

A Report on the Requirements of Rigorous Research



In the present scenario, biostatistics has a great importance in medical research to improve the existing goals of policy-making in public health. It also plays a supreme role in helping take decisions pertaining to the benefits for humankind. Further, it helps make conclusions about the efficacy of the new drug and in the establishment of new diagnostic methods along with the verification of proposed medical therapies. Medical data are generated for verifying adverse effects with the objective of evaluating safety of new drugs that are carried out on human beings.

Thus, for the aforesaid purposes, medical professionals and researchers need some statistical tools and tests of significance for analyzing data generated from their medical research study.

The principal purpose of this editorial is to develop better understanding about choosing a best statistical test on the basis of the type of data. Most of the medical professionals today are adequately aware of descriptive statistics (central tendencies and dispersion) but are feeble at inferential statistics (test of significance).

In existing literature, there are multiple tests available for analyzing data, but the major concern lies in choosing the most appropriate one. While selecting a statistical test, a researcher should ask logical questions concerning the rationale of the study and the relationship of the outcome of the proposed study to the existing one.

The choice for an appropriate statistical test should be based on the type of data collected and design of the study. If one is not able to frame the hypothesis regarding the research question being pursued, they would not be able to apply any statistical test for the study. In other words, the nature of hypothesis plays a crucial role in determining the statistical test that would follow.

All statistical tests are majorly divided into groups: parametric and nonparametric. Parametric tests are used when the data are normally distributed, i.e., when most cases fall in the center of the distribution. However, when the data are nonparametric, i.e., when there is a significant skew (concentration of data on either side of the distribution), nonparametric tests should be used. They are also recommended when the sample size is

too small (<25 or 30 cases). In the present editorial, one type of parametric test is discussed as described below.

Student's *t*-test

It is one of the most common parametric statistical tests used in the scientific community. The Student's *t*-test has further categorization: paired and unpaired *t*-test.

- a. Paired *t*-test: This statistical test is used when the research question is: "Is there a difference on the dependent variable of interest (such as self-reported appetite on a scale of 1–10) before and after the administration of a drug?" This type of pairing involves observations across two conditions that are related to one another. Or we may take a set of individuals who are related to one another (such as mother-daughter dyads) and see whether or not there is a significant difference between the mother and daughter group scores on cholesterol level
- b. Unpaired or independent samples *t*-test: This test is used when the research question is: "Is there a difference between the effect of the treatment in two independent groups?" For example, when we want to compare the efficacy of a drug on the appearance of some symptoms, we can recruit a set of participants (unrelated to one another) that can be randomly assigned into "treatment" or "no-treatment" group. Then, the independent samples *t*-test would specify whether the difference in the scores on the symptoms between both the groups is because of the drug or because of random variation in participants (if the *t*-statistic does not reach a value of significance).

A researcher should always bear in their mind that the selection of parametric or nonparametric tests, along with their right subtype, has immense influence on the kind of conclusions we make, as well as the degree to which we correctly inform the scientific community. True value addition is possible only when scientists follow theoretical, technical and statistical rigor throughout the course of their research study and beyond!


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