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Latent variable models for harmonization of ordered scales from different observational studies: A case study on memory

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Combining data from different studies has a long tradition within the scientific community. It requires that the same information is collected from each study to be able to pool data. When studies have implemented different methods or instruments for measuring the same characteristics (e.g. questionnaires), the observed variables need to be harmonized in some way to obtain equivalent content information. This paper formulates the main concepts for harmonizing ordered scales from different observational studies in terms of latent variable models. These concepts are not new since they are related to the theory of measurement reliability and invariance principles for measuring complex constructs, but they have not been formulated explicitly before. It is demonstrated that harmonization requires one of the weakest forms of invariance. Additionally, it needs a large value for a special subject-specific intraclass correlation coefficient for all participating subjects in all studies. Multiple bridge scales, which are scales that connect all of the different studies, are necessary to be able to test the underlying assumptions of harmonization. The concepts of harmonization are demonstrated on multiple memory scales from three different Canadian studies.

Biography

Edwin R Van Den Heuvel performed a PhD in Mathematical Statistics at the University of Amsterdam in 1996. He changed his career to industrial statistics at IBIS UvA, a consultancy institute at the University of Amsterdam. In 2002, he became Director of the Statistical Department of the pharmaceutical company MSD. He has received a Fellowship at the Eindhoven University of Technology (TU/e) and a part-time position as Professor in Statistics for Life Sciences at the University of Groningen. In 2010, he became a Professor in Medical Statistics at the University Medical Center Groningen, but holds now a chair in statistics at the mathematics department of Eindhoven University of Technology.

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