Development and validation of a scale for measuring attitude towards breastfeeding

Desarrollo y validación de una escala para la medición de la actitud hacia la lactancia materna

Desenvolvimento e validação de uma escala para medir a atitude em relação ao aleitamento materno

Álvaro Jacome Orozco[1]*, Fabio Alexander Sierra Matamoros[2], Laura Camila Lozano Neira[2, 3]

Received: November 14th, 2020. Accepted: March 19th, 2021.
Published online: April 6th, 2021.
https://doi.org/10.35454/rncm.v4n3.234

Summary

Introduction: Better knowledge of breastfeeding women for the design of strategies that promote exclusive breastfeeding will improve current rates. The use of tools to measure things such as attitude towards breastfeeding contributes to this purpose. The objective of the study was to develop and validate a scale that measures attitude towards breastfeeding.

Method: 17 Likert-type items were defined. The scale was applied to 518 mothers with healthy term newborns in the immediate postpartum period, in two institutions in Bogotá. The results were assessed using the Classical Test Theory and Item Response Theory, with a partial credit model.

Results: The scale has adequate validity. A single construct was defined based on the exploratory factor and item content analysis: Attitude. The internal consistency and reliability indices were moderate. The infit and outfit adjustment statistics allowed us to keep all the items on the scale. The questions that contributed the most to the measurement were the ones that evaluated knowledge about the benefits of breastfeeding and the use of milk formula. The scale has items to measure low and medium levels of attitude, but is in need of others to discriminate high levels. The information function showed that the scale is adequate to measure medium and low levels of attitude.

Resumen

Introducción: un mejor conocimiento de las mujeres lactantes, para el diseño de estrategias que fomenten la lactancia materna exclusiva, permitirá mejorar las tasas actuales. El uso de instrumentos de medición en conceptos, como la actitud frente a la lactancia, permiten este propósito. El objetivo del estudio fue desarrollar y validar una escala que mida la actitud frente a la lactancia.

Métodos: se definieron 17 ítems tipo Likert. Se aplicó la escala a 518 madres con productos sanos, a término y en el posparto inmediato, en dos instituciones de Bogotá. Los resultados se evaluaron mediante la teoría clásica de prueba y teoría respuesta del ítem mediante un modelo de crédito parcial.

Resultado: se encontró una validez semántica adecuada. El análisis factorial exploratorio y del contenido de los ítems definió un solo constructo: la actitud. Los índices de consistencia interna y confiabilidad fueron moderados. Los estadísticos de ajuste *infit* y *outfit* permitieron conservar todos los ítems en la escala. Las preguntas que más aportaron a la medición evaluaron el conocimiento sobre los beneficios de la lactancia y el uso de leches de fórmula. La escala posee ítems para medir los niveles bajos y medios de actitud, pero requiere otros para discriminar niveles altos. La función de información mostró

Resumo

Introdução: um melhor conhecimento das mulheres lactantes para o desenho de estratégias que promovam o aleitamento materno exclusivo irá melhorar os índices atuais. A utilização de instrumentos de medição em conceitos como a atitude em relação à amamentação permite este propósito. O objetivo do estudo foi desenvolver e validar uma escala para medir a atitude em relação ao aleitamento materno.

Método: foram definidos 17 itens do tipo Likert. A escala foi aplicada a 518 mães com produtos saudáveis, a termo, no pós-parto imediato, em duas instituições de Bogotá. Os resultados foram avaliados por meio da Teoria Clássica do Teste e da Teoria de Resposta ao item por meio de um modelo de crédito parcial.

Resultados: foi encontrada uma validade semântica adequada. A análise fatorial exploratória e o conteúdo dos itens definiram um único construto: a atitude. Os índices de consistência interna e confiabilidade foram moderados. As estatísticas de ajuste de *infit* e *outfit* permitiram manter todos os itens da escala. As questões que mais contribuíram para a medição avaliaram o conhecimento sobre os benefícios da amamentação e da utilização de fórmulas infantis. A escala tem itens para medir níveis baixos e médios de atitude, mas requer outros itens que discriminem níveis altos. A função de informação mos-

Conclusions: The scale developed to measure attitude towards breastfeeding is valid to discriminate the construct in patients with low and medium levels, showing its usefulness to identify mothers who would benefit from support in this activity.

Keywords: Attitude; Breastfeeding; Scales.

Conclusión: la escala desarrollada para la actitud hacia la lactancia materna es válida para discriminar el constructo en pacientes con niveles bajos y medios, lo que muestra su utilidad para identificar madres que se beneficiarían de apoyo en esta actividad.

Palabras clave: actitud, lactancia materna, escalas.

Conclusões: a escala desenvolvida para a atitude frente ao aleitamento materno é válida para discriminar o construto em pacientes com níveis baixos e médios, mostrando sua utilidade para identificar mães que se beneficiariam de apoio em esta atividade.

Palavras-chave: atitude, aleitamento materno, escalas.

[1] Department of Pediatrics. Clínica del Country, Bogotá, Colombia.
[2] Health Sciences University Foundation, Bogotá, Colombia.
[3] Hospital San José de Bogotá, Bogotá, Colombia.

*Correspondence: Álvaro Jacome Orozco.
alvarjacome@gmail.com

STATEMENT OF CLINICAL RELEVANCE

After applying it to the population, use the scale to design breastfeeding promotion strategies in accordance with the cultural characteristics of the target population, based on the degree of knowledge and attitude towards breastfeeding. It can also be used to measure the impact of the strategies applied.

INTRODUCTION

About breastfeeding, the World Health Organization (WHO) states that "It is the best food for newborns from the first moment and exclusively until six months of age and supplemented until beyond two years"[1]. The development and validation of scales are based on quantifying non-tangible facts, such as intelligence, quality of life, attitude, or aptitude. The magnitude of the construct being measured is determined through the responses given to the items on the scales or tests[2]. Different methodologies for scale development are available, including the classical test theory and the item response theory[3, 4].

In classical test theory, construct evaluation results from the sum of the items that make up the scale. The score ranges from zero to the maximum in the test. It is made up of each participant's responses plus the measurement error, which helps discriminate between easy and difficult items and also with response discrimination. Dependence on the population in which it is performed is a weakness of the development methodology[4, 5].

The item response theory uses probabilistic models which relate the measured construct (for example, the mother's attitude towards breastfeeding)[6] to the probability of response to a specific item[7]. In this way, the likelihood of a subject responding adequately to the item can be established, as determined by the amount of construct the subject has.

Attitude and maternal self-efficacy in the breastfeeding woman are recognized as determinants, especially within the first weeks of breastfeeding initiation. Considering the role these attitudes play, these conditions need to be quantified in order to evaluate the results of public health strategy implementations in this area.

Current psychometric scales related to attitude include the Gender Role Attitudes Scale towards breastfeeding (GRABS)[8] and the Iowa Infant Feeding Attitude Scale (IIFAS)[9]. The former measures fitness with lactation and primiparous women, while the latter has been validated to measure two constructs: attitude and knowledge about breastfeeding, and it is a recognized scale of which several cultural adaptations have been made[10-12]. There are scales to measure and evaluate maternal attitude towards breastfeeding, with validated Spanish translations[13, 14]. However, these scales include items that measure aspects related to the use of formula milk, but not aspects such as attitude towards exclusive breastfeeding in the first six months, bonding of the partner in breastfeeding, social support networks, and the possibility of milk expression in working mothers. Hence the decision to build a scale

that would include these new aspects, using the content suggested by IIFAS as a basis[9].

METHODOLOGY

Design

The study was carried out in two phases: scale construction and validation.

Scale construction

A literature review was carried out on the attitude towards breastfeeding and the scales for its measurement. Based on the results obtained, a pediatrician with knowledge of breastfeeding proposed a group of items which were then subjected to an iterative process of semantic validation and adjustments by a group of experts comprising a pediatric gastroenterologist, a pediatric nutritionist, a psychologist with expertise in semantics, an expert lactation nurse and a mother. The semantic validation consisted of evaluating the sufficiency, clarity, coherence, and relevance of the item. "Sufficiency" indicates whether the items that belong to the same domain are sufficient to obtain a measurement. "Coherence" assesses whether the item has a logical relationship with the domain being measured. "Relevance" refers to whether the item is essential or important, i.e., whether it should be included. Finally, "Clarity" indicates if the item is easily understood, indicating adequate syntax and semantics. A four-point scale was used:

- Does not meet the criteria
- Low level of compliance
- Moderate level of compliance
- High level of compliance.

Adjustments were made when the level of compliance was 3 when averaging the four experts' assessments. A Likert scale, which is a psychometric instrument where the respondent must indicate their agreement or disagreement about a statement or item using an ordinal one-dimensional scale, was used for construct classification[15].

Scale validation

The scale was applied to 518 mothers staying with their babies in the immediate postpartum period in two institutions in Bogotá, Colombia. This sample was used to evaluate internal consistency and content validity of the scale, and to conduct the analysis in accordance with the item response theory. The IIFAS scale was applied to 100 mothers simultaneously to assess the validity of the convergent construct; in 55 of them, the scale was applied again one week later in order to assess test reliability and repeat the test.

Internal consistency was evaluated using statistical Cronbach's Alpha. Content validity was assessed through exploratory factor analysis. The Bartlett test of sphericity and the Kaiser-Meyer-Olkin test were applied to evaluate matrix factorability; then a polychoric correlation matrix was calculated to perform the factor analysis, taking into account that the items were constructed on an ordinal scale. The number of factors was determined based on sedimentation graph inspection and eigenvalues greater than 1. The validity of the convergent construct was evaluated utilizing a Spearman coefficient and the reliability of the examination and repetition of the examination by means of Lin's coefficient. The STATA 15® software was used to perform these analyses.

The item response theory analysis was carried out using a Rasch model on partial credit to analyze item and people reliability[16] and item fit on the scale, and to evaluate the measurement scale of each item and obtain an estimated scale measurement precision. People and item reliability was measured with reliability indices (they vary between 0 and 1, higher values imply better results) and separation (values greater than 2 are suggested to show good discrimination). Fit was measured using infit and outfit statistics. In its unstandardized form (MNSQ), values greater than 1.5 indicate mismatch, while values less than 0.5 show redundancy. On the other hand, in its standardized form (ZSTD), values greater than 1.9 suggest mismatch and lower than -1.9 show redundancy.

A map of people and items was made to evaluate each item's ability to measure different levels of attitude and describe the distribution of attitude in the sample of participants. The precision of the measurement was evaluated through the test information function graph. Compliance with the assumptions of unidimensionality and local independence was verified. The Winsteps® software and the eRm library of the R package were used for this analysis. The study was approved by the Ethics and Research Committee of the University Foundation of Health Sciences and the Clínica del Country in Colombia.

RESULTS

Classical item theory

Scale construction

The literature search allowed to identify the IIFAS scale[9] as the model from which 17 items related to the topics presented in the new scale of attitude towards breastfeeding were built. Based on the current cultural context, the topics incorporated for the construction of the new scale were participation of the partner, social support networks, breastfeeding as a means of communication between mother and child, duration of breastfeeding, and the relationship between breastfeeding and the mother's health.

The items were constructed on a Likert-type scale, with five response options:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Totally agree.

Items 2, 6, 14, and 17 are scored inversely. Two possible dimensions of the attitude towards breastfeeding were considered: knowledge (measured by items 1, 2, 3, 6, 8, 10, 13, 15) and attitude (measured by items 4, 5, 7, 9, 11, 12, 14, 16, 17). The scale items, together with the semantic validation results and the Spanish version, are presented in Table 1.

Scale validation

Five hundred eighteen mothers were included in the validation study. The median age was 28 years (interquartile range (IQR) 23.4 to 34). Most of the interviewees were married, with 1 (246; 47.6%) or two children (196; 37.9%), low or medium schooling (436; 84.4%), and time to return to work scheduled for more than three months (203; 60.8%). Cesarean delivery was 55.4%. The children were within the normal range in weight, height, and gestational age, as shown in Table 2.

Content validity

The Bartlett test (Chi-squared = 1249.4 (136), p <0.001) and the Kaiser-Meyer-Olkin criterion (0.70) indicated that the correlation matrix was factorable. Although the initial extraction by using the main factors method and the sedimentation graph suggested two factors, it was decided to consider a single factor since the unrotated solution and the rotated solutions grouped most of the items in the first factor, leaving the items in the second inverse scoring, which included items to measure both attitude and knowledge (Table 3).

Convergent construct validity

The Spearman correlation between the attitude towards breastfeeding scale and the IIFAS was 0.363 (p <0.001). The result indicates that the evaluation of the attitude towards breastfeeding measures a construct associated with that evaluated by the IIFAS (the one related to formula milk), but that it differs in other aspects, such as partner participation, social support networks, breastfeeding as a means of communication between mother and child, duration of breastfeeding, the relationship between breastfeeding and the mother's health.

Internal consistency

A Cronbach's alpha coefficient of 0.538 was found, which did not decrease if items were removed from the scale (data not shown).

Test reliability and retest

The median time between scale applications was eight days (interquartile range 7 to 8 days, minimum 4 days, maximum 11 days). The average of results obtained in the first application was 71.6 (SD = 5.2), and the average for the second was 72.0 (SD = 4.3). Lin's rho coefficient was 0.377 (95% CI 0.140-0.614). The difference between the two applications was -0.44, and the Bland and Altman limits were between -10.8 and 9.9.

Item response theory

The data matrix met the unidimensionality criteria (Martin Löf test: Chi-square: 572.745; p = 1,000). Table 4 shows the adjustment statistics of the items. The MNSQs were within the expected ranges, while the ZSTDs showed a case of poor adjustment ("for me, it does not matter where I breastfeed my baby"); however, this question is preserved since, in its non-standardized version, the indexes are adequate (Table 4).

The map of people and items (Figure 1) showed people distribution between -2 and 3 logits being more frequent between 0 and 2 logits. As a higher position on the map shows more attitude on the responders, the distribution found indicates that the participants had, for the most part, average-to-high attitude. Item distribution was narrower, between -1 and almost one logit, which indicates that the scale has items that measure an

Table 1. Semantic validation of the scale items

Item	Sufficiency	Consistency	Relevance	Clarity
1. Breastfeeding my baby for the first 6 months of life will give it better health (*Amamantar a mi bebé los primeros 6 meses de vida le dará una mejor salud*)	4	4	4	4
2. It is easier to control my baby's feeding with the bottle than when I breastfeed (*Es más fácil controlar la alimentación de mi bebé con el tetero que cuando lo amamanto*)	3	3	3.5	3
3. My baby can let me know when it is full and does not want to drink more milk (*Mi bebé puede manifestarme cuando está lleno y no quiere tomar más leche*)	3.5	4	4	4
4. The place where I breastfeed my baby does not matter to me (*Para mí no tiene importancia el lugar donde doy pecho a mi bebé*)	4	4	4	4
5. Breastfeeding can be continued after maternity leave ends (*Se puede continuar la lactancia materna después de terminar la licencia de maternidad*)	4	4	4	4
6. Prolonged breastfeeding after 6 months affects my health (*La lactancia prolongada luego de 6 meses afecta mi salud*)	4	4	4	4
7. Support from my partner in the breastfeeding process is important to me (*El apoyo en el proceso de la lactancia por mi pareja es importante para mí*)	4	4	4	4
8. Breastfeeding is less expensive than formula feeding (*La lactancia materna es menos costosa que la lactancia con leche de formula*)	2.5	3	3.5	3.5
9. I feel less personal satisfaction when I feed my baby formula milk than breast milk (*Siento menos satisfacción personal cuando alimento a mi bebé con leche de fórmula infantil que con leche materna*)	4	4	4	4
10. What I eat affects the quality of the milk I produce (*La forma como me alimento afecta la calidad de la leche que produzco*)	3.5	4	4	4
11. My partner's attitude towards breastfeeding is very important to me (*La actitud de mi pareja en relación con la lactancia es muy importante para mí*)	4	4	4	4
12. Expressing my milk is another option to breastfeed my baby (*Extraer mi leche es otra opción de alimentar con pecho a mi bebé*)	3.5	4	4	3.5
13. My baby grows better if I only feed it breast milk (*Mi bebé crece mejor si lo alimento solo con el pecho*)	3.5	3.5	3.5	4
14. Permanently breastfeeding my baby affects the shape of my body (*Amamantar a mi bebé en forma permanente afecta mi figura*)	3.5	4	4	3.5
15. My baby is more at risk of being obese if I feed it infant formula (*Mi bebé tiene más riesgo de engordarse si lo alimento con fórmula infantil*)	3.5	3	4	4
16. My baby accepts the initiation of complementary feeding more easily when breastfeeding than with infant formula (*Mi bebé acepta más fácil el inicio de la alimentación complementaria cuando se alimenta con pecho que por fórmula infantil*)	4	4	4	4
17. Infant formula milk is just as healthy as breast milk (*La leche de fórmula infantil es igual de saludable a la leche materna*)	3.5	3.5	3.5	4

intermediate level of attitude. As the mean for people is higher than for items, it is suggested that the sample of participants has an attitude higher than would be obtained by a random sample of participants to whom the scale is applied. Item 15 ("My baby is more at risk of being obese if I feed it infant formula") is in a higher position, thus being a good marker for measuring attitude. An item gap was observed for discrimination between very high levels of attitude. This result is consistent with the reliability and separation indices: 0.63

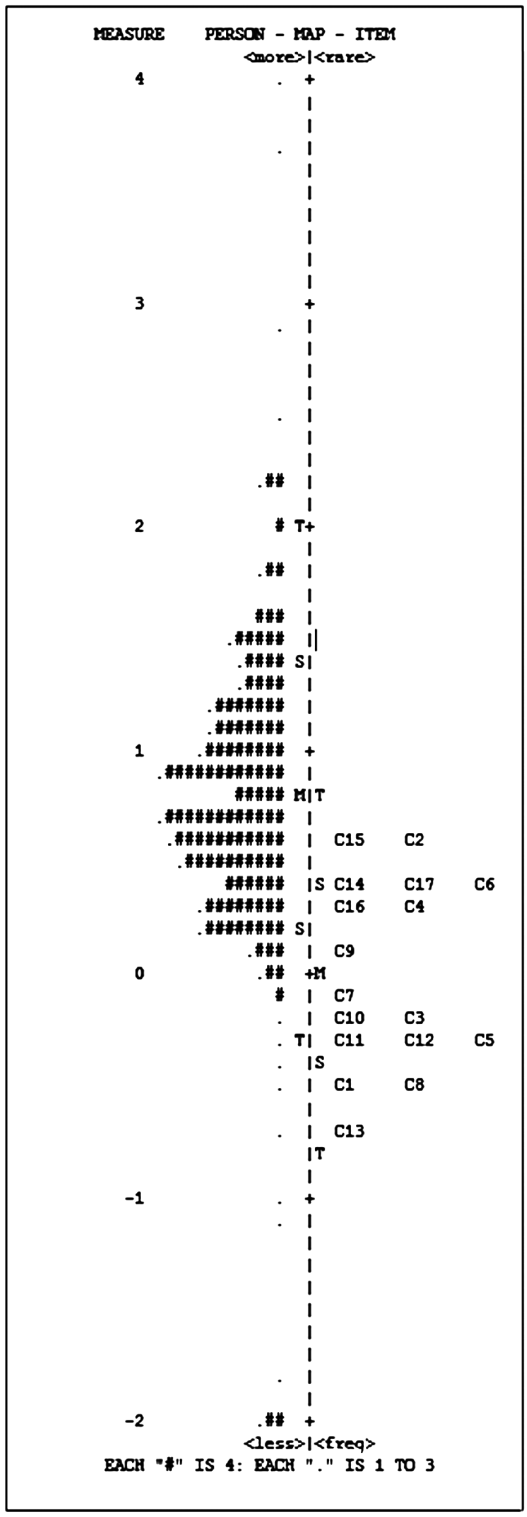

Figure 1. Map of people and Wright items of the attitude towards breastfeeding assessment scale. **Left:** each "#" corresponds to 4 patients and measures the attitude distribution against the responses (logit = probability of response). **Right:** corresponds to the distribution of questions according to attitude. The graph's height corresponds to the magnitude of the attitude; this goes from lowest to highest.

Table 2. Characteristics of the participants in the validation study

Variable[1]	N (%)
Age	28 (23.4 - 34)
Children - 1 - 2 - 3 or more	 246 (47.6) 196 (37.9) 75 (14.5)
Education - Primary - Secondary - University - Graduate	 27 (5.2) 221 (42.8) 215 (41.6) 54 (10.4)
Return to work - Less than 1 month - 1 month - 2 months - 3 months - More than 3 months	 15 (4.5) 3 (0.9) 7 (2.1) 106 (31.7) 203 (60.8)
Mother's weight	69 (62 - 78)
Mother's height	1.6 (1.4 - 1.8)
Baby's weight in grams	3010 (2760 - 3300)
Baby's length in centimeter	50 (49 - 51)
Gender: Female	262 (50.6)
Gestational age in weeks	38 (38 - 39)
Delivery form, cesarean	285 (55.4)

[1]Median and interquartile range are presented for the quantitative variables, and absolute and relative frequency for the qualitative variables.

and 1.30 for people and 0.98 and 7.33 for the items, which indicates that the scale may lack items to discriminate certain levels of the construct.

The graphs shown in Figure 2 illustrate the different response options in relation to the level of attitude they measure. In general, it can be observed that the response options are associated with a more significant construct; however, in most items, the construct's range is covered by 3 or 4 response options.

Figure 3 illustrates the item and the test information functions. This graph indicates that, although the test measures people attitudes in a wide range of the construct, the most precise measurements are produced in the center, between -2 to 2 logits, which indicates that

Table 3. Factor loadings for the items of the attitude towards breastfeeding assessment scale

Item	Factor 1	Factor 2	Unicity
1. Breastfeeding my baby for the first 6 months of life will give it better health	0.572	-0.2738	0.5978
2. It is easier to control my baby's feeding with the bottle than when I breastfeed	0.2651	0.4906	0.6891
3. My baby can let me know when it is full and does not want to drink more milk	0.2564	-0.1481	0.9123
4. The place where I breastfeed my baby does not matter to me	0.1166	-0.1311	0.9692
5. Breastfeeding can be continued after maternity leave ends	0.5616	-0.1812	0.6518
6. Prolonged breastfeeding after 6 months affects my health	0.3515	0.6835	0.4093
7. Support from my partner in the breastfeeding process is important to me	0.5458	-0.0109	0.702
8. Breastfeeding is less expensive than formula feeding	0.6047	-0.1196	0.6201
9. I feel less personal satisfaction when I feed my baby formula milk than breast milk	0.4137	-0.0552	0.8258
10. What I eat affects the quality of the milk I produce.	0.4161	-0.299	0.7375
11. My partner's attitude towards breastfeeding is very important to me	0.5551	-0.2359	0.6363
12. Expressing my milk is another option to breastfeed my baby	0.4671	-0.2817	0.7024
13. My baby grows better if I only feed it breast milk	0.546	-0.0231	0.7014
14. Permanently breastfeeding my baby affects the shape of my body	0.3027	0.597	0.5519
15. My baby is more at risk of being obese if I feed it infant formula	0.124	0.0298	0.9837
16. My baby accepts the initiation of complementary feeding more easily when breastfeeding than with infant formula	0.0226	-0.0634	0.9955
17. Infant formula milk is just as healthy as breast milk	0.3836	0.6751	0.3971

the scale can yield more information on average levels of attitude.

DISCUSSION

Given the importance of attitude towards breastfeeding, this study proposes a new scale for measuring breastfeeding attitude and describes its development process and the first validation using the classical test theory and the item response theory.

Prior experience with its use revealed contextual elements, prompting the design of a new scale for our setting[14]. The IIFAS scale[8], in its original basic design, places significant emphasis on determining the attitude towards the use of breast milk substitutes. Likewise, it has concepts related to the cultural and social moment of the 1990s, describing male perception of breastfeeding under a cultural gender term, the controversy regarding the consumption of alcoholic beverages and its relationship with breastfeeding.

Without impairing their validity, the elements that make up the constructs require a change of context according to current culture and society. Today, some elements influence the success or failure of exclusive breastfeeding, such as the participation of social networks and their role in supporting breastfeeding, the existence and cooperation of support groups, the participation of the partner and friends, and even the nutritional concept of breastfeeding versus the use of breast milk substitutes and the risk of childhood obesity[17, 18].

The predominant population of this study consisted of mothers of middle to middle-lower income brackets, low schooling level (only high school), mostly young, and in a marital relationship. This population represents Colombian breastfeeding mothers in whom breastfeeding strengthening programs can be carried out, similar to those developed as part of other studies evaluating attitude or self-efficacy towards breastfeeding[12, 19-22].

The reliability analysis yielded low coefficients, both for internal consistency and concordance as

Table 4. Adjustment statistics of the items according to the item response theory

Item	INFIT		OUTFIT	
	MNSQ	ZSTFD	MNSQ	ZSTFD
1. Breastfeeding my baby for the first 6 months of life will give it better health	0.95	-0.2	0.83	-0.5
2. It is easier to control my baby's feeding with the bottle than when I breastfeed	0.96	-0.7	0.96	-0.5
3. My baby can let me know when it is full and does not want to drink more milk	1.08	1.1	1.11	1.5
4. The place where I breastfeed my baby does not matter to me	1.25	5.0	1.46	7.2
5. Breastfeeding can be continued after maternity leave ends	0.95	-0.4	1.0	0.0
6. Prolonged breastfeeding after 6 months affects my health	0.91	-1.3	0.89	-1.3
7. Support from my partner in the breastfeeding process is important to me	0.92	-1.0	0.95	-0.5
8. Breastfeeding is less expensive than formula feeding	0.95	-0.4	0.86	-1.0
9. I feel less personal satisfaction when I feed my baby formula milk than breast milk	0.99	-0.1	1.04	0.6
10. What I eat affects the quality of the milk I produce.	1.07	0.9	1.14	1.5
11. My partner's attitude towards breastfeeding is very important to me	0.98	-0.3	0.98	-0.2
12. Expressing my milk is another option to breastfeed my baby	0.98	-0.2	1.02	0.3
13. My baby grows better if I only feed it breast milk	0.98	-0.1	0.95	-0.5
14. Permanently breastfeeding my baby affects the shape of my body	0.96	-0.6	0.94	-0.9
15. My baby is more at risk of being obese if I feed it infant formula	1.11	2.2	1.13	2.4
16. My baby accepts the initiation of complementary feeding more easily when breastfeeding than with infant formula	1.15	2.4	1.17	2.7
17. Infant formula milk is just as healthy as breast milk	0.85	-2.2	0.79	-2.6

MNSQ: show mean-square; ZSTD standardized as a z-score

well as Lin correlation. This may be explained by the conditions in which the scale was applied, initially at a stressful time for the mothers during the immediate postpartum period[23], and then a second time when they were already outside the institutions and had had some experience with the breastfeeding process. We believe that the estimation of reliability can be improved by applying the scale in other circumstances, for example, during pregnancy, a critical time to identify women who will require breastfeeding counseling. The moderate correlation between the IIFAS scale and the Colombian scale showed cultural aspects that differ in the attitude construct development.

The exploratory factor analysis suggested two possible factors. However, the content analysis of the second factor allowed us to observe that the items written inversely were grouped and correspond to aspects of attitude and knowledge. For this reason, a single underlying factor was considered.

In the analysis of the scale using the item response theory, the results obtained showed that the scale has items that discriminate well the attitude towards breastfeeding in participants with medium and low attitude levels. The sample from which the validation was obtained included participants with medium to high levels of attitude, as observed in the people and items map (Figure 1), and was a homogeneous population in terms of attitude. This homogeneity is attributed to the fact that the population consisted mainly of mothers of middle and lower-middle income. Although the education level of the sample was known, other cultural aspects were not evaluated, allowing us to better determine the reason for this homogeneity.

When analyzing individual adjustment statistics, redundancy was found for some questions, as was the case for 6 and 17. Other questions have similar wording to these items: for example, question 6 ("prolonged breastfeeding greater than six months affects my

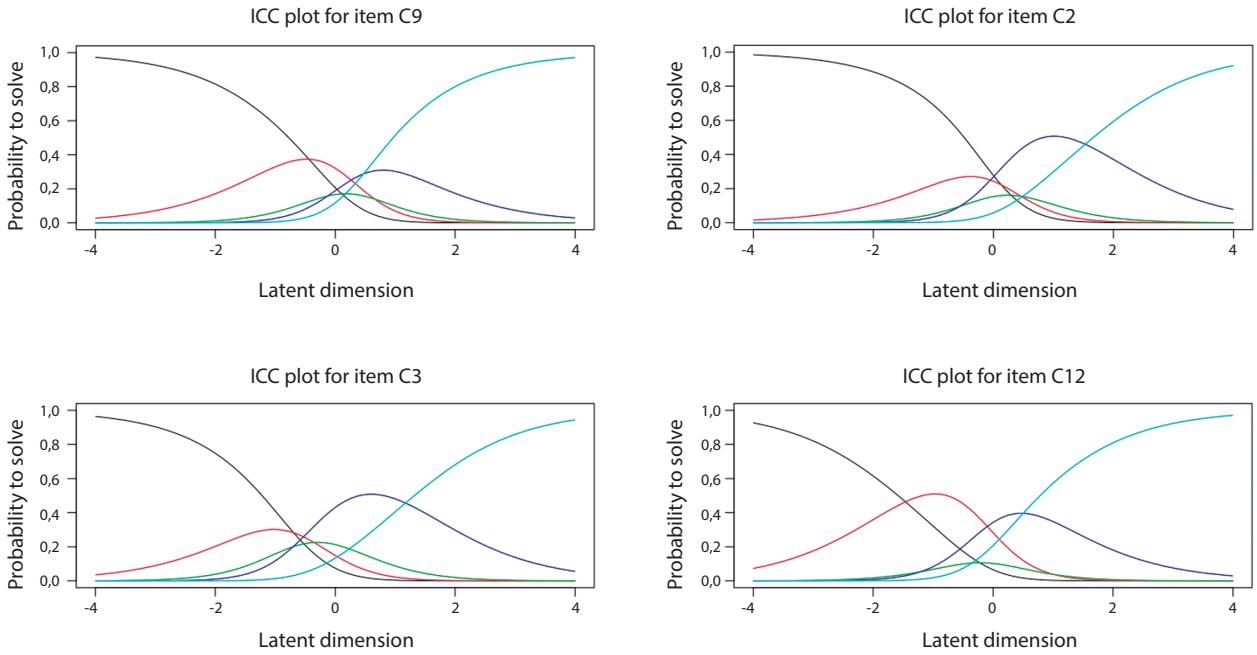

Figure 2. Evaluation of the measurement scale. Example for items 2, 3, 9 and 12. ICC: Item characteristic curve.

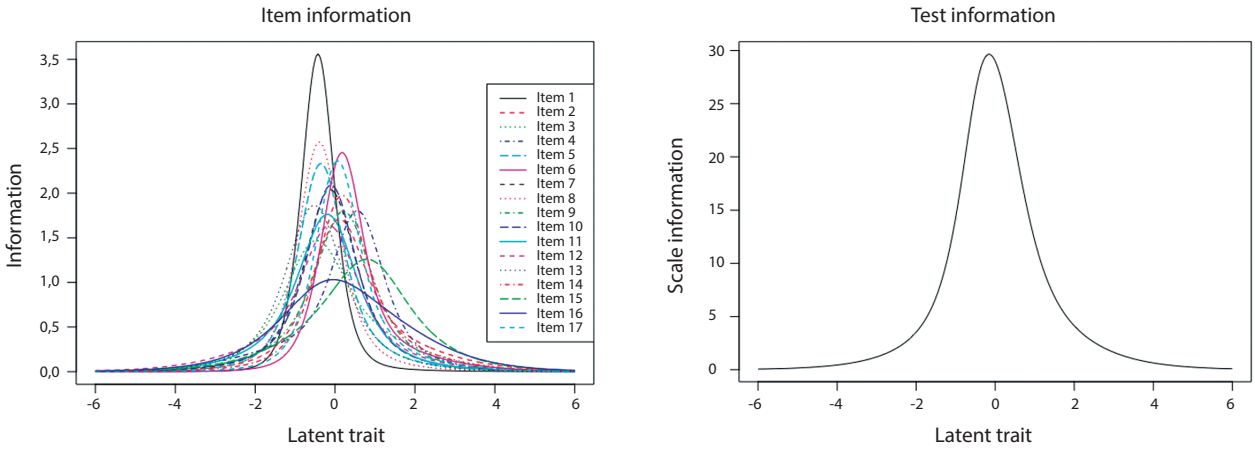

Figure 3. Test information function. Construct range precision measure.

health") can be related to question 14 ("breastfeeding my baby permanently affects the shape of my body"). When analyzing the detail of its meaning, we found that question 14 refers to an aesthetic aspect, while question 6 points to a health-related issue associated with prolonged breastfeeding. In areas such as maternal weight and nutritional status, both questions measured the same amount of attitude, so they were maintained on the scale.

Item 17 ("Infant formula milk is just as healthy as breast milk") can be related to item 15 ("My baby is more at risk of being obese if I feed it infant formula"). The two questions address different concepts. Question 17 refers to the woman's knowledge concerning the nutritional

and biological composition of both milk sources and the associated biological and nutritional results of their use; question 15 focuses on the risk of obesity with the use milk substitutes as compared to breast milk. Therefore, these questions were kept on the final scale. It is interesting to note that question 15 fell on the upper part of the people and items map, allowing to discriminate high attitude towards breastfeeding.

When analyzing the differences between the questions that have a greater probability of response (easy), compared to those classified as complex, the ease of the former is attributed to the clarity of the issues concerning the current construct: partner support, extended breastfeeding, milk expression for work, optimal result in the health of the child. On the other hand, the questions classified as difficult, those with an inverse score whose negative answer means positive attitude or knowledge towards breastfeeding, imply a more profound knowledge regarding breastfeeding: risk of obesity in the infant, risk of nutritional changes in women and ease of starting the complementary diet.

Regarding the Likert scoring system, if was found that patients did not use certain scores, suggesting that a smaller number of levels could be used: strongly disagree, neutral, and strongly agree. These options are adequate, taking into account that the use of all the response options may lead respondents to choose indifference options, hindering adequate measurement of the construct[23, 24].

The evaluation of the scale using two different methodologies, the classical test theory and the item response theory, is a strength of this work. For scale validation, the latter has advantages over the former since its provides item-level analysis, evaluating the ability of the scale to discriminate different levels of the construct, and not depending on the population in which the scale is applied to obtain the estimates[24]. The higher proportion of people with a middle and middle-low social distribution, low schooling level and the relationship with the ability to respond and selectivity in response possibilities is a limitation of the study. This could be addressed by applying the scale to a more heterogeneous population.

CONCLUSIONS

In conclusion, the use of the scale that measures attitude towards breastfeeding is valid to discriminate the construct in patients with low and medium levels, showing its usefulness in identifying mothers who would benefit from improvement interventions. The inclusion of items to discriminate high levels is needed. Likewise, it is essential to promote the application of the scale in various populations in order to determine its performance and introduce further adjustments.

KEY POINTS

- Psychometric scale to measure maternal attitude towards breastfeeding
- Development and evaluation of the scale under two methodologies
- Scale update according to current social parameters.

Appreciation

We thank Helen Preciado Barrera, from the Department of Pediatrics of the University Foundation of Health Sciences, Hospital de San José de Bogotá; Mayra Ivonne Ramírez, third-year resident; and Laura del Pilar Villarreal Torres, second-year resident of Pediatrics, both from the Health Sciences University Foundation, Hospital de San José de Bogotá.

Financing

No funding was received for this work.

Conflict of interest

The authors declare that they have no conflict of interest in carrying out this work.

Declaration of authorship

AJ designed the scale, the application in one of the institutions and actively participated in the analysis and the development of the manuscript. FS actively participated in the analysis of the data and in the development of the manuscript. LV actively participated in data collection at one of the institutions and in data analysis.

Bibliographic references

1. Lactancia materna exclusiva [Internet]. Organización Mundial de la Salud. (Consultado el 12 de marzo de 2021). Disponible en: https://www.who.int/nutrition/topics/exclusive_breastfeeding/es/
2. Martínez AMR, Hernández LMJ, Hernández LMV. Psicometría. Madrid: Alianza Editorial. 2014.
3. Crocker LM, Algina J. Introduction to classical and modern test theory. New York: Holt, Rinehart, and Winston. 1986.

4. DeVellis RF. Scale development: theory and applications. 3ª edición. California: SAGE Publications. 2012. p. 73-114.
5. Steiner DL, Norman GR, Cairney J. Health measurement scales: A practical guide to their development and use. 5ª edición. Oxford: Oxford University Press. 2014.
6. Wolfe EW, Smith EV Jr. Instrument development tools and activities for measure validation using Rasch models: Part I - instrument development tools. J Appl Meas. 2007;8(1):97-123.
7. Yang FM, Kao ST. Item response theory for measurement validity. Shanghai Arch Psychiatry. 2014;26(3):171-7. doi: 10.3969/j.issn.1002-0829.2014.03.010.
8. Kelley MA, Kviz FJ, Richman JA, Kim JH, Short C. Development of a scale to measure gender-role attitudes toward breast-feeding among primiparas. Women Health. 1993;20(1):47-68. doi: 10.1300/J013v20n01_04.
9. de la Mora A, Russell DW, Dungy CI, Losch M, Dusdiecker L. The Iowa Infant Attitude Scale: Analysis of reliability and validity. J Appl Soc Psychol. 1999;29(11):2362-80. doi: 10.1111/j.1559-1816.1999.tb00115.x.
10. Aluş TM, Okumuş H, Dennis CL. Translation and psychometric assessment of the Breast-feeding Self-Efficacy Scale-Short Form among pregnant and postnatal women in Turkey. Midwifery. 2010;26(1):101-8. doi: 10.1016/j.midw.2008.04.002.
11. Dencker A, Taft C, Bergqvist L, Lilja H, Berg M. Childbirth experience questionnaire (CEQ): Development and evaluation of a multidimensional instrument. BMC Pregnancy Childbirth. 2010;10:81. doi: 10.1186/1471-2393-10-81.
12. Holbrook KE, White MC, Heyman MB, Wojcicki JM. Maternal sociodemographic characteristics and the use of the Iowa infant attitude feeding scale to describe breastfeeding initiation and duration in a population of urban, Latina mothers: A prospective cohort study. Int Breastfeed J. 2013;8(1):7. doi: 10.1186/1746-4358-8-7.
13. Aguilar-Navarro HJ, Coronado-Castilleja A, Gómez-Hernández OJ, Cobos-Aguilar H. Adaptación de la Iowa Infant Feeding Attitude Scale en población mexicana. Acta Pediatr Mex. 2016;37(3):149-58.
14. Jacome A, Jiménez R. Validación de la Iowa Infant Feeding Attitude Scale. Pediatr. 2014;47(4):77-82. doi: 10.1016/S0120-4912(15)30143-9.
15. Matas A. Diseño del formato de escalas tipo Likert: un estado de la cuestión. REDIE. 2018;20(1):38-47. doi: 10.24320/redie.2018.20.1.1347.
16. López PJA. Análisis psicométrico de la escala de marcha y equilibrio de Tinetti con el modelo de Rasch. Fisioterapia. 2009;31(5):192-202. doi: 10.1016/j.ft.2008.10.004.
17. Hancox RJ, Stewart AW, Braithwaite I, Beasley R, Murphy R, Mitchell EA, et al. Association between breastfeeding and body mass index at age 6-7 years in an international survey. Pediatr Obesit. 2015;10(4):283-87. doi: 10.1111/ijpo.266.
18. Hansstein FV. The impact of breastfeeding on early childhood obesity: Evidence from the National Survey of Children. Am J Health Promot. 2016;30(4):250-8. doi: 10.1177/0890117116639564.
19. Janke JR. Development of the breast-feeding attrition prediction tool. Nurs Res. 1994;43(2):100-4.
20. Dennis CL. The breastfeeding self-efficacy scale: Psychometric assessment of the short form. J Obstet Gynecol Neonatal Nurs. 2003;32(6):734-44. doi: 10.1177/0884217503258459.
21. Dennis CLE. Identifying predictors of breastfeeding self-efficacy in the immediate postpartum period. Res Nurs Health. 2006;29(4):256-68. doi: 10.1002/nur.20140.
22. Tuthill EL, McGrath JM, Graber M, Cusson RM, Young SL. Breastfeeding self-efficacy: A critical review of available instruments. Journal Hum Lact. 2016;32(1):35-45. doi: 10.1177/0890334415599533.
23. Chabbert M, Guillemot-Billaud A, Rozenberg P, Wendland J. Determinants of anxiety symptoms, depression and peritraumatic distress in immediate postpartum women's mental health. Gynecol Obstet Fertil Senol. 2021;49(2):97-106. doi: 10.1016/j.gofs.2020.10.002.
24. Morales VP. Medición de actitudes en psicología y educación. 3ª edición. Madrid: Universidad Ponticia Comillas. 2006.