VALIDATION OF VIETNAMESE VERSION OF PEDIATRIC QUALITY OF LIFE INVENTORY VERSION 4.0 GENERIC SCORE SCALE AMONG SCHOOL CHILDREN

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Abstract. Health-related quality of life (HRQoL) is increasingly an important evaluation tool of health improvement interventions and healthcare services outcome. A validated measurement of HRQoL was carried out to assess initial reliability and validity of a Pediatric Quality of Life Inventory (PedsQL) 4.0 generic score scales for Vietnamese school children 8-12 years of age. Backward and forward translations of the English version of PedsQL into Vietnamese were performed and the translated version was administered to 276 Vietnamese school children and 276 parents. Internal consistency and test-retest reliability were evaluated, and exploratory and confirmatory factor analysis and known-groups method were conducted to assess construct and discriminant validity, respectively. Satisfactory internal consistency and test-retest reliability were obtained. Factor analysis supported a four-factor model of PedsQL and discriminant validity was demonstrated in comparison of HRQoL between obese and normal weight children. Thus, the Vietnamese version of PedsQL 4.0 generic score scale proved reliable and valid and should be applicable in community and school settings in Vietnam.

Keywords: health-related quality of life, Pediatric Quality of Life Inventory (PedsQL) 4.0 generic score scales, reliability, validity, Vietnam

INTRODUCTION

Health-related quality of life (HRQoL) is considered a measurement of the health state of an individual and is increasingly becoming an important evaluation tool to evaluate outcome of health improvement interventions and healthcare services (Varni *et al*, 2005). The concept was used the first time in the mid-20th century when the World Health Organization (WHO) introduced the definition of health as "a state of complete physical, mental and social well-being and not merely the absence of a diseases or infirmity" at its 1946 assembly (WHO, 1948).

Based on this definition, instruments measuring HRQoL must reflect an individual's perception and cover different dimensions of health including at least physical, psychological and social wellbeing (Varni *et al*, 2007; Romero *et al*, 2013). An effective HRQoL measurement instrument should also be short enough to enable repeated administration, especially in busy clinical settings, use understandable

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and age-appropriate language and have acceptable reliability and validity (Osoba, 1998). Furthermore, in pediatric HRQoL assessment, it is important that both children and their parents' viewpoints be evaluated (Varni *et al*, 2005).

One of the most competent instruments containing all of these properties is Pediatric Quality of Life Inventory 4.0 (PedsQL 4.0), which includes generic score scales and disease-specific modules, allowing for integration of relative merits of generic and disease-specific HRQoL measurements (Varni, 2017). PedsQL 4.0 generic score scales measure the generic HRQoL in children and adolescents. Each scale is composed of 23 items, evaluating core dimensions of health as delineated by WHO (physical, emotional and social) as well as school performance. There are different versions for child self-reporting, taking into account the subject age (5-7, 8-12 and 13-18 years). Parent proxy-report versions are available for children of age groups 1-4, 5-7, 8-12 and 13-18 years. PedsQL 4.0 generic score scales have been validated and demonstrated feasibility, reliability and validity in various languages (Kook and Varni, 2008; Gheissari *et al*, 2012; Li *et al*, 2013).

However, a validated Vietnamese PedsQL 4.0 version is currently not available. Given that Vietnam has a young population with children under 15 years of age accounting for one third of the total population (General Statistics Office of Viet Nam, 2009), it is important to have a HRQoL instrument for this population group that is short, allows evaluation of both children and their parents, is simple to administer and score, and has been validated in the Vietnamese context to assist in evaluation of health care services and health improvement interventions for children outcome. The project reports reliability and validity of a Vietnamese version of PedsQL 4.0 Generic Score Scales for children aged 8-12 years.

MATERIALS AND METHODS

Study group

Children ($n = 276$) in grades 3-5 at two secondary schools in Hanoi, Vietnam and their parents were enrolled. The study group comprised of 93 obese children [body mass index (BMI) $\geq$ +2 SD] and 183 normal weight children (-2SD <BMI <1 SD) and their parents (mother, father or legal guardian).

The research protocols were approved by the Ethics Committee of Hanoi University of Public Health, Vietnam (approval no. 325/2017/YTCC-HD3).

Measurements

The 23-item PedsQL 4.0 Generic Score Scales, which are self-administered questionnaires, for children 8-10 years of age were used (Varni, 2017). They included children self-reports and parent proxy-reports and each scale encompasses four subscales: 1) physical functioning status (8 items), 2) emotional functioning status (5 items), 3) social functioning status (5 items), and 4) school functioning status (5 items). Questions in both types of reports were scored on a 5-point response scale, ranging from 0 (never a problem) to 4 (almost always a problem). In order to assess HRQoL, items were inversely scored and linearly transformed from 0-4 scale to 0-100 (0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0). Scores were obtained for each subscale as a total scale score or as two major parameters, namely, physical health (physical functioning items) and psychosocial health (emotional, social and school functioning items) by summing scores of all items, then dividing by the number of items answered. Score was not given if >50% of the items in

the scale were missing (Varni, 2017).

Transcultural adaptation process

Permission for use of PedsQL 4.0 Generic Score Scales was obtained from the author, Dr James W Varni. Translation process of the Scales was adapted from the Linguistic Validation of PedsQL Protocol by Mapi Research Institute (Mapi Research Institute, 2017). Two Vietnamese translators, fluent in English, independently translated the PedsQL 4.0 Scales from English to Vietnamese, then a consensus meeting was held between these two translators to produce the 1st Vietnamese version.

In order to ensure PedsQL 4.0 Scales were understandable and culture appropriate for the target population, the research team organized two focus group discussions, one with 10 students of grades 3-5 and 10 parents from one of the study schools. In addition, the translated PedsQL 4.0 Scales were sent to two experts in sociology and child health for consultation. Content of the focus group discussions and experts' consultation covered the following issues: (i) PedsQL 4.0 Scales format, clarity and understandability of each scale item, and (ii) appropriateness for the target population age group. Revisions were made based on comments of the students, parents and experts, resulting in the 2nd Vietnamese version.

Then, these Vietnamese versions were translated back to English by a bilingual translator who did not have access to the original English version. This version was then compared to the original English version to identify details that needed amendment in the 2nd Vietnamese version. Finally, the revised 2nd Vietnamese PedsQL 4.0 Scales were tested on 8 students 8-10 years of age and their parents to explore feasibility of the data collection procedure and identify further issues in PedsQL 4.0 Scales that needed amendment.

Data collection

Collection of data was approved by the schools' management boards. Trained research staffs provided a package, which contained detailed information of the study, assurance of data confidentiality, written consent form, self-administered questionnaire containing PedsQL 4.0 Generic Score Scales for parents, and guidelines for filling out the questionnaire. The schools were requested to send the package to the participating parents and have the children bring back the completed questionnaires and consent forms to the research staffs on a set date. Children whose parents completed the questionnaire and provided written consents for their participation in the study were informed of the data collection plan with details regarding date, time and in which classroom they would be seated to fill out the self-administered questionnaire containing the PedsQL 4.0 Generic Score Scales for children. On the data collection day, research staffs came to the classrooms and administered the questionnaires to the children. In order to assess the Scales test-retest reliability, data collection was conducted twice with the same participants within a two-week interval.

Statistical analysis

Demographic characteristics of the samples are reported by descriptive analysis. In order to examine the construct validity of PedsQL 4.0 Generic Score Scales, an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed. EFA was performed using principal component analysis, with varimax rotation. Factors having an eigenvalue ≥1 were extracted while items having a loading factor ≥0.5 after rotation

were retained. For CFA, model fit was assessed based on several fit indices including chi-square (χ^2), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker Lewis index (TLI), and standardized root mean square residual (SRMR). RMSEA <0.08, CFI >0.90, TLI >0.90, and SRMR <0.08 indicate satisfactory model fit (Hu and Bentler, 1999). As χ^2 is sensitive to sample size, if sample is large, there is considerable power to reject the null hypothesis even though the model fits the data well. Therefore χ^2 / df ratio was used to assess model fit, with χ^2 / df <5 demonstrating an acceptable model fit (Li *et al*, 2013). A 4-factor model was tested based on EFA results and previous PedsQL 4.0 CFA findings (Bastiaansen *et al*, 2008; Solveig *et al*, 2009).

Known-groups discriminant validity was also tested to assess whether the scales could differentiate between groups known to be different in the health construct being surveyed. We hypothesized obese children have higher HRQoL scores than normal-weight children. Independent *t*-test was used for this purpose with a *p*-value <0.05 accepted as statistically significant.

In order to assess reliability in terms of internal consistency, Cronbach's alpha coefficient was calculated for each subscale and the overall scales. An alpha coefficient ≥0.7 is considered satisfactory (Cronbach, 1951). Test-retest reliability was assessed from intra-class correlation coefficient (ICC), with ICC ≤4 indicating poor agreement, 0.41-0.79 moderate agreement, 0.61-0.80 good agreement, and >0.8 excellent agreement (Bartko, 1966). Parent-child agreement was assessed from ICC between children self-reports and parent proxy-reports for each subscale and the overall scale.

CFA was conducted with time two's data and other analyses were with time one's data. All analyses were performed with SPSS 18.0 (IBM, Armonk, NY).

RESULTS

Transcultural adaptation of PedsQL 4.0 Generic Score Scales into Vietnamese language

In general, discussion with the children, parents and consultation with experts revealed the translated versions were easy to understand and the questions were clear and simple. However, discussion with children and experts indicated amendment was needed for one item in the original physical functioning status subscale: "It is hard for me to walk more than one block". The distance measured by "a block" was rather vague to children. They could not estimate how far a "block" was and it was necessary to provide a more concrete measure of distance. Therefore, to ensure the Scales cultural relevance, an alternative phrase, "a distance of about 200 meters", was used. A number of other minor changes to the translated versions that did not change the meaning of the original items were made after a preliminary trial of the Vietnamese version.

Characteristics of questionnaires received

Parent proxy-reports and child self-reports were completed by 276 parents and 276 children respectively, with a response rate of 97%. Of the 276 children, 42%, 34% and 24% were 8, 9 and 10 years of age, respectively, with 77% being boys, 34% obese and 84%, 7% and 3% from families with average, wealthy and poor economic status, respectively.

Construct validity

Principal component analysis was first performed for both child self-report

and parent proxy-report scales to explore PedsQL 4.0 Scales factor structure. Kaiser-Meyer-Olkin measurement of sampling adequacy was 0.91 and 0.94 for child self-reports and parent proxy-reports, respectively, values higher than the normative threshold (0.7). Bartlett's test of Sphericity is significant (p <0.001) for both types of reports. These results indicated the data were adequate for factor analysis. Four factors extracted for both types of reports indicated 62% and 66% of the total variance for child self-reports and parent proxy-reports, respectively. Applying varimax rotations, the 23 items of each scale were grouped into four components consistent with the four original subscales (physical functioning, emotional functioning, social functioning and school functioning status) (Table 1).

CFA, using a 4-factor model, for child self-reports provided fit indices with all values indicating acceptable fit (χ^2/df = 1.699, RMSEA = 0.059, CFI = 0.936, TLI

Table 1
Principal component analysis of Vietnamese Pediatric Quality of Life Inventory 4.0 Generic Score Scales, Vietnamese language version.

Subscale	Item	Factor loading Child self-report				Factor loading Parent proxy-report			
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 4
Physical functioning status	1	**0.62**	0.22	0.25	0.17	**0.74**	0.10	0.08	0.17
	2	**0.70**	0.23	0.15	0.19	**0.77**	0.11	0.10	0.16
	3	**0.64**	0.29	0.31	0.15	**0.76**	-0.00	0.12	0.16
	4	**0.67**	0.02	0.17	0.27	**0.67**	-0.01	-0.08	0.18
	5	**0.68**	0.38	0.11	0.19	**0.72**	0.05	0.13	0.23
	6	**0.68**	0.28	0.08	0.14	**0.74**	0.15	-0.03	0.12
	7	**0.56**	-0.06	0.25	0.46	**0.66**	0.08	-0.02	0.27
	8	**0.66**	0.27	0.17	0.28	**0.72**	0.07	0.13	0.15
Emotional functioning status	1	0.33	0.28	0.25	**0.65**	0.27	0.13	0.10	**0.79**
	2	0.20	0.28	0.27	**0.71**	0.25	0.13	0.14	**0.82**
	3	0.23	0.16	0.10	**0.74**	0.24	0.09	0.15	**0.74**
	4	0.29	0.19	0.13	**0.63**	0.22	0.07	0.11	**0.71**
	5	0.20	0.35	0.24	**0.62**	0.27	0.14	0.07	**0.74**
Social functioning status	1	0.23	**0.72**	0.28	0.20	0.11	**0.84**	0.22	0.06
	2	0.28	**0.73**	0.20	0.20	0.12	**0.81**	0.23	0.12
	3	0.13	**0.50**	0.23	0.34	0.06	**0.80**	0.21	0.14
	4	0.22	**0.71**	0.18	0.19	0.08	**0.78**	0.30	0.13
	5	0.31	**0.73**	0.17	0.24	0.08	**0.82**	0.26	0.14
School functioning status	1	0.14	0.34	**0.68**	0.23	0.09	0.30	**0.77**	0.11
	2	0.26	0.12	**0.72**	0.10	0.13	0.27	**0.77**	0.08
	3	0.10	0.39	**0.73**	0.10	0.09	0.37	**0.81**	0.03
	4	0.24	0.12	**0.72**	0.26	-0.00	0.20	**0.82**	0.17
	5	0.19	0.13	**0.74**	0.21	0.04	0.15	**0.78**	0.17

Numbers in bold indicate items having a loading factor ≥0.5 after rotation, hence retained in the factor.

= 0.927, and SRMR = 0.038). For parent proxy-reports, χ^2/df ratio and SRMR met the recommended criteria for model fit (χ^2/df = 3.057 and SRMR = 0.032) while the other indices did not (RMSEA = 0.086, TLI = 0.885, and SRMR = 0.032). However, RMSEA, CFI and TLI values from the parents' data were only marginally different from pre-established thresholds for model fit (Hu and Bentler, 1999).

Known-groups discriminant validity

Known-groups discriminant validity was assessed by comparing HRQoL scores between obese and normal weight children. As expected, obese children have significantly lower scores in all domains compared to children with normal weight (p<0.05) (Table 2). Parent proxy-reports indicated obese children have only significantly lower HRQoL, and emotional functioning and social functioning status.

Reliability

Cronbach's alpha value for each subscale and for the overall scale was >0.7, respectively, for both child self-reports and parent proxy-reports, indicating excellent internal consistency (Table 3). In terms of test-retest reliability, ICCs ranged from 0.64 for school functioning status to 0.96 for emotional functioning status for child self-reports, indicating good to excellent agreement. With regards to parent proxy-reports, ICCs ranged from 0.59 for social functioning status to 0.89 for school functioning status, indicating moderate to excellent agreement.

Table 2
Pediatric Quality of Life Inventory 4.0 (PedsQL 4.0) (Vietnamese language version) scores of obese and normal weight children 8-10 years of age.

	Normal weight children PedsQL 4.0 score Mean (SD) (n = 183)	Obese children PedsQL 4.0 score Mean (SD) (n = 93)	p-value[a]
Status (child self-report)			
Physical functioning	87 (13)	81 (16)	0.001
Emotional functioning	79 (17)	71 (22)	0.001
Social functioning	89 (14)	81 (18)	<0.001
School functioning	85 (15)	76 (19)	<0.001
Psychosocial functioning	84 (13)	76 (17)	<0.001
Overall scale	85 (12)	77 (16)	<0.001
Status (parent proxy-report)			
Physical functioning	86 (13)	84 (15)	0.229
Emotional functioning	80 (16)	72 (23)	0.001
Social functioning	88 (14)	84 (16)	0.031
School functioning	82 (16)	80 (16)	0.219
Psychosocial functioning	83 (12)	79 (15)	0.003
Overall scale	84 (10)	80 (14)	0.005

[a]Significant at p-value <0.05, independent t-test.

Table 3
Internal consistency and test-retest reliability of Pediatric Quality of Life Inventory 4.0 Generic Score Scales, Vietnamese language version.

Status	Number of items	Cronbach's alpha		ICC (95% CI)	
		Child self-report	Parent proxy-report	Child self-report	Parent proxy-report
Physical functioning	8	0.88	0.89	0.84 (0.80-0.87)	0.87 (0.83-0.89)
Emotional functioning	5	0.85	0.88	0.96 (0.95-0.97)	0.81 (0.76-0.85)
Social functioning	5	0.85	0.91	0.95 (0.94-0.96)	0.59 (0.48-0.68)
School functioning	5	0.85	0.90	0.64 (0.55-0.72)	0.89 (0.86-0.91)
Psychosocial functioning	15	0.92	0.90	0.93 (0.91-0.95)	0.86 (0.82-0.89)
Overall scale	23	0.94	0.91	0.94 (0.92-0.95)	0.87 (0.84-0.90)

CI. confidence interval; ICC, intra-class correlation coefficient.

Table 4
Comparison of Pediatric Quality of Life Inventory 4.0 (Vietnamese language version) scores between child self-reports and parent proxy-reports.

Status	ICC (95% CI)
Physical functioning	0.84 (0.8-0.88)
Emotional functioning	0.94 (0.92-0.95)
Social functioning	0.61 (0.5-0.69)
School functioning	0.55 (0.43-0.64)
Psychosocial functioning	0.84 (0.79-0.87)
Overall	0.88 (0.85-0.91)

CI, confidence interval; ICC, intra-class correlation coefficient.

Consistency between child self-reports and parent proxy-reports

Agreements between children and parent proxy-reports were satisfactory for all subscales and overall scale with ICCs ranging from 0.55 for school functioning status to 0.94 for emotional functioning status (Table 4).

DISCUSSION

Our study is the first to assess the reliability and validity of a Vietnamese version of PedsQL 4.0 Generic Score Scales for children 8-10 years of age. PedsQL 4.0 Generic Score Scales were translated from English to Vietnamese following recommended translation protocols. In addition, focus group discussions with children and parents and consultation with experts regarding content and format of PedsQL 4.0 were also conducted, enabling a more thorough assessment the PedsQL 4.0 Scales culture appropriateness. All children participating in the study found the questionnaire easy to understand and complete without or with some assistance from the research staffs. It is worth noting children found difficulty in understand-

ing the term "block" as a measurement of distance in the first version, and this was replaced with "about 200 meters". A similar difficulty was reported by Arabiat *et al* (2011) who used the term "a short distance" in the Arabic version.

CFA of PedsQL 4.0 Scales construct validity showed data fitted the 4-factor model for child self-reports, while for parent proxy-reports, 3/5 indices did not (marginally) meet pre-established criteria for the model fit. Overall, the results provided empirical support for the 23 items of child self-report and parent proxy-reports of the PedsQL 4.0 Generic Score Scales. The Vietnamese version of PedsQL 4.0 Scales had satisfactory discriminant validity, as demonstrated by the ability to distinguish between obese children and those with healthy nutritional status. Similar results were obtained in a study between Malaysian obese and healthy weight children (Hamaid *et al*, 2011). Total scale score and subscale scores in our study were higher than those reported for obese and healthy children in other Asian countries (Hamaid *et al*, 2011; Chan and Wang, 2013) for reason that are unclear but cultural differences might play an important role.

Cronbach alpha coefficients of both internal consistency and reproducibility for child self-reports and parent proxy-reports were comparable and indicative of internal consistency with the original (English) version as well as other translated versions (Varni *et al*, 2001; Kobayashi and Kamibeppu, 2010; Arabiat *et al*, 2011). ICCs showed favorable level of test-retest reliability for both types of reports. Our findings regarding reproducibility of PedsQL 4.0 Generic Score Scales were observed in studies of other populations (Gkoltsiou *et al*, 2008; Kobayashi and Kamibeppu, 2010).

Although there was moderate to excellent agreement between child self-reports and parent proxy reports, lower levels of agreement for school functioning and social functioning status and higher levels of agreement for physical functioning, emotional functioning status and overall HRQoL were obtained. Studies assessing reliability and validity of PedsQL 4.0 Generic Score Scales among children in other countries reported much lower levels of agreement between child self-reports and parent proxy-reports (Varni *et al*, 2001; Hamaid *et al*, 2011). Obtaining perspectives of both children and their parents in assessing child HRQoL are still necessary because parents play key roles in deciding on health inventions for their children (Hamaid *et al*, 2011). High level of agreement between child self-reports and parent proxy-reports in our study is consistent with various studies of the PedsQL 4.0 Generic Score Scales in other parts of the world (Kook and Varni, 2008; Parpour *et al*, 2011), suggesting parent proxy-reports can be used as an informative resource for measuring children HRQoL when the children are not able or reluctant to participate (Cremeens *et al*, 2006).

This study has a number of limitations. Firstly, as the test children were from only two secondary schools in Hanoi and included those 8-10 years old, the results are not representative of children in the same age group across the country. Secondly, for testing the validity of the Vietnamese language PedsQL 4.0 Generic Score Scales, comparisons were conducted between obese children and those of normal weight, the results may not be the same for children residing in rural or less developed areas of the country, or if other health conditions were chosen for evaluation. Thirdly, a potential recall

bias might have occurred. We recommend future studies be conducted with a more representative sample of Vietnamese children and with more thorough assessment of the reliability and validity of PedsQL 4.0 Generic Score Scales (with concurrent validity taken into account, for example).

In conclusion, the results demonstrate culture appropriateness, reliability and validity of the Vietnamese version of the PedsQL 4.0 Generic Score Scales for both child self-reports and parent proxy-reports. The Vietnamese version of PedsQL will help fill the gap in pediatric health outcome measurements in the country, but as this was an initial endeavor, further refinements and evaluations will be needed to make PedsQL 4.0 Generic Score Scales applicable in all settings within Vietnam.

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