Short Form of the Chinese Version Diabetes Quality of Life for Youth Scale

A psychometric testing in Taiwanese adolescents with type 1 diabetes

RUEY-HSIA WANG, PHD, RN
FU-SUNG LO, MD
BAI-HSIUN CHEN, MD

HSIU-YUEH HSU, DNSC, RN
YANN-JINN LEE, MD, MS

OBJECTIVE—To test the psychometric properties of the short form of the Chinese version Diabetes Quality of Life for Youth scale (C-DQOLY-SF).

RESEARCH DESIGN AND METHODS—A 30-item C-DQOLY-SF was administered to 371 adolescents with type 1 diabetes. Exploratory and confirmatory factor analysis, correlation with HbA1c, internal consistency, and test-retest reliability were used to examine the psychometric characteristics of C-DQOLY-SF.

RESULTS—A 25-item questionnaire with three correlated second-order factor structures best fitted data. Scores on the 25-item C-DQOLY-SF significantly correlated with HbA1c values. Cronbach’s $\alpha$ and ICCs of each scale and subscale ranged from 0.77 to 0.90 and from 0.70 to 0.92, respectively.

CONCLUSIONS—The C-DQOLY-SF has satisfactory reliability and validity. The C-DQOLY-SF can be conveniently used in clinical settings to assess the quality of life of adolescents with type 1 diabetes.

A total of 371 adolescents (171 male and 200 female) who were diagnosed with type 1 diabetes for more than 1 year, aged between 9 and 19 years (mean $\pm$ SD 14.3 $\pm$ 2.4 years), and did not have major cognitive disorders were recruited from five medical centers in southern and northern Taiwan. The institutional review board of each hospital approved the study, and all adolescents and their guardians gave their written informed consent. The 30-item C-DQOLY-SF was administered to these participants for psychometric testing.

Items having an item-total correlation $<0.3$ or absolute value of skewness or kurtosis $>2$ were deleted (7). Exploratory factor analysis (EFA) using a principal component method with Promax rotation was used to examine the construct validity of C-DQOLY-SF. Items that double loaded or had factor loadings $<0.5$ were removed. To test the factor structure produced by EFA, confirmatory factor analysis (CFA) was performed with a structural equation-modeling program by EQS (version 6.1). The correlation between C-DQOLY-SF and the latest HbA1c was examined.

Cronbach’s $\alpha$ was calculated to assess internal consistency. The C-DQOLY-SF was administered to 21 participants twice with a 2-week interval. Test-retest reliability was examined by ICC.

RESULTS—Five items were deleted because of absolute value of kurtosis, skewness $>2$, or factor loadings $<0.50$ by EFA. After EFA on the retained 25 items, six factors were produced. Furthermore, two subscales were extracted from each scale. Because life satisfaction, diabetes impact, and diabetes-related worry scales are considered independent but correlated (2), a three-correlated second-order factor CFA was performed to test the structure of C-DQOLY-SF produced by the EFA. Each item statistically significantly loaded on its corresponding factor of EFA. Furthermore, each subscale also significantly loaded on its higher second-order factor (scale) (Table 1). The fit indices were $\chi^2 = 583.77$, d.f. = 266; $\chi^2$/d.f. = 2.19, comparative fit index = 0.93, nonnormed
fit index = 0.92, root mean square error of approximation = 0.06 (90% CI 0.05–0.06). The three-correlated second-order factor CFA was supported (8). The three second-order factors were also significantly intercorrelated; the correlation coefficients were 0.66, 0.49, and 0.88.

Scores of diabetes life satisfaction \( r = -0.11; P = 0.03 \), diabetes impact \( r = -0.13; P = 0.01 \), and diabetes-related worry scales \( r = -0.14; P < 0.01 \) significantly negatively correlated with HbA1c.

Cronbach’s \( \alpha \) and ICCs of each scale and subscale ranged from 0.77 to 0.90 and from 0.70 to 0.92, respectively.

**CONCLUSIONS**—The C-DQOLY-SF included three scales, which supported the factor structure of DQOLY (2). Furthermore, two distinct subscales were extracted from each scale. It indicated that each subscale can be examined individually to represent specific subdomains or summed together to represent their specific domain of QOL (9). Health care providers can use C-DQOLY-SF to assess specific QOL and provide adequate intervention.

In DQOLY-SF, items of life satisfaction and satisfaction to treatment were combined to one satisfaction scale. Regarding the items of diabetes-related worry, only items of future worries were retained. In C-DQOLY-SF, satisfaction scale included subscales of satisfaction of school life and satisfaction of treatment. Furthermore, the diabetes-related worry scale included subscales of worry about the future and worry about social activities. C-DQOLY-SF could be used to assess the satisfaction and diabetes-related worry QOL more comprehensively and specifically than DQOLY-SF. Parental concern scale is a unique subscale in both DQOLY-SF and C-DQOLY-SF. Parental concern is important for QOL of adolescents with type 1 diabetes.

Significant correlation between scores of each scale and HbA1c, is consistent with previous studies (5,10). The C-DQOLY-SF had satisfactory concurrent validity. QOL is in conjunction with clinical outcome, which can provide health care providers with more information to educate adolescents with type 1 diabetes.

Cronbach’s \( \alpha \) and the test-retest reliability of each scale and their subscales all exceeded the recommended standard of 0.70 (11). The C-DQOLY-SF has satisfactory reliability.

The C-DQOLY-SF is noticeably shorter and is better constructed than the DQOLY and DQOLY-SF. The C-DQOLY-SF can be used in clinical settings to assess the QOL of adolescents with type 1 diabetes.

Acknowledgments—This study was supported by the National Science Council, Taiwan (NSC 98-2314-B-037-047).

No potential conflicts of interest relevant to this article were reported.

H.-W. designed and collected research data, wrote the manuscript, and reviewed and edited the manuscript. F.-S.L. collected research data, contributed to discussion, and edited the manuscript. B.-H.C. collected research data and edited the manuscript. H.-Y.H. collected research data and contributed to discussion. Y.-J.L. collected research data and wrote, reviewed, and edited the manuscript.

The authors thank Gary M. Ingersoll (College of Education, United Arab Emirates University, Al Ain, United Arab Emirates) for permission to use the scale. The authors also acknowledge the editorial assistance of Tredrea Stephen Russell, Kaohsiung Medical University, Kaohsiung, Taiwan.
References
1. Naughton MJ, Ruggiero AM, Lawrence JM, et al.; SEARCH for Diabetes in Youth Study Group. Health-related quality of life of children and adolescents with type 1 or type 2 diabetes mellitus: SEARCH for Diabetes in Youth Study. Arch Pediatr Adolesc Med 2008;162:649–657
2. Ingersoll GM, Marrero DG. A modified quality-of-life measure for youths: psychometric properties. Diabetes Educ 1991;17:114–118
3. Al-Akour N, Khader YS, Shatnawi NJ. Quality of life and associated factors among Jordanian adolescents with type 1 diabetes mellitus. J Diabetes Complications 2010;24:43–47
4. Graue M, Wentzel-Larsen T, Hanestad BR, Båtsvik B, Søvik O. Measuring self-reported, health-related, quality of life in adolescents with type 1 diabetes using both generic and disease-specific instruments. Acta Paediatr 2003;92:1190–1196
5. Skinner TC, Hoey H, McGee HM, Skovlund SE; Hvidøre Study Group on Childhood Diabetes. A short form of the Diabetes Quality of Life for Youth questionnaire: exploratory and confirmatory analysis in a sample of 2,077 young people with type 1 diabetes mellitus. Diabetologia 2006;49:621–628
6. Waltz CF, Strickland OL, Lenz ER. Measurement in Nursing and Health Research. 3rd ed. New York, Springer, 2005
7. Pesudovs K, Burr JM, Harley C, Elliott DB. The development, assessment, and selection of questionnaires. Optom Vis Sci 2007;84:663–674
8. Joreskog KG, Sorbom D. LISREL 8: User’s Reference Guide. Chicago, Scientific Software International, 1996
9. Noar SM. The role of structural equation modeling in scale development. Struct Equ Modeling 2003;10:622–647
10. Varni JW, Burwinkle TM, Jacobs JR, Gottschalk M, Kaufman F, Jones KL. The PedsQL in type 1 and type 2 diabetes: reliability and validity of the Pediatric Quality of Life Inventory Generic Core Scales and type 1 Diabetes Module. Diabetes Care 2003;26:631–637
11. Rosner B. Fundamentals of Biostatistics. 6th ed. Toronto, Canada, Thomson, 2006