	3	11	4	6	18	21	7.5

4. CALCULATE THE SUM OF RANKS (T) IN THE *SMALLER* SAMPLE GROUP:

$$T = \text{Group 1 Sum of Ranks} = \mathbf{93.5}$$

5. CALCULATE U FROM THE FOLLOWING FORMULA:

$$U = n_1n_2 + [n_1(n_1 + 1)]/2 - T = \mathbf{81.5}$$

where n_1 = number of participants in smaller sample and n_2 = number of participants in larger sample

6. CALCULATE U':

$$U' = n_1n_2 - U = \mathbf{38.5}$$

7. USING THE SMALLER VALUE OF U AND U', DETERMINE CRITICAL VALUE FROM TABLE:

Tabled value for a one-tailed test at the 5% level is 34 (and 24 at the 1% level). Since $38.5 > 34$, there is insufficient evidence to reject the null hypothesis.

8. STATE CONCLUSION:

There is not enough evidence to conclude that training improves performance in this task.