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The role of background assumptions in severity appraisal

In the past decade discussions around the reproducibility of scientific findings have led to a re-appreciation of the importance of guaranteeing claims are severely tested. The inflation of Type 1 error rates due to flexibility in the data analysis is widely considered one of the underlying causes of low replicability rates. Solutions, such as study preregistration, are becoming increasingly popular to combat this problem.

Preregistration only allows researchers to evaluate the severity of a test, but not all preregistered studies provide a severe test of a claim. The appraisal of the severity of a test depends on background information, such as assumptions about the data generating process, and auxiliary hypotheses that influence the final choice for the design of the test. In this article, I will discuss the difference between subjective and inter-subjectively testable assumptions underlying scientific claims, and the importance of separating the two. I will stress the role of justifications in statistical inferences, the conditional nature of scientific conclusions following these justifications, and highlight how severe tests could lead to inter-subjective agreement, based on a philosophical approach grounded in methodological falsificationism. Appreciating the role of background assumptions in the appraisal of severity should shed light on current discussions about the role of pre-registration, interpreting the results of replication studies, and proposals to reform statistical inferences.