

THE SPEARMAN'S RANK CORRELATION

	X	u	Y	V	d	d ²
1	10.5	5	22.3	2	3	9
2	8.2	1.5	25.0	4.5	-3	9
3	11.3	6.5	24.6	3	3.5	12.25
4	9.1	3	26.1	6.5	-3.5	12.25
5	13.0	8	26.4	8	0	0
6	11.3	6.5	25.0	4.5	2	4
7	8.2	1.5	26.1	6.5	-5	25
8	10.1	4	21.6	1	3	9

CORRECTION
80.5

$\sum d^2 = 58$

Ranking for X

8.2	8.2	9.1	10.1	10.5	11.3	11.3	13.0
1	2	3	4	5	6	7	8
1.5	1.5	3	4	5	6.5	6.5	8

Ranking for Y

21.6	22.3	24.6	25.0	25.0	26.1	26.1	26.4
1	2	3	4	5	6	7	8
1	2	3	4.5	4.5	6.5	6.5	8

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2-1)} = 1 - \frac{6 * (58)}{8(64-1)} \approx 0.31$$

(Shortcut Formula)

$$r_s = \frac{SS_{uv}}{\sqrt{SS_{uu} SS_{vv}}}$$

$$r = \frac{SS_{xy}}{\sqrt{SS_{xx} SS_{yy}}}$$

u_i = Rank of ith obs. in sample 1
v_i = " " " " 2

X_i = ith observation in sample 1
Y_i = ith " " " 2

	U	V	U ²	V ²	UV
1	5	2	25	4	10
2	1.5	4.5	2.25	20.25	6.75
3	6.5	3	42.25	9	19.5
4	3	6.5	9	42.25	19.5
5	8	8	64	64	64
6	6.5	4.5	42.25	20.25	29.25
7	1.5	6.5	2.25	42.25	9.75
8	4	1	16	1	4
	<u>ΣU</u>	<u>ΣV</u>	<u>ΣU²</u>	<u>ΣV²</u>	<u>ΣUV</u>
	36	36	203	203	162.75

$$SS_{UV} = \sum UV - \frac{\sum U \sum V}{n} = 162.75 - \frac{36 \times 36}{8} = .75$$

$$SS_{UU} = \sum U^2 - \frac{(\sum U)^2}{n} = 203 - \frac{36^2}{8} = 41$$

$$SS_{VV} = \sum V^2 - \frac{(\sum V)^2}{n} = 203 - \frac{36^2}{8} = 41$$

$$r_B = \frac{SS_{UV}}{\sqrt{SS_{UU} SS_{VV}}} = \frac{.75}{\sqrt{41 \times 41}} \approx .018$$

AFTER THE CORRECTION,
THE DIFFERENCE
BETWEEN THE SHORTCUT
FORMULA (.0417)
AND THE FULL FORMULA
IS NOT SO BAD

Spearman's Test for Rank Correlation

$$H_0: \rho = 0$$

$$H_a: \rho \neq 0$$

$$H_0: \rho = 0$$

$$H_a: \rho > 0$$

$$H_0: \rho = 0$$

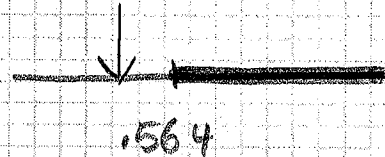
$$H_a: \rho < 0$$

$$r_s = .5$$

$$n = 10$$

$$r_s = .5$$

$$RR: r_s > .564$$



Fail to reject

Conclusion: "the data provide insufficient evidence, at $\alpha = .05$, to conclude that the Spearman's rank correlation coefficient is greater than zero."