Original Article

Development of the revised Japanese Maternal Breastfeeding Evaluation Scale, short version

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Background and Objectives: The Japanese Maternal Breastfeeding Evaluation Scale (JMBFES) was developed in 2013 based on the original Maternal Breastfeeding Evaluation Scale (MBFES). Mothers' abilities to incorporate breastfeeding into their daily life may influence their decision to continue or discontinue to breastfeed, but that version of the JMBFES had no questions to measure this important aspect of breastfeeding. Therefore, we sought to improve the JMBFES by incorporating questions measuring "lifestyle compatibility-incompatibility," and we conducted psychometric testing of the improved version. **Methods and Study Design:** In this longitudinal study, the revised JMBFES was developed, and its reliability and validity was tested among 215 Japanese mothers. In the first survey, which was done three months after delivery, infant-feeding status and the prenatal intention regarding breastfeeding were measured. In the second survey, which was done two months later, the JMBFES questions were asked along with questions regarding infant-feeding status. We identified items that could be deleted while maintaining high reliability. Using regression models, we examined associations of JMBFES scores with breastfeeding intention and breastfeeding outcomes. **Results:** All three subscales in the revised JMBFES had acceptable reliability (alpha $\geq$0.78). The two "lifestyle compatibility-incompatibility" items (one new item and the one that had been deleted previously) belonged to the "potentially negative aspects" subscale. Scores on that subscale were not associated with breastfeeding intention. However, in both surveys, the mothers who were using formula reported more potential difficulties ($p \leq 0.01$). **Conclusion:** Results of validation testing and reliability testing indicate that the revised JBFEES can be used to measure breastfeeding satisfaction among Japanese mothers.

Key Words: breastfeeding, Japanese, maternal breastfeeding evaluation, satisfaction, psychometric testing

INTRODUCTION

The Japanese Maternal Breastfeeding Evaluation Scale (JMBFES)[1] was developed in 2013. However, it does not include questions to measure how well mothers can integrate breastfeeding with other aspects of life. This "lifestyle compatibility-incompatibility" is nonetheless important, as it may affect mothers' decisions to continue or discontinue breastfeeding.[2,3] The original Maternal Breastfeeding Evaluation Scale (MBFES) has an item "I could easily fit my baby's breastfeeding with other activities" to measure "lifestyle compatibility-incompatibility." It was deleted, however, from the first version of the JMBFES, because principal components analysis showed that this item did not have a loading above 0.5 on any of the factors.[1] In addition, as this item had no similar items in the first version of the JMBFES, it could not be part of a multi-item scale or subscale. Because of these two considerations (low loading and not being in a multi-item scale) it was not included in the first version of the JMBFES. Thus, we previously suggested that the JMBFES might be improved by adding at least one more similar item.[1] Here we report on the improved version of the JMBFES, including the results of psychometric testing among Japanese mothers.

METHODS

Data collection procedures and ethical considerations

This was a longitudinal study, using data from a study designed to develop a scale to measure perceived social support for breastfeeding. We recruited participants from 4 public health centres in the Adachi city in Tokyo, from October 28 through December 4, 2014. Self-administered questionnaires were distributed to potentially eligible mothers at their infants' 3-month health check-up. In that questionnaire, sociodemographic and obstetric background, prenatal intention of infant-feeding and infant-

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feeding status were measured. Each participant wrote her home address on an envelope that was later used for the second survey. We sent the second set of self-administered questionnaires, including the JMBFES and questions to measure infant-feeding status, two months after the first survey.

To maintain confidentiality, the questionnaires were filled out anonymously with research identification numbers. The participants were told that filling out and submitting the questionnaire would be taken as provision of informed consent, and self-addressed envelopes would be used only for sending the second questionnaires. Those procedures were approved by the public health centres and by the Research Ethics Committee of the Graduate School of Medicine at the University of Tokyo.

Participants

Participants were mothers who had a singleton birth, were literate in Japanese, were older than 18 years of age, and visited the public health centre for their infants' health check-up. Of 414 mothers we approached in the first survey, 38 declined to participate. We sent out the second questionnaires to 376 participating mothers, and 253 questionnaires were returned (61%). We excluded data from 38 mothers because their infants were less than 4 months old or more than 7 months old at the time of the second survey (n=5), their doctors told them not to breastfeed for medical reasons (n=3), they had intended to formula-feed exclusively (n=20), or because they had missing data on breastfeeding intention (n=2) or on breastfeeding outcomes (n=3) or on any JMBFES item (n=13). The total number of reasons for exclusion exceeded 38 because some mothers had more than one reason. Consequently, we analyzed data from 215 participants who completed both surveys.

The original MBFES and the JMBFES

The original MBFES and the JMBFES use a 5-point Likert-type scale, with 1 indicating strong disagreement and 5 indicating strong agreement. Reverse-scoring was used when appropriate so that higher scores would indicate more positive evaluation. Both the original MBFES[2] and the first version of the JMBFES[1] have 3 subscales. In the first version of the JMBFES, they are "maternal satisfaction" (11 items, alpha=0.91), "perceived benefit to baby" (7 items, alpha=0.84), and "potentially negative aspects" (5 items, alpha=0.77).[1]

We added 2 items to the JMBFES to measure "lifestyle compatibility-incompatibility" with breastfeeding. Of those two, one was in the original MBFES ("I could easily fit my baby's breastfeeding with other activities") and the other was new ("I can handle other activities while enjoying breastfeeding"). Of those two items, the first emphasizes time management and multitasking, and the second mentions "enjoying" breastfeeding. That is, the first is more about practical matters, while the second is more about emotion. Nonetheless, those two items are similar, in that both are expected to reflect aspects of lifestyle compatibility-incompatibility with breastfeeding. For scores on a multi-item scale to be reliable, it is important for all items to measure the same construct.[4,5]

Breastfeeding intention and outcomes

Prenatal intention to breastfeed was measured by asking mothers, retrospectively as part of the first survey, how they had intended to feed their infants for the first 5-6 months: (a) breastfeeding, or (b) either mixed feeding or undecided.

Breastfeeding outcomes were measured by asking mothers how they had fed their infants in the past 24 hours: (a) breastfeeding without formula, (b) either mixed feeding or exclusive formula feeding. Breastfeeding outcomes were measured both in the first and the second surveys.

Data analysis

After conducting the Kaiser-Mayer-Olkin test and Bartlett's test of sphericity, we used factor analysis and decided how many factors to retain by examining the eigenvalues and the scree plot. Factor loadings were examined after promax rotation. First, only items with loading >0.5 were assigned to subscales. Items with loading <0.5 were then deleted and factor analysis was done again, followed again by promax rotation. Then other items were eliminated as necessary to obtain subscales that were brief without sacrificing reliability (coefficient alpha).

As a validation test, multiple linear regression was used to examine associations of subscale scores with prenatal breastfeeding intention and with breastfeeding outcomes. Maternal sociodemographic information was used as confounders. Stepwise backward-elimination was used to create the final model: variables with $p>0.2$ were deleted.

Data were analyzed with Stata version 12 (Stata Corporation, College Station Texas, USA).

RESULTS

Demographic characteristics

The average age of the mothers was 32.2 years (SD 4.3) and 53% had no or little economic concerns about the future. Fifty-seven percent of mothers were first-time mothers; 16% had cesarean birth; 41% had no plan to return to work or school; 78% had at least some formal schooling after high school; 98% had a spouse or partner; and 5% were current smokers. The average number of persons to give mothers emotional support was 3.0 (SD 1.4). During pregnancy, 61% of mothers had intended to breastfeed for 5-6 months and 39% wanted to mixed-feed or had been undecided.

Factor analysis

The Kaiser-Mayer-Olkin statistic was .91, and the X^2 from Bartlett's test of sphericity was 3315.52 (df=300, $p<0.001$), both of which indicate that factor analysis is appropriate. Three factors had eigenvalues greater than 1. (Figure 1) After promax rotation, both before and after deleting items with factor loading <0.5, the JMBFES had 3 factors, which we used as subscales. (Table 1) After we deleted 4 items from the "maternal satisfaction" subscale, alpha was still high (0.93), thus we retained only 7 items in that subscale. The results after these procedures were that coefficient alpha was 0.93 for "maternal satisfaction", 0.89 for "perceived benefit to baby", and 0.78 for "potentially negative aspects." The two items asking about

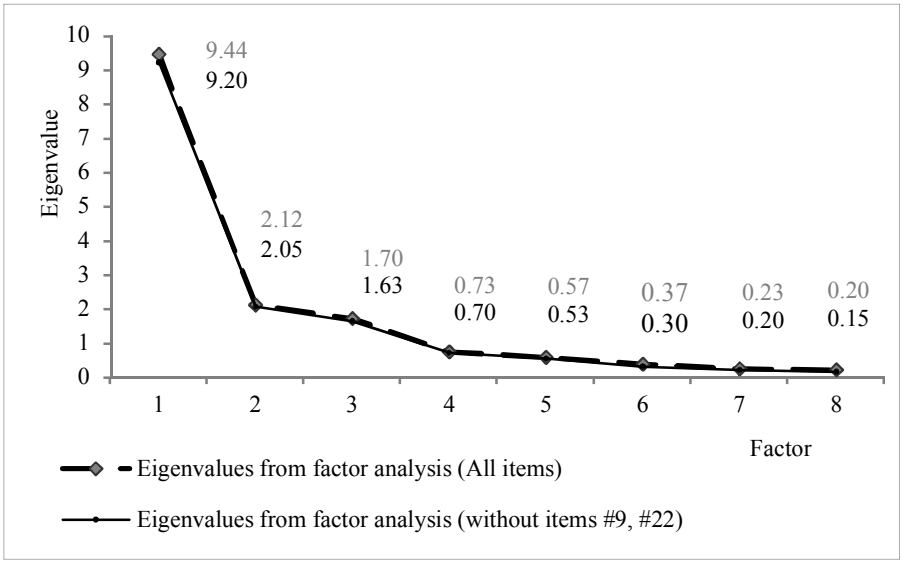

Figure 1. Scree Plot. Three factors were extracted because the eigenvalues of the first three factors were greater than 1.0. That held both with all 25 items and after two items had been deleted (due to having factor loadings less than 0.5).

Table 1. Factor structure of 3 subscales in the revised Japanese Maternal Breastfeeding Evaluation Scale (JMBFES) (n=215)

		3 subscales					
		Maternal satisfaction		Perceived benefit to baby		Potentially negative aspects	
Factor loading after promax rotation							
JMBFES item #	Description	All 25 items	without #9‡, #22‡	All 25 items	without #9‡, #22‡	All 25 items	without #9‡, #22‡
1	Contentment	0.87	0.88				
2	Special time	0.81	0.81				
3	Baby loved to nurse			0.77	0.77		
4	Close to baby	0.73	0.74				
5	Baby eager breastfeeder			0.73	0.73		
6	Physically draining					0.57	0.57
7	Important	0.72	0.75				
8	Baby excellent growth			0.79	0.78		
9‡	Worked together			(0.43)†			
10	Fit with activities					0.53	0.56
11	Nurturing maternal	0.85	0.85				
12	Too tied down					0.72	0.71
13	Soothing baby			0.61	0.62		
14	A high of sorts (happy)	0.75	0.76				
15§	Satisfying to have produced nutrition	0.64	0.65				
16§	Good mother	0.66	0.67				
17§	Enjoyed nursing	0.63	0.64				
18	Anxious body back					0.64	0.64
19§	More confident	0.62	0.63				
20	Baby gain weight well			0.82	0.82		
21	Baby more secure			0.75	0.74		
22‡	Feel like a cow	<0.3‡		<0.3‡		<0.3‡	
23	Emotionally draining					0.58	0.56
24	Wonderful	0.79	0.80				
25 (new)	Handle other activities					0.56	0.57
Coefficient alpha		0.93		0.89		0.78	
Correlations among subscales							
	Maternal satisfaction	1					
	Perceived benefits to baby	0.50	0.50	1			
	Potentially negative aspects	0.43	0.44	0.32	0.33	1	

†Parentheses indicate that the factor loading was greater than 0.3 but less than 0.5.
‡These items were eliminated because they had no loading above 0.5 on any factor. For item 22 there was no loading greater than 0.3.
§Items #15, 16, 17, and 19 were deleted because the subscale's reliability was high even without them. Coefficient alpha=0.93 even without those items.

Table 2. Associations of breastfeeding intentions and outcomes with 3 subscales

Associations with breastfeeding intention and outcomes†	3 subscales (Regression coefficient (*p* value))		
	Maternal satisfaction (n=213)	Perceived benefit to baby (n=215)	Potentially negative aspects (n=215)
Intention to breastfeed exclusively	2.29 (<0.001)***	2.38 (<0.001)***	0.93 (0.153)
Breastfeeding without formula at the time of the first survey	1.13 (0.073)	4.85 (<0.001)***	2.17 (0.001)**
Breastfeeding without formula the time of the second survey	1.32 (0.036)*	4.97 (<0.001)***	1.66 (0.010)*

†Multiple linear regressions, adjusted for maternal confounders (age, income, educational status, parity, mode of birth, marital status, smoking status, working status, the number of persons for emotional support) (p<0.2). The number of participants varied because of missing values in confounders in some of the final models.
*p<0.05; **p<0.01; ***p<0.001

lifestyle compatibility-incompatibility were in the "potentially negative aspects" subscale.

Association with intention and with breastfeeding outcomes (Table 2)

Prenatal intention to breastfeed was positively associated with 2 subscales: "maternal satisfaction" and "perceived benefit to baby". Compared with the mothers who were either undecided or intended to practice mixed feeding, the mothers who intended to breastfeed were more likely to have higher scores on the "maternal satisfaction" subscale (p<0.001) and on the "perceived benefit to baby" subscale (p<0.001). Breastfeeding intention was not associated with scores on the "potentially negative aspects" subscale.

On the other hand, breastfeeding status, both in the first and second surveys, was associated with 2 subscales: "perceived benefit to baby" and "potentially negative aspects". While breastfeeding without formula at the time of the second survey was also positively associated with the score on the "maternal satisfaction" subscale (p=0.03), breastfeeding without formula at the time of the first survey was not associated with scores on the "maternal satisfaction" subscale (p=0.073). At the time of the second survey, mothers who were breastfeeding without formula had higher scores than did the other mothers, on all subscales. (Table 2)

DISCUSSION

The revised JMBFES had 3 subscales that were similar to those in the first version. While we expected that the 2 items regarding "lifestyle compatibility-incompatibility" might form their own subscale, the results of factor analysis showed that they both belonged to the "potentially negative aspects" subscale. The correlations among the subscales were consistent with those in our previous study. The first version had 23 items, and the revised version has 19, which should lessen the burden on participants in future research. The revised "maternal satisfaction" subscale is shorter but its reliability is still high.

Mothers who had intended to breastfeed were more likely to be satisfied with breastfeeding and to perceive benefits to the baby, but not necessarily to perceive less difficulty related to breastfeeding. In our previous study, intention to breastfeed was positively associated with scores on all 3 subscales.[1] The discrepancy may be partly explained by the 2 new items in the "potentially negative aspects" subscale. Giving information about lifestyle compatibility-incompatibility, the responses to those two questions could indicate that among the mothers who had intended to breastfeed, some were less resilient than others to negative aspects of breastfeeding that differed from their expectations.

Limitations of this study were that most mothers were married or had partners, were non-smokers, and had few or no economic concerns. Those who did not respond to the survey may have been socio-economically disadvantaged, which could have been associated with early termination of breastfeeding and with breastfeeding dissatisfaction. Further research is needed to listen to their voices. One strength of this longitudinal study was that we assessed breastfeeding status twice by 24-hour recall.

Conclusion

This revised JMBFES can be useful to measure breastfeeding satisfaction in Japan. It is slightly shorter than the previous version, its reliability is high, and the "potentially negative aspects" subscale now includes questions regarding lifestyle compatibility-incompatibility.

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AUTHOR DISCLOSURES

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