A simulation study of multiple comparison procedures for differences in proportions

This study concerns the use of multiple comparison procedures following a significant Chi-square test or Fisher’s Exact test. Ten thousand 2x3 matrices of data were simulated from a binomial distribution for various combinations of $n (= 20, 50, 100, 200)$ and $p (= 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9)$. Three different methods were examined: the chi-square test followed by pairwise chi-square tests, Fisher’s exact test followed by pairwise Fisher’s exact tests, a combination of the chi-square test and Fisher’s exact test when more than 20% of the expected counts were less than 5, and the chi-square test followed by Cohen’s multiple comparisons (Cohen, 1967). Type I error and power were estimated for each procedure. All simulations were performed in R v.3.2.2.