

Why ANCOVA Should Be Standard Practice in Rehabilitation Clinical Trials?

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Randomized Controlled Trials (RCTs) in rehabilitation often involve heterogeneous patient populations and small sample sizes, making precise estimation of treatment effects challenging. Analysis of covariance (ANCOVA) is gaining prominence as a superior statistical method in RCTs, especially in rehabilitation sciences, due to its ability to adjust for baseline differences and increase statistical power compared to unadjusted or change-score analyses.^{1,2} This adjustment is important in rehabilitation trials where there is a huge variation in functional status at the baseline level.

Recent methodological studies reveal that ANCOVA provides unbiased, more precise and highly statistically enhanced estimation of treatment effects, even when model assumptions are moderately violated.³ For example, Wang et al. reported that ANCOVA ensures the integrity of inferential conclusions and enhances power in trials with continuous and binary outcomes.⁴ Additionally, ANCOVA can decrease the required sample sizes by up to 25%, maximizing resource efficiency in clinical research.⁵

In rehabilitation sciences, where intervention protocols are complex and multi-component and the outcomes are multi-dimensional, ANCOVA's ability to control for baseline heterogeneity enhances interpretability and trial rigour.⁶ Therefore, ANCOVA should be the standard analytic approach in rehabilitation RCTs to ensure accurate and efficient evaluation of therapeutic interventions.

Before using the ANCOVA, it must be noted that the dependent variable must be continuous and must be normally distributed, the covariate must be a continuous quantitative variable, the levels of the qualitative variable must be independent⁷, the dependent variable and covariate should have a linear relationship⁸ the positive or negative sign and magnitude of the correlation coefficient at each level of the qualitative variable should be similar between the dependent variable and the covariate.⁹ In other words, there should be equality of regression slopes⁷ there should be no relationship between the independent variable and the covariate variable.¹⁰

How to correctly report the ANCOVA results:

- Revealing the correlation coefficient and statistically significant P-value of assessing the association between the covariate and dependent variable.¹⁰
- Revealing the insignificant relationship between the independent variable and covariate variable, and thus the homogeneity of slope of regression lines.
- Tabular representation of means of the dependent variable before and after the adjustment of the impact of the covariate, as well as revealing the p-value of the means comparison separately.

References

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