Scientific rigor

Scientific rigor is the strict application of the scientific method to ensure unbiased and well-controlled experimental design, methodology, analysis, interpretation, and reporting of results.

Methodological quality refers to the level of rigor and validity in the design, implementation, and analysis of a research study. In other words, it refers to how well a study has been conducted and how confident we can be in its findings.

Some factors that can affect methodological quality include the sampling method, data collection techniques, the use of appropriate measures and statistical analyses, the control of confounding variables, and the reporting of results. A study with high methodological quality is more likely to produce reliable and accurate results and to be considered trustworthy by other researchers and the scientific community.

In today's climate of high healthcare costs and limited research resources, much attention has been given to inefficiency in research. Open access to research data has been proposed as a way to pool resources and make the most of research funding while also promoting transparency and scientific rigor.

Progress in basic and clinical research is slowed when researchers fail to provide a complete and accurate report of how a study was designed, executed, and the results analyzed. Publishing rigorous scientific research involves a full description of the methods, materials, procedures, and outcomes. Investigators may fail to provide a complete description of how their study was designed and executed because they may not know how to accurately report the information or the mechanisms are not in place to facilitate transparent reporting. Prager et al. provided an overview of how authors can write manuscripts in a transparent and thorough manner. They introduced a set of reporting criteria that can be used for publishing, including recommendations on reporting the experimental design and statistical approaches. They also discuss how to accurately visualize the results and provide recommendations for peer reviewers to enhance rigor and transparency. Incorporating transparency practices into research manuscripts will significantly improve the reproducibility of the results by independent laboratories. [1)].

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Prager EM, Chambers KE, Plotkin JL, McArthur DL, Bandrowski AE, Bansal N, Martone ME, Bergstrom HC, Bespalov A, Graf C. Improving transparency and scientific rigor in academic publishing. Cancer Rep (Hoboken). 2019 Feb;2(1):e1150. doi: 10.1002/cnr2.1150. Epub 2018 Dec 2. PMID: 32721132.