Comparing Quality of Life Instruments: Sizing Them Up versus Pediatric Quality of Life Inventory and Kid-KINDL

Abstract

Introduction: Children with overweight or obesity are very likely to experience health problems including low levels of psychological well-being and impaired quality of life (QoL). Given that the importance of QoL includes policymaking measuring QoL is especially crucial. Therefore, comparing generic (Kid-KINDL and Pediatric QoL Inventory [PedsQL]) and weight-related (Sizing Them Up) measures could provide insights for healthcare providers to decide how and when to use which QoL instrument. Methods: I recruited 199 school children studied between 3rd and 6th grades from 11 schools in Southern Taiwan, and all the children completed child depression inventory (for depression) and Rosenberg self-esteem scale (for self-esteem); one of their parents completed Sizing Them Up, PedsQL, and Kid-KINDL. Results: I constructed structural equation modeling to investigate the associations between these instruments, and the results indicated that self-esteem had the strongest relationship with Kid-KINDL; weight had the strongest relationship with Sizing Them Up. Moreover, both PedsQL and Kid-KINDL could observe the depression among children. Conclusion: Healthcare providers may have insights to select appropriate measure to assess QoL for overweight/obese children according to my findings.

Keywords: Children, obesity, parent-proxy, quality of life

Introduction

The problem of overweight/obesity has been acknowledged in both developing and developed countries including the pediatric population.[1] Similar overweight/obesity problem exists in Taiwan because of high prevalence (say, over 20%) among children and adolescents.[2] Negative consequences of childhood overweight/obesity include physical (e.g., cardiovascular problems and type 2 diabetes)[3] and psychological issues (e.g., depression and low self-esteem).[4] In addition, studies have shown that overweight/obese children usually have lower quality of life (QoL) as compared with their normal-weight counterparts.[2,4,6]

QoL, a patient-reported outcome obtaining more and more attention in healthcare practice, may contribute to several benefits for public health, such as designing public health policy and evaluating cost-effectiveness, among different treatment effects.[7] In other words, the importance of using QoL goes beyond simply assessing health for overweight/obese children. Healthcare providers and health policymakers gain benefits from the QoL findings because QoL provides a holistic view in children’s physical, psychological, and social health. Therefore, assessing QoL for overweight/obesity populations has been recommended,[8] and two approaches to assess QoL have been developed: generic measures which can compare QoL across various diseases/conditions, and weight-related measures which can compare QoL across different severity in weight. Good examples of generic QoL instrument include the Kid-KINDL[9] and Pediatric QoL Inventory (PedsQL).[10] Good examples of weight-related QoL measures include Sizing Me Up[11] and Sizing Them Up.[12]

Although healthcare providers can use either generic or weight-related QoL measures to assess the QoL of overweight/obese children, generic, and weight-related QoL could provide different information for healthcare providers. Given that little is known about the similarities and differences between generic and weight-related QoL instruments, there is a need to compare different QoL instruments. Moreover, the

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factorial structures of different QoL instruments appear to be different as follows: Kid-KINDL has six domains, PedsQL has four domains, and Sizing Them Up has six domains; and these domains are not totally matched with each other. As a result, healthcare providers and health policymakers may be confused by how and when to use which specific QoL instrument. To the best of my knowledge, only one study on child-rated QoL instrument has compared generic and weight-related QoL instrument.[13] However, given that in some occasions, parent-proxy QoL instruments are needed (e.g., some children do not have sufficient cognitive to complete a questionnaire), comparing parent-proxy QoL instruments between generic and weight-related designs is highly recommended. To fill in the knowledge gap of the current literature, I compared three parent-proxy QoL instruments; they are Sizing Them Up, PedsQL, and Kid-KINDL. Specifically, I used several external criteria (depression, self-esteem, and body mass index [BMI]) to assess the discriminative abilities of these instruments among schoolchildren in Taiwan.

Methods

Participants and procedure

After obtaining the ethical approval from the Institutional Review Board of the National Cheng Kung University Hospital, the data were collected between March and June 2010 through convenience sampling. I invited third to sixth graders from 11 schools located in Southern Taiwan to participate in the study through the assistance from several school teachers. As the target sample was children, all the children and one of their parents were fully informed regarding the study purpose and had signed a written informed consent (one from children and one from parents; n = 199).

Each child completed a child depression inventory (CDI) and a Rosenberg self-esteem scale in the classroom under the supervision of the author and a teacher. Afterward, the children brought the following questionnaires home for their parents to complete: Sizing Them Up, PedsQL, and Kid-KINDL and a background information sheet. The parent-proxy QoL instruments (namely Sizing Them Up, PedsQL, and Kid-KINDL) and background information sheets were collected 1 week later.

Measures

Sizing Them Up is a weight-related QoL instrument with seven domains (physical, emotional, teasing/marginalization, positive attributes, mealtime, school, and adolescent developmental adaptation). However, given that I only recruited children, the adolescent developmental adaptation domain was not used in this study, and I used 22 items distributed in the retained six domains as follows: physical (five items), emotional (seven items), teasing/marginalization (three items), positive attributes (four items), mealtime (two items), and school (one item). A four-point Likert-type scale from 1 to 4 was used for all items, and the final scores were converted into a 0–100 scale,[12] where a higher score represents a higher level of QoL. The internal consistency (α = 0.77), test-retest reliability (intraclass correlation coefficient [ICC] = 0.75), and concurrent validity (r = 0.46–0.53 with Sizing Me Up,[6,11] PedsQL,[14] and Kid-KINDL[19]) were adequate or nearly acceptable for its Taiwan version.[9]

PedsQL is a generic QoL instrument contains four domains as follows: physical (eight items), emotional (five items), social (five items), and school (five items). A five-point Likert-type scale from 0 to 4 was applied to all the items, and the scores were converted into a 0–100 scale, where a higher score represented a higher level of QoL.[10] The internal consistency (α = 0.68–0.90), test-retest reliability (ICC = 0.67–0.82), and construct validity of the PedsQL Taiwan version are satisfactory.[14]

Kid-KINDL is a generic QoL instrument contains six domains, each has four items as follows: physical well-being, emotional well-being, self-esteem, friends, family, and school. A five-point Likert-type scale from 1 to 5 was applied to all items, and the scores were converted into a 0–100 scale, where a higher score represented a higher level of QoL. The construct validity of the Kid-KINDL Taiwan version has been established.[16]

CDI contains 27 items and is often used as a screen tool to measure depression. A three-point Likert scale was used for all items, and a higher score represents more depression. The CDI Taiwan version illustrates satisfactory psychometric properties including internal consistency (α = 0.81–0.89) and test-retest reliability (ICC = 0.85).[17,18]

The Rosenberg self-esteem scale (RSES) contains ten items and is used to measure the self-esteem. A four-point Likert scale was used for all items, and a higher score represents the higher level of self-esteem. The RSES Taiwan version is confirmed to have unidimensionality using the Rasch model.[19]

BMI was calculated using height (cm) and weight (kg), which were derived from the school records.

Statistical analysis

In addition to using descriptive statistics for describing the sample characteristics, I proposed three models to tackle whether each QoL instrument had different specific characteristics. Model 1 [Figure 1a] included three latent QoL variables using different investigated QoL measures (Sizing Them Up, PedsQL, and Kid-KINDL), and their domain scores were treated as observed variables. Model 2 [Figure 1b] included two latent QoL variables; one latent variable represents weight-related QoL according to Sizing Them Up, the other latent variable represents generic QoL using the Kid-KINDL and the PedsQL (the sum scores...
for both measures were used as observed variables for this latent variable). Therefore, domain scores of PedsQL and Kid-KINDL were observed variables for generic QoL instrument concept; domain scores of Sizing Them Up were observed variables for weight-related QoL instrument concept. Model 3 [Figure 1c] combined all QoL instruments as an only QoL latent concept, and the domain scores of all QoL instruments were used as observed variables. For all three models, each latent QoL concept was pointed by three external criteria (BMI, CDI, and RSES), and I controlled age and gender in all the models.

All the models were constructed using structural equation modeling (SEM) with maximum likelihood estimators, and the missing values were tackled by full information maximum likelihood estimation. I used the following indices to evaluate the fit of each investigated model: root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) <0.08.\[^{[20]}\] I also reported that the Chi-square test, of which a nonsignificant result is in anticipation, for all the models. After investigating the fit indices of each model, I compared the three competing models using Chi-square difference tests and Akaike’s information criterion (AIC). The Chi-square difference test indicated whether every two models were significantly different from each other, and a lower value of AIC indicates a better model fit.

All the data were analyzed using R software or IBM SPSS 23.0 (IBM Corp., Armonk, NY, USA), and the SEM models were performed using the lavaan package (http://lavaan.ugent.be/) in R.

### Results

After excluding those who have missing information in height and weight, I analyzed the retained participants ($n = 199$) with a mean (standard deviation) age of 10.96 (1.06) years. There were slightly more girls (58.3%) than boys (41.7%), and there were slightly more than one-third of the participants being overweight or obese (34.7%). Table 1 presents the QoL scores of the participants rated by their parents and the parents’ demographic information.

Of the three proposed SEM models, Model 1 [Figure 1a] had both RMSEA (0.077; 90% confidence interval = 0.066, 0.088) and SRMR (0.077) acceptable, except for the significant Chi-square test ($P < 0.001$). Models 2 and 3 [Figures 1b and c] had relatively poor fit in RMSEA (0.082 and 0.114, respectively), SRMR (0.081 and 0.092, respectively) together with significant Chi-square tests ($P < 0.001$). The Chi-square difference tests additionally showed that Model 1 outperformed Models 2 ($\Delta \chi^2 \text{[df]} = 39.62 \text{[6]]; } P < 0.001$) and 3 ($\Delta \chi^2 \text{[df]} = 248.38 \text{[11]; } P < 0.001$); similarly, the AIC in Model 1 showed the smallest value among the three models [Table 2]. Therefore, based on the fit indices and the results of model comparisons, I investigated the path coefficients in detail in the Model 1 (i.e., the coefficients between the QoL instruments and the external criteria).

Table 3 shows whether the significant paths exist between external criteria and the three QoL instruments. Specifically, after controlling for age and gender,
BMI was negatively correlated with Sizing Them Up (standardized coefficient = −0.441; \( P < 0.001 \)); CDI was negatively correlated with PedsQL (standardized coefficient = −0.398; \( P < 0.001 \)) and Kid-KINDL (standardized coefficient = −0.243; \( P = 0.016 \)); RSES was positively correlated with the Kid-KINDL (standardized coefficient = 0.232; \( P = 0.021 \)).

### Discussion

The study used three external criteria (BMI, depression, and self-esteem) to compare the similarities and differences in two generic and a weight-specific QoL measures among schoolchildren, where about one-third of them were overweight or obesity. In general, I demonstrated that Sizing Them Up, PedsQL, and Kid-KINDL provided some similar and some unique information. Specifically, depression was negatively correlated with PedsQL and Kid-KIND; self-esteem was positively correlated with Kid-KINDL only; and BMI was negatively correlated with Sizing Them Up only.

Through the results, the weaknesses and strengths of generic and weight-specific QoL measures can be discussed for healthcare providers who want to assess QoL for children with overweight/obesity. Specifically, Sizing Them Up showed the strongest association with BMI. However, negative associations though not significant were also observed between BMI and both generic QoL instruments. Given that the items in Sizing Them Up related to physical discomforts, body shape, and size concerns, the impaired QoL was obviously found in the Sizing Them Up. Therefore, Sizing Them Up may be appropriate for obese/overweight children and adolescents.

Obese/overweight children are reported to have high risk in developing mental health problems including depression.\(^{[21,22]}\) Therefore, the link between depression and QoL is obvious. Unfortunately, the validity of measuring depression seems an issue in child-rated QoL instrument; measurement properties of PedsQL and Kid-KINDL have been compared and found to have deficits in psychometric properties among the Medicaid-receiving children in the US.\(^{[23]}\) In contrast, my study demonstrated that both PedsQL and Kid-KINDL having a significant relationship with depression. A possible reason maybe because I used proxy-measure in QoL, while that the previous study\(^{[23]}\) used child-rated QoL. Nevertheless, the future studies are needed to identify whether parent-proxy and child self-report matter in psychometric properties.

Another common psychological phenomenon among overweight/obese children is their low self-esteem.\(^{[4]}\) However, findings from my study indicate that the significant relationship between self-esteem and QoL only occurred when QoL was measured using Kid-KINDL. I postulated that a similar reason to Pakpour et al.\(^{[13]}\) that Kid-KINDL contains a self-esteem domain while the other two measures (Sizing Them Up and PedsQL) do not. My results echo a recent review, which recommended using Kid-KINDL to assess the impact

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**Table 1: Participant characteristics (n=199)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Age (year)</td>
<td>10.96 (1.06)</td>
</tr>
<tr>
<td>Gender (boy)</td>
<td>83 (41.7)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>145.65 (9.21)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>42.22 (11.08)</td>
</tr>
<tr>
<td>BMI (BMI; kg/m(^2))</td>
<td>19.66 (3.75)</td>
</tr>
<tr>
<td>Weight status (overweight)</td>
<td>69 (34.7)</td>
</tr>
<tr>
<td>PedsQL score (range: 0-100)</td>
<td>87.20 (10.10)</td>
</tr>
<tr>
<td>Kid-KINDL score (range: 0-100)</td>
<td>75.92 (10.77)</td>
</tr>
<tr>
<td>Sizing Them Up score (range: 0-100)</td>
<td>86.93 (7.91)</td>
</tr>
<tr>
<td>CDI score (range: 0-54)</td>
<td>9.56 (6.48)</td>
</tr>
<tr>
<td>RSES score (range: 10-40)</td>
<td>30.70 (4.79)</td>
</tr>
<tr>
<td><strong>Parents characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Father’s age (year)</td>
<td>44.32 (12.25)</td>
</tr>
<tr>
<td>Mother’s age (year)</td>
<td>40.99 (5.20)</td>
</tr>
<tr>
<td>Father’s BMI (kg/m(^2))</td>
<td>24.53 (3.79)</td>
</tr>
<tr>
<td>Mother’s BMI (kg/m(^2))</td>
<td>21.46 (2.84)</td>
</tr>
<tr>
<td>Father’s educational level</td>
<td>73 (36.6)*</td>
</tr>
<tr>
<td>Mother’s educational level</td>
<td>77 (38.9)</td>
</tr>
<tr>
<td>Rater (mother)</td>
<td>145 (72.9)</td>
</tr>
</tbody>
</table>

*With 39 missing values, †With 43 missing values. CDI: Child depression inventory, RSES: Rosenberg Self-Esteem Scale, PedsQL: Pediatric Quality of Life Inventory, BMI: Body mass index

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**Table 2: Model comparisons among three proposed models**

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Models 1 versus 2</th>
<th>Models 1 versus 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \chi^2 ) (df)</td>
<td>328.23</td>
<td>367.85</td>
<td>576.61</td>
<td>39.62 (6)*</td>
<td>248.38 (11)*</td>
</tr>
<tr>
<td>( \Delta \chi^2 ) (Adf)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.077</td>
<td>0.082</td>
<td>0.114</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90% CI for RMSEA</td>
<td>0.066-0.088</td>
<td>0.071-0.093</td>
<td>0.104-0.124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRMR</td>
<td>0.077</td>
<td>0.081</td>
<td>0.092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>249952.68</td>
<td>24980.30</td>
<td>25179.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\( P<0.001 \). Model 1: PedsQL, Kid-KINDL, and Sizing Them Up were in separated concepts (see Figure 1a); Model 2: PedsQL and Kid-KINDL were in the same concept (see Figure 1b); Model 3: All quality of life instruments were in the same concept (See Figure 1c). CFI: Comparative fit index, RMSEA: Root mean square error of approximation, CI: Confidence interval, SRMR: Standardized root mean square residual, AIC: Akaike’s information criterion
of self-esteem on obese/overweight children’s QoL after that review compared several commonly used QoL instruments.\textsuperscript{[24]} As a result, healthcare providers should be cautioned that the Sizing Them Up and PedsQL may not be sensitive to detect low self-esteem problem among overweight/obese children.

There are several limitations in this study. First, this is a cross-sectional study, and the associations investigated here cannot be generalized to any causal relationship. That is, for example, my results cannot claim impaired QoL was resulted from low self-esteem or vice versa. Second, only about one-third of the children in the present study were obese or overweight, and the small sample size with overweight (n = 69) recruited using a convenience sampling method had little representativeness. Thus, the generalizability of my results was restricted. In addition, given all the children were recruited from school, my results were unable to extend to clinically obese children. Future studies using a large sample size with children having severe obesity are thus needed. Third, I did not use child self-reports of the three QoL measures, and the results of my parent-proxy measures might be different from the results derived using child self-reports.

\section*{Conclusion}

The study used SEM to identify the different characteristics among three parent-proxy QoL instruments for children. The SEM results indicated that Kid-KINDL was sensitive to self-esteem; Sizing Them Up had the strongest ability to detect weight problems. Both PedsQL and Kid-KINDL could observe the depression among children.

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Nil.

\section*{Conflicts of interest}

There are no conflicts of interest.

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