Factor Structure of the Child Health Questionnaire-Parent Form in Pediatric Populations

Dennis Drotar,[1] PhD, Lisa Schwartz,[2] MA, Tonya M. Palermo,[3] PhD, and Christopher Burant,[4] MA

[1]Rainbow Babies & Children's Hospital and Department of Pediatrics, Case Western Reserve University School of Medicine, [2]Department of Psychology, Case Western Reserve University, [3]Department of Anesthesiology and Peri-Operative Medicine, Oregon Health and Sciences University, and [4]Department of Bioethics, Case Western Reserve University School of Medicine

Objective To conduct separate exploratory factor analyses (EFA) and confirmatory factor analyses (CFA) of the Child Health Questionnaire-Parent Form 50 (CHQ-PF-50) with a sample of children and adolescents with chronic conditions and physically healthy children seen in a pediatric setting. **Method** Parents of 329 children with chronic conditions including cancer, epilepsy, recurrent headache, inflammatory bowel disease (IBD), juvenile rheumatoid arthritis (JRA), sickle cell disease (SCD), and recurrent sleep disturbance and 332 physically healthy children completed CHQ-PF-50. **Results** The EFA yielded a 27-item measure with seven factors for children with chronic conditions and a 28-item measure with eight factors for physically healthy children. Structural equation modeling procedures were used to conduct a second order CFA, which yielded the secondary factors of physical health and psychosocial health. A CFA yielded an excellent fit to the data for each group, but the models were different for each group. **Conclusions** CFA-derived models of the CHQ-PF-50 demonstrated construct validity for measuring the latent constructs of physical and psychosocial health in children and adolescents with chronic conditions and physically healthy children and adolescents. However, somewhat different factor solutions emerged for each group, suggesting that the specific domains assessed by the CHQ-PF-50 were not equivalent across groups. Findings have implications for applications of the CHQ-PF-50.

Key words child health questionnaire; chronic health conditions; confirmatory factor analysis; exploratory factor analysis; quality of life.

In recent years, there has been extraordinary growth in research on pediatric health-related quality of life (HRQOL) (Drotar, 1998; Koot & Wallander, 2001; Varni, Seid, & Rode, 1999). Measures of pediatric HRQOL have many potential applications in research and clinical care with children and adolescents with chronic health conditions such as description of health status and functioning, identification of functional problems associated with chronic or acute illness, and assessment of response to medical treatment (Eiser, 1995; Mulhern et al., 1989). Several measures of pediatric HRQOL, including condition-specific and generic measures, have been developed for the above applications (Eiser & Morse, 2001; Levi & Drotar, 1998). Generic or noncategorical measurement is most useful for comparing the HRQOL of children who have different chronic health conditions or for comparing children with chronic illness and physically healthy children (Drotar, 1998; Koot & Wallander, 2001).

One of the best known and most widely used noncategorical measures of HRQOL for children and adolescents

All correspondence concerning this article should be addressed to Dennis Drotar, Division of Behavioral Pediatrics and Psychology, 11100 Euclid Avenue, Cleveland, Ohio 44106. E-mail: dxd2@case.edu.

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is the Child Health Questionnaire (CHQ) (Landgraf, Abetz, & Ware, 1996; Raat, Bonsel, Essink-Bot, Landgraf, & Gemke, 2002). The CHQ-Parent Form 50 (CHQ-PF-50) is a 50 item, multidimensional measure that includes 13 single and multi-item scales that measure salient domains of children's functioning and well being based on parental report (Landgraf et al., 1996). Published descriptions are available for the distribution of CHQ-PF-50 items and scales in boys and girls of different ages (Landgraf & Abetz, 1997; Landgraf et al., 1996) and for parents of varying educational, marital, and work status (Landgraf & Abetz, 1996; Landgraf et al., 1996). Validity studies have shown that CHQ-PF scores can discriminate among children with various chronic conditions (Landgraf et al., 1996), predict outcomes in specific chronic conditions, and correlate with other measures of HRQOL (Sung, Greenberg, & Doyle, 2003). The CHQ has become a widely used research instrument with pediatric populations. Although clinical applications of the CHQ have not been published to our knowledge, such applications include evaluation of interventions such as pain management (Radcliffe, personal communication, September 1, 2004), partial hospitalization programs for children and adolescents with a range of chronic conditions (Nassau, personal communication, September 1, 2004), as well as assessment and monitoring of pretransplant patients (Zelikovsky, personal communication, September 1, 2004).

Despite widespread use of the CHQ, the construct validity of this measure, as exemplified by its factor structure, remains an important but understudied topic. Data concerning construct validity are necessary to document the underlying measurement structure of an instrument and provide a foundation for studies of validity (e.g., discriminant, predictive) that are applicable to research and practice (Cronbach & Meehl, 1955). Derived form a review of generic measures of children's health and functioning, the items and constructs that are measured in the CHQ were intended to reflect the broad domains of children's psychosocial health and physical health (Landgraf et al., 1996). The initial construct validation study of the CHQ-PF-50, which was based on principal components analysis (PCA), was conducted in a sample of 914 children from a general pediatric population and children with a wide range of specific chronic physical and mental health conditions (asthma, attention deficit hyperactivity disorder, cystic fibrosis, epilepsy, rheumatoid arthritis, and psychiatric problems). This analysis was conducted to document how well the hypothesized dimensions of psychosocial and physical health explained variation in each of the 10 individual scales of the CHQ-PF-50 (Landgraf et al., 1996). Four scales (e.g., physical functioning, role/social-physical, general health perceptions, and bodily pain) loaded most strongly on the dimension of physical health. Four others (e.g., role/social-emotional/behavioral, self-esteem, mental health, and behavior) loaded most strongly on psychosocial health. Two scales (e.g., parental impact-time, parental impact-emotional) loaded on both dimensions but had stronger loadings on psychosocial health (Landgraf et al., 1996). However, the PCA conducted by Landgraf et al. (1996) did not differentiate between common and unique variance in documenting the core dimensions of physical and psychosocial health, nor did it document the adequacy or degree of fit of the hypothesized measurement models that were tested, which is critical for and accurate evaluation of construct validity (Fabrigar, MacCallum, Wegener, & Strahan, 1999). To extend data on the factor structure of the CHQ-PF-50, Waters, Salmon, and Wake (2000) conducted an exploratory factor analysis (EFA) of three instruments in a large sample (N = 5,414) of parents of Australian school-age children, which produced 11 factors that were generally consistent with those noted by Landgraf et al. (1996). On the other hand, the secondary factor structure of physical health and psychosocial health was not replicated in the normative sample but held for a subsample of children with one or more chronic conditions (N = 3,123).

There is a need to extend Waters et al.'s (2000) EFA to a sample of children and adolescents in the United States by using confirmatory factor analysis (CFA) to test the construct validity of the CHQ-PF-50. The most important methodological advantages of CFA compared with traditional factor-analytic methods include (a) estimation of precise measurement parameters that adjust for measurement error and (b) the ability to test the adequacy of the fit of a specific model (Bollen, 1989; Fabrigar et al., 1999). Such analyses have both scientific and clinical relevance. For example, if the measurement model and construct validity underlying the CHQ-PF-50 does not generalize across various chronic illness and physically healthy populations, this could affect interpretation of research data as well as clinical applications of this instrument, especially those that involve comparisons of children with chronic health conditions and physically healthy children.

To our knowledge, Hepner and Seechrest (2002) conducted the only previous CFA of the CHQ-PF-50. Hepner and Seechrest (2002) found that the two secondary factor model of physical and psychosocial health fit

their data. However, this analysis, which was designed to provide a direct replication of Landgraf et al. (1996) measurement model, was limited because it was based on data from a relatively small, predominantly minority sample of parents ($N = 151$) of physically healthy children who were recruited from pediatric outpatient clinics. For this reason, these data may not pertain to scientific or clinical application of the CHQ-PF-50 across broad samples of children with chronic conditions and physically healthy children. Consequently, there is a need to apply factor-analytic methods, including CFA-derived measurement models of the CHQ-PF-50, to more representative and ethnically diverse samples, including children with chronic conditions and healthy children (Drotar, 2004).

To address these limitations, this study was designed to conduct a separate EFA and CFA of the CHQ-PF-50 in two samples: (a) children and adolescents with a range of chronic conditions that were available for research on HRQOL in a large pediatric hospital setting, including many chronic conditions that were not represented in the original standardization sample of the CHQ and (b) physically healthy children and adolescents. These analyses were conducted on individual items of the CHQ-PF-50 to test the accuracy of the construction of each factor and determine the extent to which individual items cross-loaded onto multiple factors, which was not accomplished in Hepner and Seechrest's (2002) analysis. This analytic strategy was necessary because EFA and CFA that are based on composite subscale scores rather than analyses of individual items can contaminate the factor structure that is derived by including items that can measure more than one factor. Based on previous research (Eiser & Morse, 2001; Landgraf et al., 1996) with pediatric populations, researchers hypothesized that the second order factor structure of physical and psychosocial health of the CHQ-PF-50 would be replicated in separate CFA analyses conducted for children and adolescents with chronic conditions and physically healthy children.

Methods

Participants

The sample included 329 children with chronic conditions and 332 physically healthy children and their caregivers ($N = 661$) who ranged in age from 5 to 18 years. Demographic information for the caregivers completing the CHQ-PF-50 and children and adolescents are shown in Table I. More than 80% of the children's caregivers were biological mothers with a smaller number of fathers and others, mostly grandmothers. Most caregivers in both groups were married and had at least a high-school education (more than 90%). Caregivers with Caucasian ethnicity comprised most respondents, but African Americans were also well represented (29–48%). Differences in some demographics were identified as children in the chronic illness sample were younger, more likely to be male, and African American.

The chronic conditions group included the following conditions and sample sizes: cancer ($n = 33$), epilepsy ($n = 25$), recurrent headache ($n = 57$), inflammatory bowel disease (IBD; $n = 51$), immunodeficiency (IMD; $n = 27$), juvenile rheumatoid arthritis (JRA; $n = 24$), sickle cell disease (SCD; $n = 62$), and sleep disturbance ($n = 50$). Children with these conditions represented a convenience sample that was drawn from samples who participated in research on HRQOL at a pediatric tertiary care center. The specific chronic conditions comprised a wide range of conditions that reflected areas of research interest for the investigators and collaboration with pediatric colleagues. With the exception of epilepsy and JRA, these conditions were not represented in the standardization sample of the CHQ-PF-50 (Landgraf et al., 1996).

Procedure for Data Collection

Children and adolescents were recruited into several ongoing studies of HRQOL in chronic disease. The procedure for data collection was similar across studies and involved identification of eligible patients through rosters of clinics and pediatric practices at a large tertiary care center. Inclusion criteria included diagnosis of a specific chronic health condition (cancer, epilepsy, arthritis, SCD, recurrent headache, IBD, IMD, and sleep disturbance), age between 5 and 18 years, not acutely ill or hospitalized, attending follow-up clinic, and able to read and speak English. Healthy-control patients were recruited from two sources, ambulatory pediatric clinics and from normative controls in a community-based research study on sleep. Exclusion criteria for the community-based sample included parental report of any chronic health condition or sleep problem. Families of these patients were contacted and asked to participate in the study during a visit to an outpatient clinic. In accord with institutional review board procedures, informed consent was obtained from all caregivers before their completion of a questionnaire about family demographics and the CHQ-PF-50.

All questionnaires were completed in the outpatient clinic. Parents with limited reading skills were assisted with the questionnaires. Data collection were continued

Table I. Sociodemographic and Disease Information on Caregivers and Their Children By Group ($N = 661$)

	Chronic conditions group ($n = 329$)	Healthy group ($n = 332$)
Relationship to child		
Biological mother	269 (81.8%)	280 (84.3%)
Biological father	32 (9.7%)	33 (9.9%)
Other	27 (8.1%)	16 (4.8%)
Age of caregiver (in years) [*M* (*SD*)]	40.9 (7.2)	38.8 (6.6)
Marital status		
Married	224 (68%)	206 (62.02%)
Single or separated	100 (30.4%)	120 (36.1%)
Caregiver education**		
Some high school	17 (5.2%)	19 (5.7%)
High-school diploma or general equivalency diploma	80 (24.3%)	94 (28.3%)
Vocational school or some college	94 (28.6%)	135 (40.6%)
College degree	93 (28.3%)	56 (16.8%)
Professional or graduate degree	42 (12.8%)	25 (7.5%)
Ethnicity***		
Caucasian	226 (68.7%)	167 (50.3%)
African American	94 (28.6%)	152 (45.8%)
Other	8 (2.4%)	7 (2.1%)
Gender of child (number of male)*	175 (53.2%)	150 (45.2%)
Age of child** [*M* (*SD*)]	12.3 (3.5)	11.4 (3.5)
Median	12.6	11.3
<12 years	168 (52%)	214 (65.5%)
7–12 years	161 (49%)	118 (34.5%)

*$p < .05$.
**$p < .01$.
***$p < .001$.
Percentages do not equal 100% because of missing data.

for at least a 12-month period and for longer periods (up until 24 months) until as many potential participants as was possible in a given sample were contacted.

Numbers of available participants in the various chronic condition groups ($n = 555$ overall) who met the criteria were cancer ($n = 58$), epilepsy ($n = 56$), recurrent headache ($n = 89$), IBD ($n = 96$), IMD ($n = 31$), JRA ($n = 42$), SCD ($n = 95$), sleep disturbance ($n = 88$). A total of 423 physically healthy children met the criteria.

The numbers of eligible patients whose families did not participate included the following: cancer ($n = 6$), epilepsy ($n = 7$), recurrent headache ($n = 16$), IBD ($n = 9$), IMD ($n = 1$), JRA ($n = 3$), SCD ($n = 8$), sleep disturbance ($n = 0$), and physically healthy controls ($n = 77$). The age and gender of participants were comparable with that of nonparticipants. Overall consent rates were 91% for the chronic illness sample and 74% for the physically healthy sample.

The program that was used to run the analyses does not accept cases that have missing data and many protocols had missing data on one or more items. The numbers of participants in each group with missing data included cancer ($n = 2$), epilepsy ($n = 3$), headache ($n = 5$), IBD ($n = 10$), IMD ($n = 8$), JRA ($n = 4$), SCD ($n = 20$), sleep disturbance ($n = 34$), and physically healthy children ($n = 24$). A total of 110 participants had missing data. There were no differences between participants with missing versus complete data in age, gender, and maternal education. Overall participation rates combining consent rates and missing data were 75% for the chronic illness group and 78% for the physically healthy group.

Statistical Analyses

In accord with procedures described by Landgraf et al. (1996), specific items of the CHQ-PF-50 were recoded so that higher values represented better health, and scoring procedures for individual scales were used to manage the different response scales (e.g., true, false: Likert Scale in the CHQ-PF-50). Because this EFA was conducted on items and not on composite subscale scores, scale scores were not computed at the outset. Based on Fabrigar et al.'s (1999) recommendation to use EFA to

identify a measurement model and CFA to test the model, the following procedures were utilized in separate analyses for children with chronic conditions as one group and physically healthy children as another.

EFA

Using SPSS 11.0, the 42 items representing the 10 scales of the CHQ-PF-50 that were used in the original principal components factor analysis (Landgraf et al., 1996) and the CFA of the Hepner and Seechrest (2002) study were entered into a principal axis factor analysis with a varimax rotation and eigenvalue set at one. Previous analyses of the factor structure of the CHQ (Hepner & Seechrest, 2002; Landgraf et al., 1996) did not include the family activities (FA) scale, the family cohesion (FC), and the change in health (CH) items because these items were not included in some clinical samples. To be consistent with these previous analyses, these items were also omitted from this analysis.

Items were retained if they had primary factor loadings ≥.40 (including values that equal .4 when rounded) and secondary factor loadings ≤.30 and did not load on more than one factor. However, items that loaded on two factors but had a specific value on one factor that was at least twice as high as the value on another factor were retained. Items were removed one at a time. That is, after each analysis, a judgment was made as to the least adequate item based on the factor loadings and was then deleted. Additional factor analyses were conducted until a clean solution was attained.

CFA

The factor solutions for each of the groups were tested by using Analysis of Moment Structures Version 5 (AMOS-5). A model was constructed in AMOS that represented the items and the corresponding factors based on the EFA for each group. Additionally, the latent constructs of physical health and psychosocial health were added to the models. Each model was tested by using a second order CFA involving three levels: items, primary factors (representing the subscales), and secondary factors (representing the two latent constructs of physical health and psychosocial health).

The primary goal of testing CFA models is to determine the goodness of fit between the hypothesized model and the sample data. Based on recommendations by Bentler and Bonett (1980) and Browne and Cudeck (1992), the adequacy of model fit was evaluated using the following statistics to assess the degree of fit between estimated and observed variance: chi square, Tucker Lewis Index (TLI) (>.90 acceptable, >.95 excellent), the Comparative Fit Index (CFI) (>.90 acceptable, >.95 excellent), and root mean square error of approximation (RMSEA) (<.08 acceptable, <.05 excellent).

Group Comparisons

The models obtained for each group were compared by using a nested model group analysis in AMOS. Because two different second order CFA models were identified, it was necessary to test if any one model could fit the data from both groups well. The analytic procedure of running two nested models on the data from both groups (rather than testing alternative models) was used for this purpose.

Results

EFA

The EFA with the group with chronic health conditions yielded a 27-item solution representing seven factors. The item deletion resulted in the removal of the parent impact-time, parent impact-emotional, and the role/social–physical scale, and several other items. The remaining factors were physical functioning, general health, bodily pain, behavior, mental health, role-emotional, and self-esteem. The items corresponded to the factors in the same way that they do in the CHQ-PF-50 measurement model. The one exception was that a mental health item "acted cheerful" loaded onto self-esteem factor rather than mental health.

The EFA with the healthy group yielded a 28-item solution with eight factors. The eight factor solution for the physically healthy sample included the same factors in addition to one other: attention and learning. However, items that comprised the factors were not identical to those retained for the chronic conditions group: The attention and learning factor included two items, "parental emotional worry or concern related to child's attention and learning abilities" and "parental impact on time related to child's attention and learning abilities." In addition, for the physically healthy group, the mental health item described above also loaded onto the self-esteem factor and the item "parental emotional worry or concern due to child's physical health" loaded on to the general health factor rather than parent impact-emotional. The factor loadings for each sample are shown in Tables II and III.

CFA

Figure 1 shows the final second order CFA model for the chronic conditions group and Fig. 2 shows the final second order CFA model for the physically healthy group. The individual items and factors in the final model are shown in Tables IV and V. The factors represented in

Table II. Child Health Questionnaire-Parent Form (CHQ-PF) Factor Loadings for Children with Chronic Health Conditions ($n = 329$)

Item	Physical functioning	Self-esteem	General health	Factor role limitations emotional	Mental health	Bodily pain	Behavior
Physical functioning							
PFNEIGH	.859	.085	.047	.163	.107	.094	–.004
PFWALK	.853	.049	.066	.138	.120	.017	.024
PFBEND	.760	.038	.058	.179	.095	.114	.023
PFSOME	.759	.143	.258	.120	.083	.177	–.087
PFALOT	.719	.145	.320	.095	.052	.163	–.095
Self-esteem							
SEOVERAL	.122	.819	.089	.064	.188	.114	.105
SELOOKS	.109	.733	.173	.126	.181	.078	–.042
SEFAMILY	–.028	.722	–.003	.101	.093	.020	.220
SEFRIEND	.106	.697	.097	.084	.123	–.005	.045
MHCHEER	.109	.361	.046	.130	.236	.162	.067
General health							
GHLSHLTH	.114	.124	.799	.060	.151	.096	.093
GHGLOBAL	.172	.154	.738	.046	.110	.143	.077
GHWORRY	.076	–.025	.533	.119	.053	–.044	–.043
GHCATCH	.096	.023	.534	.066	.110	.086	.057
GHEXPECT	.096	.213	.495	.024	.057	.067	.024
GHNVILL	–.002	–.017	.386	.031	–.033	–.063	–.055
Role limitations							
REAMOUNT	.224	.147	.132	.891	.180	.027	.130
REPERF	.208	.244	.141	.815	.150	.044	.099
REKIND	.288	.115	.173	.799	.168	.030	.104
Mental health							
MHUPSET	.001	.262	.100	.142	.748	.110	.106
MHCRY	.150	.073	.079	.088	.697	.150	.096
MHLONELY	.125	.261	.150	.047	.666	.047	.073
MHNERVES	.089	.105	.061	.130	.564	.032	.095
Bodily pain							
BPGLOBAL	.231	.098	.051	.024	.114	.863	–.036
BPFREQ	.170	.127	.099	.043	.187	.802	–.039
Behavior							
BESTEAL	–.056	.103	–.011	.114	.119	–.031	.827
BELIES	–.033	.217	.070	.138	.250	–.041	.600

the two groups were the same with two exceptions: The physically healthy group had the factor attention and learning and the chronic condition group had the factor bodily pain. In accord with Bentler and Bonett (1980), data from modification indices suggested that three paths reflecting covariance be added between error terms to improve the fit of the model that was obtained for the physically healthy group. These paths involved pairs of items that shared variance from variance accounted for by various factors. These items included "ability to get around the neighborhood or school" (PFNEIGH), "taking care of himself" (PFSLFCAR), "had tantrums or a hot temper" (BETEMPER) and "argued a lot" (BETEMPER), and "how satisfied do you think your child has felt about looks and appearance" (SELOOKS) and "athletic ability" (SEATHLET). For the chronic health condition group, a path was added between the error terms of the items "doing things that take a lot of energy" (PFALOT) and "doing things that take some energy" (PFSOME).

These final CFA models showed an excellent fit to our data: Goodness of model fit statistics for the chronic condition group were $\chi^2(df = 315) = 584.68$, CFI = .944, TLI = .938 and RMSEA = .051 and for the physically healthy group were $\chi^2(df = 288) = 607.61$, CFI = .933, TLI = .924 and RMSEA = .058.

Group Comparisons

Nested model group comparisons revealed that the models for each group were different and not applicable

Table III. Child Health Questionnaire-Parent Form (CHQ-PF) Factor Loadings for Physically Healthy Children ($n = 332$)

Item	Factor physical functioning	Self-esteem	Role limitations emotional	Behavior	Bodily pain	Mental health	Attention learning	General health
Physical functioning								
PFWALK	.917	.043	.102	.014	.045	.132	.018	.122
PFSLFCAR	.882	.101	.142	–.022	.033	.076	.063	.022
PFBEND	.881	.084	.156	.053	–.083	.127	.064	.089
PFNEIGH	.823	.037	.127	.034	–.036	.052	.052	.166
Self-esteem								
SEOVERAL	.088	.760	.131	.276	.054	.173	.168	.048
SEFAMILY	.061	.736	.055	.308	.094	.194	.089	.037
SELOOKS	.033	.709	.017	.071	.101	.097	.054	.053
SEFRIEND	.032	.651	.129	.148	–.065	.226	.090	.132
SEATHLET	.033	.623	.152	–.062	.048	.018	.048	.187
MHCHEER	.067	.368	.136	.173	–.005	–.109	–.023	.078
Role limitations								
REKIND	.166	.191	.882	.140	.068	.053	.128	.114
REPERF	.174	.167	.875	.158	.020	.041	173	.068
REAMOUNT	.200	.136	.844	.153	.058	.095	.087	.181
Behavior								
BETEMPER	.066	.176	.074	.699	.067	.106	.045	.057
BEARGUE	–.036	.172	.051	.656	.067	.099	.070	.071
BELIES	–.027	.098	.170	.615	–.073	.229	.157	.102
BEGLOBAL	.082	.223	.320	.586	–.100	.050	.200	.168
Bodily pain								
BPGLOBAL	–.013	.102	.063	.017	.873	.089	.013	.074
BPFREQ	–.021	.050	.039	.016	.861	.076	–.001	–.015
Mental health								
MHLONELY	.156	.283	.112	.125	.087	.763	.062	.013
MHCRY	.141	.061	–.011	.226	.091	.675	.081	.065
MHNERVES	.147	.185	.285	.170	.051	.341	.063	–.015
Attention and learning								
PEATTENT	.044	.102	.120	.181	–.015	.127	.873	.142
PTPHYSI	.124	.177	.223	.162	.028	.045	.591	–.017
General health								
PEPHYSI	.131	.074	.052	.029	.213	.122	.057	.646
GHWORRY	.068	–.029	–.010	.054	–.187	.041	.062	.496
GGLOBAL	.102	.189	.158	.095	.034	.017	.002	.443
GHLSHLTH	.022	.166	.078	.083	.039	–.078	–.005	.441

across groups. Testing of the chronic condition group's data on the model for the physically healthy group indicated that the factor loadings were significantly different. The test of the data for the healthy group on the model obtained for children with chronic conditions indicated that AMOS would not come to a solution. These analyses demonstrated that the measurement models were different in the two groups.

Discussion

To our knowledge, this study is the first to report the results of an EFA and CFA of the CHQ-PF-50 in relatively large, diverse samples of children and adolescents with chronic conditions and physically healthy children. An additional methodological contribution of this study is the application of a combined EFA and CFA analysis based on the individual items of the CHQ-PF-50 using separate analyses for children with chronic conditions and physically healthy children.

Our findings that a two (secondary) factor model of HRQOL fit our data, extend the construct validity of the CHQ-PF-50, and are consistent with Landgraf et al.'s (1996) PCA in a sample of children with chronic health conditions and healthy children and Hepner and Seechrest's (2002) CFA in a smaller, less diverse sample

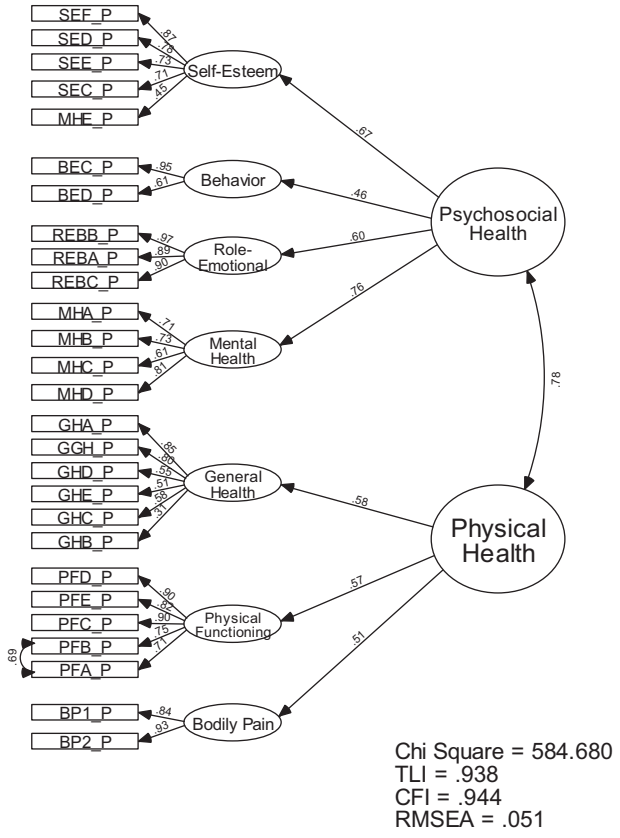

Figure 1. Final second order confirmatory factor analyses (CFA) model for chronic conditions group.

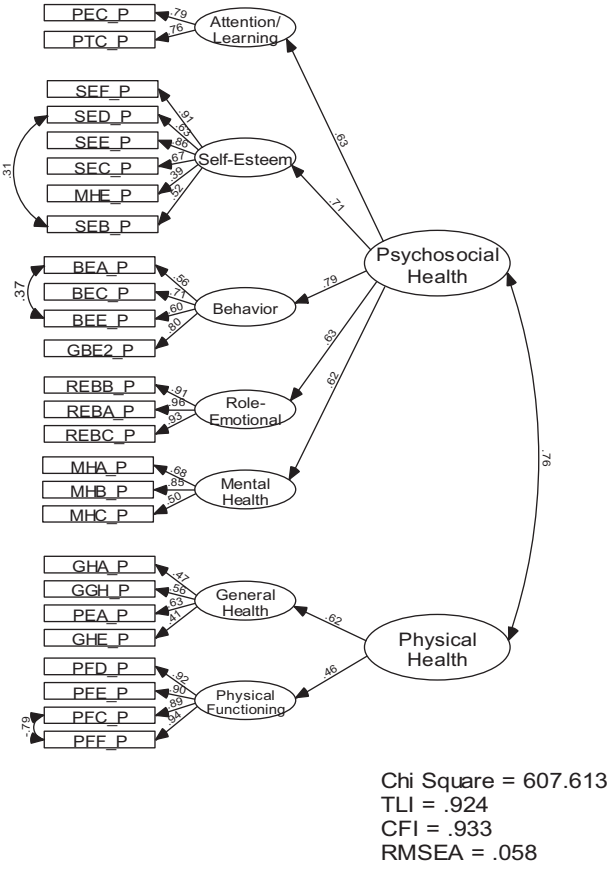

Figure 2. Final second order confirmatory factor analyses (CFA) model for physically healthy group.

of physically healthy children. These data document the generalizability of the measurement model of the CHQ-PF-50 for the secondary factors of physical health and psychosocial health. These two core components of the construct of HRQOL have been also identified in studies with other measures in both child and adult populations (Eiser & Morse, 2001; Hays & Stewart, 1990; Ware, 2002). Taken together, these findings suggest that HRQOL as measured by the CHQ-PF-50 among children with chronic conditions as well as physically healthy children reflect consistent and distinguishable domains.

On the other hand, the significant relationship between the secondary factors of physical and psychosocial health, which was identified in the present CFA, suggests that reciprocal influences between these factors on the CHQ-PF-50 cannot be easily disentangled (Drotar, 2004; Feyers, Hand, & Bjord, 1997). One potential clinical implication of this finding is that limitations in physical health (e.g., health symptoms) among children and adolescents as described by their parents are likely to be accompanied by limitations in psychosocial health (e.g., mental health symptoms) and vice versa. Consequently, it can be very difficult to determine primary causal influences between these two major domains of HRQOL, especially from a single measurement. However, researchers and practitioners who obtain an initial assessment based on the CHQ-PF-50 and compare this with subsequent measures can determine how changes in children's physical health predict changes in psychosocial health (and vice versa).

Although the CHQ-PF-50 was shown to have a similar two secondary factor structure in each of the present samples, the CFA models and specific primary factors that were identified differed in each group: For example, bodily pain related to physical health for the chronic health condition group but not for the healthy group whereas attention and learning related to psychosocial health for the healthy group but not for the chronic condition group. Items involving bodily pain would be expected to be more relevant for assessing HRQOL among children with chronic health conditions. However, it is not clear why the attention and learning factor was more relevant for physically healthy children in this sample. Moreover, the items that comprised many factors for each group were somewhat different. Finally, the factors that reflected the impact of the child's health

Table IV. Items and Factors Retained in Sample with Chronic Conditions

Psychosocial health	Summary scale	
Self-esteem (α = .84)	SEOVERAL	How satisfied do you think your child has felt about his or her life overall?
	SELOOKS	How satisfied do you think your child has felt about his or her looks and appearance?
	SEFAMILY	How satisfied do you think your child has felt about his or her family relationship?
	SEFRIEND	How satisfied do you think your child has felt about his or her friendships?
	MHCHEER	How much of the time do you think your child acted cheerful?
Behavior (α = .70)	BELIE	How often did your child lie or cheat?
	BESTEAL	How often did your child steal things inside or outside the home?
Role limitations: emotional problems (α = .94)	REAMOUNT	Has your child been limited in the amount of time he or she could spend on schoolwork or activities with friends because of emotional difficulties or problems with his or her behavior?
	REKIND	Has your child been limited in the kind of schoolwork or activities with friends he or she could do because of emotional difficulties or problems with his or her behavior?
	REPERF	Has your child been limited in the performing schoolwork or activities with friends because of emotional difficulties or problems with his or her behavior?
Mental health (α = .81)	MHCRY	How much of the time do you think your child felt like crying?
	MHLONELY	How much of the time do you think your child felt lonely?
	MHNERVES	How much of the time do you think your child acted nervous?
	MHUPSET	How much of the time do you think acted bothered or upset?
Physical health	**Summary scale**	
General health (α = .75)	GHLSHLTH	How true or false is the following statement? My child seems to be less healthy than other children I know.
	GHGLOBAL	Compared to one year ago, how would you rate your child's health (much better to much worse)?
	GHEXPECT	How true or false is the following statement? I expect my child to have a very healthy life.
	GHWORRY	How true or false is the following statement? I worry more about my child's health than other people worry about their children's health.
	GHCATCH	How true or false is the following statement? When there is something going around my child usually catches it.
	GHNVILL	How true or false is the following statement? My child has never been seriously ill.
Physical functioning (α = .91)	PFWALK	Has your child been limited in walking one block or climbing one flight of stairs because of health problems?
	PFBEND	Has your child been limited in bending, lifting, or stooping because of health problems?
	PFNEIGH	Has your child been limited in the ability (physically) to get around the neighborhood, playground, or school because of health problems?
	PFSOME	Has your child been limited in doing things that some energy such as riding a bike or skating?
	PFALOT	Has your child been limited in doing things that take a lot of energy, such as playing soccer or running?
Bodily pain (α = .88)	BPGLOBAL	How much bodily pain or discomfort has your child had?
	BPFREQ	How often has your child had bodily pain or discomfort?

on parents that were included in Landgraf et al.'s (1996) PCA were not found in this model owing to their weak loadings.

Several issues that relate to the sampling methods and characteristics of this study may have accounted for these differences (Bollen, 1989). The use of a convenience sample and differences in demographic characteristics across the groups may have contributed to differences that were obtained. Moreover, many of the chronic conditions' studies were different than those that were included in the initial standardization sample (Landgraf et al., 1996) may have contributed to differences in findings. In addition, participation rates and missing data limited the representativeness of data from the current sample. For all these reasons, it will be important to replicate these findings with other samples of physically healthy children and those with chronic conditions.

Table V. Items and Factors Retained in Healthy Sample

Psychosocial health	Summary scale	
Attention and learning (α = .69)	PEATTEN	How much emotional worry or concern did your child's attention or learning abilities cause you?
	PTATT	Were you limited in the amount of time you had for your own needs because of your child's attention or learning abilities?
Self-esteem (α = .83)	SEOVERAL	How satisfied do you think your child has felt about his or her life overall?
	SELOOKS	How satisfied do you think your child has felt about his or her looks and appearance?
	SEFAMILY	How satisfied do you think your child has felt about his or her family relationship?
	SEFRIEND	How satisfied do you think your child has felt about his or her friendships?
	MHCHEER	How much of the time do you think your child acted cheerful?
	SEATHLET	How satisfied do you think your child has felt about his or her athletic ability?
Behavior (α = .79)	BEARGUE	How often did your child argue a lot?
	BELIE	How often did your child lie or cheat?
	BETEMPER	How often did your child have tantrums or a hot temper?
	BEGLOBAL	Compared to other children your child's age, in general would you say his or her behavior is … (excellent to poor)?
Role limitations: emotional problems (α = .95)	REAMOUNT	Has your child been limited in the amount of time he or she could spend on schoolwork or activities with friends because of emotional difficulties or problems with his or her behavior?
	REKIND	Has your child been limited in the kind of schoolwork or activities with friends he or she could do because of emotional difficulties or problems with his or her behavior?
	REPERF	Has your child been limited in the performing schoolwork or activities with friends because of emotional difficulties or problems with his or her behavior?
Mental health (α = .70)	MHCRY	How much of the time do you think your child felt like crying?
	MHLONELY	How much of the time do you think your child felt lonely?
	MHNERVOUS	How much of the time do you think your child acted nervous?
Physical health	**Summary scale**	
General health (α = .54)	GHLSHTH	How true or false is the following statement? My child seems to be less healthy than other children I know.
	GGLOBAL	Compared to 1 year ago, how would you rate your child's health (much better to much worse)?
	PEPHYSI	How much emotional worry and concern did your child's physical health cause you?
	GHWORRY	How true or false is the following statement? I worry more about my child's health than other people worry about their children's health.
Physical functioning (α = .94)	PFWALK	Has your child been limited in walking one block or climbing one flight of stairs because of health problems?
	PFBEND	Has your child been limited in bending, lifting, or stooping because of health problems?
	PFWEIGH	Has your child been limited in the ability (physically) to get around the neighborhood, playground, or school because of health problems?
	PFSLFCAR	Has your child been limited in taking care of him or herself, that is, eating, dressing, bathing, or going to the toilet due to health problems?

A related limitation of the study is that the samples of children with specific chronic conditions who were assessed were small. Researchers invite other investigators to determine whether the present findings can be replicated in larger samples, including children with chronic conditions that were not represented in this study. It is possible that the factor structure of the CHQ-PF-50 differs across chronic conditions and this should be studied with larger samples. On the other hand, the CHQ was developed to describe the HRQOL of broad populations of children, rather than as a condition-specific measure.

Assuming the present differences in factor solutions are replicated in future samples, investigators and practitioners need to be aware of the potential implications of these findings when using the CHQ-PF-50 in different

populations. For example, our data concerning the structure of the primary factors suggest that practitioners and researchers should not assume equivalence in the factors in comparing children with chronic illness and physically healthy children when using the CHQ-PF-50 instrument. Such differences may complicate interpretation of differences that are obtained in factors on the CHQ-PF-50 between chronic illness and healthy samples, which could reflect differences in the factor structure and construct validity of the instrument. It should also be noted that the version of the CHQ-PF-50 that demonstrated the best fit contained fewer items than the original measure, suggesting that the present CFA-derived version may be a more efficient version of the CHQ-PF-50 that could reduce response burden of this measure. However, replication of these findings across samples is needed before routine research or clinical application of this shorter version can be recommended.

Several future research directions are recommended to extend the validity of the CHQ-PF-50. One logical step is to extend the validity data for the CHQ-PF-50 by describing external correlates for the secondary and primary factors with other measures, and so on. It would be also useful to develop a CFA of children's reports of HRQOL to determine similarities and differences between the construct validity of parents versus children's reports on the CHQ. Finally, clinical applications of the CHQ-PF-50 should be described such as predictive validity and assessment of responsiveness to psychological intervention and clinically significant events (e.g., changes in health status)(Drotar, 2004).

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