

REGULAR ARTICLE

Health-related quality of life of Estonian adolescents: reliability and validity of the PedsQL™ 4.0 Generic Core Scales in Estonia

Roomet Viira (roomet.viira@ut.ee), Andre Koka

University of Tartu, Tartu, Estonia

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Correspondence

Roomet Viira, Ph.D., Institute of Sport Pedagogy and Coaching Science, University of Tartu, Jakobi 5, Tartu, 51014 Estonia.
Tel: +372 7375382 |
Fax: +372 7375362 |
Email: roomet.viira@ut.ee

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ABSTRACT

Aim: The main aim of this study was to examine the reliability and validity of the Pediatric Quality of Life Inventory™ 4.0 (PedsQL™ 4.0) Generic Core Scales among Estonian adolescents. Gender differences in health-related quality of life (HRQoL) were also investigated.

Methods: The 654 adolescents (309 boys and 345 girls) aged 13–14 years (M age = 13.57 years, SD = 0.62) completed Estonian version of the PedsQL™ 4.0.

Results: Results of the confirmatory factor analysis for a five-factor model of the Estonian version of PedsQL™ 4.0 approached the criteria of acceptable fit after setting error covariance to be free between some of the items within physical health, emotional functioning and social functioning subscales. Cronbach's alpha coefficients exceeded the minimum criterion of 0.70 for all subscales except for days missed from school because of illness subscale. With regard to gender differences, consistent with previous studies, girls reported lower level on total score of HRQoL as well as its aspects of physical health, emotional functioning and psychosocial health.

Conclusion: The present study revealed that after some modifications, the PedsQL™ 4.0 could be considered as suitable instrument to measure HRQoL among Estonian adolescents.

INTRODUCTION

Promoting health-related quality of life (HRQoL) among adolescents have become an essential focus for both governments, foundations and behavioural researchers because, as was noted by Bisegger et al. (1), quality of life in this age has shown to be a basis for health and quality of life in adulthood. One of the most widely used paediatric population health-related quality of life measures has been the Pediatric Quality of Life Inventory™ 4.0 (PedsQL™ 4.0) Generic Core Scales, developed by Varni et al. (2).

The PedsQL™ 4.0 includes four domains of HRQoL. These four domains are physical health, emotional functioning, social functioning and school functioning, including both child self-reports and parent proxy-reports with versions for ages 5–7, 8–12 and 13–18 (3,4). Parent proxy-reports include also ages 2–4. The PedsQL™ 4.0 has been translated into many languages and number of studies has revealed it as a reliable, valid and sensitive instrument (5–9). However, to our best knowledge, no studies so far have screened the adolescents' HRQoL in populations of post-soviet countries such as Estonia. The main reason for that is a lack of appropriate instrument in Estonian adapted or developed according to scientific criteria.

Studies examining the effect of age and gender on HRQoL have shown that in some aspects, as well as in a general index of HRQoL, children's scores have been higher than those in adolescents (1,10). Bisegger et al. (1), for

example, assessing HRQoL among children and adolescents from seven Western European countries, found that after 12–13 years, HRQoL decreases rather sharply in majority of aspects. Furthermore, results of the study by Bisegger et al. (1) as well as Amiri et al. (5) revealed that significant gender differences in physical well-being and psychological aspects (i.e. mood and emotions) of HRQoL start from the age of 13 years, with higher values for male adolescents. Bisegger et al. (1) explained this noticeable increase in gender differences in these aspects of HRQoL with the assumption that puberty is physically more drastic for girls than for boys. While acknowledging the importance of assessing the HRQoL among children and adolescents with various age groups, based on above evidence, in the present study, we focus on the HRQoL of the most sensitive age group (i.e. adolescents aged 13–14 years).

Key notes

After some modifications the PedsQL™ 4.0 Generic Core Scales can be considered as reliable and valid instrument to measure health-related quality of life (HRQoL) of Estonian adolescents. Girls reported lower level on total score of HRQoL as well as its aspects of physical health, emotional functioning, and psychosocial health compared with boys, supporting findings from previous studies.

The aim of this study was to (i) evaluate psychometric properties of the Estonian version of PedsQL™ 4.0 to determine its suitability to assess HRQoL among Estonian adolescents and (ii) assess gender differences in HRQoL. With regard to gender differences, based on previous findings (1,5), it was hypothesized that male adolescents will score higher on both physical well-being and psychological aspects of HRQoL than female adolescents.

METHOD

Participants and procedures

The participants were 659 secondary school students aged 13–14 years from a city located in south-east of Estonia. Because of missing data in any of the questionnaire item, five cases were eliminated from the data analyses. Thus, the final sample size for this study was 654 (309 boys and 345 girls; *M* age = 13.57 years, *SD* = 0.62). Permission to carry out the study was obtained from the head teachers of all schools. The informed consent was obtained from the participants as well as their parents via a letter sent home. No letters with refusal were sent back to school. The Ethical Committee of the University of Tartu, Estonia, approved all the study procedures and protocol.

Measures

HRQoL

Students' perception of HRQoL was assessed using the Estonian version of PedsQL™ 4.0 (2). According to Varni et al. (2), conceptually derived measurement model for the 23-item PedsQL™ 4.0 assesses four domains of HRQoL, namely physical health (eight items, e.g. 'It is hard for me to do sports activity or exercise'), social functioning (five items, e.g. 'Other kids do not want to be my friend'), emotional functioning (five items, e.g. 'I feel angry'), school functioning (five items, e.g. 'I have trouble keeping up with my school-work') and psychosocial health that includes social functioning, emotional functioning and school functioning subscales. However, results of the study by Varni et al. (3,11) provided empirical evidence for a five-factor model of PedsQL™ 4.0. Specifically, items of the school functioning domain split into two factors, i.e. three items measured school-related cognitive functioning (e.g. 'It is hard to pay attention in class') and two items measured days missed from school because of illness (e.g. 'I miss school because of not feeling well'). In the present study, thus, psychometric properties of a five-factor model of Estonian version of PedsQL™ 4.0 were assessed through the confirmatory factor analyses (CFA). Participants responded to all of the items of PedsQL™ 4.0 on a 5-point scale, ranging from 0 (never a problem) to 4 (almost always a problem). Prior to data analysis, items were reversed-scored and linearly transformed to a 0–100 scale (i.e. 0 = 100, 1 = 75, 2 = 50, 3 = 25 and 4 = 0).

Translation procedures

The standardized back-translation techniques, suggested by Brislin (12), were used to produce an Estonian version of the PedsQL™ 4.0 scales, i.e. a bilingual translator

translated the original questionnaire items into Estonian, and then, two independent bilingual translators translated them back into English. The back-translated versions were then compared with the initial English version in which any inconsistencies and errors were highlighted. These inconsistencies were removed in a further translation, and the back-translation comparison process was repeated until the versions were identical. The final versions of scales exhibited no discrepancies with the original English version of the PedsQL™ 4.0 when back translated.

Data analysis

Data were analysed using LISREL 8.51 (Scientific Software International, Lincolnwood, IL, USA) and SPSS 17.0 (IBM Corp, Somers, NY, USA) for Windows. First, a five-factor model of the Estonian version of PedsQL™ 4.0 was examined via CFA. That is, all items purported to measure the physical health, social functioning, emotional functioning, school-related cognitive functioning and days missed from school because of illness constructs were specified as indicators of a latent factor representing their respective theoretical construct. To define the scale of the factor, a single indicator was arbitrarily selected to be set at unity. As it is typical in CFA models, all latent factors were allowed to covary (13). Several indices such as Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), and Root Mean Square Error of Approximation (RMSEA) were used to assess the adequacy of the fit of CFA models to the data. According to Hu and Bentler (14), a model that fits the data well is indicated when values for CFI and NNFI are close to or >0.95, and value for RMSEA is 0.06 or less. Subscales internal consistency was determined by calculating Cronbach's alpha coefficient (15).

Second, independent samples *T*-tests were used to investigate gender differences on physical health, psychosocial health, social functioning, emotional functioning, school-related cognitive functioning and days missed from school because of illness constructs.

RESULTS

Construct validity of the Estonian version of PedsQL™ 4.0

The application of the five-factor model of the Estonian version of PedsQL™ 4.0 to assess HRQoL among Estonian adolescents should be deemed as unacceptable on the basis of the CFA results [$\chi^2(220) = 661.41$, $p < 0.001$, χ^2/df ratio = 3.01, CFI = 0.85, NNFI = 0.83, RMSEA = 0.055, 90% confidence interval (CI₉₀) for RMSEA range = 0.050–0.060]. Although RMSEA indicated acceptable structural validity, low values for CFI and NNFI indicated that there was still room for improvement. Examination of the modification indices revealed that there were large values associated with error covariance between five items from the physical health subscale (between Item 1 'It is hard for me to walk more than one block' and Item 2 'It is hard for me to run'; between Item 2 'It is hard for me to run' and Item 3 'It is hard for me to do sports activity or exercise'; and between Item 5 'It is hard for me to take a bath or shower by myself'

and Item 6 'It is hard for me to do chores around the house'), four items from the emotional functioning subscale (between Item 1 'I feel afraid or scared' and Item 2 'I feel sad or blue'; and between Item 4 'I have trouble sleeping' and Item 5 'I worry about what will happen to me'), and four items from the social functioning subscale (between Item 1 'I have trouble getting along with other kids' and Item 2 'Other kids do not want to be my friend'; and between Item 4 'I cannot do things that other kids my age can do' and Item 5 'It is hard to keep up when I play with other kids'). Although error terms between items are assumed to be uncorrelated, Bentler and Chou (16), for instance, have suggested that incorporation of these correlated error terms into CFA model provides even more realistic factorial representation of the observed data and does not undermine the factorial validity. As a result, the error covariances between these items were set to be free and the CFA model was reestimated. The revised CFA for the PedsQL™ 4.0 approached the criteria of acceptable fit suggested by Hu and Bentler (1999) [$\chi^2(213) = 359.34$, $p < 0.001$, χ^2/df ratio = 1.69, CFI = 0.92, NNFI = 0.91, RMSEA = 0.032, CI₉₀ for RMSEA range = 0.026–0.038]. Table 1 presents factor loadings and error terms of each item from the final CFA model.

Reliability of the Estonian version of PedsQL™ 4.0

Cronbach's alphas for physical health, social functioning, emotional functioning, school-related cognitive functioning,

days missed from school because of illness were 0.77, 0.81, 0.77, 0.68 and 0.50, respectively. Cronbach's alphas for psychosocial health and total scale score were 0.84 and 0.87, respectively.

Gender differences in HRQoL

Independent samples *T*-tests revealed that boys scored significantly higher than girls on physical health ($M_{\text{boys}} = 76.28 \pm \text{SD} = 15.32$ vs. $M_{\text{girls}} = 71.70 \pm \text{SD} = 15.21$, $t = 3.85$, $p < 0.001$), emotional functioning ($M_{\text{boys}} = 76.52 \pm \text{SD} = 18.55$ vs. $M_{\text{girls}} = 67.27 \pm \text{SD} = 19.81$, $t = 6.17$, $p < 0.001$), psychosocial health ($M_{\text{boys}} = 74.20 \pm \text{SD} = 13.70$ vs. $M_{\text{girls}} = 70.71 \pm \text{SD} = 13.78$, $t = 3.25$, $p < 0.001$) and total score of HRQoL ($M_{\text{boys}} = 74.92 \pm \text{SD} = 12.53$ vs. $M_{\text{girls}} = 71.53 \pm \text{SD} = 12.75$, $t = 3.91$, $p < 0.001$) (see Fig. 1).

DISCUSSION

Results of the present study revealed a five-factor Estonian version of PedsQL™ 4.0 to be a valid instrument to measure HRQoL among adolescents after allowing error terms between several items to be correlated. According to Bollen and Lennox (17), correlated errors between items within subscale are mainly possible because of their similar content or wording. For example, the stem of the items 1–3 from the physical health subscale that were allowed to be correlated is the same ('It is hard for me...'). Furthermore, the content of items 1–3 from the physical health subscale focuses on assessing problems associated with physical activity, whereas items 4 and 5 from the same subscale, that were also allowed to be correlated, focus on taking care for itself and surroundings. The reason for correlated errors between items within emotional functioning subscale is that if an adolescent feels afraid or scared (Item 1), he/she most likely feels sad or blue as well. Also, if a youngster worries about what will happen to him or her (Item 5), then he/she probably has trouble with sleeping (Item 4). Similarly, if an adolescent has trouble getting along with others (Item 1), then they do not want to be friends with him or her (Item 2); and if an adolescent cannot do things that others his or her age can do (Item 4), then it will be probably hard to keep up when playing with peers (Item 5), providing thus the rationale for correlation between error terms among these items within social functioning subscale.

Cronbach's alphas for most of the subscales exceeded the minimum criterion of 0.70 (18), except for two-item subscale of days missed from school because of illness. Although both items from this subscale assess the reasons for absence from school, one item (i.e. 'I miss school to go to the doctor or hospital') does not necessarily reflect the reason for absence from school because of illness, because seeing the doctor or going to hospital may be related to regular health check. In general, these results are similar with previous studies (3,5,6,8) indicated also poor internal consistency for items from the school functioning subscale.

Consistent with previous studies (1,5), we found that female adolescents perceived significantly higher than their

Table 1 Standardized factor loadings and uniquenesses for PedsQL™ 4.0 Generic Core Scales

Item	Loading	Error terms
Physical health		
1. It is hard for me to walk more than one block	0.60	0.64
2. It is hard for me to run	0.70	0.50
3. It is hard for me to do sports activity or exercise	0.82	0.32
4. It is hard for me to lift something heavy	0.56	0.68
5. It is hard for me to take a bath or shower by myself	0.54	0.70
6. It is hard for me to do chores around the house	0.42	0.83
7. I hurt or ache	0.40	0.84
8. I have low energy	0.69	0.53
Emotional Functioning		
1. I feel afraid or scared	0.70	0.51
2. I feel sad or blue	0.79	0.38
3. I feel angry	0.72	0.48
4. I have trouble sleeping	0.52	0.73
5. I worry about what will happen to me	0.69	0.53
Social functioning		
1. I have trouble getting along with other kids	0.74	0.46
2. Other kids do not want to be my friend	0.84	0.29
3. Other kids tease me	0.84	0.29
4. I cannot do things that other kids my age can do	0.63	0.61
5. It is hard to keep up when I play with my peers	0.60	0.64
School-related cognitive functioning		
1. It is hard to pay attention in class	0.67	0.55
2. I forget things	0.64	0.59
3. I have trouble keeping up with my schoolwork	0.72	0.48
School missed due to illness		
1. I miss school because of not feeling well	0.79	0.38
2. I miss school to go to the doctor or hospital	0.50	0.75

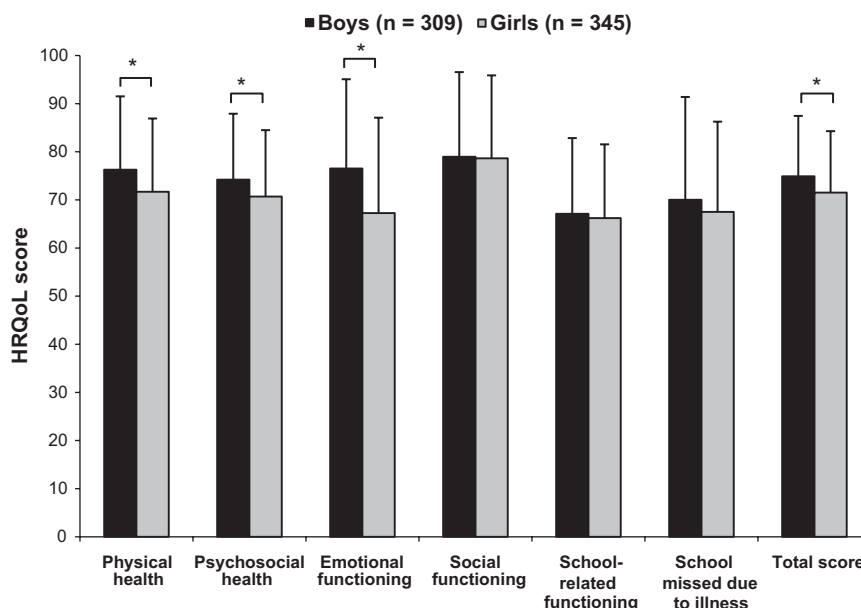


Figure 1 Gender differences in PedsQL™ 4.0 Generic Core Scales. Note. * $p < 0.001$.

male counterparts that they have problems with physical health and emotional functioning. As was suggested by Bisegger et al. (1), the main reason for this may be the onset of menstruation that is a cause of complaints for many girls.

Although the present study contributes to the extant literature by demonstrating the suitability of the PedsQL™ 4.0 to measure HRQoL among Estonian adolescents, as well as confirming gender differences that have been reported previously, there are several limitations. First, a sample included only adolescents aged 13–14 years. Thus, further Estonian PedsQL™ 4.0 studies are needed with younger children and adolescents to validate other versions of PedsQL™ 4.0 into Estonian. The present study, therefore, can be considered as initial test of validation of the Estonian version of PedsQL™ 4.0. Second, the present study was conducted among adolescents from one city in Estonia, reducing the level of generalizability. Future studies would do well by assessing HRQoL of children and adolescents from other cities as well as in rural areas.

In conclusion, the findings of the present study revealed that after some modifications, the PedsQL™ 4.0 can be considered as suitable instrument to measure HRQoL among Estonian adolescents. Emerged gender differences, supporting findings from previous studies, should continuously provide guidance for both researchers and health professionals to design intervention programs that will better meet the needs of specific target groups.

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