The ordered alternatives in a one-way layout with k ordered treatment levels are appropriate for many applications, especially in psychology and medicine. There is extensive literature in this area, and many parametric and nonparametric approaches have been introduced. Abelson-Tukey (AT) test is a frequently used parametric method. Its coefficients provide an ideal way of combining means for the purpose of detecting a monotonic relationship between the independent and dependent variables. The AT method, though, is not robust. Furthermore, our initial empirical studies show that it is not more powerful than the Jonckheere-Terpstra (JT) and the Hettmansperger-Norton (HN) nonparametric tests at normal errors for moderate sample sizes. These nonparametric tests, unlike the AT test, are not easily extended to general linear and mixed models.

For this study, we have developed a rank-based procedure which has the same optimal efficacy properties as the HN procedure for the ordered and umbrella alternative problems, including the unknown peak problem. It is a rank-based procedure and is easily extended to linear, mixed and covariance models. This procedure can utilize general score functions.