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**Unveiling Heterogeneity in Data Transformation Procedures: A Systematic Review, Meta-Analysis, and Empirical Investigation of Psychophysiological Outcome Measures**

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**Abstract** (181 words)

Psychophysiological signals are commonly used outcome measures in the field of psychology. Data of these measures are usually not normally distributed, which is why researchers apply different data transformation procedures. Importantly, there is a lack of knowledge regarding the heterogeneity of transformation procedures and how it influences statistical power across various psychophysiological measures and analyses, with an additional absence of guidance for selecting appropriate transformations.

To fill this gap, the current project aims at (1) reviewing the literature on transformation procedure heterogeneity and reporting standards for multiple outcome measures (e.g., skin conductance, heart rate, electromyography), as well as (2) examining the impact of different transformation specifications on statistical power and reliability using empirical and simulated datasets in the field of human fear conditioning as a case example.

Preliminary results underscore the urgent need for standardized reporting practices and reveal the complexity of transformation choices across measures. The ultimate goal of this work is to provide researchers with a comprehensive guide for selecting appropriate transformation approaches, offering insights into test-specific statistical assumptions and a practical overview of data transformation procedures. The results will contribute to improving methodological reporting and transformation standards in biopsychological research, thereby further enhancing robustness and replicability.

**Keywords**

data transformation, statistical power, fear conditioning, psychophysiology, meta-analysis,

systematic review