COMPARING THE TECHNIQUES FOR SAMPLE SIZE CALCULATIONS IN WILCOXON SIGNED RANKS TEST: A SIMULATION STUDY

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Sample size calculation is one of the most important steps in experimental design. Since sample size is a major factor that affects the power of the test, in well-planned research, the question of an appropriate sample size is crucial. Some authors calculate the power after conducting the test while the others, consider the power of a statistical test before conducting it. Choosing an inappropriate sample size results not only in the waste of time and money resources, but also in obtaining low power value and therefore not reaching the initial aims. Sample size for the parametric tests needs the population error variance, the effect size, the level of significance and the power of the test must be considered. On the other hand, for the nonparametric tests researchers only need the positive ratio of the differences between repeated measurements. In this simulation study, we aimed to compare the parametric approach with two nonparametric methods, rank test and Noether that are used to calculate the sample size for the Wilcoxon signed ranks test.

For the simulation, by randomization technique, we produced populations each of which consisted of one million pairs on Delphi platform using positive ratio values like 0.60, 0.70, 0.80, and 0.90 for a desired period. Using these populations, we made 500, 1000, 5000, and 10000 times random samples of 7, 8,,....,25 pairs. For each trial, we calculated the power values of the samples by using parametric method, signed test and Noether functions. We graphically showed the change in power values according to the sample size chosen and the positive ratio.

The study shows that although parametric approach has higher power values when compared to nonparametric approaches, it requires bigger sample size than the other two approaches. Another result we obtained is that Noether approach always provides both higher power and low sample size values when compared to the rank test.

As a result, when at least 80% power value is desired, it's observed that for the sample size for Wilcoxon signed test, Noether approach is more appropriate than both parametric and rank test. Therefore, we suggest the use of the Noether approach to calculate the sample size for the application of Wilcoxon signed test. We will redesign the online computer program that will calculate the required sample size for the Wilcoxon signed ranks test.