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Reliability and validity of the Bristol Breastfeeding Assessment Tool in the Turkish population

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ABSTRACT

Background: breast milk is a natural source of nourishment, with a high level of bioefficacy that is easily digestible, easy to deliver, providing all the fluids, energy and nutrients that are needed for the optimum growth and development of a newborn.
Objective: this research aims to conduct a reliability and validity study of the Bristol Breastfeeding Assessment Tool (BBAT) in the Turkish population.
Design: the research was conducted in methodological design.
Setting: the Child Health Follow-up Polyclinic of a university hospital in Istanbul.
Participants: the participants were 217 breastfed infants and their mothers.
Findings: the internal consistency of the Turkish version of Breastfeeding Assessment Tool (Cronbach's alpha = 0.77) and the intraclass correlation level are high (ICC = 0.89). Breastfeeding Assessment Tool displayed a high correlation with LATCH (Latch Audible, Swallowing, Type of Nipple, Comfort of Breast/Nipple, H-Hold/Position) (Pearson $r = 0.76$; $p = 0.000$).
Conclusions: Breastfeeding Assessment Tool was successfully adapted into Turkish as a reliable and valid breastfeeding assessment tool that can be quickly and easily administered, and it was shown that the instrument could be readily adapted into other languages as well.
Implications for Practice: the Turkish version of Breastfeeding Assessment Tool is now available to Turkish midwives and nurses, who will be able to employ an instrument for breastfeeding assessment that has been proven effective. More studies are needed to demonstrate the efficacy of the instrument.

Introduction

Breast milk is a natural source of nourishment, with a high level of bioefficacy that is easily digestible, easy to deliver, providing all the fluids, energy and nutrients that are needed for the optimum growth and development of a newborn (Kramer and Kakuma, 2012). The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend that infants be fed only breast milk for the first six months of life and that breastfeeding should be continued accompanied by complementary foods or the first two years of life (Victora et al., 2016).

Breastfeeding is a considerably widespread practice in Turkey. Turkey Population and Health Research (TNSA) data for 2013 reveal that 96% of babies born in Turkey are breastfed for some time after birth (Enstitüsü, 2013). However the exclusive breastfeeding rate is not at the desired level in the first 6 months. Moreover, while the rate of exclusive breastfeeding in the first 6 months was 42 percent in 2008 (Enstitüsü, 2009), this rate receded to 30% in 2013 (Enstitüsü, 2013). The duration of “exclusively breastfeeding" in infants is less than two months (Enstitüsü, 2013). In addition, half of newborns are not breastfed in the first hour after birth, and 30% are not breastfeed in the first day of life (Enstitüsü, 2013). The most important problem in our country is not starting breastfeeding, but continuing to exclusively breastfeed for the first six months. Among the most common reasons cited in the literature about why breastfeeding is stopped at an early stage is the mother's anxiety about not being able to feed her infant adequately and the lack of self-confidence mothers feel about breastfeeding (Akgün, 2006; Akyüz et al., 2007).

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Breastfeeding is a process that can be learned. It is very important to know and apply the right breastfeeding technique if babies are to benefit optimally from mother's milk. The position of the mother during breastfeeding, the way the infant is held, the baby's way of latching onto the breast, the sound of swallowing, the tip of the breast (too big, inwardly or collapsed), the mother's comfort level with offering her breast are all indicators that guide the evaluation of breastfeeding and help to identify problems (Ingram et al., 2015).

Determining the adequacy of breastfeeding through the use of a valid and reliable measuring tool is important in providing guidance in breastfeeding education. It is important for this reason that midwives/nurses observe a mother's breastfeeding technique and evaluate the effectiveness of breastfeeding. Scott et al. (2006) report in their study that mothers who have breastfeeding problems in the first month after birth are at risk of abandoning exclusive breastfeeding before the end of six months and may abandon breastfeeding entirely before the end of 12 months (Scott et al., 2006). On the other hand, it has been shown that postpartum support increases the duration of breastfeeding (Wambach et al., 2005). It is because of this that breastfeeding must be routinely evaluated after birth and any difficulties with breastfeeding must be identified. At the same time, because a valid instrument has not been available for use at hospitals that provide first line health care in Turkey, many mothers who have difficulty with breastfeeding go unidentified. Determining the adequacy of breastfeeding through the use of a valid and reliable assessment tool is important in providing guidance in breastfeeding education. Such an assessment tool can be developed according to the cultural characteristics of Turkey or an existing instrument can be adapted to the Turkish language and be tested for validity and reliability (Akbaş and Korkmaz, 2007).

The form developed for evaluating the breastfeeding experience, which was published by WHO and UNICEF in 1992, is widely used in Turkey. This form has not been tested for validity and reliability. We used the LATCH scale as the reference scale because of the single breastfeeding scale has Turkish validity and reliability. (L-Latch, A-Audible Swallowing, T-Type of Nipple, C- Comfort of Breast/Nipple, H-Hold/Position) (Yenal and Okumuş, 2003). However, because of certain limitations, this tool has not found as wide an application as desired.

The Bristol Breastfeeding Assessment Tool was developed by Jenny Ingram in 2015 (Ingram et al., 2015). The tool was developed to measure frequently encountered postpartum breastfeeding difficulties and its validity has been approved. The short, simple, common terminology, easy use and evaluation that the tool provides were the reasons that we preferred it (Akbaş and Korkmaz, 2007). Also, the tool is noted as being effective in identifying the problems of tongue-tied infants (Ingram et al., 2015).

Evaluating the effectiveness of breastfeeding, which is within the domain of midwifery/nursing care, with a tool in Turkish that has been approved for validity and reliability is important in terms of obtaining accurate research results, developing evidence-based practices and nursing theories. The purpose of this research was to conduct reliability and validity studies of BBAT in the Turkish Population.

Methods

Design

This methodological study translated the BBAT from English to Turkish and then examined the reliability and validity of the translated version. The sample of the study consisted of 127 mothers and their healthy babies that met the study selection criteria, consented to participate in the study, spoke Turkish fluently, delivered their babies in the 37th gestational week or later, whose babies were between 0–6 months old and continuing to breastfeed. Determining sample size was based on the supposition that at least 20 participants per item would be more reliable (Kline et al., 2013). Exclusion criteria for the study were any congenital anomalies in the infant and any chronic disease in either mother or their babies. The mothers participating in the study were taken into the breastfeeding room and two pediatric nurses evaluated them on the basis of BBAT, writing up separate and independent reports. The data were collected over the period September 2016 - February 2017.

Translation of the Bristol Breastfeeding Assessment Tool

Permission was first obtained from Jenny Ingram for the translation of the tool into Turkish. 1. At this stage, the tool was separately translated from English into Turkish by the study researchers. 2. In this next stage, a professional translator back-translated the tool into English. 3. Then, the researchers compared the translations, discussing and deciding upon the best expressions to use. 4. In this stage, the tool was subjected to the views of experts. Seven specialists fluent in both languages evaluated the tool in terms of the clarity of the statements, the cross-culture comprehensibility, and language coherence. The expert opinions were analyzed with Kendall's W analysis and it was determined that the opinions were consistent and each item had a high agreement rating ($p = 0.835$) (Flaherty et al., 1988). 5. At this stage, the needed revisions were made in accordance with the views of the experts and the Turkish version of the tool was given its final form. 6. In the next stage, to attain semantic equivalence, the tool was translated into its original language by a professional translator who was not a specialist in the field (Brislin, 1970; Chapman and Carter, 1979). 7. At this point, the back-translated tool was sent to its developer, Jenny Ingram for feedback as to whether the statements in the tool were semantically equivalent to the original form (Flaherty et al., 1988). 8. Data were then collected for the validity and reliability study of the Turkish adaptation. For this, two researchers independently administered the Turkish version of the tool to 127 mothers for field testing (Dennis and Faux, 1999). At this point, the LATCH scale created by Yenal and Okumuş (2003), which had already been tested for Turkish validity and reliability, was used to assess Concurrent Validity (Yenal and Okumuş, 2003).

Data collection instruments

1. **Questionnaire:** This is a questionnaire that was developed on the basis of the literature (Ingram et al., 2015; Yenal and Okumuş, 2003), containing 33 questions on the demographic characteristics of the mothers and infants and the variables that could potentially affect breastfeeding.
2. **Bristol Breastfeeding Assessment Tool:** Jenny Ingram developed this tool in 2014; Cronbach's alpha value was found to be 0.688. Cronbach's alpha coefficient in our study was 0.77. The scale is a Likert-type scale comprising the 4 items of "positioning," "holding," "sucking" and "swallowing." Each item is scored between 0- 2 points. The lowest possible score on the scale is 0, the highest is 8. Lower scores indicate that the breastfeeding is not successful, the higher scores signify successful breastfeeding (Fig. 1).

   Positioning: The infant should be well supported, made to lean on the mother's body lying on its side; the neck should not be bent. The baby's nose should be facing the nipple; the mother should be sure of herself when holding the baby. Achieving all of these steps without help is scored as good.
   Grasping/Attachment: The baby should strongly latch onto the breast, the mouth should be opened wide, and the attachment should be achieved and maintained with an adequate amount of breast tissue in the mouth. Success with all of this is scored as 2.
   Sucking: An effective sucking cycle should be achieved on each breast (rapid sucking at first and then slower with pauses in between sucks); the baby should end the feed. If an effective sucking pattern has been achieved, this is given a score of two.
   Swallowing: Achieving a state of producing audible, regular, soft sucking with no clicking sounds receives a score of 2.

ITEMS	0 Poor	1 Moderate	2 Good	Score
POSITIONING **The baby is well supported, resting on or adjacent to the mother's body; The baby is lying on its side/the head is not bent;** **The nose is facing the nipple; The mother knows how to hold/grasp the infant**	None or very few of the criteria have been met **Needs to have a discussion about positioning**	Some of the criteria have been met **Still needs some advice on positioning**	All of the criteria have been met **No advice on positio ning is needed**	
GRASPING/ ATTACHMEN T **There is a searching reflex; The mouth is open wide; The baby has successfully latched onto an adequate amount of the breast tissue; the baby is well attached throughout the feeding**	The baby is unable to attach to the beast or the attachment is inadequate None or very few of the criteria have been met **Needs to have a discussion about attachment**	Some of the criteria have been met **Some advice is needed about latching onto/attachment to the breast**	All of the criteria have been met **No advice in needed about latching on/attach ment**	
SUCKING **An effective cycle of sucking is achieved on**	There is no effective sucking; no sucking cycle	There is some effective sucking; no satisfying	An effective sucking	
both breasts (initially rapid sucking followed by slow sucking with pauses); **The infant ends the feeding**		sucking; the baby is on and off the breast	cycle is achieved	
SWALLOWING/GULPING **There is audible, regular soft swallowing.** **No clicking sounds**	No sound of swallowing/gulping. No sound of clicking	Intermittent sounds of swallowing/gulping. Some swallowing/gulping is noisy or accompanied by clicks	There is regularly audible, quiet swallowing/g ulping	

Fig. 1. The Bristol Breastfeeding Assessment Tool and its scoring.

3. **LATCH:** The LATCH Breastfeeding Assessment Tool was developed in 1993 by Deborah Jensen and Sheila Wallace. It contains five assessment criteria. The name of the instrument is an English acronym for: L-Latch (Latch on the breast); A-Audible (Audible swallowing); T-Type (Type of Nipple); C-Comfort (Comfort of Breast/Nipple); H-Hold/Help (the positioning of the baby). Each item is assessed on the basis of 0–2 points. The highest score to be obtained on the instrument is 10, and the higher the score, the more effective is the breastfeeding.

The validity and reliability study of the Turkish version of the scale was first carried out in 1997 by Demirhan and Pek as a Master's Thesis but since this was not published (Demirhan, 1997), a second validity and reliability study was conducted in 2003 by Yenal and Okumuş. The mother is observed during breastfeeding and evaluated in steps. The administration of the scale takes 5–10 minutes. The original version of the instrument had a Cronbach alpha coefficient of 0.93 whereas the Turkish adaptation had a coefficient of 0.95. The coefficient was 0.88 in our study.

Ethical considerations

Permission to use BBAT was obtained via email from its owner Jenny Ingram. Additionally, legal permission to conduct and implement the study was obtained from Istanbul University Cerrahpaşa Medical Faculty Ethics Committee (Permit No: **393811**).

Data analysis

A statistics expert performed the statistical analysis using the Number Cruncher Statistical System 2007 (Kaysville, Utah, USA) program. Means, standard deviation, frequencies, percentages were used as descriptive statistics in the analysis of the study data. In testing the validity of the scale, Kendall's W was used for assessing the agreement of the raters, Confirmatory Factor Analysis (CFA) was performed for construct validity, Kruskal Wallis analysis was employed for comparing known groups, and Pearson's correlation analysis for concurrent validity. Reliability of agreement between raters was tested with Kappa, intra-class correlation (ICC) and the Wilcoxon Signed Ranks test, ICC and McNemar analysis was performed to determine consistency over time. Item analysis was performed with Spearman's correlation analysis and Cronbach's alpha analysis was employed for internal consistency.

Findings

The age range of the mothers participating in the research (n = 127) was 19–45 years; mean age was 31.55 ± 5.34 years. Of the mothers, 52% (n = 66) were graduates of high school or schools of higher education, 30% (n = 38) were employed and 95.3% (n = 121) had social security. Among the mothers, 63.0% (n = 80) stated that their incomes equaled their expenditure.

Demographic characteristics

Table 1 displays the distribution of data on the mothers' smoking status, pregnancies and infants. Table 2 presents initial breastfeeding time and feeding status of babies.

Reliability and validity analysis of Scale

Validity study for BBAT in Turkish population

The language equivalence stage of the study was described in the methods section. In line with the recommendations of the experts,

Table 1
Distribution of data on smoking status, pregnancy, infants and previous children.

Smoking		
Smoking during pregnancy; *n (%)*	No	113 (89.0)
	Yes	14 (11.0)
Number of cigarettes smoked during pregnancy (n = 14)	*Min-Max (Median)*	1–12 (4.5)
	Mean ± SD	5.36 ± 3.00
Smoking while breastfeeding; *n (%)*	No	117 (92.1)
	Yes	10 (7.9)
Number of cigarettes smoked during breastfeeding (n = 10)	*Min-Max (Median)*	1–10 (4.5)
	Mean ± SD	4.70 ± 3.13
Distribution of data on pregnancy		
Total number of pregnancies	*Min- Max (Median)*	1–7 (2)
Primipara	*Mean ± SD*	2.49 ± 1.51
Multipara	1 pregnancy	39 (%30.7)
	2 pregnancies	38 (%29.9)
	3 pregnancies	23 (%18.1)
	≥4 pregnancies	27 (%21.3)
Mode of delivery; *n (%)*	Normal	31 (24.4)
	Cesarean section	96 (75.6)
Was the pregnancy wanted? *n (%)*	No	26 (20.5)
	Yes	101 (79.5)
Distribution of data on infant		
Birth weight (gr	*Min-Max (Median)*	2550–4400 (3230)
	Mean ± SD	3251.97 ± 409.39
Present weight (gr	*Min- Max (Median)*	2600–9100 (3850)
	Mean ± SD	4568.49 ± 1780.02
Infant's age in weeks	*Min- Max (Median)*	0.5–24 (2.5)
	Mean ± SD	6.52 ± 7.44
Gender; *n (%)*	Female	61 (48.0)
	Male	66 (52.0)

Table 2
Distribution of data on breastfeeding and ınfant feeding.

Time of First Breastfeeding; *n (%)*	In the first half-hour	5 (3.9)
	Within an hour	17 (13.4)
	After an hour	37 (29.1)
	After 2 hours	51 (40.2)
	1 week later	17 (13.4)
Initial feeding; *n (%)*	Breast milk	46 (36.2)
	Formula	81 (63.8)
Problem with breastfeeding; *n (%)*	No	86 (67.7)
	Yes	41 (32.3)
Breastfeeding problems (n = 41); *n (%)*	Sleep	4 (9.8)
	No latching onto the breast	28 (68.3)
	No milk	5 (12.2)
	Collapsed nipple	4 (9.8)
Breastfeeding education; *n (%)*	No	56 (44,1)
	Yes	71 (55,9)
Individuals who provided breastfeeding education (n = 71); *n (%)*	Nurse	67 (94,4)
	Midwife	4 (5,6)
Time of breastfeeding education (n = 71); *n (%)*	Before the birth	6 (8,5)
	After the birth	65 (91.5)
Sleeping in same room; *n (%)*	No	4 (3.1)
	Yes	123 (96.9)
Number of years planning to breastfeed	*Min-Max (Median)*	1–2.5 (2)
	Mean ± SD	2.00 ± 0.4
	1.0	11 (8.7)
	1.5	7 (5.5)
	2.0	81 (63.8)
	2.5	28 (22)
What the infant is being fed; *n (%)*	Exclusively breast milk	63 (49.6)
	Breast milk and sometimes formula	42 (33.1)
	Breast milk and complementary food	5 (3.9)
	Breast milk and formula	17 (13.4)
Experiencing problems at the breast; *n (%)*	No	86 (66.9)
	Yes	42 (33.1)
Breast problems related to breastfeeding (n = 42); *n (%)*	Nipple sores	37 (29.1)
	Sensitivity due to fullness	5 (3.9)
Using a pacifier; *n (%)*		49 (38.6)
Using a bottle; *n (%)*		68 (53.5)
Mothers' assessment of the infant's development; *n (%)*	Good	99 (78.0)
	Moderate	23 (18.1)
	Poor	5 (3.9)

Kendall's W Analysis Content Validity Index was computed as p = 0.835 and it was seen that the expert responses were in agreement.

Construct validity: Confirmatory factor analysis results

CFA was performed to test the adaptation of the Bristol Breastfeeding Assessment Tool into the Turkish language. To test the model, goodness of fit indexes and the chi-square continuity correction (^{2}א/df) test were applied to the dimensions established in the model. The values found can be seen in Table 3. The confirmatory factor analysis showed that the measures of RMSEA, NFI, NNFI, CFI, IFI, SRMR, GFI, AGFI and the ^{2}א/df value were at desired levels. Item-total correlation factor loadings (path coefficients) varied between .29- .86 (Fig. 2).

Comparison of known groups to test construct validity (testing the hypothesis)

In assessing the success of the mothers' breastfeeding, the Bristol Breastfeeding Assessment Tool mean score of the mothers who stated they had success was 6.75 ± 1.21, the mean score of those who claimed moderate success was 6.07 ± 1.47, and that of those who said they had a poor experience was 5.00 ± 1.55. The difference between groups was highly significant ($p < .01$, Table 4), and in the advanced analysis, the mean score of those who had achieved success in breastfeeding was significantly higher than the score of the others. The mothers who stated moderate success had a higher Bristol breastfeeding mean score than those who had a poor experience, but the difference was not significant. This is believed to be related to the small size of the sample.

Concurrent validity: Bristol and LATCH agreement

To evaluate the concurrent validity of the Bristol Breastfeeding Assessment Tool, its agreement with the LATCH scale was tested since this scale had previously been tested for concurrent validity and

Table 3
Fit criteria from the confirmatory factor analysis.

Fit Criteria	Good Fit	Acceptable Fit	Model results	Fit
RMSEA	0 < RMSEA < 0.05	0.05≤ RMSEA ≤0.10	0.071	Acceptable
NFI	0.95≤ NFI ≤1	0.90≤ NFI ≤0.95	0.98	Good Fit
NNFI	0.97≤ NNF ≤1	0.95≤ NNFI ≤0.97	0.98	Good Fit
CFI	0.97≤ CFI ≤1	0.95≤ CFI ≤0.97	0.99	Good Fit
IFI	0.97≤ IFI ≤1	0.95≤ IFI ≤0.97	0.99	Good Fit
SRMR	0≤ SRMR ≤0.05	0.05≤ SRMR ≤0.10	0.027	Good Fit
GFI	0.95 ≤GFI ≤1	0.90≤ GFI ≤0.95	0.99	Good Fit
AGFI	0.90≤ AGFI ≤1	0.85≤ AGF I≤0.90	0.94	Good Fit
RFI	0.90≤ RFI ≤1	0.85≤ RFI ≤0.90	0.95	Good Fit
$^{2}\chi$ /df	0 < $^{2}\chi$ /df < 3		1.63	Good Fit

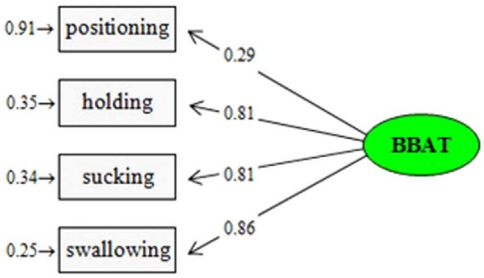

Fig. 2. Results of confirmatory factor analysis of the Bristol Breastfeeding Assessment Tool: Error variance and path Coefficients.

Table 4
Comparison of mean scores of infants on the Bristol Breastfeeding Assessment Tool according to problems experienced by mothers.

Breastfeeding success (as reported by mothers)	$\bar{x} \pm SS$	KW*	p
Good (n: 75)	6.75 ± 1.21		
Moderate (n: 46)	6.07 ± 1.47	11.888	.003
Poor (n: 6)	5.00 ± 1.55		Good > moderate, poor

* KW: Kruskal Wallis testi, df: 2, post hoc: Bonferroni düzeltmeli Mann Whitney U.

considered valid and reliable. A statistically positive and very strongly significant correlation was found between the scores of the two breastfeeding scales (Pearson r = .76 p = .000). The LATCH scores of the infants increased as their scores on the Bristol Breastfeeding Assessment Tool increased.

Results of the reliability analysis

Inter-rater agreement

In the Turkish adaptation of the Bristol Breastfeeding Assessment Tool, inter-rater consistency was evaluated with Kappa analysis and it was found that there was strongly significant agreement between the two raters in terms of the first (positioning), second (latching) and third (sucking) criteria and a significant agreement in terms of the fourth (swallowing) criterion ($p < .001$, Table 5).

Consistency over time analysis

While the Bristol Breastfeeding Assessment mean score for the 1st Observer was 6.38 ± 1.53, this was 6.24 ± 1.58 for the 2nd observer. In the reliability analysis of the evaluation of whether there was consistency over time, it was found that there was no statistically significant difference between the mean scores in the first observation and the second observation (retest) made in the subsequent breastfeeding ($p > .05$, Table 6).

To evaluate the agreement between the assessment scores of the first and second (retest) observations, it was also seen through an examination of the Intraclass Correlation Coefficient (two-way random effect, consistency model) that there was agreement (ICC: .89, $p < 0.001$).

Table 5
Interrater agreement on Bristol Breastfeeding Assessment Tool items (*n*: 127).

First observation Assessment	Second Observation Assessment			Test
	Moderate *n* (%)	**Good *n* (%)**	**Total *n* (%)**	
Positioning/holding				
Moderate	89 (70.0)	3 (2.4)	92 (72.4)	*Kappa:* .70
Good	11 (8.7)	24 (18.9)	35 (27.6)	*p: .000*
Total	100 (78.7)	27 (21.3)	127 (100.0)	
Attachment/latching				
Moderate	36 (28.3)	8 (6.3)	44 (34.6)	*Kappa:* .66
Good	12 (9.4)	71 (55.9)	83 (65.4)	*p: .000*
Total	48 (37.8)	79 (62.2)	127 (100.0)	
Sucking				
Moderate	28 (22.0)	9 (7.1)	37 (29.1)	*Kappa:* .65
Good	7 (5.5)	83 (65.4)	90 (70.9)	*p: .000*
Total	35 (27.6)	92 (72.4)	127 (100.0)	
Swallowing				
Moderate	24 (18.9)	4 (3.1)	28 (22.0)	*Kappa:* .59
Good	17 (13.4)	82 (64.6)	99 (78.0)	*p: .000*
Total	41 (32.3)	86 (67.7)	127 (100.0)	

Item analysis

In the item-total score correlation analysis (Spearman's correlation) of the Bristol Breastfeeding Assessment Tool (positioning/holding, attachment/latching, sucking and swallowing), a positive and strongly significant relationship was found between the reliability coefficients ($r = .66$ - $.83$) ($p < .001$, Table 7).

In the analysis to test the Bristol Breastfeeding Assessment Tool's internal consistency, which is one of the indicators of reliability, Cronbach's alpha reliability coefficient was found to be $\propto = .77$.

Discussion

The results of the psychometric study are consistent with the original study (Ingram et al., 2015) and provide evidence that the Turkish version of the BBAT can be a valid and reliable instrument. This study provides further evidence for the international applicability of BBAT.The study discusses the data in terms of validity and reliability but does not treat demographic characteristics (Tables 1 and 2).

Table 6
Comparison and correlations of Bristol Breastfeeding Assessment Tool test- retest mean scores (*n* = 21).

Bristol Breastfeeding Assessment Tool	$\bar{x} \pm SD$	t*	p	ICC†	p
First observation	6.38 ± 1.53	1.142	.267	.89	.000
Second observation (Retest)	6.24 ± 1.58				

* Wilcoxon analysis: df: 20.
† Intraclass correlation.

Table 7
Means and item-total correlations of the Bristol Breastfeeding Assessment Tool (*n*: 127).

Tool Items	$\bar{x} \pm SD$	Item-Total Correlation Coefficients		When item is removed α
		r_s	*p*	
Positioning/holding	1.28 ± .45	.66	.000	.87
Attachment/latching	1.65 ± .48	.83	.000	.65
Sucking	1.71 ± .46	.76	.000	.68
Swallowing	1.78 ± .42	.75	.000	.64
Total Score (α = .77)	**6.42 ± 1.39**	–	–	

r_s:Spearman's correlation analysis.

Validity study for the assessment tool

Reliability studies, which are defined as a means of proving that an assessment tool actually assesses the intended construct under study, are conducted on the basis of three elements: content, criteria and construct (Güngör, 2016). BBAT was reviewed for content validity by faculty members specialized in the field. The experts studied the statements mainly for clarity, fluency, correct usage of the language, spelling and comprehensibility and with regard to whether or not all the items were related to the intended construct under study. The Kendal W analysis results showed that there were no significant differences between the views of the experts, indicating content validity (Brown, 2000; Güngör, 2016).

The confirmatory factor analysis (Table 3 and Fig. 2) performed for construct validity showed that the RMSEA, NFI, NNFI, CFI, IFI, SRMR, GFI, AGFI agreement values and the ^{2}א value were at the intended levels. Since the factor loadings (path coefficients) of the items in the instrument were between .29 - .86 and the loadings were sufficient, and in the case of the first item, which was borderline, the other validity and reliability values were good, this first item was not removed from the tool but left as in the original. Accordingly, because the goodness of fit measurements showed good and acceptable fit, and also since the adjusted chi-squared value was a good fit, our data fit the model well and thus the model proved to be statistically both significant and valid (Harrington, 2009).

The procedure of comparing the scale measurement with the characteristics of the element intended to be measured in order to determine whether there is a correlation between them is described as concurrent validity. This is done to determine whether the assessment has accurately estimated what was predicted. In terms of concurrent validity, the fact that the mothers' assessments of their breastfeeding experiences were consistent with their scores on the BBAT Turkish version validates the scale (Table 4).

To evaluate the concurrent validity of the Bristol Breastfeeding Assessment Tool, its agreement with the LATCH scale for concurrent/criteria validity was tested since this scale had previously been tested and proved valid and reliable. The strong relationship between the Bristol Breastfeeding Assessment Tool and LATCH scores showed that there was agreement and that this new Turkish version of the instrument could validly measure the intended construct (Drost, 2011).

Results of the reliability analysis

One of the requirements an assessment tool must fulfill is reliability, which is an indication of the consistency of the performance of an instrument in repeated measures attempted under the same conditions (Ercan and Kan, 2004). In the Turkish adaptation of the Bristol Breastfeeding Assessment Tool, inter-rater consistency was evaluated with Kappa analysis and it was found that there was strongly significant agreement between the two raters in terms of the first (positioning), second (latching) and third (sucking) elements and a moderately significant agreement in terms of the fourth (swallowing) element. Cronbach's alpha and similar coefficients are used for constantly changing variables since these coefficients are based on correlations. Different methods have been developed for ascertaining the reliability of nominal categorical scales. These methods generally deal with the consistency between expert judgments. In this case, reliability is generally explored with what is known as the Kappa statistic (Kılıç, 2015). In our study, the results of a Kappa analysis were used to test inter- rater agreement (Table 5). Agreement between observers (Table 6) indicates that a measurement tool is reliable.

In measuring the reliability of a tool, the expectation is that there is no difference between two repeated measures when the instrument is used more than once (Ercan and Kan, 2004). In the reliability analysis of the evaluation of whether there was consistency over time, it was found that there was no statistically significant difference between the mean scores in the first observation and the second observation (retest) made in the subsequent breastfeeding (Table 6), which indicated that the instrument made a consistent and reliable measurement.

Item analysis involved testing to see whether the items matched the construct of the breastfeeding assessment (Erkuş, 2007). The reliability of BBAT Turkish in the item analysis was also found to be at a significantly high level (Table 7).

When the psychometric characteristics of the Turkish version of BBAT are considered, it can be concluded that the instrument is a reliable and valid tool of measurement that can be used by midwives and nurses to assess breastfeeding practices.

Research limitations

The limitations of the study were the fact that it was carried out by two pediatric nurses among the patient population of a single university and that its effectiveness in the case of tongue-tied infants was not evaluated.

Conclusions and recommendations

The Turkish version of the Bristol Breastfeeding Assessment Tool was found to be highly valid and reliable. The study makes a significant contribution to the objective evaluation of breastfeeding by providing a second assessment tool for use in the Turkish population. The instrument should be used in different sociodemographic groups, with newborns having sucking difficulties due to tongue-tie, and in different hospitals.

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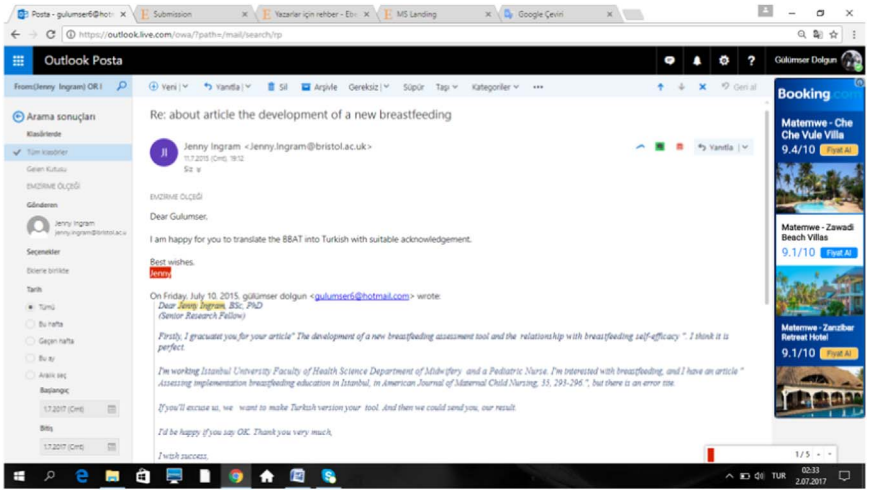
The authors declare no conflicts of interest.Author statement

This manuscript or a very similar manuscript has not been published, nor is under consideration by any other journal.Confirmed



We have seen and approved the final, submitted version of this manuscript. Additionally, we confirm that all authors have substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data.

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