

# Validity of Bardo and Hughey's Monte Carlo Simulation

John W. Bardo and Joseph Hughey

In a recent paper (Bardo & Hughey, 1978), relationships between central tendency error and the expected magnitude of Cronbach's coefficient of reliability, alpha, were explored using a Monte Carlo simulation. As a test of the validity of this original simulation, inter-scale correlations (Pearson product-moment correlation coefficients) were examined using the same technique and data sets.

Two sets of 50,000 random numbers (scores) with a range of 1 to 5 were generated from an extensive table of random numbers; for details see Bardo and Hughey (1978). To eliminate all scores outside the acceptable range, a transformation procedure was utilized that allowed maintenance of the original qualities of randomness. One distribution was totally random and the second was central tendency biased (there were 12.94% 1's, 24.10% 2's, 25.96% 3's, 24.12% 4's and 12.94% 5's). Each distribution was then divided into 100 5-item "tests" with 100 "responses" to each item. A total of 2500 correlation coefficients were calculated for each distribution.<sup>2</sup> For the random distribution, 113 (.045%) correlation coefficients were significant at  $p \leq .05$  while for the central tendency biased distribution 131 (.052%) coefficients were significant. Calculation of the significance of a difference between proportions test showed that even with the large  $N$ s the difference between these two proportions was insignificant ( $z = 1.16, p > .05$ ).

These results would be expected if the data sets generated were random and the distributions unskewed. For both data sets, correlation coefficients tended to be low, and roughly the expected proportion was significant. These results tend to support the efficacy of procedures used to generate the two random number sets and the assertion that only central tendency error was operating. Other forms of systematic error would tend to result in skewed distributions; see Guilford (1954) and Nunnally (1967).

## REFERENCES

- BARDO, J., & HUGHEY, J. A Monte Carlo simulation of effects of central tendency error on the magnitude of Cronbach's coefficient alpha. *Perceptual and Motor Skills*, 1978, 46, 308-310.
- GUILFORD, J. *Psychometric methods*. New York: McGraw-Hill, 1954.
- NUNNALLY, J. *Psychometric theory*. New York: McGraw-Hill, 1967.

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<sup>2</sup>Due to computer program limitations, each set of tests was divided in half and correlation matrices were calculated for each half.