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A reduced factor structure for the PROQOL–HIV questionnaire provided reliable indicators of health-related quality of life

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Abstract

Objectives: To identify a simplified factor structure for the PROQOL–human immunodeficiency virus (HIV) questionnaire to improve the measurement of the health-related quality of life (HRQL) of HIV-positive patients in clinical care and research settings.

Study Design and Setting: HRQL data were collected using the eight-dimension PROQOL-HIV questionnaire from 2,537 patients (VESPA2 study). Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) validated a simpler four-factor structure and assessed measurement invariance (MI). Multigroup analysis assessed the effect of sex, age, and antiretroviral therapy (ART) on the resulting factor scores. Correlations with symptom and Short Form (SF)-12 self-reports assessed convergent validity.

Results: Item analysis, EFA, and CFAs confirmed the validity [comparative fit index (CFI), 0.948; root mean square error of approximation, 0.064] and reliability (α's $\geq$ 0.8) of four dimensions: physical health and symptoms, health concerns and mental distress, social and intimate relationships, and treatment-related impact. Strong MI was demonstrated across sex and age (decrease in CFI $<$0.01). A multiple-cause multiple-indicator model indicated that HRQL correlated as expected with sex, age, and the ART status. Correlations of HRQL, symptom reports, and SF-12 scores evidenced convergent validity criterion.

Conclusion: The simplified factor structure and scoring scheme for PROQOL-HIV will allow clinicians to monitor with greater reliability the HRQL of patients in clinical care and research settings.

Keywords: Psychometrics; Health-related quality of life; HIV; Measurement invariance; Factor analysis; Structural equation modelling

Abbreviations: PHS01, tiredness; PHS02, sleeping; PHS03, concentration; PHS04, memory; PHS05, daily activities; PHS06, phyical activities; PHS07, digestive problems; PHS08, pain; PHS09, appetite; PHS10, weight change (BC01 in the 8-factor scoring scheme); PHS11, skin problems (BC02); REL01, body shape change (BC03); REL02, phyical appearance (BC04); REL03, social life (SR01); REL04, family (SR02); REL05, love life (IR01); REL06, sexual desire (IR02); REL07, sexual (IR03); COG01, HIV disclosure (ST01); COG02, infecting others (ST02); COG03, sadness (ED01); COG04, anxiety (ED02); COG05, irritability (ED03); COG06, depression (ED04); COG07, stress (HC01); COG08, result-related stress (HC02); COG09, disease worsening (HC03); COG10, catching infections (HC04); TRT01, treatment bother; TRT02, satisfaction; TRT03, side effects; TRT04, size of pills; TRT05, number of pills; TRT06, daily intake; TRT07, treatment-related stigma; TRT08, treatment acceptability; TRT09, impact of treatment; TRT10, adherence.

Conflict of interest: None.

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1. Introduction

The PROQOL−human immunodeficiency virus (HIV) questionnaire was developed to measure the health-related quality of life (HRQL) of people living with HIV disease [1] in routine care, clinical trials, and operational research. It was designed to be sensitive to highly active antiretroviral therapy (ART), disease stage, and applicable across diverse populations, features which were otherwise lacking in older HRQL HIV-specific instruments [2]. In the present study, we present a simplified factor structure and scoring system for the PROQOL-HIV to further improve its utility in research settings.

The PROQOL-HIV is used to summarize patient's HRQL as eight-scale scores on the following dimensions: physical health and symptoms (PHSs, 9 items), treatment impact (10), emotional distress (ED, 4), health concerns (HCs, 4), body change (BC, 4), intimate relationships (IR, 3), social relationships (2), and stigma (ST, 2). A single item assessing general health during the past 2 weeks and four further items dealing with religious beliefs, finance, parenthood, and satisfaction with care are used to gather additional information related to patient's HRQL and are not part of the scoring scheme.

Although highly detailed HRQL profiling is useful for monitoring patients in routine care settings, in operational research where numerous other factors are often under consideration, composite measures facilitate parsimonious interpretation of changes across multiple related subscale indices. For instance, PROQOL-HIV subscale scores indicating heightened ED and anxiety over health may be summarized as diminished mental health without losing their meaning or impact in a given study. This is the approach frequently taken in cross-sectional HRQL studies that use the Short Form (SF)-36 or MOS-HIV questionnaires, in which composite mental and physical health scores are used in place of numerous-related subscale scores. Likewise, in HIV research, epidemiologists or medical scientists are often interested in analyzing a reduced number of HRQL scores derived from self-reports. This facilitates their use in prognostic modeling and allows comparison with generic measures, like the SF-36 questionnaire.

Several statistical techniques are available to reduce the dimensionality of a multiscale multiitem measurement instrument. For instance, second-order latent common factors can be used instead of first-order factors (e.g., SF-36 or MOS-HIV), or a global score can be constructed as a weighted or unweighted sum of all item responses (e.g., MQoL-HIV [3] or HAT-QOL [4]). As an alternative to a single global score, the use of bifactor models has gained interest in the HRQL literature [5] because this allows exploration of the dimensionality of a given measurement instrument and to derive meaningful subscale scores or weighted orthogonal composites in addition to a global score (based on a general factor).

A simplified factor structure also presents some advantages over a more complex model with respect to scale reliability. An increase in the amount of items per scale will result as a byproduct in increased internal consistency (e.g., as measured by Cronbach's alpha) as well as reduced measurement error, assuming that average interim correlation is not affected when combining subscales. The simplified and more robust structure provides a synthetic summary of the underlying multidimensional structure, represented by variables that can be used in multivariate or multivariable regression models, provided construct validity still holds. Increasing scale reliability further strengthens the use of a given questionnaire in longitudinal observational or controlled studies, for example, when treatment switches, responsiveness, or response shifts are of primary interest [6] or in international cross-sectional studies where measurement invariance (MI) is needed to ensure valid between-group comparisons [7].

Inclusion of the PROQOL-HIV questionnaire in the most recent wave of a large cross-sectional nationally representative study of people treated for HIV in France and the French Caribbean (the VESPA study [8]) provided us with the opportunity to (1) apply the foregoing techniques to the development of a simplified factor structure and scoring system, (2) provide further evidence of the current validity of the instrument, and (3) provide normative scale scores for the French population of patients living with HIV.

2. Methods and participants

2.1. Participants

Self-reported HRQL data were collected from patients during the VESPA2 national survey (2011−2012), together with face-to-face collection of sociodemographic information. A medical history was provided by the caregiver in charge of the patient. All patients were aged older than 18 years, diagnosed at least 6 months before participating in the study, and had lived in France for at least 6 months.

The sampling design for this study is described in a previous publication [8], and a brief rationale for such cross-sectionals studies and previous results is available in Préau [9]. Briefly, the design considered three strata defined by size of the active file of 118 French hospitals (low, 100−300 patients; intermediate, 300−800; and high, more than 800), with unequal sampling fraction in each strata (low, 1:4; intermediate, 1:2; and high, 1:1) with respect to total active file. Proportional sampling was used to ensure that small medical centers were adequately represented. A total of 68 primary sampling units (i.e., centers) were considered in the final database, and data from 3,022 participants among the 5,239 eligible patients were included (57.7% participation rate). It should be noted that one or more of numerous self-reported measures (HRQL,