10.5005/jp-journals-10024-2097

EDITORIAL

P-hacking

[1]A Thirumal Raj, [2]Shankargouda Patil, [3]Sachin Sarode, [4]Gargi Sarode

How to cite this article: Raj AT, Patil S, Sarode S, Sarode G. P-hacking. J Contemp Dent Pract 2017;18(8):633-634.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Due to increasing rate of research articles getting published in recent times, medical science is evolving very fast. Open access policies of the journals make information easily available to the stakeholders for building future research proposal. Blindly having faith in whatever is published in the literature is detrimental for science; however, it is hard to find out the correctness of the data analysis.

P-hacking is a form of data manipulation wherein only selected data are included to obtain a statistically significant result.[1] The culture of P-hacking is instigated by the institutions, grant commissions, and journals where the possibility of obtaining positive results are prioritized over the methodological strength of a study.[2,3] There are several detrimental effects of P-hacking, ranging from researchers wasting their time and money in exploration of the results of a P-hacked study which had produced false-positive results. These individual P-hacked studies could cause drastic changes to the result of meta-analysis, based on which most interventional studies are formulated.[4] Thus, P-hacking may indirectly result in significant health hazards to the patients. Thus, it is of utmost importance to identify possible P-hacking in studies before accepting them in a journal or including them in systematic reviews or a meta-analysis.

[1]Department of Oral Pathology and Microbiology, Sri Venkateswara Dental College and Hospital, Chennai, Tamil Nadu, India

[2]Division of Oral Pathology, Department of Diagnostic Sciences College of Dentistry, Jazan University, Jazan, Kingdom of Saudi Arabia

[3,4]Department of Oral Pathology and Microbiology, Dr. D. Y. Patil Dental College & Hospital, Dr. D.Y. Patil Vidyapeeth, Pune Maharashtra, India

Corresponding Author: A Thirumal Raj, Department of Oral Pathology and Microbiology, Sri Venkateswara Dental College and Hospital, Chennai, Tamil Nadu, India, e-mail: thirumalraj666@gmail.com

Identifying P-hacking using P-curve and the Two-tailed Sign Test

A P-curve represents the distribution of p-values from studies with similar research questions. Although interpreting the P-curve may not confirm the presence/absence of P-hacking, it may serve as a screening tool to assess the validity of a published research.[1]

Interpreting the P-curve

Step 1: Most studies consider a p-value less than 0.05 as statistically significant. In such studies, one has to observe the distribution pattern of the p-values, especially below the significant value, i.e., between 0 and 0.05.

Step 2: The next step involves interpretation of the direction of the distribution. In a study with true significant effect (i.e., p-values less than 0.05), the distribution of p-value will have a right skew. In studies with true nonsignificant results, the distribution of p-value will have a left skew.[1,5]

The two-tailed sign test is used in combination with the P-curve analysis to identify possible P-hacking. It consists of two p-value ranges, $0<p<0.025$ and $0.025<p<0.05$. This test is based on the assumption that there would be an equal distribution of p-value in the two p-value ranges under a null hypothesis.

By combining the characteristic of the P-curve with the results of the two-tailed test, we increase the chances of identifying possible P-hacking.

Interpretation 1: In a study with a truly significant result, P-curve exhibits right skew. The two-tailed test

would show the p-values being equally distributed among the two p-value ranges, $0<p<0.025$ and $0.025<p<0.05$.

Interpretation 2: In a study with the true nonsignificant result, P-hacking (to obtain significant result) would result in a drastic left skewing of the p curve. Further, the two-tailed test would show the majority of the p-values being categorized within the range of $0.025<p<0.05$.[1]

Although such methods aid in identifying P-hacking, it is unfortunate that the data obtained from current researchers need such validation. It is vital that the scientific community incorporate positive changes to its research policies, enabling the researchers to prioritize the methodological strength of the study over the possibility of obtaining statistically significant results. Until then the incidence of P-hacking will increase, leading to a subsequent decrease in scientific progress.

RECOMMENDATIONS

It is said that prevention is better than cure. Identification of such research papers at the time of submission could prevent dissemination of wrong information in the international community. For the same, it is recommended that journals have software that can detect P-hacking at submission stage and mode of actions can be framed for problematic papers. This will be similar to plagiarism check done by publishers at the initial stage of submission.

REFERENCES

1. Head ML, Holman L, Lanfear R, Kahn AT, Jennions MD. The extent and consequences of p-hacking in science. PLoS Biol 2015 Mar;13(3):e1002106.
2. Ioannidis JPA. Why most published research findings are false. PLoS Med 2005; 2(8):e124.
3. Fanelli D. Negative results are disappearing from most disciplines and countries. Scientometrics 2012 Mar; 90(3): 891-904.
4. Jennions MD, Møller AP, Hunt J. Meta-analysis can "fail": reply to Kotiaho and Tomkins. Oikos 2004 Jan;104(1): 191-193.
5. Mariscampo EJ, Lalande DR. A peculiar prevalence of p-values just below .05. Q Rev Biol. 2012;65:2271-2279.