Lord and Novick (1968) noted that test scores have a tendency to violate both the assumption of linearity and homoscedasticity at the extremes of a distribution. Empirical data exist that suggest these violations are not uncommon. In particular, several researchers have found concave relationships between test scores and criteria (Arneson et al., 2011; Cullen et al., 2004; Lee & Foley, 1986).

In addition, corrections are generally not robust to violations of the linearity assumption. For example, some (e.g., Greener & Osburn, 1979, 1980; Gross, 1982; Gross & Fleischman, 1983) have investigated how correction procedures perform when either (or both) of these assumptions are violated. Greemer and Osburn (1980) noted that corrected estimates generally perform poorly, and in some cases lead to overcorrection (depending on the form of the distribution, Gross & Fleischman, 1983). In addition, Gross and Fleishman (1987) concluded that unless X and Y are strongly correlated and the sample size is large, it may be best to leave estimates uncorrected.

Given these problems, Culpepper (2016) developed a correction for nonlinear relationships that was adapted from the econometrics literature. His correction assumes indirect range restriction. His Monte Carlo investigation concluded that his estimate yielded unbiased estimates of ρ.