Applied Psychological Measurement
2021, Vol. 45(5) 386–388

DOI: 10.1177/01466216211013106
journals.sagepub.com/home/apm
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PROsetta: An *R* Package for Linking Patient-Reported Outcome Measures

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Abstract

A common problem when using a variety of patient-reported outcomes (PROs) for diverse populations and subgroups is establishing a harmonized scale for the incommensurate outcomes. The lack of comparability in metrics (e.g., raw summed scores vs. scaled scores) among different PROs poses practical challenges in studies comparing effects across studies and samples. Linking has long been used for practical benefit in educational testing. Applying various linking techniques to PRO data has a relatively short history; however, in recent years, there has been a surge of published studies on linking PROs and other health outcomes, owing in part to concerted efforts such as the Patient-Reported Outcomes Measurement Information System (PROMIS®) project and the PRO Rosetta Stone (PROsetta Stone®) project (www.prosettastone.org). Many R packages have been developed for linking in educational settings; however, they are not tailored for linking PROs where harmonization of data across clinical studies or settings serves as the main objective. We created the `PROsetta` package to fill this gap and disseminate a protocol that has been established as a standard practice for linking PROs.

Keywords

R package, linking, PROsetta

The `PROsetta` package provides an integrated environment where multiple linking procedures—item response theory (IRT) characteristic curve methods (Schalet et al., 2014), fixed-parameter (Kaat et al., 2018), calibration calibrated projection (Thissen et al., 2011), and equipercentile score linking (Kolen & Brennan, 2014) —can be evaluated and compared based on a single-group design with an objective of linking closely-related patient-reported outcomes (PROs; Cella et al., 2010) to a harmonized metric (Dorans, 2007). The package provides wrapper functions to connect input/output objects with five primary packages: `equate` (Albano, 2016), `lavaan` (Rosseel, 2012), `mirt` (Chalmers, 2012), `plink` (Weeks, 2010), and `psych` (Revelle, 2019).

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The package includes a data loading function, `loadData`, and eight structured procedures: `runFrequency`, `runDescriptive`, `runClassical`, `runCFA`, `runCalibration`, `runLinking`, `runEquateObserved`, and `runRSSS`. It also provides extensions of `plot` and `summary` functions. A Shiny app can be accessed with `PROsetta()`, which allows the user to run the procedures on a point-and-click basis.

The `PROsetta` package is freely available on CRAN (https://CRAN.R-project.org/package=PROsetta/) and GitHub (https://github.com/choi-phd/PROsetta). The package includes detailed documentation, sample data files, and a vignette replicating a published study introducing the `PROsetta` methodology (Choi et al., 2014).

Development of the `PROsetta` package was funded in part by the Office of The Director, National Institutes of Health (OD) under award number 4U24OD023319-02, with co-funding from the Office of Behavioral and Social Sciences Research (OBSSR). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Supplemental Material

Supplementary material is available for this article online https://github.com/choi-phd/PROsetta.

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