Review of: "Intersections of Statistical Significance and Substantive Significance: Pearson's Correlation Coefficients Under a Known True Null Hypothesis"

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Potential competing interests: No potential competing interests to declare.

Review of the Manuscript: "Intersections of Statistical Significance and Substantive Significance: Pearson's Correlation Coefficients Under a Known True Null Hypothesis"

Summary of Content

Context and Objective

The article argues against the abolition of the use of "statistical significance" as suggested by editors of the American Statistical Association (ASA).

It asserts that statistical significance is crucial to reduce misinterpretation of substantive significance, especially in small sample sizes.

Method

Empirical sampling distributions of 4950 bivariate correlations calculated with independent and identically distributed (iid) variables were used for five sample sizes (n = 4, 30, 100, 1000, 2000).

Hypothesis tests were conducted using the "Fisher" option in PROC CORR from SAS, with a significance level $\alpha = 0.05$.

Results

Small sample sizes ($n < 1000$) exhibit a high proportion of effect size errors, which could be misinterpreted as substantively significant without statistical significance tests.

For large sample sizes (n = 1000 and 2000), the need for Fisher's r to z transformation decreases as the sampling distribution approaches normality.

Critical Evaluation

Strengths

Clarity and Didactic Nature: The article is clear and didactic, making it particularly useful for students and non-specialist researchers.

Limitations

Limited Contribution: The manuscript does not provide a significant contribution to the discussion of the problem of significance. It is merely a didactic illustration with no originality compared to the previous work of Komaroff (2020).

Inadequate Discussion: The discussion should focus on the fallacies of rejecting and accepting H0, as highlighted by Spanos (2014).

Relevant Excerpt from Spanos (2014)

"Indeed, the real problem does not lie with the P value or the accept/reject rules as such, but with how such results are transformed into evidence for or against a hypothesis H0 or H1.

The large n constitutes an example of a broader problem known as the fallacy of rejection: (mis)interpreting reject H0 (evidence against H0) as evidence for a particular H1; this can arise when a test has very high power, e.g., large n. A number of attempts have been made to alleviate the large n problem, including rules of thumb for decreasing a as n increases; see Lehmann (1986). Due to the trade-off between the Type I and II error probabilities, however, any attempt to ameliorate the problem renders the inference susceptible to the reverse fallacy known as the fallacy of acceptance: (mis)interpreting accept H0 (no evidence against H0) as evidence for H0; this can easily arise when a test has very low power; e.g., a is tiny or n is too small.

These fallacies are routinely committed by practitioners in many applied fields. After numerous unsuccessful attempts, Mayo (1996) provided reasoned answers to these fallacies in the form of a post-data severity assessment."

Conclusion

Komaroff's manuscript is a didactic illustration that does not make a significant contribution to the academic discussion on the problem of statistical significance. Furthermore, the article fails to focus on the fallacies of rejecting and accepting H0, as discussed by Spanos (2014). Therefore, I recommend rejecting the manuscript.

References

Spanos, A. (2014). Recurring controversies about P values and confidence intervals revisited. Ecology, 95(3), 645–651. https://doi.org/10.1890/13-1291.1

Komaroff, E. (2020). Relationships between p-values and Pearson correlation coefficients, Type 1 errors and effect size errors, under a true null hypothesis. Journal of Statistical Theory and Practice, 14, 49. https://doi.org/10.1007/s42519-020-00115-6