The Spearman rho

The *Spearman rho* statistic is the only correlation statistic you can use when:

- ONE or BOTH X and Y variables are ORDINAL, i.e., Ranked , DATA

- Under the circumstance where only one variable is ORDINAL, the non-ordinal data must be ranked before proceeding.[1]

Rules for ranking:

- Begin by assigning a rank of 1 to the highest value in your data, a rank of 2 to the second highest, 3 to the third highest, and so on with the following stipulation, values that tie for two or more rank positions all receive the same rank, meaning an average of the rank positions they would otherwise occupy.

  - For example, if two scores tied for 2nd and 3rd place, give them both the average of those two ranks, *viz.*, 2.5, or (2+ 3)/2;

  - …if there were a tie for three positions, say 6th, 7th, & 8th, give them all the average of those three ranks, *viz.*, 7, or (6+7+8)/3; and,

  - …if there were four rank positions, say, 8th, 9th, 10th, and 11th, give them all a rank of 9.5, (8+9+10+11)/4.

The formula for the Spearman rho (r_s) is: **rho =** $1 - [6(\sum d^2) / N(N^2-1)]$

In this formula, the two 1s & the 6 are CONSTANTS.

To determine significance, use "**Table E** Values of r_s (Rank-Order Correlation Coefficient) at the 5% and 1% Levels of Significance…" appended to this document below.

df = N (the No. of pairs)

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[1] **When both your variables are interval or ratio data, always do a *Pearson r*. Statistically speaking, it is more a ROBUST measure of correlation meaning that if a correlation exists, the Pearson r will detect it sooner than the *Spearman rho*.**

Table E Values of r_S (Rank-Order Correlation Coefficient) at the 5% and 1% Levels of Significance (Two-Tailed Test)

N	5%	1%
5	1.000	—
6	.886	1.000
7	.786	.929
8	.738	.881
9	.683	.833
10	.648	.794
12	.591	.777
14	.544	.714
16	.506	.665
18	.475	.625
20	.450	.591
22	.428	.562
24	.409	.537
26	.392	.515
28	.377	.496
30	.364	.478

Source: Computed from E. G. Olds, "Distribution of the sum of squares of rank differences for small numbers of individuals," *Annals of Mathematical Statistics*, 1938, *9*, 133–48, and, "The 5% significance levels for sums of squares of rank differences and a correction," *Annals of Mathematical Statistics*, 1949, *20*, 117–18, by permission of the author and the Institute of Mathematical Statistics.