

Validation Study of a Disease-specific Module, the Asthma Health Questionnaire (AHQ) Using Japanese Adult Asthmatic Patients

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ABSTRACT

Background: An asthma-specific questionnaire, the Asthma Health Questionnaire (AHQ) was developed for Japanese asthmatic patients. A self-administered 37-item version (AHQ-37) consisting of 36 disease-specific items and a Face Scale was designed for socially active patients.

Methods: Exploratory factor analysis, test-retest reliability, internal consistency, concurrent validity and longitudinal validity were evaluated. A total of 326 asthma patients (202 men; range of age from 18 to 65 years) answered the AHQ-37 twice.

Results: Each item of the AHQ-37 was well accepted by the patients with answering rates of 95 to 100%. Six subscales (Asthmatic Symptoms, Emotion, Daily Activity, Factors which Worsened Symptoms, Social Activity and Economics) were extracted by factor analysis. Psychometric testing showed high feasibility, good repeatability and good internal consistency. The Face Scale moderately correlated with all subscales except for Economics, indicating that the Face Scale alone could measure global quality of life (QOL) functioning of asthmatic patients. Concurrent validity with peak-flow values was insufficient (Spearman's correlation coefficient = 0.05–0.27), showing that the peak flow alone could not estimate QOL. In longitudinal validity, however, changes in peak-flow values had an impact on the Asthmatic Symptoms, Daily Activity and Factors which Worsened Symptoms ($P = 0.000$ – 0.419), indicating that changes in peak-flow were important to asthmatic patients' QOL.

Conclusions: The QOL of asthmatic patients must be evaluated by asthma-specific questionnaires, such as the AHQ-37.

KEY WORDS

adult asthma, Face Scale, Japanese, quality of life, questionnaire

INTRODUCTION

Adult asthma is a chronic inflammatory disease of the airway¹⁻³ that involves long-term treatment and follow-up.⁴⁻⁶ Within the past decade, new guidelines for diagnosis and treatment of adult asthma have been formulated in many countries and inhaled corticosteroids have been shown to be very effective for control of symptoms.⁷⁻⁹ To evaluate the effectiveness of the treatments, symptoms¹⁰ and peak flow value were assessed. However, because many patients are relatively young and socially active, the influences of

the disease and its treatment on daily life can be great. In assessing the effectiveness of treatment and the health status of asthmatic patients, quality of life (QOL) should be evaluated¹¹⁻¹³ in addition to symptoms¹⁰ and peak-flow value.¹⁴

Recently, health related quality of life (HRQOL) is a much-discussed issue, and now, many researchers evaluate patients' HRQOL by a general illness questionnaire and a disease-specific module. In measuring QOL of people who are active in their daily lives, culture-specific issues must be considered, such as the differences between Japanese customs and cul-

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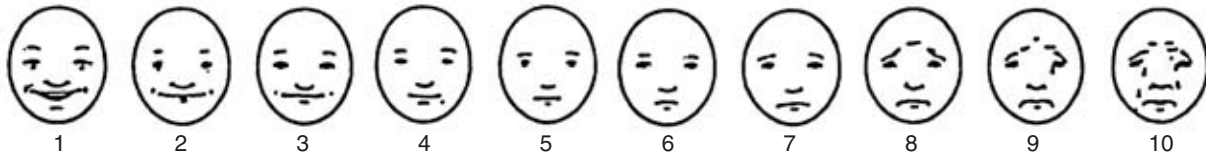


Fig. 1 Patients choose one of the 10 faces which is considered to express their own QOL best.

tures and those of English-speaking countries. Instruments to measure QOL of asthmatic patients such as the Asthma Quality of Life Questionnaire (AQLQ) by Juniper *et al.* were developed and well validated in Western countries.¹⁵⁻¹⁹ There have been some reports from Japan using international questionnaires in the field of respiratory disease.²⁰⁻²⁵ However, although internal consistency and clinical validity were reported, the reliability and validity of the questionnaire for Japanese were not fully investigated. Therefore the cross-cultural validity of such imported questionnaires remains unclear. At the beginning of this study, Japanese researchers had no tools to measure QOL of asthmatic patients.

In the field of cancer, there have been two streams in the development of QOL questionnaires in Japan ; the development of Japanese versions of international questionnaires, which were cross-culturally validated using Japanese patients with target diseases^{26,27} on the one hand, and the original development of questionnaires, such as the QOL Questionnaire for Cancer Patients Treated with Anticancer Drugs (QOL-ACD),^{28,29} on the other. The standard procedures for development of questionnaires were employed as reported before, such as item collection from Japanese patients, nurses, doctors and so on, extracting factors and clinical validity analysis. The later method was adopted because both the Japanese tongue and culture vastly differ from the English language and Western culture. Cross-cultural validation and differences have been investigated meticulously in the development of both imported questionnaires and Japanese original questionnaires.

In the field of asthma, we considered that the same methods, *i. e.*, both importing international questionnaires and developing Japanese original questionnaires, were needed, because most asthmatic patients are relatively young and socially active. The latter was the aim of this study, namely to develop and validate an asthma-specific questionnaire, the Asthma Health Questionnaire (AHQ), using Japanese patients with adult asthma.

METHODS

OVERVIEW

From October 1996 through January 2001, development and validation of the AHQ took place in three

phases : (1) item generation, (2) pilot testing and (3) estimation of reliability and validity. The procedures in this study were in accordance with the Helsinki Declaration (1964, amended in 1975 and 1983) of the World Medical Association. Each phase will be presented in sequence.

Item Generation

The questionnaire was designed for patients 18 to 65 years of age and to be self-administered. Initially, items for the questionnaire were decided upon by discussion among four pulmonologists. The questionnaire was constructed from 26 items that could influence the daily life of patients. Thereafter, 62 Japanese patients with asthma (28 male, 34 female ; age 20–65 years) who received care at the International Medical Center of Japan (IMCJ) in Tokyo, 38 pulmonologists, 17 nurses and 7 psychiatrists discussed these items and added 10 items. An initial questionnaire (37-item version) was constructed using 36 asthma-specific items and a Face Scale³⁰ (Fig. 1), which was the 37th item. The Face Scale does not have a language barrier and is easy to answer intuitively. Kurihara *et al.* demonstrated that it expressed global QOL functioning. The asthma-specific items had 5 responses on the Likert scale and the Face Scale had 10 responses. Each item focused on the most recent week with higher levels on each subscale representing worse levels of QOL.

Pilot Testing

To measure the instrument's comprehensibility and acceptability, the 37-item version was pre-tested on 20 Japanese patients with asthma at the IMCJ. All patients were asked to complete the 37-item version and then were interviewed to determine whether any questions were difficult to comprehend and/or were not relevant to their QOL. Furthermore, patients were asked to identify QOL issues that were not covered in the 37-item version. Specifically, qualitative patient comments about item comprehension were recorded. Information gathered during patient interviews was later considered in determining the final version. As no inadequate items were identified, the 37-item version, the AHQ-37 (Appendix I), was investigated in terms of its reliability and validity.

Appendix I

Asthma Health Questionnaire

This questionnaire is designed to find out how you have been feeling during the last week

-
- Q1 I have a cough.
- Q2 I have phlegm.
- Q3 I wheeze.
- Q4 I have asthma attacks.
- Q5 I get headaches.
- Q6 I have shortness of breath.
- Q7 My chest or shoulders feel heavy.
- Q8 My chest feels tight.
- Q9 I feel fatigued.
- Q10 My asthma keeps me awake at night.
- Q11 My asthma wakes me up in the morning.
- Q12 Exercise brings on asthma symptoms.
- Q13 Fatigue brings on asthma symptoms.
- Q14 Having a cold triggers my asthma.
- Q15 Inhaling substances like tobacco smoke, dust, cold air, exhaust fumes, pollen, or cosmetics brings on asthma symptoms.
- Q16 Consuming certain food, alcohol, or non-asthma medications (fever-reducing medications, analgesics, etc.) brings on asthma symptoms.
- Q17 Contact with pets brings on asthma symptoms.
- Q18 Changes in the weather or atmospheric pressure bring on asthma symptoms.
- Q19 I feel depressed because I have asthma.
- Q20 I feel upset because I have asthma.
- Q21 I feel anxious because I have asthma.
- Q22 I feel irritable because I have asthma.
- Q23 My asthma makes it difficult for me to concentrate.
- Q24 My asthma prevents me from feeling refreshed.
- Q25 I am worried about having asthma.
- Q26 I am worried about having to continue taking asthma medication.
- Q27 My emotional condition can make my asthma symptoms worse.
- Q28 My asthma symptoms limit my ability to walk.
- Q29 My asthma symptoms limit my ability to run or go uphill.
- Q30 My asthma symptoms limit my household activities, such as housework.
- Q31 My asthma symptoms limit my social and professional activities.
- Q32 My family has difficulties understanding my asthma problems.
- Q33 My coworkers, classmates and other people have difficulties understanding my asthma problems.
- Q34 I am reluctant to meet people who don't know I have asthma.
- Q35 My asthmatic condition and it's treatment are financially burdensome.
- Q36 I am worried that my asthma is a burden to my family.
- Q37 Considering the past 7 days, how is your overall of quality of life (QOL) ?
Please choose one of the following faces which is considered to express your QOL best.
-

Response option: 0. not at all, 1. a little bit, 2. somewhat, 3. quite a bit, 4. very much for items 1 – 36

Item 37: (Fig.1)

RELIABILITY AND VALIDITY OF THE AHQ-37 Study Sample and Protocol

After informed consent had been obtained, the AHQ-37 was administered to patients with asthma who were treated at 15 cooperative institutes. These instruments were administered twice at an interval of 2 weeks. At the same time, patients wrote a diary recording their asthmatic symptoms, peak flow values and treatments. This diary was made by the Japanese

Society of Allergology, and is widely used in asthma clinics in Japan. Patients recorded their asthmatic symptoms using 5 responses according to the classification of the Japanese Society of Allergology (Fig. 2).³¹ A clinically meaningful change of peak flow value was defined as a 10% change from the maximum baseline also according to the guidelines of the Japanese Society of Allergology.

1. The severity of symptoms
It is mainly diagnosed by "Dyspnea".

The severity of symptoms	Dyspnea	conversation	Daily activity	cyanosis	consciousness	PEF (%)
A major attack (severe)	cannot move due to dyspnea	difficult	disable	+	disturbed – normal	unmeasurable
B moderate attack (moderate)	cannot lay down due to dyspnea	slightly difficult	difficult	—	normal	less than 50%
C mild attack (mild)	can lay down	almost normal	slightly difficult	—	normal	50 – 70%
D1 wheeze	wheeze	normal	almost normal	—	normal	more than 70%
D2 dyspnea	dyspnea on effort	normal	almost normal	—	normal	more than 70%
N asymptomatic	—	normal	normal	—	normal	more than 80%

2. The severity of asthma
It is diagnosed by the combination of the severity of symptoms and the frequency.

frequency \ severity	A	B	C	D
5 – 7days a week	severe	severe	moderate1	moderate2
3 – 4days a week	severe	moderate1	moderate2	mild
1 – 2days a week	severe	moderate1	mild	mild

Fig. 2 The standard of the severity of asthmatic symptoms. This classification is defined by the Japanese Society of Allergology.

Table 1 Patients' Characteristics

Subjects	<i>n</i> = 326 (100.0%)	
	mean ± SE	51.3 ± 14.9 years old
Age	<30	33 (10.1%)
	30 – 39	51 (15.6%)
	40 – 49	38 (11.7%)
	50 – 59	95 (29.1%)
	60 –	105 (33.4%)
Sex	Male	202 (62.0%)
	Female	124 (38.0%)
Inpatient/Outpatient	Inpatients	4
	Outpatients	322
Change of symptoms *	Improved	37 (11.3%)
	Not Change	200 (61.3%)
	Deterioration	48 (14.7%)
	unknown	41 (12.6%)
Change of peak flow value **	Improved	37 (11.3%)
	Not Change	188 (57.7%)
	Deterioration	30 (9.2%)
	unknown	71 (21.8%)

* During two weeks, the changes of symptoms were recorded by a diary (see METHODS section). Improvement or deterioration of symptoms was recorded according to the classification of the Japanese Society of Allergology.

** During two weeks, the change of peak flow value was recorded. Improvement or deterioration was defined as a change of more than +10% or less than -10%, respectively, from baseline.

Table 2 Multitrait Scaling Analysis for AHQ: Convergent and Discriminant Validity

Evidence of item convergence validity was defined as a correlation above 0.4 (bold) of an item with its own scale. In terms of item discriminant validity, a definite scaling error was defined as correlation of an item with another scale that exceeded the correlation with its own scale.

	Asthmatic Symptoms	Emotion	Daily Activity	Factors which Worsened Symptoms	Social Activity
Q1	0.645	0.405	0.322	0.515	0.336
Q2	0.572	0.338	0.283	0.446	0.242
Q3	0.761	0.567	0.448	0.628	0.384
Q4	0.721	0.571	0.424	0.563	0.452
Q5	0.497	0.470	0.311	0.460	0.399
Q6	0.740	0.628	0.607	0.690	0.471
Q7	0.645	0.601	0.455	0.573	0.435
Q8	0.773	0.619	0.495	0.654	0.419
Q10	0.724	0.610	0.466	0.565	0.437
Q11	0.690	0.591	0.506	0.621	0.449
Q9	0.654	0.600	0.487	0.595	0.475
Q19	0.643	0.829	0.593	0.645	0.610
Q20	0.651	0.816	0.598	0.598	0.571
Q21	0.598	0.830	0.603	0.631	0.626
Q22	0.652	0.830	0.582	0.635	0.625
Q23	0.640	0.803	0.628	0.623	0.576
Q24	0.644	0.787	0.632	0.576	0.578
Q25	0.453	0.720	0.511	0.561	0.630
Q26	0.394	0.602	0.428	0.482	0.592
Q28	0.521	0.602	0.823	0.555	0.505
Q29	0.472	0.576	0.789	0.617	0.508
Q30	0.582	0.698	0.758	0.601	0.606
Q12	0.672	0.607	0.642	0.721	0.521
Q13	0.739	0.677	0.637	0.785	0.550
Q14	0.686	0.579	0.533	0.739	0.460
Q15	0.564	0.520	0.482	0.716	0.446
Q16	0.409	0.417	0.337	0.537	0.306
Q17	0.344	0.364	0.230	0.497	0.269
Q18	0.610	0.586	0.542	0.735	0.484
Q27	0.545	0.612	0.487	0.634	0.589
Q31	0.542	0.664	0.728	0.613	0.535
Q32	0.238	0.354	0.182	0.295	0.376
Q33	0.253	0.359	0.209	0.298	0.515
Q34	0.387	0.533	0.497	0.437	0.490
Q36	0.441	0.624	0.457	0.485	0.537

Psychometric Testing

The answering rate (feasibility) of the items on the AHQ-37 at the initial and second measurements was calculated. Using patients whose health status (symptoms and peak flow values written in the diary) had not changed between the initial and second estimation, weighted kappa coefficients of each item between the estimations were evaluated to investigate test-retest reliability.

Factor analysis by Promax rotation were employed to extract factors using the 36 asthma-specific items on the AHQ-37. Then, the subscale structures of the AHQ-37 were evaluated. Testing for item conver-

gence and discriminative validity was based on examination of the item-subscale correlation. Pearson's correlations of the item with its own subscale (corrected for overlap) and with other subscales were calculated. Evidence of item convergence validity was defined as a correlation above 0.4 with its own subscale. Item discriminant validity was supported by a comparison of the magnitude of the correlation of an item with its own subscale³² compared with other subscales. A definite scaling error was defined as the correlation of an item with another subscale that exceeded the correlation with its own subscale.

The internal consistency of each subscale was esti-

Table 3 Mean, Median and Cronbach's alpha and intra-class correlations (κ value) of the scales on the AHQ-37

The higher score of the AHQ-37 represents the worse level. Intraclass correlations was estimated by weighted kappa coefficients. Internal consistency was estimated by Cronbach's alpha coefficient. A value of 0.7 or greater was considered acceptable.

scale	Item	κ value	Mean (S.D.)	Median (range)	Cronbach's alpha
Asthmatic Symptoms (AS)	Q1-8,10,11	0.685	81.02 (19.1)	87.50 (0-100)	0.89
Emotion (Em)	Q9,19-26	0.895	82.29 (20.1)	88.88 (0-100)	0.88
Daily Activity (DA)	Q28-30	0.868	82.33 (24.4)	91.66 (0-100)	0.89
Factors which Worsened Symptoms (FWS)	Q12-18,27	0.840	77.33 (22.6)	84.37 (6.25-100)	0.89
Social Activity (SA)	Q31-34,36	0.865	81.43 (18.9)	85.00 (0-100)	0.89
Economics (Ec)	Q35	0.864	81.50 (28.0)	100 (0-100)	—
Face Scale (Global QOL)(FS)	Q37	0.653	72.84 (22.1)	80.00 (10-100)	—

Table 4 Interscale correlation

It was hypothesized that a Pearson's correlation greater than 0.40 between scales inferred that the two were conceptually related.

	AHQ-37						
	AS	Em	DA	FWS	SA	Ec	FS
Asthmatic Symptoms (AS)	1.00	0.71	0.53	0.74	0.52	0.40	0.62
Emotion (Em)		1.00	0.67	0.72	0.71	0.46	0.60
Daily Activity (DA)			1.00	0.63	0.60	0.33	0.48
Factors which Worsened Symptoms (FWS)				1.00	0.60	0.43	0.54
Social Activity (SA)					1.00	0.59	0.47
Economics (Ec)						1.00	0.31
Face Scale (Global QOL)(FS)							1.00

Table 5 Concurrent Validity

The relationship between the scores of the AHQ-37 and the values of the symptom score and peak flow at the first measurement was evaluated. Spearman's correlation coefficients were used to test the relationships.

Variables	Source	Correlation	Source	Correlation
AHQ-37				
Asthmatic Symptoms (AS)	symptom	-0.54	PEF	0.21
Emotion (Em)	symptom	-0.34	PEF	0.13
Daily Activity (DA)	symptom	-0.33	PEF	0.27
Factors which Worsened Symptoms (FWS)	symptom	-0.52	PEF	0.27
Social Activity (SA)	symptom	-0.27	PEF	0.09
Economics (Ec)	symptom	-0.17	PEF	0.05
Face Scale (Global QOL)(FS)	symptom	-0.40	PEF	0.11

ated by Cronbach's alpha coefficient. A value of 0.7 or greater was considered acceptable for group comparison.³³ Weighted kappa coefficients of each subscale between the estimations were evaluated to investigate subscale reliability. Construct validity was estimated by correlations among the subscales comprising the AHQ-37. It was hypothesized that a Pearson's correlation greater than 0.40 between subscales

inferred that the two were conceptually related.²⁶

There was no gold standard instrument to estimate the QOL of Japanese asthmatic patients. Thus, to estimate concurrent validity, we evaluated the relationship between the subscale scores of the AHQ-37 and the symptom scores and peak flow values. Spearman's correlation coefficients were used to test the relationships. To evaluate clinical validity, longitudi-

Table 6 Responsiveness

The changes in the AHQ-37 scores over time were examined in relationship to change in the symptom score and peak flow value. Repeated-measures ANOVA was used to test inter-group differences in scores over time of the AHQ-37.

	Source	Delta value worsened no change improved	P-Value	Source	Delta value worsened no change improved	P-Value
AHQ-37						
Asthmatic Symptoms (AS)	symptom	14.9	<0.0001	PEF	9.7	0.0059
		0.1			1.3	
		-8.5			-2.1	
Emotion (Em)	symptom	2.5	0.0006	PEF	0.4	0.5004
		-1.1			-0.9	
		-7.2			-2.7	
Daily Activity (DA)	symptom	5.0	0.0142	PEF	6.7	0.0131
		-1.1			-0.7	
		0			-1.3	
Factors which Worsened Symptoms (FWS)	symptom	7.7	<0.0001	PEF	6.6	0.0096
		-1.3			-1.4	
		-9.1			-2.9	
Social Activity (SA)	symptom	1.3	0.3679	PEF	0.9	0.8332
		-0.3			-0.1	
		-1.7			-0.5	
Economics (Ec)	symptom	-1.2	0.1554	PEF	3.0	0.4442
		0.9			-0.3	
		-4.8			-1.6	
Face Scale (Global QOL) (FS)	symptom	13.7	<0.0001	PEF	7.1	0.3357
		0			2.3	
		-2.7			0	

nal validity was investigated. Changes in the AHQ-37 scores over time were examined in relation to changes in symptom scores and peak flow values. Repeated-measures ANOVA was used to test inter-group differences in scores over time of the AHQ-37.

RESULTS

A total of 326 patients with adult asthma were studied. Their characteristics are shown in Table 1. Of the 326 patients, 202 were male and 124 were female; the mean age was 51 years (18–65 years). The feasibility of items of the AHQ-37 ranged from 95 to 100% at both the initial and second measurements, indicating that the AHQ-37 was well accepted by Japanese patients with asthma. Using only patients whose symptoms and peak-flow values were stable over 2 weeks, test-retest reliability was investigated by calculating weighted kappa coefficients of each item between the two measures. All of the items of the AHQ-37 were 0.5 or greater, indicating good repeatability.

From the 36 asthma-specific items on the AHQ-37, an exploratory factor analysis extracted 6 factors: Asthmatic Symptoms (10 items), Emotion (9 items), Daily Activity (3 items), Factors which Worsened Symptoms (8 items), Social Activity (5 items) and Economics (1 item). Multitrait scaling analysis con-

firmed adequacy in terms of item-convergent validity for multi-item subscales on the AHQ-37 except for one item (Table 2), Q32: "My family has difficulties understanding my asthma problems". The other items were well correlated (above 0.4) within their own subscale, indicating satisfactory item-convergent validity. In terms of item discriminant validity of the AHQ-37, there were one and three problematic items in the Emotion and the Social Activity subscales, respectively; the rate of scaling error was 5.7% (8/140).

Cronbach's Alpha coefficients for 5 multi-item subscales in the AHQ-37 were 0.75 or greater (Table 3), indicating satisfactory internal consistency. Using the stable patients above described, test-retest reliability of the six subscales and the Face Scale was also investigated by weighted kappa coefficients, and satisfactory results were obtained (Table 3).³⁴

In intersubscale correlations (Table 4), strong correlations were observed in the relationships between Asthmatic Symptoms and Factors which Worsened Symptoms ($r = 0.74$), between Emotion and Factors which Worsened Symptoms ($r = 0.72$), and between Emotion and Social Activity ($r = 0.71$), as expected. Modest correlations were observed between each of the subscales of the AHQ-37 except for Economics.

The Economics subscale was not highly correlated with the Daily Activity subscale (0.33) and the Face Scale (0.31) of the AHQ-37. The Face Scale was moderately correlated with all of the subscales of the AHQ-37 (0.47–0.62) except for the Economics subscale (0.31).

Concurrent validity with symptoms written in the diary was supported by moderate correlations with the Asthmatic Symptoms subscale (–0.54), Factors which Worsened Symptoms subscale (–0.52), and the Face Scale (–0.40) on the AHQ-37 (Table 5). However, correlation coefficients between the peak-flow value and all the subscales of the AHQ-37 were low (0.05 to 0.27).

At the assessment made two weeks after the initial assessment, symptoms had worsened in 48 patients, improved in 37 patients and had not changed in 200 patients (Table 1). Repeated measures ANOVA was employed to test for inter-group differences over time in the AHQ-37 scores (Table 6). Responsiveness of the AHQ-37 to changes in symptoms appeared to be good except for the Social Activity and the Economics subscales. At the second assessment, peak flow values had worsened in 30 patients, improved in 37 patients and had not changed in 188 patients (Table 1). Repeated measures ANOVA showed that statistically significant inter-group differences over time were observed for Asthmatic Symptoms, Daily Activity, and Factors which Worsened Symptoms on the AHQ-37 (Table 6).

DISCUSSION

Concurrent validity between the subscale scores on the AHQ-37 and peak-flow values was insufficient, showing that the peak flow alone could not estimate QOL (Table 5). The same situation was cited in other reports. Juniper *et al.* reported that the correlation between peak-flow values and the subscales of the AQLQ were weak or modest.¹⁹ This indicates the importance of estimating the QOL of asthmatic patients by self-administered, asthma-specific questionnaires.

The AHQ was developed for Japanese patients with asthma in this study, and its 37 item version, the AHQ-37, was found to have 6 subscales: Asthmatic Symptoms, Emotion, Daily Activity, Factors which Worsened Symptoms, Social Activity and Economics. Psychometric testing showed that the AHQ-37 had high feasibility, was easy to answer, and had good repeatability. However, multitrait scaling analysis showed that only one item (Q32), “My family has difficulties understanding my asthma problems” was inadequate with respect to item convergence (Table 2). It may be considered to be reasonable that Q32 loads on both Emotion and Social Activity. In terms of item discriminancy, although the Social Activity subscale had slightly weak structure, close relationships between this subscale and the other subscales may be

also reasonable. Cronbach’s alpha values for all the multi-item subscales on the AHQ-37 indicated good internal consistency.

The AHQ-37 had a unique item, the Face Scale (Fig. 1). The Face Scale was developed by Lorish and Maisiak.³⁰ Kurihara *et al.* employed it in their questionnaire, the QOL-ACD, and the Face Scale moderately correlated with all of the subscales on the QOL-ACD, indicating that the Face Scale could be used to estimate overall QOL functioning.^{28,29} This report led us to consider whether the Face Scale could also be used to express overall QOL of patients with asthma. We found that this Face Scale moderately correlated with all of the subscales of the AHQ-37 except for the Economics subscale. This indicates that the Face Scale could measure global QOL functioning of patients with asthma.

In concurrent validity, there were only modest correlations between the scores of the Asthmatic Symptoms subscale, Factors which Worsened Symptoms subscale and Face Scale on the AHQ-37, and the levels of asthmatic symptoms cited using the diary (Table 5). In longitudinal validity, however, changes in symptoms affected the Asthmatic Symptoms, Emotion, Daily Activity, and Factors which Worsened Symptoms subscales, and the Face Scale on the AHQ ($P = 0.000$ – 0.014) (Table 6). Although concurrent validity between the subscale scores on the AHQ-37 and peak-flow values was insufficient as mentioned above (Table 5), changes in peak-flow values had an impact on the Asthmatic Symptoms ($P = 0.0059$), Daily Activity ($P = 0.0131$) and Factor which Worsened Symptoms ($P = 0.0096$) subscale (Table 6). These indicated that changes in asthmatic symptoms and peak-flow were important to asthmatic patients’ QOL.

The AHQ-37 has clinical validity, and is also reliable and valid for discriminative purposes, so it can be used with confidence in clinical research. The next step will be the validation of an imported questionnaire such as the AQLQ and comparison between the imported questionnaire and the AHQ-37 in Japan. This instrument has been translated into English through rigid translation/back translation procedures (Appendix I). If the translated AHQ-37 could be evaluated in English speaking cultures, cross-cultural comparison would also become an interesting theme. In conclusion, QOL of patients with asthma must be measured by an asthma-specific module such as the AHQ-37.

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