The validity of statistical inference depends on proper randomization methods. However, even with proper randomization, we can have imbalanced with respect to important characteristics. In this paper, we introduce a method based on ranked auxiliary variables for treatment allocation in crossover designs using Latin squares models. We evaluate the improvement of the efficiency in treatment comparisons using the proposed method.

Our simulation study reveals that our proposed method provides a more powerful test compared to simple randomization with the same sample size. The proposed method is illustrated by conducting an experiment to compare two different concentrations of titanium dioxide nanofiber (TDNF) on rats for the purpose of comparing weight gain.

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