Psychometric properties of the Iranian version of the Pediatric Quality of Life Inventory™ Short Form 15 Generic Core Scales

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INTRODUCTION The objective of this study was to assess the feasibility, reliability and validity of the Iranian version of the Pediatric Quality of Life Inventory™ 4.0 Short Form 15 Generic Core Scales (PedsQL™ 4.0 SF15) in a sample of Iranian schoolchildren and children with chronic health conditions.
METHODS A total of 1236 schoolchildren and 1183 parents of schoolchildren participated, and 52 children with chronic health conditions and their parents were recruited from an outpatient clinic. Feasibility, internal consistency reliability, test-retest reliability, known-groups discriminant validity and construct validity of the PedsQL™ 4.0 SF15 were determined.
RESULTS The Iranian version of PedsQL™ 4.0 SF15 evidenced minimal missing responses for child self-report and parent proxy-report (0.4% and 0.6%, respectively), generally demonstrated no significant floor or ceiling effects, and achieved acceptable internal consistency reliability for the Total Scale Score (α = 0.82 child self-report, 0.84 parent proxy-report) and acceptable test-retest reliability. Schoolchildren and their parents reported significantly higher PedsQL™ 4.0 SF15 scores than paediatric patients with chronic health conditions. Child self-report and parent proxy-report showed poor to good agreement. A four-factor model was confirmed among child self-report and parent proxy-report in the confirmatory factor analyses.
CONCLUSION This study supports the feasibility, reliability and validity of the Iranian version of the PedsQL™ 4.0 SF15 among Iranian children and their parents.

Keywords: children, health-related quality of life, Iran, PedsQL™, short form

INTRODUCTION

There has been increasing international interest in the assessment of health-related quality of life (HRQoL) among children in developing countries, including countries in the Middle East.[1,2] HRQoL is defined by the World Health Organization as *"an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and standards and concerns"*. It is a broad-ranging concept that is affected in a complex way by a person's physical health, psychological state, level of independence, social relationships, and his/her relationships to salient features of his/her environment, as delineated by the World Health Organization.[3] This theoretical framework was utilised in developing the original PedsQL™ 4.0 Generic Core Scales. Assessment of HRQoL can help provide insights on the burden of disease, identify health inequalities, as well as ensure proper allocation of health resources and tailored interventions – the latter is achieved through the acquisition of a comprehensive understanding of the child's and family's experience.[4] Moreover, HRQoL measures are useful in facilitating physician-patient communication and promoting shared decision-making.[4]

There are a number of generic and disease-specific measures that assess HRQoL in children.[5,6] While disease-specific measures provide detailed information about HRQoL in children with chronic health conditions, those measures do not provide a basis for comparison between patients and healthy populations.[7] Generic measures enable comparisons across population groups.[8] One such generic measure – the PedsQL™ – is an internationally-used instrument developed to assess the HRQoL of children aged 2–18 years.[9] The PedsQL™ 4.0 Generic Core Scales can also be used in conjunction with disease-specific modules.[10–15] The 23-item version of the PedsQL™ 4.0 Generic Core Scales[16] has previously been validated in many countries, including Iran.[1,2,17–19] In general, these studies have demonstrated that the translated 23-item version has internationally satisfactory psychometric properties. However, if shorter versions with adequate psychometric performance can be established to reduce response burden and limit the cost of data collection, such versions would be desirable.

The PedsQL™ 4.0 SF15 is a shortened, 15-item version of the 23-item PedsQL™ 4.0 Generic Core Scales.[20] The original study of the PedsQL™ 4.0 SF15 demonstrated that it had satisfactory measurement properties, particularly so given its brevity.[20] Two international studies, one from Japan and the other from Sweden, have also supported the measurement properties of the country-specific translated PedsQL™ 4.0 SF15.[21,22] The Japanese

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version of the PedsQL™ 4.0 SF15 was tested using principal component analysis with oblique (Promax) rotation to examine factor validity; the results demonstrated that four factors were extracted from the PedsQL™ 4.0 SF15 and that those four factors corresponded mainly to the four scales.[21] The Swedish version of the PedsQL™ 4.0 SF15 was tested using confirmatory factor analysis (CFA), and the results supported the four-factor structure of the PedsQL™ 4.0 SF15 for the majority of fit indices.[22] To the best of our knowledge, there has been no study reporting on the feasibility, reliability and validity of the Iranian version of the PedsQL™ 4.0 SF15. Consequently, the objective of the present study was to assess the feasibility, reliability and validity of the Iranian version (i.e. Persian translation) of the PedsQL™ 4.0 SF15 in a sample of Iranian schoolchildren and paediatric patients with chronic health problems.

METHODS

The PedsQL™ 4.0 SF15 is composed of 15 items from the original 23-item PedsQL™ 4.0 Generic Core Scales.[20] Items were retained in the initial developmental study of the PedsQL™ 4.0 SF15 if they loaded highly (> 0.60) on their *a priori* conceptually-derived scale, based on the parent proxy-report factor analysis reported in the original 23-item study. Items were also selected to replicate the original scale structure and to enhance representativeness within each scale.[20] The PedsQL™ 4.0 SF15 encompasses four scales: (a) Physical Functioning Scale (5 items), (b) Emotional Functioning Scale (4 items), (c) Social Functioning Scale (3 items) and (d) School Functioning Scale (3 items). There are two parallel forms for the PedsQL™ 4.0 SF15 – a child self-report form and a parent proxy-report form. All items are scored on a five-point Likert scale ranging from 'never a problem' (score = 0) to 'almost always a problem' (score = 4). The items were then reverse scored and transformed into a 0–100 point scale, with higher scores indicating better HRQoL.[20] To create scale scores for the Physical Functioning Scale, Emotional Functioning Scale, Social Functioning Scale and School Functioning Scale, the mean was computed as the sum of the items over the number of items answered. The Physical Health Summary Score (5 items) was the same as the Physical Functioning Scale. To create the Psychosocial Health Summary Score (10 items), the mean was computed as the sum of the items divided by the number of items answered in the Emotional, Social and School Functioning Scales.

The PedsQL™ 4.0 SF15 was made available in Persian through the Mapi Research Trust. After receiving permission from the developer of the PedsQL™ and the Mapi Research Trust, the PedsQL™ 4.0 SF15 was translated from English to Persian (i.e. forward translation) by two independent translators. Subsequently, the translators discussed their translations and agreed on a single reconciled version. The resulting reconciled Persian version of the PedsQL™ 4.0 SF15 was then translated back into English (i.e. backward translation) by a local translator who was a native speaker of English and bilingual in English and Persian. The backward translation of the PedsQL™ 4.0 SF15 was then compared with the original English version and any misunderstandings and mistranslations were corrected. In the next phase of the translation process, cognitive interview testing was conducted. The Persian version of the PedsQL™ 4.0 SF15 was administered to 30 children and their parents to assess whether the questionnaire was understandable, as well as to assess its user-friendliness and cultural appropriateness for Iran. All steps in the translation procedure were supervised and verified by the developer of PedsQL™.[23]

Children aged 8–18 years and their parents participated in the study. Qazvin, a city located some 165 km northwest of Tehran, has approximately 120,000 children in its schools. 20 schools were randomly selected, and in each school, three classes were randomly selected. A total of 1,270 schoolchildren were selected to participate in the study. 1,236 schoolchildren and 1,183 parents of schoolchildren completed the PedsQL™ 4.0 SF15. The mean age of the schoolchildren was 15.2 years and 51.6% were girls. 524 (42.4%) of the children were aged 8–12 years and 712 (57.6%) were aged 13–18 years. Most (46.8%) of the parents who completed the PedsQL™ 4.0 SF15 were mothers, while the rest of the parents were fathers (25.7%), grandmothers (19.6%), grandfathers (5.1%), and others (2.8%) such as uncles.

Paediatric patients with chronic health conditions were recruited from a paediatric outpatient clinic in a university hospital. The patients were identified when they presented to the hospital outpatient clinic, and children diagnosed with severe cognitive impairments were excluded from the study. A total of 52 children with chronic health conditions participated in the study. The mean age of the children with chronic health conditions was 15.4 years and most of the patients were boys (57.7%). The specific diagnoses of the chronic health conditions were: 13 (25.0%) heart disease, 10 (19.2 %) diabetes, 9 (17.3%) cancer, 8 (15.4 %) renal failure, 7 (13.5%) asthma and 5 (9.6%) epilepsy.

For the schoolchildren sample, the children and their parents completed the PedsQL™ 4.0 SF15 separately in the schools, while for the paediatric patients sample, the children and their parents completed the PedsQL™ 4.0 SF15 in the hospital outpatient clinic. One month later, the schoolchildren and their parents were asked to complete the PedsQL™ again. 61 schoolchildren and 88 parents did not complete the test-retest procedure at follow-up. A sociodemographic form, which included details such as age and gender, was also completed by the parents and children in both the schoolchildren and paediatric patient samples. Both the children and their parents gave their consent to participate in the study. This study was approved by the ethics committee of Qazvin University of Medical Sciences, Iran.

The feasibility of the PedsQL™ 4.0 SF15 was determined using the percentage of missing values for each item. Floor effect (i.e. the percentage of the lowest possible scores) and ceiling

Table I. Means, standard deviations, floor and ceiling effects, and Cronbach's α of the Iranian version of the PedsQL™ 4.0 SF15 in schoolchildren. The intraclass correlation coefficients for all scales of the Iranian version of the PedsQL™ 4.0 SF15 summary and scale scores are also shown.

Scale	Number of items	Mean score	SD	Floor effect (%)	Ceiling effect (%)	Cronbach's α	ICC[†]
Child self-report							
Total score	15	77.09	13.98	0.4	1.3	0.82	0.71
Physical Health*	5	87.19	15.33	1.2	15.1	0.72	0.79
Psychosocial Health	10	77.96	14.26	0.4	2.0	0.79	0.73
Emotional Functioning	4	69.06	19.97	0.8	6.6	0.75	0.70
Social Functioning	3	77.48	19.04	0.6	38.0	0.74	0.73
School Functioning	3	77.02	19.08	1.0	12.5	0.77	0.74
Parent proxy-report							
Total score	15	68.80	17.30	0.4	2.0	0.84	0.74
Physical Health*	5	73.31	25.48	4.6	16.9	0.86	0.80
Psychosocial Health	10	68.21	17.39	0.2	4.2	0.81	0.72
Emotional Functioning	4	70.18	23.56	4.6	11.7	0.82	0.73
Social Functioning	3	76.98	20.36	5.0	7.6	0.75	0.81
School Functioning	3	64.16	20.44	6.1	6.6	0.75	0.72

*The Physical Health Summary Score is the same as the Physical Functioning Scale. [†]All p-values were < 0.05.
ICC: intraclass correlation coefficient; SD: standard deviation

effect (i.e. the percentage of the highest possible scores) were computed.[24] It is recommended that the floor and ceiling effects should not be greater than 15%.[25] The reliability of the PedsQL™ 4.0 SF15 was assessed by internal consistency and test-retest methods. Internal consistency reliability was determined by Cronbach's α coefficient. A Cronbach's α coefficient of 0.70 or greater is considered as adequate scale reliability for use at the level of group comparisons.[26] Test-retest reliability was computed by using the intraclass correlation coefficient (ICC). ICC at < 0.40 indicates poor to fair agreement, 0.41–0.60 indicates moderate agreement, 0.61–0.80 good agreement and > 0.80, excellent agreement.[27] Parent-child agreement was assessed by intraclass correlations between child self-reports and parent proxy-reports. ICCs were calculated using a two-way mixed effect model.[28] A known-groups comparison was used to assess the discriminant validity of the PedsQL™ 4.0 SF15 scales across health statuses. Based on previous studies,[1,10-16] we hypothesised that paediatric patients with chronic health conditions would report worse HRQoL and lower functioning than schoolchildren across all PedsQL™ scales.

The factor structure of the PedsQL™ 4.0 SF15 was determined using CFA, based on the *a priori* four-scale structure.[20] A weighted least squares estimation was used for the CFA analysis, and an asymptomatic covariance matrix was computed. The model fit was determined using absolute fit indices, incremental fit indices and parsimony fit indices. Chi-square value, root mean square error of approximation (RMSEA) and standardised root mean square residual (SRMR) were used for the absolute fit indices.[29,30] Chi-square value assesses the magnitude of discrepancy between the sample and fitted covariances matrices.[31] However, as chi-square statistic is sensitive to sample size and the sample size of the present study was large, the chi-square statistic was not a practical test of model fit. RMSEA incorporates a penalty function for poor model parsimony.[32] RMSEA values

in the range of 0.05–0.08 were taken to indicate acceptable fit, while values in the range of 0.08–0.10 indicated marginal fit and values larger than 0.10 indicated poor fit.[32] SRMR is the square root of the difference between the residuals of the sample covariance matrix and the hypothesised covariance model. SRMR values of 0.80 or less are generally considered to be favourable.[29] Non-normed fit index (NNFI), also known as the Tucker-Lewis index, and comparative fit index (CFI) were used for incremental fit indices. The suggested cutoff for NNFI and CFI is equal to or greater than 0.90. Parsimonious normed fit index (PNFI) was computed to assess the parsimony of the model.[29,30] For PNFI, we did not consider any absolute standard of model fit, but rather simply noted that higher PNFI values reflect a more parsimonious fit.[33] Missing items for each scale ranged from 0.6% to 2%. Missing data were treated using full information maximum likelihood.[34] Statistical Package for the Social Sciences version 16.0 (SPSS Inc, Chicago, IL, USA) for Windows and LISREL 8.8 (SSI Inc, Lincolnwood, IL, USA) were used for data analyses and p-value of < 0.05 was considered statistically significant.

RESULTS

In the schoolchildren sample, the percentage of missing item responses for the PedsQL™ 4.0 SF15 for the child self-report and parent proxy-report was 0.4% and 0.6%, respectively. The percentage of scores at the extremes of the scale range (i.e. floor and ceiling effects) in the schoolchildren sample are presented in Table I. In this predominantly healthy population, floor effects were not observed across the four scales and the two summary scores, but ceiling effects were observed for the child self-reported Social Functioning Scale and the parent proxy-reported Physical Functioning Scale. The ceiling effect that was observed in the parent-proxy reported Physical Functioning Scale was slight.

In the present study, the age groups were well-distributed and there were no significant differences between age groups

in the PedsQL™ SF15 (χ^2 = 17.858; p > 0.05). The coefficient alpha values for child self-report and parent proxy-report ranged from 0.72–0.85 (Table I). The test-retest reliability results demonstrated that the PedsQL™ 4.0 SF15 values were stable within a one-month interval for this predominantly healthy schoolchildren sample. All scales of the PedsQL™ 4.0 SF15 for both self-report and parent proxy-report showed acceptable test-retest reliability between the two assessment points (Table I). The known-groups discriminant validity comparisons were evaluated by comparing the PedsQL™ 4.0 SF15 scale scores across child health statuses. As hypothesised, schoolchildren and their parents reported significantly higher scores in the PedsQL™ 4.0 SF15 summary and scale scores than paediatric patients with chronic health conditions (Table II). Parent-child agreement was assessed using ICC, and the results showed that the child self-report and parent proxy-report had poor to moderate agreement (Table III).

The *a priori* factor structure of the PedsQL™ 4.0 SF15 was examined with CFA. For the child self-report, the four-factor model had acceptable fit (RMSEA = 0.056; SRMR = 0.048; χ^2(83) = 213.06; p-value < 0.001; NNFI = 0.946; CFI = 0.958; and PNFI = 0.738), and 14 of the 15 items loaded at least 0.40 on their hypothesised factor; item 5 of the Physical Health Summary Score (i.e. hard to do chores around house) did not load at least 0.40. The interfactor correlations among the scales ranged from 0.56 to 0.67.

For the parent proxy-report, the model that did not allow for any correlated error terms had the following indices: RMSEA = 0.083; SRMR = 0.738; χ^2(83) = 373.02; p-value < 0.001; NNFI = 0.946; CFI = 0.957; and PNFI = 0.742. To obtain a better model fit, a correlated error was added between item 5 of the Physical Health Summary Score and item 1 of the Social Functioning Scale. This modification resulted in the following indices: RMSEA = 0.078; SRMR = 0.070; χ^2(82) = 329.72; p = 0.0001; NNFI = 0.956; CFI = 0.965; and PNFI = 0.774. For the parent proxy-report, 13 of the 15 items loaded at least 0.40 on their hypothesised factor; item 1 of the Social Functioning Scale (i.e. trouble getting along with peers) and item 2 of the School Functioning Scale (i.e. forgets things) did not load at least 0.40. The interfactor correlations among the scales ranged from 0.16 to 0.77.

DISCUSSION

This study evaluated the feasibility, reliability, and validity of the Iranian version (i.e. Persian translation) of the PedsQL™ 4.0 SF15 in a sample of Iranian schoolchildren and children with chronic health conditions, as well as their parents. The findings support the measurement properties of the Iranian version of the PedsQL™ 4.0 SF15.

Previous studies have found significant differences between HRQoL scores across age groups using HRQoL instruments other than the PedsQL™.[35,36] A previous multigroup factorial invariance research demonstrated that children across different

Table II. Comparison of the PedsQL™ 4.0 SF15 summary and scale scores in schoolchildren and paediatric patients with chronic health conditions (i.e. different health status categories).

Scale	Health status‡	
	Schoolchildren (n = 1236)	Paediatric patients (n = 52)
Child self-report		
Total score	77.09 (13.98)*	60.71 (8.86)
Physical Health	87.19 (15.33)†	72.22 (23.19)
Psychosocial Health	77.96 (14.26)†	61.31 (10.47)
Emotional Functioning	69.06 (19.97)†	48.12 (12.51)
Social Functioning	77.48 (19.04)†	67.50 (15.58)
School Functioning	77.02 (19.08)*	57.57 (16.00)
Parent proxy-report		
Total score	68.80 (17.33)†	57.87 (15.63)
Physical Health	73.31 (25.48)†	55.45 (29.53)
Psychosocial Health	68.21 (17.39)*	59.09 (13.97)
Emotional Functioning	70.18 (23.56)†	53.40 (26.42)
Social Functioning	76.98 (20.36)*	59.69 (25.53)
School Functioning	64.16 (20.44)*	42.06 (25.30)

*p-value < 0.05. †p-value < 0.01. ‡Data is expressed as mean (standard deviation).

Table III. Intraclass correlation coefficients between child self-report and parent proxy-report for the PedsQL™ 4.0 SF15.

Scale	ICC*
Total score	0.59
Physical Health	0.64
Psychosocial Health	0.45
Emotional Functioning	0.65
Social Functioning	0.32
School Functioning	0.29

*All p-values were < 0.01. ICCs < 0.40 show poor to fair agreement, 0.41–0.60 moderate agreement, 0.61–0.80 good agreement and > 0.80 excellent agreement.
ICC: Intraclass correlation coefficients

age groups interpreted the items on the 23-item version of the PedsQL 4.0 Generic Core Scales in a similar manner regardless of their age.[37] In the present study, the age groups were well-distributed.

The feasibility of PedsQL™ 4.0 SF15 was supported in the present study, with few missing values. In the schoolchildren sample, none of the PedsQL™ 4.0 SF15 scales demonstrated any significant floor effects. However, moderate ceiling effects were observed in the child self-reported Social Functioning Scale and slight ceiling effects were observed in the parent proxy-reported Physical Functioning Scale. The presence of a ceiling effect in social functioning may be attributed to the general lack of problems in social engagement in the schoolchildren tested. One possible explanation for this observation is that Iran has a collectivistic culture, with a greater emphasis on the community group over the individual.[38,39] Another possible reason for these findings might be that the present study's schoolchildren sample was a predominantly

healthy school sample. A previous study using PedsQL™ 4.0 SF15 also found ceiling effects for the Social Functioning and Physical Functioning Scales in healthy populations.[21]

The internal consistency of the PedsQL™ 4.0 SF15 was acceptable for group level measurement, with all scales demonstrating a Cronbach's α coefficient of 0.70 or greater. Previous studies with the PedsQL™ 4.0 SF15 reported similar findings.[21,22] The test-retest findings also support the reliability of the Iranian version of the PedsQL™ 4.0 SF15. These findings suggest that the Iranian version of PedsQL™ 4.0 SF15 is highly reproducible over time in a mostly healthy Iranian schoolchildren population.

The study showed that poor to good agreement was observed between child self- and parent proxy-reports. This is similar to the Swedish PedsQL™ 4.0 SF15 study that reported poor to moderate agreement between child self- and parent proxy-reports.[22] However, differences were observed in the subscales between the Swedish study and the present (Iranian) study. In the Swedish study, agreement in the Social and School Functioning Scales were observed to be less problematic, while agreement for physical functioning was more problematic than that observed in the present study. Also, when compared to the Swedish study, the present study observed better parent-child agreement on emotional functioning. These differences may reflect cultural differences in parent-child communication and/or differences in the educational and socioeconomic levels between Sweden and Iran. The determinants of parent-child agreement are an avenue for future research in Iranian culture.

The known-groups comparisons demonstrated that the PedsQL™ 4.0 SF15 was able to significantly discriminate between healthy children and paediatric patients with chronic health conditions. In the present study, the factor structure of the PedsQL™ 4.0 SF15 was assessed by CFA. This study provides evidence to support the four-factor structure of the 15-item PedsQL™ 4.0 SF15, although some interfactor correlations for the factor loadings in both the child self- and parent-proxy reports did not meet the minimum acceptable level loading (i.e. 0.80).[26,27] The four-factor structure of the 15-item PedsQL™ 4.0 SF15 was supported for the child self-report, but the fit was less acceptable for the parent proxy-report.

Future research with the PedsQL™ 4.0 SF15 in larger populations of paediatric patients with chronic health conditions and schoolchildren is required to further test the factor structure of the short form version of the PedsQL™ 4.0 as a population health measure in Iran. One of the major limitations of this study was that the sample population was derived solely from Qazvin, Iran. There was a lack of representation of children from the other regions in Iran, which may reduce the generalisability of the findings to other parts of Iran.

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