Calculation of Somers D

Somers' D is a non-parametric measure of association related to Kendall's Tau [ref]. Kendall's Tau can be expressed as the probability of "concordance" minus the probability of "discordance" between randomly selected pairs taken from two disparate but quantitative measures "A" and "B". In our application, "A" is a physiological outcome and "B" is a functional test outcome; for example "A" could be the cEQ Score from the Dynamic Posturography Test and "B" might be the 619 Completion Time measure from the Seat Egress and Walk Test. Because we are interested in comparing changes as a result of exposure to spaceflight and bed rest, the pair of sessions across which the changes are calculated is restricted to the same subject's test sessions (e.g. pre and first session post mission, first session post mission and last session post mission, etc.). "Concordance" means that the change within pairs of sessions for A and the corresponding change in B are in the same direction. "Discordance" means that the changes are in opposite directions. Somers' D is defined similarly, except that the probabilities are conditional, excluding ties in the first measure. Being a difference of two probabilities, Somers' D is scaled within the range of -1 (perfect discordance) to +1. Somers' D is a non-parametric measure of association related to Kendall's Tau (1, SDC 4). Kendall's Tau can be expressed as the probability of "concordance" minus the probability of "discordance" between randomly selected pairs taken from two disparate but quantitative measures "A" and "B". In our application, "A" is a physiological outcome and "B" is a functional test outcome; for example "A" could be the cEQ Score from the Dynamic Posturography Test and "B" might be the Completion Time measure from the Seat Egress and Walk Test. Because we are interested in comparing changes as a result of exposure to spaceflight and bed rest, the pair of sessions across which the changes are calculated is restricted to the same subject's test sessions (e.g. pre and first session post mission, first session post mission and last session post mission, etc.). "Concordance" means that the change within pairs of sessions for A and the corresponding change in B are in the same direction. "Discordance" means that the changes are in opposite directions. Somers' D is defined similarly, except that the probabilities are conditional, excluding ties in the first measure. Being a difference of two probabilities, Somers' D is scaled within the range of -1 (perfect discordance) to +1. (perfect concordance) between the two variables of interest. See (2, SDC 4) for details on how the standard error of D is calculated.

1. Kendall, M. G. and Gibbons, J. D. (1990). *Rank Correlation Methods*. 5th ed. London: Griffin

2. Newson, R. 2006. Confidence intervals for rank statistics: Somers D and extensions. The Stata Journal Vol 6, No. 3 : 309 -334.