The Norwegian version of the Childhood Health Assessment Questionnaire (CHAQ) and the Child Health Questionnaire (CHQ)

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ABSTRACT

We report herein the results of the cross-cultural adaptation and validation into the Norwegian language of the parent's version of two health related quality of life instruments. The Childhood Health Assessment Questionnaire (CHAQ) is a disease specific health instrument that measures functional ability in daily living activities in children with juvenile idiopathic arthritis (JIA). The Child Health Questionnaire (CHQ) is a generic health instrument designed to capture the physical and psychosocial well-being of children independently from the underlying disease. The Norwegian CHAQ and CHQ have already been published and therefore they were fully revalidated in this study. A total of 148 subjects were enrolled: 88 patients with JIA (6% systemic onset, 45% polyarticular onset, 10% extended oligoarticular subtype, and 39% persistent oligoarticular subtype) and 60 healthy children. The CHAQ clinically discriminated between patients with various JIA subtypes, with the systemic, polyarticular and extended oligoarticular subtypes having a higher degree of disability, pain, and a lower overall well-being when compared to those with persistent oligoarticular arthritis. Also the CHQ clinically discriminated between healthy subjects and JIA patients, with the systemic onset, polyarticular onset and extended oligoarticular subtypes having a lower physical and psychosocial well-being when compared to their healthy peers.

In conclusion the Norwegian version of the CHAQ-CHQ is a reliable, and valid tool for the functional, physical and psychosocial assessment of children with JIA.

Introduction

The aim of this study was to cross-culturally adapt and validate the Norwegian parent's version of the Childhood Health Assessment Questionnaire (1) and the Child Health Questionnaire (2) in patients with juvenile idiopathic arthritis (JIA) being followed by the Norwegian members of the Paediatric Rheumatology International Trials Organisation (PRINTO) and a cohort of healthy children. This project formed a part of a larger international survey conducted by PRINTO and supported by the European Union (contract BMH4 983531 CA) (3-5), whose scope is to evaluate the health-related quality of life in children with JIA as compared to their healthy peers.

Patients and results

The methodology used is described in detail in the introductory paper of this supplement (6). The complete Norwegian version of the CHAQ-CHQ, with the corresponding lines of the original American-English questionnaires marked in the left column,is reproduced at the end of this paper.

In brief, after obtaining ethics committees approval of the respective participating institutions and the consent of at least one parent per child, children were recruited into a prospective study performed from April 1998 to March 2000, by the Norwegian members of PRINTO. Patients included children with JIA of either systemic onset, polyarticular onset, extended oligoarticular or persistent oligoarticular subtype (Durban criteria) (7). The controls consisted of healthy children (6 to 18 years of age) recruited from the National Population Register of Norway; controls filled in only the CHQ questionnaire.

Demographic and clinical characteristics of the subjects (Table I)

A total of 148 subjects were enrolled: 88 patients with JIA(6% systemic onset, 45% polyarticular onset, 10% extended oligoarticular subtype, and 39% persistent oligoarticular subtype) and 60 healthy children. The CHAQ-CHQ were completed in 85% of the cases by the mother (mean age 37.5 ± 6.3),and in 15% of the cases by the father (mean age 40.9 ± 6.8).

Clinical discriminant validity

Table II reports the results (mean ± SD) for the 8 CHAQ domains, the disability index (DI) and the 2 VAS scores for parental assessment of pain and overall well-being. The CHAQ clinically discriminated between patients with various JIAsubtypes, with the systemic, polyarticular and extended oligoarticular subtypes having a higher degree of disability, pain, and a lower overall well-being when compared to those with persistent oligoarthritis.

Table III reports the CHQ results (mean ± SD) for the 15 health concepts (see table for abbreviation) and summary scores. The CHQ clinically discriminated between healthy subjects and JIA patients, with the systemic onset, polyarticular onset and extended oligoarticular subtypes having a lower physical and psychosocial well-being when compared to their healthy peers.

Cross cultural adaptation

The Norwegian CHAQ and CHQ were already published (8,9) and therefore they were revalidated in full in this study.

Table I. Demographic and clinical characteristics of the Norwegian sample.

	Systemic onset n = 5	Polyarticular onset n = 40	Extended oligoart. n = 9	Persistent oligoart. n = 34	Healthy controls n =60
Age of the children[1]	7.0 ± 4.7	9.7 ± 3.5	8.1 ± 4.0	9.8 ± 2.9	10.5 ± 3.3
Disease duration[1]	1.7 ± 1.3	0.9 ± 0.8	1.4 ± 0.9	1.0 ± 0.5	
ESR[1]	25.4 ± 16.2	21.5 ± 18.9	13.1 ± 12.7	13.2 ± 11.6	
MD VAS (0-10 cm)[1, 2]	5.1 ± 3.4	5.4 ± 2.1	2.8 ± 2.4	2.6 ± 1.8	
No. swollen joints[1, 2]	3.2 ± 4.0	7.2 ± 8.4	1.9 ± 2.4	0.8 ± 0.8	
No. joints with pain[1, 2]	1.4 ± 1.9	4.3 ± 8.1	0.8 ± 1.4	0.5 ± 0.9	
No. joints with limited range of motion[1, 2]	1.8 ± 2.0	6.0 ± 7.1	1.7 ± 1.7	1.0 ± 0.8	
No. active joints[1, 2]	3.8 ± 4.0	7.4 ± 8.7	2.0 ± 2.4	0.9 ± 0.9	
Female[3]	2 (40%)	17 (45%)	4 (44%)	18 (53%)	
Persistent systemic features[3]	3 (75%)	0	0	0	
Antinuclear antibody[3]	1 (20%)	7 (23%)	4 (44%)	8 (29%)	
Rheumatoid factor[3]	0	2 (6%)	0	1 (4%)	
Chronic iritis[3]	0	5 (28%)	0	4 (12%)	

[1]Mean ± SD; [2]ANOVA $p < 0.05$; [3]number and percentage.

Table II. The 8 CHAQ domains (range 0-3), the disability index (DI) (range 0-3), and the 2 VAS scores (range 0-10 cm) for pain and parent assessment of the child's overall well-being. Lower scores indicate better functional ability. Values are expressed as means ± SD.

	Systemic onset n = 5	Polyarticular onset n = 40	Extended oligoart. n = 9	Persistent oligoart. n = 34	Healthy controls n =60
Dressing[1]	1.0 ± 0.7	1.0 ± 1.0	0.6 ± 0.7	0.5 ± 0.9	
Arising	0.2 ± 0.4	0.6 ± 0.8	0.7 ± 0.9	0.3 ± 0.6	
Eating	0.4 ± 0.9	0.9 ± 0.9	0.8 ± 0.8	0.4 ± 0.9	
Walking	0.2 ± 0.4	0.6 ± 0.9	0.7 ± 1.0	0.3 ± 0.7	
Hygiene[1]	0.4 ± 0.9	0.8 ± 0.8	0.6 ± 0.7	0.2 ± 0.5	
Reach[1]	0.4 ± 0.9	0.8 ± 0.9	0.9 ± 1.1	0.2 ± 0.5	
Grip[1]	0.8 ± 1.1	1.1 ± 1.0	0.9 ± 0.8	0.3 ± 0.7	
Activities	0.4 ± 0.5	1.0 ± 0.8	0.8 ± 0.8	0.4 ± 0.9	
Disability index[1]	0.5 ± 0.5	0.9 ± 0.6	0.7 ± 0.6	0.3 ± 0.5	
Parent's evaluation of pain	4.2 ± 3.3	2.4 ± 2.6	3.5 ± 2.7	1.6 ± 1.8	
Parent's evaluation of overall well-being	2.3 ± 1.3	2.8 ± 2.3	3.1 ± 1.7	1.6 ± 1.8	

[1]ANOVA $p < 0.05$.

Table III. The 15 CHQ health concepts (and their abbreviations) and the 2 summary scores. Higher score indicates better physical or psychosocial well being (range 0-100). Values are expressed as means ± SD.

	Systemic onset n = 5	Polyarticular onset n = 40	Extended oligoart. n = 9	Persistent oligoart. n = 34	Healthy controls n =60
Global health (GGH)	68.0 ± 17.9	71.0 ± 18.3	63.9 ± 19.3	81.5 ± 16.9	87.8 ± 12.4
Physical functioning (PF)	75.6 ± 15.0	69.7 ± 23.5	73.5 ± 23.0	81.5 ± 22.0	95.0 ± 16.0
Role/social limitations - Emotional/Behavioural (REB)	75.6 ± 24.1	88.0 ± 19.0	80.2 ± 22.8	92.8 ± 11.9	99.3 ± 4.5
Role/social limitations - Physical (RP)	76.7 ± 14.9	78.1 ± 21.6	79.6 ± 16.2	88.2 ± 20.7	95.3 ± 16.0
Bodily pain/discomfort (BP)	34.0 ± 21.9	51.8 ± 30.4	43.3 ± 21.8	65.6 ± 27.5	84.1 ± 18.5
Behaviour (BE)	73.5 ± 12.0	79.5 ± 13.0	68.8 ± 12.2	69.8 ± 18.2	82.8 ± 9.6
Global behaviour (GBE)	86.0 ± 16.4	80.8 ± 18.5	76.7 ± 22.6	73.0 ± 24.6	86.0 ± 10.2
Mental health (MH)	78.8 ± 8.6	80.2 ± 9.6	75.6 ± 17.9	80.0 ± 12.9	86.3 ± 9.0
Self esteem (SE)	82.0 ± 21.1	77.6 ± 12.1	80.3 ± 9.4	76.0 ± 14.7	80.5 ± 11.5
General health perceptions (GH)	56.3 ± 10.1	64.1 ± 13.6	59.7 ± 20.6	71.8 ± 15.2	86.6 ± 11.8
Change in health (CH)	25.0 ± 25.0	38.8 ± 37.1	55.6 ± 34.9	61.8 ± 34.4	50.8 ± 4.5
Parental impact - Emotional (PE)	68.3 ± 27.9	61.5 ± 21.7	63.4 ± 20.4	67.6 ± 23.7	93.9 ± 8.9
Parental impact - Time (PT)	82.2 ± 27.9	86.3 ± 18.6	86.4 ± 14.5	88.2 ± 16.8	98.5 ± 3.8
Family activities (FA)	76.7 ± 26.8	79.9 ± 17.4	79.2 ± 21.2	85.5 ± 18.2	94.1 ± 7.0
Family cohesion (FC)	72.0 ± 27.5	76.9 ± 18.8	56.7 ± 31.9	81.0 ± 14.0	80.7 ± 14.9
Physical summary score (PhS)	43.9 ± 4.9	44.8 ± 8.5	45.6 ± 6.6	49.9 ± 7.4	53.5 ± 5.2
Psychosocial summary score (PsS)	50.3 ± 6.4	52.1 ± 5.8	48.6 ± 7.6	49.9 ± 8.6	55.9 ± 4.2

ANOVA $p < 0.05$ except for SE ($p = 0.5$).

Probe technique
For the 69 lines of the translated CHAQ, all the lines of translation were understood by more than 80% of the 11 parents tested (median = 100%; range:100-100%). For the 99 lines of the translated CHQ, all the lines of translation were understood by more than 80% of the parents (median= 100%; range: 82-100%). No change in the text of Norwegian CHAQ-CHQ was necessary after the probe technique.
Psychometric issues
The following analysis refers for the CHAQ only to JIA patients (no controls have been collected),and for the CHQ JCA patients combined with healthy children.
Descriptive statistics (first Likert assumption). For the CHAQ the total number of missing responses for the 78 patients included was 14.8% (range 0.6-33.3%) with dressing, walking, hygiene, reach, grip and activities having more than 10% missing value. The response pattern was skewed towards normal functional ability. All the CHAQ domains have response choices not used except for activities. The mean ± SD of the items within a scale were roughly equivalent except for eating, hygiene, reach, grip, and activities. The total number of missing responses on the CHQ was 1.8% (range: 0.7-5.4%); the response pattern was most often normally distributed except for REB, and PT. Most of the CHQ health concepts have response choices not used except PF, BP, GBE, CH,PE, PT, and FC. The means ± SD of the items within a scale were roughly equivalent except for BE.
Equal items-scale correlation (second Likert assumption). Pearson items-scale correlations corrected for overlap were roughly equivalent for items within a scale for most of the CHAQ domains except for dressing, hygiene, reach, grip, and activities, and for most CHQ health concepts except for BE, GH, PE, and FA.
Items internal consistency (third Likert assumption). Pearson items scale correlations were ≥ 0.4 for 60% of the CHAQ items (except for items in dressing, arising, hygiene, reach, grip and activities) and for 94% of the CHQ items (except BE, and GH).
Items discriminant validity. For the CHAQ, Pearson items correlations with its scale corrected for overlap were greater than at least 1 standard error (SE) of the correlation with other scales for 59% of the items (11% by 2 SE); scaling failure was observed for activities, where the items were better correlated with other domains. For the CHQ, Pearson items correlations with its scale were greater by at least 1 SE for 95% of the items (74% by 2 SE); no scaling failure was observed.
Floor and ceiling effect. The CHAQ floor effect had a median of 50% (range 25-67%) while for the CHQ the median was 0.0% (range 0-9.3%). The CHAQ ceiling effect had median of 0.0% (range 0.0-0.0) while the CHQ had a median of 26% (range 5.1-75.4%).
Cronbach's alpha internal consistency. Cronbach's alpha was ≥ 0.7 for 4/8 (50%) domains of the CHAQ (overall 0.92; range 0.48-0.82) with the exception being arising (0.48), eating (0.58), grip (0.64), and activities (0.54). Cronbach's alpha was ≥ 0.7 for 10/11 (91%) measurable health concepts (*i.e*. health concepts with more than 1 item) of the CHQ (overall 0.93; range 0.6-0.92) with the exception being GH (0.6).
Inter scale correlation. The Pearson correlation of each domain with all other domains of the CHAQ-CHQ was higher than their Cronbach's alpha for most of the CHAQ domains except for walking, grip,and activities. For the CHQ all 11 measurable health concepts have correlation lower than their Cronbach's alpha.
Test-retest reliability. Test-retest reliability was performed only for the CHQ. After a median of 12.5 days (range 8-24 days; number of JIA patients re-tested = 10) the intra-class correlation coefficients for the 15 CHQ health concepts showed a fair to good reproducibility with a median of 0.7 (range -0.1 to 1.0) with a poor reproducibility only for REB (-0.1), and PT (0.3).
External validity. The Spearman correlation of the CHAQ with the JIAcore set variables (10) showed a median of 0.5 (range 0.3 to 0.6), with the highest correlation being with the physician evaluation of disease activity (r = 0.6). For the CHQ the median correlation was for the PhS -0.5 (range -0.6 to -0.3) and for the PsS was 0.0 (range -0.2 to -0.1). The best correlation was for the PhS with the DI of the CHAQ (-0.6) and for the PsS with the parent's evaluation of overall well being (-0.2).

Discussion

The results of the present study show that the Norwegian versions of the CHAQ-CHQ have excellent psychometric properties.
The Norwegian CHAQ has already been published (8) and therefore it was revalidated in this study. This disease-specific questionnaire proved its ability to clinically discriminate between the JIA subtypes, with the systemic, polyarticular and extended oligoarticular subtypes having a higher degree of disability, pain, and a lower overall well-being when compared to persistent oligoarthritis. Minor statistical problems were found for some of the CHAQ domains.
The Norwegian CHQ has already been published (9) and therefore it was revalidated in this study. The generic CHQ questionnaire tended to be less able to clinically discriminate between the different JIA types than the CHAQ with the JIA patients with systemic, polyarticular onset or extended oligoarticular subtypes having a lower physical and psychosocial well-being when compared to their healthy peers. Some minor statistical problems were found for the equal item scale correlation, the item internal consistency, and Cronbach's alpha for BE, and GH.
In conclusion, the Norwegian version of the CHAQ-CHQ is a reliable and valid tool for the functional, physical and psychosocial assessment of children with JIA.

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References

1. SINGH G, ATHREYA B, FRIES JF, GOLDSMITH DP: Measurement of health status in children with juvenile rheumatoid arthritis. *Arthritis Rheum* 1994; 37: 1761-9.
2. LANDGRAF JM, ABETZ L, WARE JE: *The CHQ User's Manual*. 1st ed., Boston, The Health Institute, New England Medical Center, 1996.
3. RUPERTO N, MARTINI A, for PRINTO: A European network for randomised actively controlled clinical trials in paediatric rheumatic diseases: parenteral methotrexate in medium versus higher doses in juvenile chronic arthritis. "XIV EULAR and VI European Paediatric Rheumatology Congress". *Ann Rheum Dis* 1999; Conference Proceedings,Abstr. 105,pg 25.
4. RUPERTO N, MARTINI A, for PRINTO: Use of unlabelled and off licence drugs in children. A European paediatric rule is needed to protect children. *BMJ* 2000; 320: 1210-1.
5. BRUNNER HI, GIANNINI EH: Evidence-based medicine in pediatric rheumatology. *Clin Exp Rheumatol* 2000; 18: 407-14.
6. RUPERTO N, RAVELLI A, PISTORIO A *et al*.: Cross-cultural adaptation and psychometric evaluation of the Childhood Health Assessment Questionnaire (CHAQ) and the Child Health Questionnaire (CHQ) in 32 countries. Review of the general methodology. *Clin Exp Rheumatol* 2001; 19 (Suppl. 23): S1-S9.
7. PETTY RE, SOUTHWOOD TR, BAUM J *et al*.: Revision of the proposed classification criteria for juvenile idiopathic arthritides:Durban, 1997. *J Rheumatol* 1998; 25: 1991-4.
8. FLATØ B, SORSKAAR D, VINJE O *et al*.: Measuring disability in early juvenile rheumatoid arthritis: Evaluation of a Norwegian version of the childhood Health Assessment Questionnaire. *J Rheumatol* 1998; 25: 1851-8.
9. SELVAAG AM, FLATØ B, LANDGRAF JM *et al*.: Evaluation of the Norwegian version of the Child Health Questionnaire (CHQ) in children with juvenile arthritis. Proceedings of the VII European Paediatric Rheumatology Congress: annual scientific meeting of PRES. 23-27 September 2000, Geneva, Switzerland. *Ann Rheum Dis* 2000; 59: 713-49.
10. GIANNINI EH, RUPERTO N, RAVELLI A, LOVELL DJ, FELSON DT, MARTINI A: Preliminary definition of improvement in juvenile arthritis. *Arthritis Rheum* 1997; 40: 1202-9.