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Original article

Development of a Japanese Culturally Modified Version of the Childhood Atopic Dermatitis Impact Scale (JCMV-CADIS)

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AD	atopic dermatitis
CADIS	Childhood Atopic Dermatitis Impact Scale
JCMV-CADIS	Japanese Culturally Modified Version of the CADIS
SCORAD	Severity Scoring of Atopic Dermatitis

ABSTRACT

Background: The Childhood Atopic Dermatitis Impact Scale (CADIS) was developed to measure the impact of AD on QoL in both affected children and their families. However, no scale of this kind exists in Japan. The aims of this study were to validate the Japanese Culturally Modified Version of the CADIS (JCMV-CADIS) and to describe the family impact of children with AD in a Japanese context.

Methods: Participants included primary-caregivers for children with AD between 2 and 6 years of age. Interviews were conducted, and new items for the Japanese version were drafted. Reliability and validity were evaluated and compared with the original CADIS, and unique features of the Japanese version were analyzed.

Results: Exploratory factor analysis revealed the following factors: "Symptoms" and "Activity Limitations and Behavior" in the Child domain, and "Emotions Related to Social Factors," "Emotions Related to the Child's Condition," "Family and Social Function," "Complexity of Care," and "Approaches to Management of AD in Daily Life" in the Parent domain. The latter two factors were unique to the JCMV-CADIS and were not derived from the Original. "Emotion" was split into two independent factors. All factors showed good reliability (internal consistency and stability) and validity (concurrent validity and discriminant validity), except for the concurrent validity of "Approaches to Management of AD in Daily Life." This factor seemed to reflect characteristics similar to the family-related function.

Conclusions: The JCMV-CADIS is a QoL scale developed for Japanese children with AD and their families. Further evaluation of clinical applicability is needed.

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Introduction

Atopic dermatitis (AD) is a chronic, pruritic inflammatory skin disease that occurs most frequently in children (17% of American children), but that also affects many adults.^{1,2} In Japan, 12.8% of 4-month-old children, 9.8% of 18-month-old children, and 13.2% of 3-year-old children are affected by AD³ and the incidence appears to be increasing.

AD influences physical health as well as emotional and social well-being,^{4–7} and is documented to influence the daily lives of parents and caregivers. Faught *et al.* found that the impact on the daily lives of caregivers of children with eczema, especially in terms of parenting stress, was comparable to that on the daily lives of individuals raising children with other chronic maladies, such as diabetes or deafness.⁸ Chamlin *et al.* reported that AD influences the sleep patterns of both affected children and their parents.⁹ A study by Moore *et al.* revealed that parents of children with AD reported significantly more sleep disorders than parents of children with asthma.¹⁰ They also found that the severity of parents' sleep disruption correlates with anxiety and depression in mothers and with anxiety in fathers.

Although a number of quantitative measures of the impact of AD on the QOL of children and their parents have been developed,

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comprehensive measures of the impact of AD on the family as a whole are limited to the Dermatitis Family Impact (DFI)¹¹ and the Childhood Atopic Dermatitis Impact Scale (CADIS).^{7,12} Compared to the DFI, the CADIS includes a greater number of items, likely reflecting a more comprehensive measurement of QoL. Although the concurrent validity of the CADIS and other existing measures of QoL has not been verified and this tool has yet to be used in clinical research,^{13,14} its value lies in the ability to comprehensively measure the QoL effects of both children with AD and their parents. Of note, Neri *et al.* developed the Italian version of the CADIS.¹⁵

The aims of this study were to validate the Japanese Culturally Modified Version of the CADIS (JCMV-CADIS) and to describe the family impact of AD in the Japanese context by comparing the JCMV-CADIS to the original version.

Methods

Study design

This study began with the creation of a direct Japanese-language translation of the original CADIS. First, three Japanese individuals with numerous years of experience living in the United States translated the original CADIS into Japanese. Next, it was back-translated into English and the equivalence of the back-translation and the original CADIS was verified by an American linguist. Next, a native Japanese-speaking linguist checked the validity of the Japanese-language version.

To verify face validity, the Japanese-language version was checked by five Japanese family members of children with AD, and the wording of some items was changed based on their feedback.

Qualitative, open-ended interviews were then conducted with the same five Japanese primary caregivers of children with AD, and new items for the Japanese version were created. Items in the modified scale were compared to those of the original version, and the unique features of the Japanese version were examined.

Participants

Participants were the caregivers of children aged between 2 and 6 years old who had been diagnosed with AD were recruited at 30 Japanese hospitals or clinics. In this study, the reasons that the age of participants of children with AD was set to 2–6 years old are as follows; We set the age over 2 years old because children eat baby food until around 2 years old. In the Family Impact of AD, we assumed that diet would be a difficulty, but that baby food preparations would be equally difficult for children with or without AD. Also, difficulties of child care that did not relate to the presence of the disease were predicted in the stages of development from 0 to 1 year old, when the primary caregiver must see to all aspect of child care regardless of the presence of AD. Thus, in this study, we limited the age of participants of children with AD to 2 years old or older. The reason we limited the study to pre-school children is because it is thought that characteristics of development are different from schoolchildren.

Disease severity was measured by a pediatric allergist using the Severity Scoring of Atopic Dermatitis (SCORAD) Index. Only native Japanese speakers with the ability to complete a written survey were selected.

Ethical considerations

The interview participants received either verbal or written explanation before the research and provided written informed consent. The questionnaire respondents received written

explanation, and if they sent the completed questionnaire, consent was considered obtained.

The explanation was as follows: Participation in this study is based on the free will of the person. There are no disadvantages to not participating in the study. Participant's personal identifying information will be made indistinguishable. The data will be kept secure, and will not be used for purposes other than for this study.

This study was approved by the ethics committee at Nagoya University Graduate School of Medicine (Approval Nos. 9-165 and 11-135).

Instruments

The following scales were administered to all participants:

- Childhood Atopic Dermatitis Impact Scale (CADIS); Severity Scoring of Atopic Dermatitis (SCORAD)** for evaluation of the severity of AD;
- Dermatitis Family Impact (DFI)** for evaluation of impact on the family;
- Parenting Stress-Short Form (PS-SF)** for evaluation of parenting stress; and
- Family Assessment Inventory (FAI)** for evaluation of family function

Childhood Atopic Dermatitis Impact Scale (CADIS)^{7,12}

Chamlin *et al.* developed a measure of the impact of AD on the QoL of both affected children and their families. Altogether, five subdomains are included: the Child domain consists of "Symptoms" and "Activity Limitations and Behavior," while the Parent domain consists of "Family and Social Function," "Sleep," and "Emotions." The total score ranges from 0 to 180, with 0 for "Never" to 4 for "All the Time" for each of the 45 items. The lower the total score, the lower the impact of AD

Severity Scoring of Atopic Dermatitis (SCORAD)^{16,17}

SCORAD is a set of international criteria to assess the severity of eczema. The Japanese Dermatology Association cites the Japanese-language version of SCORAD in its AD guidelines.¹⁸

Dermatitis Family Impact (DFI)¹¹

This instrument measures the impact of a condition on the QoL of the family, just as the CADIS does. The DFI is a disease-specific instrument with verified validity and reliability. A lower score indicates lower impact. Ohya *et al.* developed a Japanese-language version of the instrument.¹⁹

Parenting Stress-Short Form (PS-SF)^{20,21}

The Parenting Stress Index (PSI) is an instrument that measures many facets of childcare stress, such as social factors affecting parents, parents' personalities, and character traits of children. This instrument is divided into subscales for parents and children. Narama *et al.* developed a Japanese-language version of this instrument.²⁰ This study used an abbreviated Japanese-language version, the PS-SF.²¹ A lower score indicates lower parenting stress.

Family Assessment Inventory (FAI)²²

The FAI was developed with the goal of understanding the functional status of family systems, and consists of subscales of "Family Communication," "Family System Flexibility," "Family Rules," "Family Evaluation," and "Family Cohesion." A lower score indicates lower family functionality.

Table 1
Characteristics of children and caregivers (N = 233).

Children	N	(%) [†]
	Mean	±SD
Mean age	3.79	±1.38
Age		
2	53	22.7
3	55	23.6
4	48	20.6
5	41	17.6
6	36	15.5
Sex		
Male	137	58.8
Female	96	41.2
Children in family		
1	73	31.3
2	124	53.2
3	33	14.2
4	1	.4
5	2	.9
Birth order		
1	144	61.8
2	74	31.8
3	12	5.2
4	1	.4
5	2	.9
Severity		
Total SCORAD	20.27	±16.53
Mild (<25)	135	57.9
Moderate	65	27.9
Severe (>50)	12	5.2
Allergy-related complications		
Yes	168	72.1
No	64	27.5
Asthma	65	38.7
Food allergy	132	78.6
Allergic rhinitis	24	14.3
Allergic conjunctivitis	2	1.2
Other	1	.6
Caregivers	N	(%) [†]
	Mean	±SD
Mean age of father	38.44	±5.19
Occupation of father		
Full-time job	207	88.8
Part-time job	1	.4
Self-employed	18	7.7
Temporarily unemployed	1	.4
Mean age of mother	36.16	±4.04
Occupation of mother		
Full-time job	45	19.3
Part-time job	39	16.7
Self-employed	14	6.0
Working at home	2	.9
Unemployed	117	50.2
Temporarily unemployed	14	6.0
Primary caregiver during the day		
Mother	113	48.5
Nursery school	117	50.2
Other	3	1.3
Marital status		
Single	5	2.1
Married/Living with partner	221	94.8
Separated	7	3.0
Family history of atopic dermatitis		
Yes	200	85.8
No	32	13.7
Satisfaction with treatment		
Satisfied	203	87.1
Not satisfied	20	8.6

[†] Percentages do not always add up to 100 because of missing values.

Validity

Factor analyses were performed using principal axis factoring with a Promax rotation. The missing values were replaced with a mean. Based on the factor structure of the original CADIS, separate factor analyses of items related to children and items related to parents were performed. The number of factors was decided based on use of factors with a cumulative contribution ratio of at least 50%.²³ If one factor consisted of only a single item, the number of factors would be decreased and factor analysis would then be performed again. The minimum loading for an item to be retained was set at 0.32.²⁴

Concurrent validity tests were performed by testing the correlation of each factor in the JCMV-CADIS with the DFI and SCORAD. Correlation was verified with Spearman's correlation coefficient.

Discriminant validity tests were performed with the PS-SF, which has a structure that divides factors into child and parent dimensions like the CADIS, and the FAI, which measures family function.

Reliability

Cronbach's alpha was calculated for each factor in order to verify internal consistency. Test-retest reliability was performed to verify stability. Participants (10% of the target group) were requested to complete the retest 48 h after the initial survey.

Results

Demographic characteristics

Surveys were sent to 621 families of children with AD. Of these, 270 were returned, and data from 233 were analyzed in this study (37.5% of distributed surveys, 86.3% of returned surveys). Children not meeting age criteria were excluded from analysis, and surveys with >10% missing values of CADIS were excluded. Details of participant demographics are shown in Table 1.

Creation of the Japanese Culturally Modified Version of the CADIS (JCMV-CADIS)

First, we created a Japanese-language version of the CADIS.

Next, we conducted interviews with primary caregivers of Japanese children with AD and 8 new items were added to the scale, for reasons described in the text.

- This skin condition has made me more careful about my child's diet.
- This skin condition has made me more careful about my child's environment.
- I feel that I have adapted to the everyday life of caring for a child with atopic dermatitis.
- I feel that our whole family is helping with the care of my child's atopic dermatitis.
- I can deal with the prospect of long-term care for my child.
- I can accept that I cannot manage the situation perfectly.
- Child himself/herself takes the behavior avoiding symptom aggravation of the AD.
- This skin conditions worsens relationships with siblings.

After this, we conducted a quantitative study with a questionnaire which contains the 45 original items and the 8 new items from the interviews.

As a result of this, the item "This skin condition worsens relationships with siblings" was excluded from this study because 15

participants did not answer this item. Analysis was thus based on seven new items (one item added to a Child domain, six items added to the Parent domain).

Factor structure of the Japanese Culturally Modified Version of the CADIS (JCMV-CADIS)

Exploratory factor analysis (EFA) was performed by analyzing the 16 items in the Child domain, plus one added based on interviews with Japanese parents, and the 29 items in the Parent domain, plus six new items, separately, as performed in the original version of the CADIS. Of note, EFA results produced a different factor structure than the original CADIS.

Analyses of the JCMV-CADIS revealed a KMO of .894 ($P < 0.01$) and it indicated that the data set characteristics were adequate for performing factor analysis.

Final version of JCMV-CADIS is shown in [Supplementary data](#).

Child domain

Factor analysis of the Child domain identified three factors with a cumulative contribution ratio of 52.4%. One of these factors included only a single item, so the number of factors was reduced to two and the analysis was repeated. The first factor included nine items, including six from the “Symptoms” of the original version, but three items were inconsistent with the original. After comprehensive consideration of these items, the decision was made to retain the designation “Symptoms” for this factor. The second factor included three items, including two from the “Activity Limitations and Behavior” of the original version, but one item was inconsistent. After comprehensive consideration of the items, the decision was made to retain the designation “Activity Limitations and Behavior” for this factor.

Items with a low commonality and a low factor loading (five items) were discarded. As a result, 12 items were included in the Child domain. Details are shown in [Table 2](#).

Parent domain

Factor analysis of the Parent domain identified five factors with a cumulative contribution ratio of 52.1%.

The first factor included six items, all from the original version’s “Emotion” domain. After consideration, the designation “Emotions Related to Social Factors” was given to this factor. The second factor included eight items, including six from the “Emotion” of the original version; the other two were from the “Sleep.” After comprehensive consideration of the items, the factor was designated “Emotions Related to the Child’s Condition.”

The third factor included five items, all from the “Family and Social Function” of the original version. The same designation was therefore retained.

The fourth factor included six items, three from the original version’s “Emotion” and three from its “Family and Social Function.” After consideration of the items included, the factor was designated “Complexity of Care.”

The fifth factor consisted of six items, all new items based on the interviews with Japanese caregivers. These items concern issues such as using measures to prevent symptoms worsening, working together with the whole family for long-term management, and accepting that the provided care is not “perfect treatment,” but rather “good enough treatment.” For these reasons, the designation “Approaches to Management of AD in Daily Life” was given to this factor.

Items with low commonality and low factor loading (four items) were discarded. The Parent domain thus included 25 items from the original version and six additional items, for a total of 31 items. Details are shown in [Table 3](#).

Reliability

Internal reliability

Cronbach’s alpha for internal reliability in the Child domain was .729–.884. In the Parent domain, Cronbach’s alpha was .734–.839. The high alpha values for all factors indicate good internal reliability.

Test-retest reliability

Nineteen participants completed the surveys twice at a 48 h interval. Spearman’s rho was .925 for “Symptoms,” .899 for “Activity Limitations and Behavior,” .867 for “Emotions Related to Social Factors,” .847 for “Emotions Related to the Child’s Condition,” .922 for “Family and Social Function,” .917 for “Complexity of Care,”

Table 2
Exploratory factor analysis of the JCMV-CADIS (child domain).

Items	Factors in original version	Factors and loading		Cronbach’s α
		Symptoms	Activity Limitations and Behavior	
9. My child scratches or rubs his/her skin.	Symptoms	.854	–.192	.884
1. This skin condition affects how well my child sleeps.	Symptoms	.814	–.147	
10. This skin condition makes my child feel frustrated.	Symptoms	.755	.093	
6. This skin condition makes my child fussy or irritable.	Symptoms	.753	.086	
14. My child’s skin seems to be painful or irritated.	Symptoms	.692	.031	
12. My child seems to cry more because of this skin condition.	Symptoms	.659	.094	
22. My child’s itching or scratching affects his/her play.	Activity Limitations and Behavior	.439	.343	
21. Taking a bath makes my child uncomfortable.	Activity Limitations and Behavior	.376	.222	
27. Certain fabrics or clothes seem to bother my child’s skin.	Activity Limitations and Behavior	.350	.233	
29. It is difficult to discipline my child because of this skin condition.	Activity Limitations and Behavior	–.123	.855	
34. My child misbehaves more because of this skin condition.	Activity Limitations and Behavior	–.069	.742	
17. My child seems to be restless or hyperactive because of this skin condition.	Symptoms	.172	.527	

Principal axis factoring.

Promax with Kaiser Normalization.

Rotation converged in 3 iterations.

Table 3
Exploratory factor analysis of the JCMV-CADIS (Parent domain).

Items	Factors in the original version	Factors and loading					Cronbach's α
		Emotions Related to Social Factors	Emotions Related to the Child's Condition	Family and Social Function	Complexity of Care	Approaches to Management of AD in Daily Life	
44. I am embarrassed by the way my child's skin looks.	Emotion	.797	-.157	.014	.122	-.058	.839
25. I am bothered by the reaction of strangers to this skin condition.	Emotion	.677	-.104	.151	.042	.099	
33. I worry that this skin condition will affect my child's ability to make friends.	Emotion	.639	.206	.005	-.132	-.048	
38. I worry that this skin condition will affect my child's self-esteem.	Emotion	.601	.223	.016	-.008	-.055	
39. My child's skin condition makes me feel sad or depressed.	Emotion	.498	.190	.133	.100	.042	
16. I/we avoid taking photos of my child because of this skin condition.	Emotion	.443	.002	.236	-.064	-.087	
32. I worry about the side effects from treatments for this skin condition.	Emotion	.021	.796	-.044	-.066	-.010	.818
13. I worry that my child's skin condition will continue.	Emotion	.027	.655	-.121	.196	-.089	
31. My child sleeps in my bed because of this skin condition.	Sleep	.016	.518	.182	-.037	.002	
35. This skin condition has affected how confident I feel about my child's medical care.	Emotion	-.006	.511	.121	.030	-.102	
3. My child's skin condition affects how well my spouse and I sleep.	Sleep	-.373	.477	.352	.150	.045	
26. I am disappointed that my child has this skin condition.	Emotion	.253	.443	-.286	.298	.014	
28. I worry that my child is exposed to things that may worsen this skin condition.	Emotion	.300	.419	.148	-.198	.116	
42. I blame myself or feel guilty that my child has this skin condition.	Emotion	.314	.389	-.178	.048	.165	
4. I am bothered that this skin condition affects our vacation plans.	Family and Social Function	-.045	.089	.814	-.083	-.018	.792
7. I am bothered that my family stays home more because of this skin condition.	Family and Social Function	.080	-.144	.696	.176	.007	
8. I am bothered that this skin condition affects our relationships with relatives.	Family and Social Function	.260	-.069	.581	-.064	.015	
5. This skin condition affects our social life.	Family and Social Function	.105	-.012	.537	.146	-.028	
11. I worry about leaving my child with others (babysitters, relatives) because of this skin condition.	Family and Social Function	.185	.172	.478	-.029	.031	
18. I am bothered by how much time is needed to care for my child's skin condition.	Emotion	-.184	.083	.032	.783	.069	.826
37. I am angry that my child has this skin condition.	Emotion	.128	.051	-.081	.621	-.040	
15. I am frustrated with my child's skin condition.	Emotion	.090	.166	.064	.575	-.069	
45. My child's skin condition makes it hard to do what I enjoy.	Family and Social Function	.178	-.130	.236	.551	-.006	
20. My child's skin condition affects my spouse's or my work performance due to missed time and decreased productivity.	Family and Social Function	.022	.051	.118	.471	.047	
30. My child's skin condition has strained my relationship with my spouse or partner.	Family and Social Function	.370	-.133	-.031	.420	-.001	
48. I feel that I have adapted to the everyday life of caring for a child with atopic dermatitis.	†	.066	.008	-.036	-.059	.739	.734
50. I can deal with the prospect of long-term care for my child.	†	.074	-.207	-.075	.040	.718	
49. I feel that our whole family is helping with the care of my child's atopic dermatitis.	†	-.011	.066	.004	-.036	.576	
51. I can accept that I cannot manage the situation perfectly.	†	-.170	-.168	-.003	.037	.503	
47. This skin condition has made me more careful about my child's environment.	†	.017	.220	.057	.022	.488	
46. This skin condition has made me more careful about my child's diet.	†	-.143	.110	.141	.100	.399	

Principal axis factoring.

Promax with Kaiser Normalization.

Rotation converged in 7 iterations.

† Additional items in Japanese version.

Table 4
Concurrent validity and discriminant validity of the JCMV-CADIS.

Child domain		Confirmation of concurrent validity				Confirmation of discriminant validity								
		DFI	Objective SCORAD	Subjective SCORAD	Total SCORAD	PS-SF domain	PS-SF child domain	PS-SF Parent domain	PS-SF score	FAI family communication	FAI family system flexibility	FAI family rules	FAI family evaluation	FAI family cohesion
Symptoms		.563 [†]	.347 [†]	.652 [†]	.430 [†]	.265 [†]	.151 [‡]	.258 [†]	-.098	-.100	.012	-.031	-.073	
	P Value	.000	.000	.000	.000	.000	.025	.000	.150	.138	.864	.653	.282	
Activity Limitations and Behavior		.499 [†]	.150 [†]	.350 [†]	.232 [†]	.461 [†]	.150 [†]	.410 [†]	-.165 [†]	-.202 [†]	-.013	-.124	-.170 [†]	
	P Value	.000	.024	.000	.001	.000	.000	.000	.013	.002	.851	.064	.010	
Emotions Related to Social Factors		.448 [†]	.187 [†]	.253 [†]	.210 [†]	.377 [†]	.243 [†]	.362 [†]	-.093	-.117	.011	-.029	-.048	
	P Value	.000	.005	.000	.002	.000	.000	.000	.168	.078	.866	.662	.472	
Emotions Related to the Child's Condition		.546 [†]	.190 [†]	.394 [†]	.239 [†]	.277 [†]	.155 [†]	.258 [†]	-.075	-.079	-.002	-.051	-.089	
	P Value	.000	.005	.000	.001	.000	.022	.000	.271	.244	.974	.456	.189	
Family and Social Function		.519 [†]	.082 [†]	.325 [†]	.141 [†]	.261 [†]	.191 [†]	.272 [†]	-.146 [†]	-.145 [†]	.049	-.057	-.092	
	P Value	.000	.231	.000	.045	.000	.005	.000	.034	.034	.477	.408	.179	
Complexity of Care		.616 [†]	.067 [†]	.299 [†]	.113	.342 [†]	.274 [†]	.368 [†]	-.103	-.218 [†]	-.114	-.096	-.189 [†]	
	P Value	.000	.322	.000	.102	.000	.000	.000	.125	.001	.089	.150	.004	
Approaches to Management of AD in Daily Life		.042	-.058	.021	-.041	.000	-.123	-.077	.216 [†]	.126	.069	.210 [†]	.196 [†]	
	P Value	.530	.400	.763	.557	1.000	.071	.262	.001	.063	.312	.002	.004	

[†] Correlation is significant at the .01 level (2-tailed).

[‡] Correlation is significant at the .05 level (2-tailed).

and .880 for “Approaches to Management of AD in Daily Life” ($P < 0.01$ in all instances).

Validity

Concurrent validity

A correlation was measured using the Japanese version of DFI scale and the JCMV-CADIS with the following correlations shown: “Symptoms” (.563), “Activity Limitations and Behavior” (.499), “Emotions Related to Social Factors” (.448), “Emotions Related to the Child's Condition” (.546), “Family and Social Function” (.519), and “Complexity of Care” (.616) ($P < 0.01$ for each). “Approaches to Management of AD in Daily Life” was not shown to be correlated with the DFI.

Total SCORAD score when correlated with the JCMV-CADIS revealed correlations with “Symptoms” (.430), “Activity Limitations and Behavior” (.232), “Emotions Related to Social Factors” (.210), and “Emotions Related to the Child's Condition” (.239) ($P < 0.01$ for each). Total SCORAD score did not correlate with “Complexity of Care” or “Approaches to Management of AD in Daily Life.” Only “Symptoms” showed a moderate correlation with Total SCORAD, with the rest showing low correlation. Details are shown in Table 4.

Discriminant validity

PS-SF total score when correlated with the JCMV-CADIS revealed correlations with “Symptoms” (.258), “Activity Limitations and Behavior” (.410), “Emotions Related to Social Factors” (.362), “Emotions Related to the Child's Condition” (.258), “Family and Social Function” (.272), and “Complexity of Care” (.368). “Approaches to Management of AD in Daily Life” correlated significantly with the FAI subdomain and “Family Communication” (.216), “Family Evaluation” (.210), and “Family Cohesion” (.196) ($P < 0.01$ for each). Details are shown in Table 4.

Discussion

About concurrent validity of the JCMV-CADIS, it was shown with all factors except “Approaches to Management of AD in Daily Life.” “Approaches to Management of AD in Daily Life” consists solely of items specific to the new Japanese version of the CADIS, so one can reasonably assume that this represents concepts not measured on the existing scale. While there is as yet no scale available to measure the concurrent validity of this factor, a previous study found that characteristics of AD and parenting stress are related to “difficulties of daily care”.^{25,26} The “Approaches to Management of AD in Daily Life” factor captures this concept and is certainly an important family-related factor fitting with the general theme of the JCMV-CADIS.

About discriminant validity, “Approaches to Management of AD in Daily Life” was not found to correlate significantly with the PS-SF, but it was found to correlate with three subdomains of FAI. The added items in “Approaches to Management of AD in Daily Life” measure qualities not found in the original scale, and their general concept is similar to the FAI; namely, a measure of family function.

Factor analysis of the JCMV-CADIS revealed a larger number of factors than in the original version. However, this tool is not intended to be applied as a simple clinical screening instrument, but rather as an instrument for detailed measurement for specialty clinics or clinical trials. As a result, a larger number of factors are appropriate.

As in the original version of the scale, the Child domain in the JCMV-CADIS consists of two factors. A few items were changed, but the Child domain shares the same general factor structure as the original.

“Emotion” was a single factor in the original version, but had to be divided into two factors in the JCMV-CADIS. The first such factor, “Emotions Related to Social Factors,” is strongly influenced by Japanese culture. Benedict pointed out that American culture is primarily a “culture of guilt,” while Japanese culture is more a “culture of shame,” in which individuals place a great deal of importance on how they are seen by others, rather than on how they see themselves.²⁷ Japanese parents are thus very sensitive to the appearance of their children and how others might react to it, and the items related to outward appearance exhibit this particular aspect of Japanese culture very strongly. The second factor, “Emotions Related to the Child’s Condition,” is quite similar to the more traditional concept of the “Emotion” on the original version.

“Complexity of Care” does not appear in the original version of the scale. Since 97.4% of respondents in this study were mothers of children with AD, this factor represents the fact that the primary burden of care for children with AD in Japan falls on the shoulders of their mothers. Regarding the Global Gender Gap Report²⁸ and the Organisation for Economic Co-operation and Development report²⁹ on “Balancing paid work, unpaid work and leisure,” Japanese men tend to immerse themselves in work rather than domestic duties, so Japanese women carry the brunt of household work. In Japanese families, where household work is seen as primarily the job of the mother, one can assume that mothers bear the primary burden for both housework and the care of children with AD. One can easily imagine that the complexity of care is felt most keenly by mothers carrying this dual responsibility.

“Approaches to Management of AD in Daily Life” concerns managing family expectations, outlooks, and preventive measures. “Daily Life” concerns issues faced by any family, such as diet and environment, but daily life for children with AD involves continuous, long-term attention to many specific issues in order to ensure that symptoms are not exacerbated. Japan differs from Western countries in a number of ways in this regard. Examples include differences in diet, the use of futons rather than beds, and the practice of removing shoes when entering the home. In addition, Triandis stated that Japan’s collectivist culture often leads to stronger parent–child bonds, but weaker spouse–spouse bonds, than in individualistic nations.³⁰ Japanese mothers might thus be willing to make more sacrifices for the sake of their children. Contrasting with this perspective, the factor “Approaches to Management of AD in Daily Life” includes a number of items related to caring for the whole family with an eye toward the long-term and accepting care that accommodates the family as a whole, rather than care that is “perfect.” This factor’s focus on the functioning of the family as a whole can help families move forward with actions that reduce the burden of care and overcome difficulties in daily life by keeping communication open and strengthening family bonds. For all of these reasons, this new factor is needed to address the particular characteristics of the Japanese family structure and the roles within it.

Limitations of this study

Retest surveys were completed after 48 h. This represented only a short period between testing and retesting and may have led to recall bias. However, use of this interval was deemed appropriate, since AD in children generally responds well to treatment within only a few days.

The clinical applicability is yet to be tested, and further evaluation of clinical applicability is needed.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.alit.2016.02.011>.

Conflict of interest

The authors have no conflict of interest to declare.

Authors' contributions

CY designed the study, performed the statistical analysis and wrote the manuscript. MF and YO contributed to data collection and critically revised the manuscript. SLC contributed to study planning and critically revised the manuscript. MA supervised the whole of this study. All authors read and approved the final manuscript.

References

- Eichenfield LF, Tom WL, Chamlin SL, Feldman SR, Hanifin JM, Simpson EL, et al. Guidelines of care for the management of atopic dermatitis: section 1. Diagnosis and assessment of atopic dermatitis. *J Am Acad Dermatol* 2014;**70**:338–51.
- Laughter D, Istvan JA, Tofte SJ, Hanifin JM. The prevalence of atopic dermatitis in Oregon schoolchildren. *J Am Acad Dermatol* 2000;**43**:649–55.
- Katayama I, Kohno Y, Akiyama K, Aihara M, Kondo N, Saeki H, et al. Japanese guideline for atopic dermatitis 2014. *Allergol Int* 2014;**63**:377–98.
- Daud LR, Garralda ME, David TJ. Psychosocial adjustment in preschool children with atopic eczema. *Arch Dis Child* 1993;**69**:670–6.
- Dahl RE, Bernhisel-Broadbent J, Scanlon-Holdford S, Sampson HA, Lupo M. Sleep disturbances in children with atopic dermatitis. *Arch Pediatr Adolesc Med* 1995;**149**:856–60.
- Chamlin SL, Frieden IJ, Williams ML, Chren MM. Effects of atopic dermatitis on young American children and their families. *Pediatrics* 2004;**114**:607–11.
- Chamlin SL, Cella D, Frieden IJ, Williams ML, Mancini AJ, Lai JS, et al. Development of the Childhood Atopic Dermatitis Impact Scale: initial validation of a quality-of-life measure for young children with atopic dermatitis and their families. *J Invest Dermatol* 2005;**125**:1106–11.
- Faught J, Bieri C, Barton B, Kemp A. Stress in mothers of young children with eczema. *Arch Dis Child* 2007;**92**:683–6.
- Chamlin SL, Mattson CL, Frieden IJ, Williams ML, Mancini AJ, Cella D, et al. The price of pruritus: sleep disturbance and cosleeping in atopic dermatitis. *Arch Pediatr Adolesc Med* 2005;**159**:745–50.
- Moore K, David TJ, Murray CS, Child F, Arkwright PD. Effect of childhood eczema and asthma on parental sleep and well-being: a prospective comparative study. *Br J Dermatol* 2006;**154**:514–8.
- Lawson V, Lewis-Jones MS, Finlay AY, Reid P, Owens RG. The family impact of childhood atopic dermatitis: the dermatitis family impact questionnaire. *Br J Dermatol* 1998;**138**:107–13.
- Chamlin SL, Lai JS, Cella D, Frieden IJ, Williams ML, Mancini AJ, et al. Childhood Atopic Dermatitis Impact Scale: reliability, discriminative and concurrent validity, and responsiveness. *Arch Dermatol* 2007;**143**:768–72.
- Lewis-Jones S. Measuring the burden of atopic eczema in young children and the family unit. *J Invest Dermatol* 2005;**125**:viii.
- Lewis-Jones S. Quality of life and childhood atopic dermatitis: the misery of living with childhood eczema. *Int J Clin Pract* 2006;**60**:984–92.
- Neri E, Agostini F, Gremigni P, Gobbi F, Casu G, Chamlin SL, et al. Italian validation of the Childhood Atopic Dermatitis Impact Scale: a contribution to its clinical application. *J Invest Dermatol* 2012;**132**:2534–43.
- Severity scoring of atopic dermatitis: the SCORAD index. Consensus report of the European Task Force on Atopic Dermatitis. *Dermatology* 1993;**186**:23–31.
- Kunz B, Oranje AP, Labrèze L, Stalder JF, Ring J, Taïeb A. Clinical validation and guidelines for the SCORAD index: consensus report of the European Task Force on Atopic Dermatitis. *Dermatology* 1997;**195**:10–9.
- Furue M, Saeki H, Furukawa F, Hide M, Ohtsuki M, Katayama I, et al. [Guidelines for management of atopic dermatitis]. [*Jpn J Dermatol*] 2009;**119**:1515–34 (in Japanese).
- Ohya Y, Sasaki R, Matsumoto M, Shiozaki M, Katsunuma T, Kawahara H, et al. [Development of the Japanese Version of the DFI: measuring the QOL of families of children with atopic dermatitis]. Presented at the 14th Spring Meeting of the Japanese Society of Allergology, Chiba, Japan. March 21–23, 2002 [abstract] *Alerugi* 2002;**51**:266 (in Japanese).
- Narama M, Kanematsu Y, Araki A, Maru M, Nakamura N, Takeda J, et al. [Validity and reliability of the Japanese version of the parenting stress index]. [*J Child Health*] 1999;**58**:610–6 (in Japanese).

21. Kanematsu Y, Araki A, Narama M, Shirahata N, Maru M, Arayashiki R. [*Guidelines for the PSI: Parenting Stress Index, Revised Edition*]. Tokyo: Koyoumondai-kenkyukai; 2013 (in Japanese).
22. Nishide T. Kazoku assessment inventory no sakusei [[Constructing the Family Assessment Inventory (FAI): measuring family functioning]]. [*Jpn J Fam Psychol*] 1993;7:53–65 (in Japanese).
23. Netemeyer RG, Bearden WO, Sharma S. *Scaling Procedures: Issues and Applications*. Thousand Oaks, CA: Sage Publications; 2003.
24. Tabachnick BG, Fidell LS. *Using Multivariate Statistics*. Boston, MA: Pearson Education; 2013.
25. Tsuzuki C, Ishiguro A, Asano M, Miura K, Yamada T, Narama M. [A study of mothers' stress in the care of children with atopic dermatitis]. [*J Soc Child Health Nurs*] 2006;15:25–31 (in Japanese).
26. Yamaguchi C, Ishiguro A, Asano M, Fujimaru I, Yamada T. [Impact of atopic dermatitis on a patient's family]. [*J Child Health*] 2011;70:245–51 (in Japanese).
27. Benedict R. *The Chrysanthemum and the Sword: Patterns of Japanese Culture*. Boston, MA: Houghton Mifflin Harcourt; 1967.
28. The Global Gender Gap Report 2013. World Economic Forum. Available at: <http://www.weforum.org/reports/global-gender-gap-report-2013>. [accessed 13.08.14].
29. Balancing paid work, unpaid work and leisure. OECD. Available at: <http://www.oecd.org/gender/data/balancingpaidworkunpaidworkandleisure.htm>. [accessed 13.08.14].
30. Triandis HC. *Individualism & Collectivism*. Boulder: Westview Press; 1995.