Contribution ID: **277** Type: **Oral Presentation**

About the (Non-) Invariance of Sensing Data

Thursday 24 July 2025 10:00 (15 minutes)

In recent years, psychological research has increasingly utilized novel (often digital) data sources. Sensing data, such as those collected from smartphones, enable researchers to monitor human behavior across diverse, ecologically valid contexts and extended periods with relative ease. These rich datasets offer great potential for predicting psychological traits, such as personality facets, through approaches like personality computing and machine learning. While previous research shows promising results, the quality and comparability of sensing data —both within and across studies —remain challenges. Smartphone sensing data, for example, are not only influenced by different preprocessing steps, but can also depend on the used hardware, the respective operating system and to some degree even on the version of a specific app. Consequently, measurements derived from sensing data may contain systematic biases unrelated to the intended behavioral constructs. To address these issues, this project adopts a measurement invariance perspective for analyzing sensing data. We adapt and apply methods from latent variable modeling to ensure comparability between data from different devices. Additionally, we explore potential biases introduced by "non-invariant"sensing variables and discuss their implications for subsequent statistical modeling.

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Session Classification: Symposium : "Measurement and Machine Learning"