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Frequentist, Bayesian Analysis and Complementary Statistical Tools for Geriatric and Rehabilitation Fields: Are Traditional Null-hypothesis Significance Testing Methods Sufficient?

Dahan da Cunha Nascimento[1]

[1]Graduate Program in Physical Education, Physical Education Department, Universidade Católica de Brasília, Distrito Federal, Brazil.

Dahan da Cunha Nascimento

ABSTRACT

Null hypothesis significant testing (NHST) is the dominant statistical approach in the geriatric and rehabilitation fields. However, NHST is routinely misunderstood or misused. In this case, the findings from clinical trials would be taken as evidence of no effect, when in fact, a clinically relevant question may have a "non-significant" *p*-value. Conversely, findings are considered clinically relevant when a significant difference is observed between groups. To assume that *p*-value is not an exclusive indicator of an association or the existence of an effect, researchers should be encouraged to report other statistical analysis approaches as Bayesian analysis and complementary statistical tools alongside the *p*-value (e.g., effect size, confidence intervals, minimal clinically important difference, and magnitude-based inference) to improve interpretation of the findings of clinical trials by presenting a more efficient and comprehensive analysis. However, the focus on Bayesian analysis and secondary statistical analyses does not mean that NHST is less important. Only that, to observe a real intervention effect, researchers should use a combination of secondary statistical analyses in conjunction with NHST or Bayesian statistical analysis to reveal what *p*-values cannot show. This paper provides potential insights for improving scientific data interpretation in rehabilitation and geriatric fields by utilizing Bayesian and secondary statistical analyses to better scrutinize results of clinical trials where a *p*-value alone may not be appropriate to determine efficacy of an intervention.

Supplementary materials

1 SUPPLEMENTARY_FILE.xlsx
INDEPENDENT_BAYESIAN_T-TEST.jasp

JASP_BAYESIAN_ANOVA.jasp

SPSS_INPUT.sav

OUTPUT_SPSS.spv