# Development of the Breastfeeding Support Scale to measure breastfeeding support from lay and professional persons, and its predictive validity in Japan

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**Background.** International and national organizations recommend exclusive breastfeeding for the first six months of life, but many women stop earlier. Lay and professional persons can support mothers' efforts to overcome breastfeeding difficulties. Considering breastfeeding support to comprise emotional support, practical help, and information offered to women who desire to breastfeed (by professionals, family members, and others), we developed and tested a scale to measure it in Japan. **Methods.** A total of 31 items were generated by literature review and from the authors' clinical experiences. Those items were tested with 243 mothers who visited public health centers in Tokyo for their infant's health check-up 3 months after birth. Breastfeeding support and infant feeding status were then assessed 5 months after birth. All the data were collected by using self-administered questionnaires. **Results.** On the basis of the results of factor analysis, the number of items was reduced to 11. There were three factors: support from breastfeeding peers and from people in specifically named healthcare professions, practical help, and support from people the mother can rely on to help meet emotional needs and address breastfeeding concerns. Internal-consistency reliability (alpha) of scores on the 11-item scale was 0.83 when measured 3 months postpartum and 0.85 when measured 5 months postpartum. Higher scores on the 11-item scale 3 months postpartum were associated with more breastfeeding exclusivity both at that time (Kruskal-Wallis test, chi-squared = 14.871, df = 3, n = 211, p = 0.002, eta-squared = 0.071) and also 5 months postpartum (Kruskal-Wallis test, chi-squared = 8.556, df = 3, n = 159, p = 0.036, eta-squared = 0.054). Further, the area under the Receiver Operating Characteristic curve was 0.73 (95% CI 0.57 to 0.88), which indicates that scores on the 11-item scale 3 months postpartum may be useful to predict which mothers will be less exclusive in breastfeeding 5 months postpartum. In conclusion, scores on this 11-item scale were reasonably reliable and valid for measuring breastfeeding support provided by

lay and professional persons to mothers in Japan. Further research is required to evaluate this scale's applicability in other settings.

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17 ## Abstract

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19 breastfeeding for the first six months of life, but many women stop earlier. Lay and

20 professional persons can support mothers' efforts to overcome breastfeeding difficulties.

21 Considering breastfeeding support to comprise emotional support, practical help, and

22 information offered to women who desire to breastfeed (by professionals, family

23 members, and others), we developed and tested a scale to measure it in Japan.

24 **Methods.** A total of 31 items were generated by literature review and from the authors'

25 clinical experiences. Those items were tested with 243 mothers who visited public

26 health centers in Tokyo for their infant's health check-up 3 months after birth.

27 Breastfeeding support and infant feeding status were then assessed 5 months after

28 birth. All the data were collected by using self-administered questionnaires.

29    **Results.** On the basis of the results of factor analysis, the number of items was reduced

30    to 11. There were three factors: support from breastfeeding peers and from people in

31    specifically named healthcare professions, practical help, and support from people the

32    mother can rely on to help meet emotional needs and address breastfeeding concerns.

33    Internal-consistency reliability (alpha) of scores on the 11-item scale was 0.83 when

34    measured 3 months postpartum and 0.85 when measured 5 months postpartum. Higher

35    scores on the 11-item scale 3 months postpartum were associated with more

36    breastfeeding exclusivity both at that time (Kruskal-Wallis test, chi-squared = 14.871, df

37    = 3, n = 211, p = 0.002, eta-squared = 0.071) and also 5 months postpartum (Kruskal-

38    Wallis test, chi-squared = 8.556, df = 3, n = 159, p = 0.036, eta-squared = 0.054).

39    Further, the area under the Receiver Operating Characteristic curve was 0.73 (95% CI

40    0.57 to 0.88), which indicates that scores on the 11-item scale 3 months postpartum

41    may be useful to predict which mothers will be less exclusive in breastfeeding 5 months

42    postpartum. In conclusion, scores on this 11-item scale were reasonably reliable and

43    valid for measuring breastfeeding support provided by lay and professional persons to

44    mothers in Japan. Further research is required to evaluate this scale's applicability in

45    other settings.

46

## Introduction

48    International and national organizations recommend exclusive breastfeeding for

49    the first six months of life (World Health Organization 2003). Nonetheless, many

50    mothers who intend to breastfeed for six months or longer in fact stop earlier (UNICEF

51    2019). Early cessation can have various causes. Among them are perceived

52    insufficiency of breast milk (Balogun et al. 2015; Dennis 2002), difficulty integrating

53    breastfeeding with work outside the home and with other aspects of life (Balogun et al.

54    2015; Sayres & Visentin 2018), and social circumstances that are not conducive to

55    breastfeeding (Brown 2017; Robinson et al. 2019). In 2019, only 42% of infants

56    under 6 months were exclusively breastfed globally (UNICEF 2019).

57    Lay persons and medical professionals can help mothers overcome those

58    challenges (Hannula et al. 2008; McFadden et al. 2017). In Brazil, regular home visits

59    by trained community health workers increased the rate of exclusive breastfeeding 4

60  months postpartum (Leite et al. 2005) and 6 months postpartum (Coutinho et al. 2005).

61  A study in Canada showed that telephone-based support from trained peers was

62  effective in maintaining breastfeeding to 3 months postpartum and in improving

63  satisfaction with the infant-feeding experience (Dennis et al. 2002). An intervention

64  study in a hospital serving a large population of low-income Latinas found that support

65  from trained peers decreased the rate of early cessation of breastfeeding within 3

66  months postpartum. A recent systematic review concluded that providing women with

67  additional organized support helps them breastfeed their babies longer (McFadden et

68  al. 2017). Also, studies in Sweden and elsewhere showed that women often value

69  emotional support for breastfeeding and practical help for child care from a partner,

70  family members, or others they rely on (Brown et al. 2011; Cato et al. 2020; Juengst et

71  al. 2019; Schmied et al. 2011). Therefore, the availability of support is a key to the

72  continuation of breastfeeding, and tools for measuring it can be useful in identifying

73  needs and in evaluating the effectiveness of interventions.

74      Several scales for measuring breastfeeding support are available. The Hughes

75  Breastfeeding Support Scale (HBSS) was developed more than 35 years ago in the

76  United States (Hughes 1984). However, since then it has not been widely used and

77  there are very few results of validation testing. In 1992 Matich and Sims described a

78  scale for measuring breastfeeding support during pregnancy and 3-to-4 weeks

79  postpartum (Matich & Sims 1992) in the United States, although its applicability up to 6

80  months postpartum remained unclear. Scales have been developed more recently for

81  measuring breastfeeding support among adolescents (Grassley et al. 2013), and

82  working mothers (Bai et al. 2008; Greene & Olson 2008) in the United States, and for

83  mothers in Uganda (Boateng et al. 2018).

84      The support needed to continue breastfeeding may differ according to social

85  context (McFadden et al. 2017). We considered that the existing scales may not be

86  appropriate for measuring breastfeeding support among the majority of mothers in

87  Japan. In Japan, only 0.9% of newborns are born to adolescent mothers (Ministry of

88  Health, Labour and Welfare. 2019a), and the majority of women who have a baby below

89  6 months of age are not in the workforce (54% had already resigned from their job and

90  94% of mothers working at a permanent position were on paid child-care leave,

91    according to a recent national survey) (Ministry of Health, Labour and Welfare. 2019b).

92    While a majority of women stay at home to take care of her newborns, only 2% of

93    fathers working in a permanent position take child-care leave (Ministry of Health, Labour

94    and Welfare. 2019a; Ministry of Health, Labour and Welfare. 2019b), which suggests

95    that there is a need to assess breastfeeding support in the context of imbalanced

96    childcare commitment between the parents. More than 93% of pregnant women in

97    Japan intend to breastfeed and a vast majority initiate breastfeeding, but only 55% were

98    found to be predominantly breastfeeding three months postpartum (Equal Employment,

99    Children and Families Bureau, Ministry of Health, Labour and Welfare. 2016.). That gap

100    between original intention and later practice might be due to a lack of support (Inoue et

101    al. 2012; Sriraman & Kellams 2016).  Appropriate infant feeding support early in the

102    postpartum period is recognized as important by Unicef and the WHO, and compliance

103    with recommendations can be evaluated (Unicef & World Health Organization 2018).

104    However, support to continue breastfeeding, including support from healthcare

105    professionals and from others, has not been quantified in a way that is relevant to

106    Japan. Consequently, in Japan the needs for support among lactating mothers and the

107    effectiveness of breastfeeding support remained unclear. Therefore, we developed a

108    scale to measure breastfeeding support 3 and 5 months postpartum among mothers

109    living in Japan and tested its reliability and predictive validity. In this study, we

110    considered breastfeeding support as comprising emotional support, practical help, and

111    information offered to women who desire to breastfeed by professionals, family

112    members, and others.

113

114    **Materials & Methods**

115    **Item development**

116        Based on the literature on social support and breastfeeding support, the authors

117    conceptualized a framework for the scale. That framework consists of support sources

118    and support type (Table S1). Previous studies in Japan suggested that socio-

119    environmental factors influence breastfeeding. Those factors include appropriate

120    professional support, support from the husband, and the option for mothers to take paid

121    maternity leave for more than six months (Inoue et al. 2012; Kaneko et al. 2006). To

122  reflect the fact that breastfeeding is often influenced by socio-environmental factors, we

123  adopted the ecological model (Institute of Medicine. 2000) when considering the source

124  of breastfeeding support. Specifically, we considered that breastfeeding support is

125  provided by social networks that include family, close friends, peers, health

126  professionals, as well as by mass media and others. In Japan, the marketing of formula

127  milk for babies is not regulated by law, and companies "support" breastfeeding through

128  websites, social networking services, childcare magazines, and face-to-face counseling.

129  Considering the possibility that mothers recognize them as a source of information to

130  support their breastfeeding, we included companies that produce and sell formula and

131  related goods as a possible source of support. Regarding the types of support, the

132  theoretical concept of social support described by House was also considered (House

133  1981). Social support is defined as the help provided through social relationships and

134  interactions. House distinguished among four main types of social support: emotional

135  (expressions of empathy, love, trust, and caring), instrumental (tangible aid and

136  services), informational (advice, suggestions, and information), and appraisal

137  (information that is useful for self-evaluation) (House 1981).

138        Candidate question-items were developed with reference to the literature on

139  social support, breastfeeding support, and factors associated with breastfeeding, and

140  also on the basis of two of the authors' (KN and HH) clinical experience in supporting

141  lactating women. To develop items that reflect support from each support source and

142  type, the first author purposively referred to the literature on factors associated with

143  breastfeeding among women who are healthy, live in high-income countries, and have a

144  single healthy full-term baby (Dennis 2002; Kaneko et al. 2006; Labbok & Taylor 2008),

145  and also reviewed other literature on breastfeeding support (Brown et al. 2011; Burns et

146  al. 2010; Hannula et al. 2008; Hughes 1984;   Ito et al. 2013; Matich & Sims 1992;

147  Schmied et al. 2011). Table S2 summarizes the findings of each study reviewed and the

148  items created based on those findings. Reports by Japan's government on the feeding

149  of infants and young children were also reviewed (Equal Employment Children and

150  Families Bureau, Ministry of Health, Labour and Welfare 2006; Ministry of Health,

151  Labour and Welfare 2011). Those reports mentioned that three-to-five months

152  postpartum was a common time for mothers to be concerned about infant feeding, but

153  they had no specific information regarding needs for breastfeeding support. Studies on

154  breastfeeding support for working mothers were not included in the literature review

155  because we studied new mothers in the general population, most of whom either were

156  not employed or were on maternity leave.

157         In addition to the question-items derived from the literature review, the first and

158  the third authors added candidate items on the basis of their experience in clinical

159  pediatrics (KN) and as International Board-Certified Lactation Consultants (KN and HH).

160  Item 6 "I have received free samples or discount coupons for formula milk" and item 20

161  "In medical facilities I see posters or logos about formula milk" were developed from the

162  idea that free samples and logos at health facilities and elsewhere might make mothers

163  feel that formula is a normative standard supported by health professionals and others

164  while exclusive breastfeeding is considered an extreme choice. Item 18 "I have heard

165  that I must not take any medicine while breastfeeding" and item 22 "I have heard that

166  there are certain things I should not eat while breastfeeding" were created because the

167  authors notice that lactating mothers are often advised to avoid all medications and to

168  avoid specific foods, and that this misinformation is provided both by health

169  professionals and by others. Item 28 "When I leave my baby with other people, I think it

170  will be problematic for them if my baby does not accept a bottle of formula milk" was

171  developed because the authors noticed that mothers often use bottles in the belief that

172  it reduces the burden on other caregivers, a belief that might reflect inappropriate or

173  insufficient breastfeeding support.

174         The items were developed in Japanese. A total of 31 items were generated to

175  provide adequate redundancy within each of the four types of support listed above.

176  Some items were positively worded and others were negatively worded. Response

177  choices used a 5-point Likert-type scale from 1 (not agree) through 5 (agree). Those 31

178  items can be found in Table S3, with English translations.

179

180  **Content validation testing**

181         As recommended by Fitzner to improve item validity, the items were reviewed

182  by a panel of experts to assess whether they adequately covered each of the concepts

183  to be measured (Fitzner 2007). The panel comprised five specialists, all of whom were

184    university professors in nursing or midwifery who had clinical experience supporting

185    breastfeeding mothers. Content validity was tested quantitatively by using the Content

186    Validity Index (CVI). CVIs can be computed for each item in a scale (item-level CVI) as

187    well as for the scale as a whole (scale CVI) (Polit et al. 2007). To calculate item-level

188    CVIs, each member of the panel of experts rated each item independently on a 4-point

189    Likert-type scale, with higher ratings indicating greater relevance. For each item, the

190    item-level CVI was computed as the number of experts who gave a rating of either 3 or

191    4, divided by 5 (the total number of experts). The scale-level CVI was assessed by two

192    methods: the proportion of items that was rated either 3 or 4 by all five experts

193    (universal agreement method), and the average of all item-level CVIs (averaging

194    method).

195         Item-level CVIs for each item are shown in Table S4. The scale-level CVI for the

196    31 items was 0.94 by the universal agreement method, and 0.99 by the averaging

197    method, both of which are above the recommended minimum of 0.90 (Polit et al. 2007).

198    Two items for which the CVI was 0.80 were modified after discussion with the expert

199    panel, and were kept for further analysis.

200         In addition to being asked to rate the items for the CVIs, the experts were also

201    asked to give comments and suggestions regarding clarity and readability of each item.

202    Those comments and suggestions led to minor editorial revisions.

203

204    **Pilot testing**

205         The items were then pilot-tested about a month prior to the main survey with a

206    convenient sample of 27 healthy mothers who visited a public health center in Tokyo's

207    Adachi Ward for their infant's 3-month health check-up. After the participants completed

208    the instrument, which took each mother about 5 minutes, the first author interviewed

209    them individually to evaluate understandability, face validity, and the instrument's

210    format. Based on feedback from the first 14 mothers, the wordings of eight items were

211    slightly modified. Then 13 other mothers completed the revised scale, and they found all

212    the items to be clear. None of the mothers noted any problem with the format.

213

214 **Design and Participants**

215       This was a longitudinal study with a survey three months after birth and a follow-

216 up survey two months later. After the pilot study, we recruited participants for the main

217 study. Mothers who visited any one of four health centers in Adachi Ward from October

218 to December, 2014 for their infant's 3-month health check-up were invited to participate

219 in the study, if they were at least 18 years old, had a singleton infant, and were fluent in

220 Japanese. Adachi Ward is one of the 23 wards of central Tokyo, and is primarily a

221 residential area. The healthy life expectancy of women in Adachi Ward was the shortest

222 among the 23 wards in Tokyo in 2016 (Toukyouto hukushi hoken kyoku. 2019) and it

223 has no Baby-Friendly certified hospital. Adachi Ward had five health centers but one

224 was not included in this study because it did not have enough space for conducting the

225 survey. Among 414 mothers who were approached, 376 (91%) consented to participate

226 in the study. Mothers were excluded if they or their infants had a medical condition that

227 could significantly interfere with breastfeeding. Those conditions included preterm birth

228 (n = 18), low birth weight (n = 22), macrosomia (n = 3), congenital abnormality of the

229 infant (n = 9), and a history of admission to an NICU (n = 3). In addition, 20 mothers

230 were excluded because they reported that during pregnancy they had intended formula

231 feeding, and 7 mothers were excluded because they visited the health center earlier or

232 later than expected (their infants were younger than 3 months or older than 5 months).

233 Some mothers met more than one exclusion criterion. After the exclusion criteria

234 described above were applied, 243 mothers participated to the study.

235       All the data were collected by using self-administered questionnaires. The first

236 survey was conducted when the participants were waiting for their appointment at a

237 health center for their infants' 3-month health checkup. The follow-up survey was

238 conducted by postal mail. Among the 243 mothers who completed the first survey, 177

239 (73%) returned the follow-up survey.

240

241 **Psychometric testing**

242       Psychometric testing included factor analysis (described in more detail below)

243 and computation of internal-consistency reliability (coefficient alpha). For validation

244 tests, we hypothesized that higher scores on the breastfeeding social support scale,

245    indicating more support, would be associated with better family functioning and with

246    better infant-feeding status at 3 and 5 months. Family functioning and infant-feeding

247    status were measured as described below.

248

249    **Family Apgar**

250         As a construct-validation test, we measured family functioning and computed its

251    correlation with scores on the new breastfeeding social support scale. The Japanese

252    version of the Family Apgar scale was used to measure family functioning. It comprises

253    five question-items regarding family adaptation, partnership, growth, affection, and

254    resolve. Responses were on a 3-point (0, 1, and 2) Likert-type scale, yielding minimum

255    and maximum total scores of 0 and 10. Higher total scores indicate better family

256    functioning. Internal-consistency reliability (coefficient alpha) for the Family Apgar scale

257    was 0.77 in this study.

258

259    **Infant-feeding status**

260         Information on infant-feeding status 3 months and 5 months after birth came from

261    the mothers' reports. Mothers were asked which of the following six options best

262    described their infant-feeding method over the previous 24 hours: (1) full breastfeeding

263    (exclusive and almost exclusive breastfeeding), (2) high partial breastfeeding

264    (breastfeeding for more than 80% of all feedings), (3) medium partial breastfeeding

265    (breastfeeding for 20%–80% of all feedings), (4) low partial breastfeeding

266    (breastfeeding for less than 20% of all feedings), (5) token breastfeeding (occasional

267    breastfeeding, not for nutritive purposes), and (6) formula feeding (formula feeding only)

268    (Labbok & Krasovec 1990; Labbok & Coffin 1997).

269

270    **Analysis**

271         Factor analysis was done to determine the factor structure and to identify items

272    that contribute to the factors. After the structure and the items to be included in the

273    scale were identified, the reliability and the validity of the scale were tested. To assess

274    reliability, coefficient alpha was computed for the scores on the scale as a whole and for

275    the scores on each subscale. Regarding validity, three hypotheses were tested. First,

276  the total score on the scale was hypothesized to correlate (Pearson's correlation
277  coefficient) with the score on the Family Apgar scale. Second, the total score on the
278  scale 3 months postpartum was hypothesized to be associated with the infant feeding
279  status at that time, and also with the infant feeding status 5 months postpartum. The
280  Kruskal-Wallis test was used to test that hypothesis. That test was used because it is a
281  non-parametric one-way analysis of variance (ANOVA). It uses the ranks of the data
282  rather than their absolute values. This has the potential advantage of not assuming that
283  residuals are normally distributed, so it may be applicable even when the data do not
284  meet that condition. Because it tests for equal medians among all groups, the results of
285  the Kruskal-Wallis test are interpreted in a way that is analogous to the way in which the
286  results of the more commonly used parametric ANOVA are interpreted. The difference
287  is that with the Kruskal-Wallis test the interpretation refers to medians whereas with
288  parametric ANOVA the interpretation refers to means. For example, a p value less than
289  0.05 would indicate that the median of the population of one or more of the groups is not the
290  same as the median of the population of one or more of the other groups. The effect size (eta-
291  squared) was computed as chi-squared/(n-1). Finally, the area under the Receiver
292  Operating Characteristic curve was calculated to assess the degree to which the total
293  score and each subscale score 3 months postpartum could be used to predict which
294  mothers would be in a low category of infant-feeding status 5 months postpartum.
295

296  **Ethical Considerations**
297       Ethical approval was obtained from the Research Ethics Committee of the
298  Graduate School of Medicine at the University of Tokyo (Ethical Application Ref:10620),
299  and written informed consent was received from all participants.
300

301

302  **Results**
303  **Characteristics of participants and infant-feeding status**
304       Characteristics of participants are shown in Table 1. Their mean age was 31.7
305  (SD 5.0) years. Among the 243 participants, 197 (81.1%) had a vaginal delivery, 144
306  (59.3%) were primiparas, 157 (65.6 %) indicated that during pregnancy they had

307   intended to breastfeed exclusively, and 84 (34.6%) had previous experience of any

308   breastfeeding for more than five months. Fourteen mothers (5.9%) were working at 3

309   months postpartum and an additional 12 (4.9%) had a plan to return to work outside the

310   home before 6 months postpartum. Compared with those who returned the follow-up

311   survey, those who did not return it were younger, less educated, and more likely to be

312   single mothers. However, there was no significant difference between the two groups in

313   mode of delivery, intention to breastfeed, previous experience breastfeeding, parity,

314   country in which the participant was raised, working status, or financial status.

315          Table 2 shows infant feeding status at the time of the survey. Three months

316   postpartum, 137 (56.4%) reported exclusive breastfeeding within the 24 hours before

317   the survey. Five months postpartum, that number was 109 (61.6% of those who

318   responded). Not many were token feeding (4 (1.7%) at 3 months postpartum and 2

319   (1.1%) at 5 months postpartum) or completely formula feeding (22 (9.1%) at 3 months

320   postpartum and 14 (7.9%) at 5 months postpartum). Among the 159 women who

321   reported their feeding method both 3 months and 5 months postpartum, during the

322   interval between those two reports 7 women increased the exclusivity of breastfeeding,

323   while 22 either reduced the exclusivity of breastfeeding (n = 18) or stopped

324   breastfeeding (n = 4).

325

326   **Initial psychometric testing, and modifications based on those results**

327          The mean and SD of each of the 31 items' scores is shown in Table 3. The

328   scores on items 16 and 27 had particularly low SDs.

329          The scree plot resulting from factor analysis of the 31 items (Figure 1) clearly had

330   two sections, which were separated by an "elbow" at factor number 4. Looking at the

331   curve in Figure 1 from left to right, the eigenvalues decrease very "steeply" between

332   factor number 1 and factor number 3, but much more gradually starting at factor number

333   4. This indicated that the number of factors to be retained was three (Figure 1). That is,

334   much of the variability in the responses to the 31 questions could be explained by

335   variability in only three underlying factors. This was not unexpected, given that the 31

336   questions were intended to ask about a smaller number of separate sources and types

337   of breastfeeding support. Figure 1 was interpreted as meaning that the 31 questions

338    were measuring three underlying variables. Next, with the number of factors restricted

339    to three, after varimax rotation the items with factor loadings less than 0.4 were deleted:

340    Those were items 6, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 22, 23, 24, 25, 27, 28, and

341    30. With the remaining 13 items, the same factor analysis procedure was done again

342    and items 21 and 29 were omitted. By that process, the only items retained were those

343    that were best for measuring the three underlying factors.

344          The resulting scale had 11 items, and factor analysis with those 11 items

345    confirmed that each of them had a loading greater than 0.4 on one, and only one, of the

346    three factors (Table 4). Items 7, 8, 9, and 31 loaded strongly on the first factor. Because

347    of the content that those four items had in common, they were considered to comprise a

348    subscale measuring support from breastfeeding peers and from people in specifically

349    named healthcare professions. Items 2, 5, and 26 loaded strongly on the second factor.

350    Because of the content that those three items had in common, they were considered to

351    comprise a subscale measuring practical help. Similarly, items 1, 3, 4, and 17 loaded

352    strongly on the third factor, and they were considered to comprise a subscale

353    measuring support from people the mother can rely on to help meet emotional needs

354    and address breastfeeding concerns.

355

356    **Reliability testing**

357          Three months postpartum, coefficient alpha of the scores on the 11-item scale

358    was 0.83, and 5 months postpartum it was 0.85. Three months postpartum, the alphas

359    for the scores on the subscales were 0.78 (breastfeeding peers and named

360    professions), 0.80 (practical help), and 0.81 (support to meet emotional needs). Five

361    months postpartum, the alphas for the scores on the subscales were 0.79

362    (breastfeeding peers and named professions), 0.86 (practical help), and 0.81 (support

363    to meet emotional needs).

364

365    **Validation testing**

366          We hypothesized that mothers in well-functioning families would have higher

367    scores on the 11-item breastfeeding support scale. That hypothesis was supported by

368 the positive correlation between the 11-item scale score and the Family Apgar score 3
369 months postpartum (r = .47, p < 0.001).
370    Table 5 shows the mean scale scores (11 items) of women in each category of
371 infant-feeding status 3 and 5 months postpartum. Among the mothers who completed
372 the scale 3 months postpartum, very few were token feeding (n = 2) or completely
373 formula feeding (n = 3) 5 months postpartum, so those two categories were combined
374 with the low-partial breastfeeding category (n = 6) to make a group of 11 mothers.
375 Higher scores on the 11-item scale 3 months postpartum were associated with more
376 breastfeeding exclusivity both at that time and also 2 months later (i.e. both 3 months
377 and also 5 months postpartum). Specifically, the results of the Kruskal-Wallis test 3
378 months postpartum were chi-squared = 14.871 (df = 3, n = 211), p = 0.002, eta-squared
379 = 0.071, and the results of the same test 5 months postpartum were chi-squared =
380 8.556 (df = 3, n = 159), p = 0.036, eta-squared = 0.054.
381    The area under the Receiver Operating Characteristic curve (AUC) was 0.73
382 (95% CI 0.57 to 0.88), which indicates that scores on the 11-item scale 3 months
383 postpartum may be useful to predict which mothers will be in a low category of infant-
384 feeding status (i.e., low-partial breastfeeding, token breastfeeding, or formula feeding) 5
385 months postpartum. Regarding the subscales, the AUC was 0.78 (95% CI 0.63 to 0.94)
386 for the subscale measuring support from breastfeeding peers and from people in
387 specifically named healthcare professions, 0.44 (95% CI 0.27 to 0.94) for the subscale
388 measuring practical help, and 0.74 (95% CI 0.60 to 0.88) for the subscale measuring
389 support from people the mother can rely on to help meet emotional needs and address
390 breastfeeding concerns.
391

392 **Discussion**
393 The purpose of the study was to develop an instrument for measuring support that
394 might help mothers continue breastfeeding. After the initial psychometric testing and
395 modifications based on the results of those tests, the final version of the Breastfeeding
396 Support Scale had 11 items with a three-factor structure: support from breastfeeding
397 peers and from people in specifically named healthcare professions, practical help, and
398 support from people the mother can rely on to help meet emotional needs and address

399  breastfeeding concerns. The scores were reasonably reliable and valid for measuring

400  breastfeeding support.

401      The structure of the scale is consistent with previous studies about breastfeeding

402  support in developed countries (Emmott & Mace 2015; Emmott et al. 2020; Fox et al.

403  2015; Negron et al. 2013; Schmied et al. 2011). Those studies indicated that the

404  effectiveness of breastfeeding support is a complex function of the provider of support

405  and the type of support. Emmott et al., found that mothers who received support from a

406  wide network of people including family, friends, health professionals, and trained peer

407  supporters breastfed longer than those who did not receive much support or who

408  received only family-based support (Emmott et al. 2020). Also, previous studies

409  suggested that breastfeeding support includes informational support (Emmott & Mace

410  2015), emotional support (Fox et al. 2015; Negron et al. 2013; Schmied et al. 2011),

411  and practical support (Emmott & Mace 2015; Negron et al. 2013). The Breastfeeding

412  Support Scale has three factors, with each factor reflecting both a source and a type of

413  support. The first factor covers informational support and appraisal from breastfeeding

414  peers and from people in specifically named healthcare professions. The second factor

415  covers practical support that gives mothers enough time for breastfeeding, childcare,

416  and rest. The third factor reflects having somebody who responds to mothers' emotional

417  needs to continue breastfeeding.

418      When we developed the candidate items for the scale, we tried to cover a wide

419  range of potential sources of support: media, infant formula companies, and the social-

420  cultural environment. Some of those candidate items mentioned informational support

421  from media (i.e., "Information from books, magazines, and the Internet is useful for

422  breastfeeding."), from infant formula companies (i.e., "I see formula milk with product

423  information saying that breastmilk and artificial milk do not differ much in their health

424  benefits for babies.", which is reverse scored), and from a breastfeeding-friendly

425  environment (i.e., "I can breastfeed comfortably when I'm out and about."). None of the

426  candidate items that asked about support from media, infant formula companies, and

427  the social-cultural environment remained after the factor analysis. This indicates that,

428  among these mothers, positive and negative influences from media, infant formula

429    companies, and the social-cultural environment are not strongly associated with support

430    from family, friends, health professionals, and trained peer supporters.

431         Psychometric testing of the Breastfeeding Support Scale among mothers in

432    Japan indicated that it had reasonable reliability and validity to measure breastfeeding

433    support both 3 and 5 months postpartum. At both times, the values of alpha for the

434    overall scale and for each of the three subscales were all substantially higher than 0.7,

435    which is often used as a minimum for group-level comparisons. The results of all three

436    validation tests were as hypothesized. First, the total score on the Breastfeeding

437    Support Scale was correlated with the score on the Family Apgar scale, which

438    measured family functioning. Second, the total score on the Breastfeeding Support

439    Scale was associated with infant feeding status 3 months and 5 months postpartum.

440    Finally, the area under the Receiver Operating Characteristic curve indicated that the

441    total score of the Breastfeeding Support Scale could be used to predict which mothers

442    would be in a low category of infant-feeding status 5 months postpartum.

443         Consistent with previous studies (Emmott et al. 2020), the results of the present

444    study suggest that different types of support from different sources might have different

445    effects on breastfeeding. The AUCs of each subscale suggested that peer and

446    professional support, and having somebody who responded to emotional needs, are the

447    keys to higher breastfeeding exclusivity. In contrast, practical help, including having

448    someone who helps with housework and childrearing, did not clearly predict

449    breastfeeding 2 months later. That might suggest such practical help does not

450    necessarily increase breastfeeding exclusivity as previously indicated in studies in

451    Japan (Ito et al. 2013) and the UK (Emmott & Mace 2015). A possible explanation might

452    be fathers' insufficient knowledge and skills regarding breastfeeding support. Another

453    reason might be the significant gender gap in Japan in unpaid housework. When fathers

454    become more involved in housework and childrearing, practical help, which is usually

455    offered by a partner, may impact breastfeeding outcomes. However, the wide range of

456    the confidence interval of the AUC for the practical help subscale suggests that more

457    information may be required before that finding can be interpreted clearly.

458         There are several limitations to this study. The study was conducted in four

459    public health centers in Tokyo Japan, so generalizations to populations in other areas

460    should proceed only with caution. Mothers younger than 18 years old were not included

461    and the majority of the participants were on paid leave or were not working outside their

462    home, so further testing may be needed before the scale is used with adolescents or

463    with working mothers. In addition, after the data were collected Japan's Ministry of

464    Health, Labor and Welfare released a revised version of its guidelines for health

465    professionals on the feeding of infants and young children (Jyunyuu rinyuu no shien

466    gaido kaitei ni kannsuru kennkyuukai. 2019). In that revised version, the term

467    "breastfeeding promotion" was omitted and the 54-page document has only two

468    sentences regarding the benefits of breastfeeding. Those guidelines might discourage

469    professional breastfeeding support in Japan. Further testing may be necessary to

470    understand how the present scale performs after that policy change. The literature

471    review to develop the items was also done more than six years ago, however, according

472    to our knowledge there has been no literature published in Japan that would suggest a

473    need to revise the scale. Finally, as all the data were collected by self-report, there

474    might be social desirability bias, such as breastfeeding reported as more exclusive or

475    support from family rated better. The English translation of the scale provided here is to

476    be used for informational purposes only, so further psychometric testing is required to

477    assess reliability and validity outside Japan.

478

479

480    **Conclusions**

481    Initial evidence favors the use of the Breastfeeding Support Scale among mothers in

482    Japan to measure breastfeeding support provided by persons a wide range of people

483    including peers, family, and professionals. Further research is required to evaluate the

484    scale's applicability in other settings.

485

486    **Acknowledgements**

487    The authors are grateful to the staff members of the Adachi public health center for their

488    help in conducting the study. We also thank the following researchers for their critical

489    review of the contents of the scale: Dr. Shigemi Iriyama, Dr. Junko Miyazawa, Dr.

490    Masako Matsunaga, Dr. Megumi Haruna, and Dr. Noriko Toyama.

491

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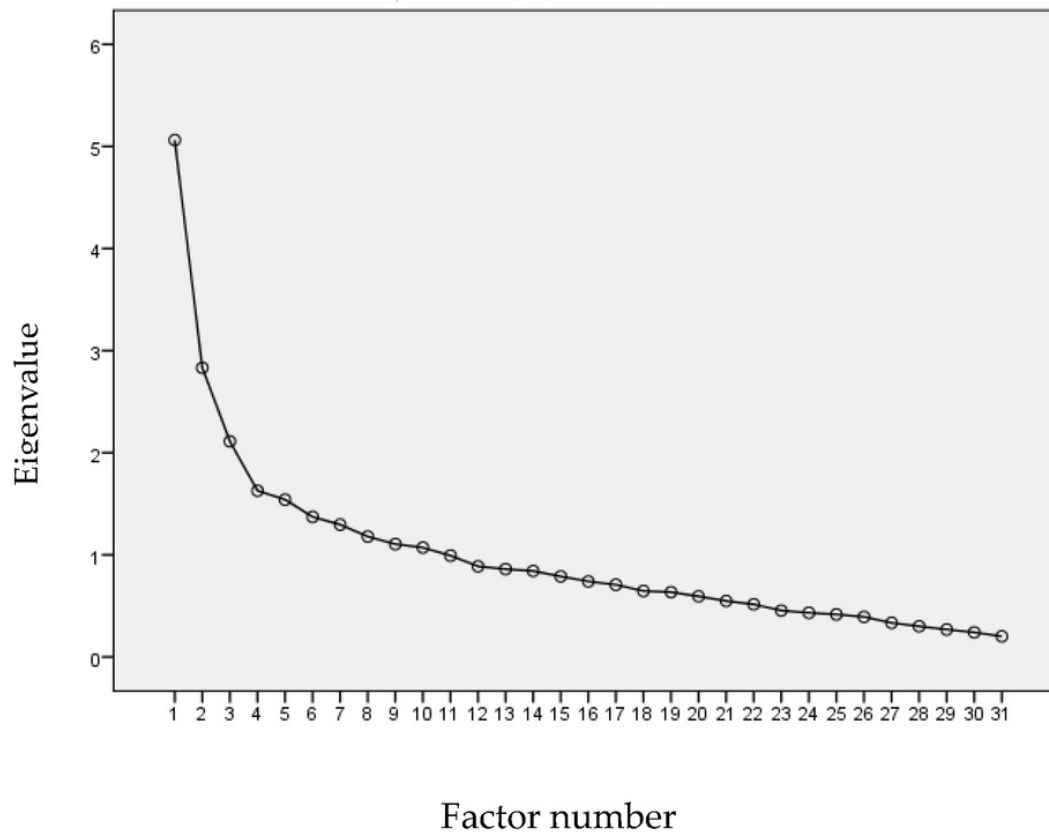
619        Switzerland.

# Figure 1

Scree plot from factor analysis with the original 31 items

The scree plot from factor analysis with the original 31 items is shown. Because the "elbow" in the curve was at factor number 4, three factors were retained.

Factor number

Characteristics of participants

The numbers of mothers and the percentages of those who responded are shown. The data are stratified by participaton status: mothers who completed the first survey 3 months postpartum, mothers who returned the follow-up survey 5 months postpartum, and those who were lost to follow-up. The characteristics of those who returned the follow-up questionnaire were compared with the characteristics of those who did not, and the p-values are shown.

1    Table 1. Characteristics of Participants

|  | Completed the survey 3 months postpartum (n = 243) | Completed the survey 5 months postpartum (n = 177) | Dropped out from the follow-up (n = 66) | P value [a] |
|---|---|---|---|---|
| Age in years (mean, SD) | 31.7 (5.0) | 32.2 (4.4) | 30.2 (6.2) | 0.016 |
| Country in which participant was raised |  |  |  |  |
| Japan | 233 (95.9%) | 172 (97.2%) | 61 (92.4%) | 0.140 |
| Others | 10 (4.1%) | 5 (2.8%) | 5 (7.6%) |  |
| Highest level of schooling |  |  |  |  |
| Junior high | 11 (4.5%) | 4 (2.3%) | 7 (10.8%) | 0.002 |
| High school | 53 (21.8%) | 34 (19.2%) | 19 (29.2%) |  |
| College[b] or equivalent | 88 (36.2%) | 64 (36.2%) | 24 (36.9%) |  |
| University[c] or higher | 90 (37.0%) | 75 (42.4%) | 15 (23.1%) |  |
| Financial status |  |  |  |  |
| No financial worries | 38 (15.6%) | 25 (14.1%) | 13 (19.7%) | 0.138 |
| Not very worried | 84 (34.6%) | 68 (38.4%) | 16 (24.2%) |  |
| Somewhat worried | 89 (36.6%) | 64 (36.2%) | 25 (37.9%) |  |
| Worried | 32 (13.2%) | 20 (11.3%) | 12 (18.2%) |  |
| Marital Status |  |  |  |  |
| Married or having a steady partner | 234 (96.3%) | 173 (97.7%) | 61 (92.4%) | 0.037 |
| Delivery mode |  |  |  |  |
| Vaginal delivery | 197 (81.1%) | 143 (81.7%) | 54 (83.1%) | 0.807 |
| Caesarian section | 43 (17.7%) | 32 (18.3%) | 11 (16.9%) |  |
| Intention to breastfeed[d] |  |  |  |  |
| Exclusive breastfeeding | 157 (65.6%) | 112 (63.3 %) | 45 (68.2%) | 0.477 |
| Partial breastfeeding | 86 (35.4%) | 65 (36.7%) | 21 (31.8%) |  |
| Primipara | 144 (59.3%) | 105 (59.3%) | 39 (59.1%) | 0.424 |
| Previous experience of | 84 (34.9%) | 60 (34.3%) | 24 (36.4%) | 0.763 |

| breastfeeding a baby for more than 5 months | | | | |
|---|---|---|---|---|
| Working status | | | | |
| Working at 3 months postpartum | 14 (5.9%) | 6 (3.4%) | 8 (12.7%) | 0.094 |
| Planning to return to work before 6 months postpartum | 12 (4.9%) | 9 (5.1%) | 3 (4.8%) | |
| Planning to return to work after 6 months postpartum | 108 (45.2%) | 83 (47.2%) | 25 (39.7%) | |
| No plan to work | 105 (43.2%) | 78 (44.3%) | 27 (42.9%) | |

3    a Comparison between those who returned and did not return the follow-up questionnaire.

4    b Typically a two-year course after high school.

5    c Typically a four-year course after high school.

6    d Those who intended formula feeding were excluded from the analysis.

Infant feeding status 3 months and 5 months postpartum

The numbers of mothers and the percentages of those who responded are shown, by infant feeding status 3 months postpartum and 5 months postpartum. Infant feeding status is shown in six categories.

2  Table 2. Infant feeding status 3 months and 5 months postpartum

| Infant feeding status at the time of the survey | 3 months (n = 242) | 5 months (n =177) |
|---|---|---|
| Breast milk only (exclusive and almost exclusive) | 137 (56.6%) | 109 (61.6%) |
| High partial breastfeeding (breastfeeding for more than 80% of all feedings) | 49 (20.2%) | 23 (13.0%) |
| Middle partial breastfeeding (breastfeeding for 20%–80% of all feedings) | 24 (9.9%) | 23 (13.0%) |
| Low partial breastfeeding (breastfeeding for less than 20% of all feedings) | 6 (2.5%) | 6 (3.4%) |
| Token feeding (occasional breastfeeding, not for nutritive purposes) | 4 (1.7%) | 2 (1.1%) |
| Formula feeding (only formula feeding only) | 22 (9.1%) | 14 (7.9%) |

Distribution of scores on each item

The mean score and the standard deviation of scores is shown for each item.

1    Table 3. Distribution of scores on each item

| Item Number | Item[a] | Mean[b] | Standard Deviation |
|---|---|---|---|
| 1 | There is someone with whom I can easily and openly discuss breastfeeding. | 4.30 | 1.12 |
| 2 | There is someone who helps with other child care and with housework such that it's easy for me to make time to breastfeed my baby. | 3.31 | 1.46 |
| 3 | There is someone close to you who gives you emotional support in breastfeeding. | 3.89 | 1.24 |
| 4 | There is someone who tells me about positive experiences of breastfeeding | 3.47 | 1.45 |
| 5 | There is someone who helps you with other child care and with housework such that it's easy for you to take care of your baby. | 3.68 | 1.39 |
| 6[c] | I have received free samples or discount coupons for formula milk. | 2.48 | 1.65 |
| 7 | If necessary, there is someone other than family or friends (e.g. health care provider, breastfeeding support group member) whom I can consult on breastfeeding. | 3.69 | 1.48 |
| 8 | Most health care providers (doctors, public health nurses, midwives, etc.) support you in breastfeeding. | 3.94 | 1.08 |
| 9 | Health care providers including doctors, public health nurses, or midwives tell me about the benefits of breastfeeding. | 3.99 | 1.12 |
| 10 | I can breastfeed comfortably when I'm out and about. | 3.47 | 1.33 |
| 11[c] | I see formula milk with product information saying that breastmilk and artificial milk do not differ much in their health benefits for babies. | 2.22 | 1.25 |
| 12[c] | I have received advice regarding infant feeding from people employed by the dairy industry ("advisors", nutritionists, etc.). | 3.44 | 1.47 |
| 13 | Information from books, magazines, and the Internet is useful for breastfeeding. | 3.86 | 1.09 |
| 14[c] | Sometimes I provide something other than breastmilk to my baby because housework or parenting of an elder child gets in the way. | 3.80 | 1.53 |
| 15[c] | Information from television, newspapers, etc. sometimes makes me anxious about breastfeeding. | 4.25 | 1.14 |
| 16[c] | There is someone close to me who encourages me to wean my baby from the breast soon. | 4.55 | 0.94 |
| 17 | There is someone I can talk with whenever I have issues with breastfeeding. | 3.95 | 1.25 |
| 18[c] | I have heard that I must not take any medicine while | 3.42 | 1.47 |

| | breastfeeding. | | |
|---|---|---|---|
| 19 c | There are discrepancies among what health care providers (doctors, public health nurses, midwives, etc.) say about breastfeeding. | 2.76 | 1.28 |
| 20 c | In medical facilities I see posters or logos about formula milk. | 2.78 | 1.51 |
| 21 c | Information on breastfeeding from mass media or the Internet confuses me. | 3.32 | 1.39 |
| 22 c | I have heard that there are certain things I should not eat while breastfeeding. | 2.07 | 1.21 |
| 23 c | There is someone close to me who encourages me to provide something other than breastmilk to my baby. | 3.75 | 1.44 |
| 24 c | I have trouble finding places to breastfeed when I'm out and about. | 2.30 | 1.24 |
| 25 c | According to product information regarding formula milk, giving formula milk has health benefits for babies. | 2.57 | 1.12 |
| 26 | There are people around you who help you get enough rest. | 3.67 | 1.22 |
| 27 | I can breastfeed my baby comfortably at home. | 4.71 | 0.62 |
| 28 c | When I leave my baby with other people, I think it will be problematic for them if my baby does not accept a bottle of formula milk. | 1.78 | 1.15 |
| 29 c | I feel pressured to breastfeed my baby. | 3.70 | 1.41 |
| 30 | There are services from the city or other local government that help me take care of my baby. | 3.60 | 1.10 |
| 31 | If necessary, I can consult with health care providers (doctors, public health nurses, midwives, etc.) on how to breastfeed. | 3.79 | 1.16 |

3  aEach item was developed and presented in Japanese. The text in the table was
4  translated into English by the authors. The English translation provided here is to be
5  used not for collecting data, but rather for informational purposes only. It has not been
6  tested in English for use among English-speaking mothers. For example, in the English
7  translation provided here, some items contain "I" while others contain "you". Neither the
8  developers nor the users found the mix of the corresponding Japanese expressions to
9  be unacceptable, but the wording might be standardized to use only "I" or only "you" if
10 the instrument were to be tested in English and used in English.

11 bEach item's score can range from 1 to 5.

12 c These items were negatively worded. Their scores were reversed, such that higher
13 scores indicate more support.

Factor loadings of 11 items after varimax rotation

The factor loadings of the 11 items after varimax rotation are shown.

2    Table 4. Factor loadings of 11 items after varimax rotation

| Item number | Item content[a] | Factor 1[b] | Factor 2[c] | Factor 3[d] |
|---|---|---|---|---|
| 7 | If necessary, there is someone other than family or friends (e.g. health care provider, breastfeeding support group member) whom I can consult on breastfeeding. | **.576** | .072 | .244 |
| 8 | Most health care providers (doctors, public health nurses, midwives, etc.) support you in breastfeeding. | **.842** | -.011 | .097 |
| 9 | Health care providers including doctors, public health nurses, or midwives tell me about the benefits of breastfeeding. | **.730** | .079 | .133 |
| 31 | If necessary, I can consult with health care providers (doctors, public health nurses, midwives, etc.) on how to breastfeed. | **.586** | .023 | .199 |
| | | | | |
| 2 | There is someone who helps with other child care and with housework such that it's easy for me to make time to breastfeed my baby. | -.003 | **.831** | .192 |
| 5 | There is someone who helps you with other child care and with housework such that it's easy for you to take care of your baby. | .029 | **.855** | .139 |
| 26 | There are people around you who help you get enough rest. | .093 | **.501** | .279 |
| | | | | |
| 1 | There is someone with whom I can easily and openly discuss breastfeeding. | .120 | .192 | **.776** |
| 3 | There is someone close to you who gives you emotional support in breastfeeding. | .193 | .378 | **.571** |
| 4 | There is someone who tells me about positive experiences of breastfeeding. | .353 | .261 | **.507** |
| 17 | There is someone I can talk with | .354 | .162 | **.698** |

| | whenever I have issues with breastfeeding. | | | |
|---|---|---|---|---|

5 ᵃ English translation of the questions asked.
6 ᵇ Considered to comprise a subscale measuring support from breastfeeding peers and
7 from people in specifically named professionals.
8 ᶜ Considered to comprise a subscale measuring practical help.
9 ᵈ Considered to comprise a subscale measuring support from people the mother can rely
10 on to help meet emotional needs and address breastfeeding concerns.

Scores on the 11-item scale, measured 3 months postpartum, by infant-feeding status 3 months and 5 months postpartum

Means of total scores measured 3 months postpartum are shown, by infant feeding status.

The scores 3 months postpartum are shown in the upper lines and the scores 5 months

postpartum are shown in the lower lines.

2  Table 5. Scores on the 11-item scale, measured 3 months postpartum, by infant-feeding

3  status 3 months and 5 months postpartum

| Infant-feeding status | n (%ᵃ) | Total score Mean (SD) |
|---|---|---|
| 3 months postpartum | | |
|     Full breastfeeding | 132 (62.6) | 42.6 (8.7) |
|     High-partial breastfeeding | 46 (21.8) | 41.9 (6.9) |
|     Medium-partial breastfeeding | 21 (10.0) | 37.8 (8.0) |
|     Low-partial breastfeeding, token breastfeeding, or formula feeding | 12 (5.7) | 33.3 (10.4) |
| 5 months postpartum | | |
|     Full breastfeeding | 104 (61.6) | 41.9 (8.9) |
|     High-partial breastfeeding | 22 (13.0) | 43.6 (7.1) |
|     Medium-partial breastfeeding | 22 (13.0) | 40.3 (6.3) |
|     Low-partial breastfeeding, token breastfeeding, or formula feeding | 11 (12.4) | 35.4 (8.4) |

6  ᵃ Among those who completed the scale 3 months postpartum and also reported

7  feeding status at the time of the survey.