

## Psychometric Properties of Breastfeeding Attrition Prediction Tool (BAPT): A Systematic Review

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### Abstract

#### Background

It is necessary to identify women who discontinue the breastfeeding to achieve the purpose of increasing the length of breastfeeding. To this end, Breastfeeding Attrition Prediction Tool (BAPT) has been developed. The current systematic review aimed to comprehensively review the validity and reliability of BAPT scale with different versions to give comprehensive information for authorities in this field.

#### Materials and Methods

Three English databases including Medline (via PubMed), Scopus, and Cochran library until May 2018 with no date restriction were searched. The search strategy was developed based on main terms of (Breastfeeding Attrition Prediction Tool OR BAPT) AND (Reliability OR validity OR Psychometrics OR Factor Analysis). Two reviewers separately extracted the required data available in full-text of all the quality of related studies was investigated using COSMIN checklist.

#### Results

All Cronbach alpha coefficient (both overall and subscale) were in excess of 0.7 except for subscale "NBS" in American version and subscale PBS in Persian version. In term of discriminant and predictive validity, BAPT revealed a good ability to classify women with or without breastfeeding. BAPT predicted breastfeeding status at postpartum period but it was not able to predict breastfeeding status in the third trimester of pregnancy. In term construct validity, four-factor solution of original English version was confirmed in Turkish, Persian and English other version.

#### Conclusion

Overall, the findings of systematic review supported that BAPT may be a valid (content, predictive and construct validity), and reliable (internal consistency and re-test reliability) instrument to use in both researches and clinics to identify mothers who are at risk of breastfeeding stop.

**Key Words:** Breastfeeding attrition prediction tool, Psychometric, Systematic review, Questionnaire.

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## 1- INTRODUCTION

Breast milk is considered to be a reliable support for infant health because of its most valuable nutritional importance for the infants, highlighting the significance of exclusive breastfeeding (1-7). Also, breastfeeding have advantages for physical and mental both mothers and infants mothers (8-10). Evidence has shown that there are numerous positive outcomes in breastfeeding, including low infant mortality and high intelligence quotient, high-quality infant growth and development and subsequently health in adulthood (11-13). The World Health Organization (WHO), and the United Nations Children's Fund (UNICEF) declared a statement that expresses each child requires the exclusive breastfeeding by six months and continued up to two years of old or more (1). Decrease in breastfeeding rate is very concerning. Breastfeeding rate for the first 6 months was found to be only 38% in some studies (14). It is necessary to identify women who discontinue the breastfeeding in the early postpartum period to achieve the purpose of increasing the length of breastfeeding.

To this end, various detection tools have been developed to screen such mothers at risk for early breastfeeding discontinuation; among which, Janke (1992, 1994) made and tested the Breastfeeding Attrition Prediction Tool (BAPT) to detect those at risk for early attrition. Exploratory factor analysis confirmed the four subscales for BAPT; these include, Negative BreastfeedingSentiment (NBS), Social and Professional Support (SPS), Positive BreastfeedingSentiment (PBS), and Control (15). Psychometrics properties of BAPT was examined in three countries; Turkey (16), Iran (17), and in the USA (15, 18, 19). In order to support interventions for increasing the duration of breastfeeding and identifying women at

risk to stop breastfeeding, the current systematic review aimed to comprehensively review the validity and reliability of BAPT scale with different versions to give comprehensive information for authorities in this field.

## 2- MATERIALS AND METHODS

### 2-1. Method

The review strategy was to search articles evaluating the psychometric characteristics of Breastfeeding Attrition Prediction Tool (BAPT) in English language. Following three English databases were searched. These are including Medline (via PubMed), Scopus, and Cochran library until May 2018 with no date. The searched articles were reviewed for bibliography to detect the studies not retrieved through the electronic databases. The applied keywords were: (Breastfeeding Attrition Prediction Tool OR BAPT) AND (Reliability OR validity OR Psychometrics OR Factor Analysis).

### 2-2. Data extraction

Two reviewers separately extracted the required data available in full-text of all related articles using standardized data extraction form, including name of first author, location of study, age of participants, date of study, type of study, sample size, study population, timing administration of test and setting (**Table.1**).

### 2-3. Quality assessment

The quality of related studies was investigated using COSMIN checklist, including internal consistency, reliability, measurement error, content validity, structure validity, and hypothesis testing, cross cultural, criterion, responsiveness, interpretability and generalizability (**Table.1**) (20).

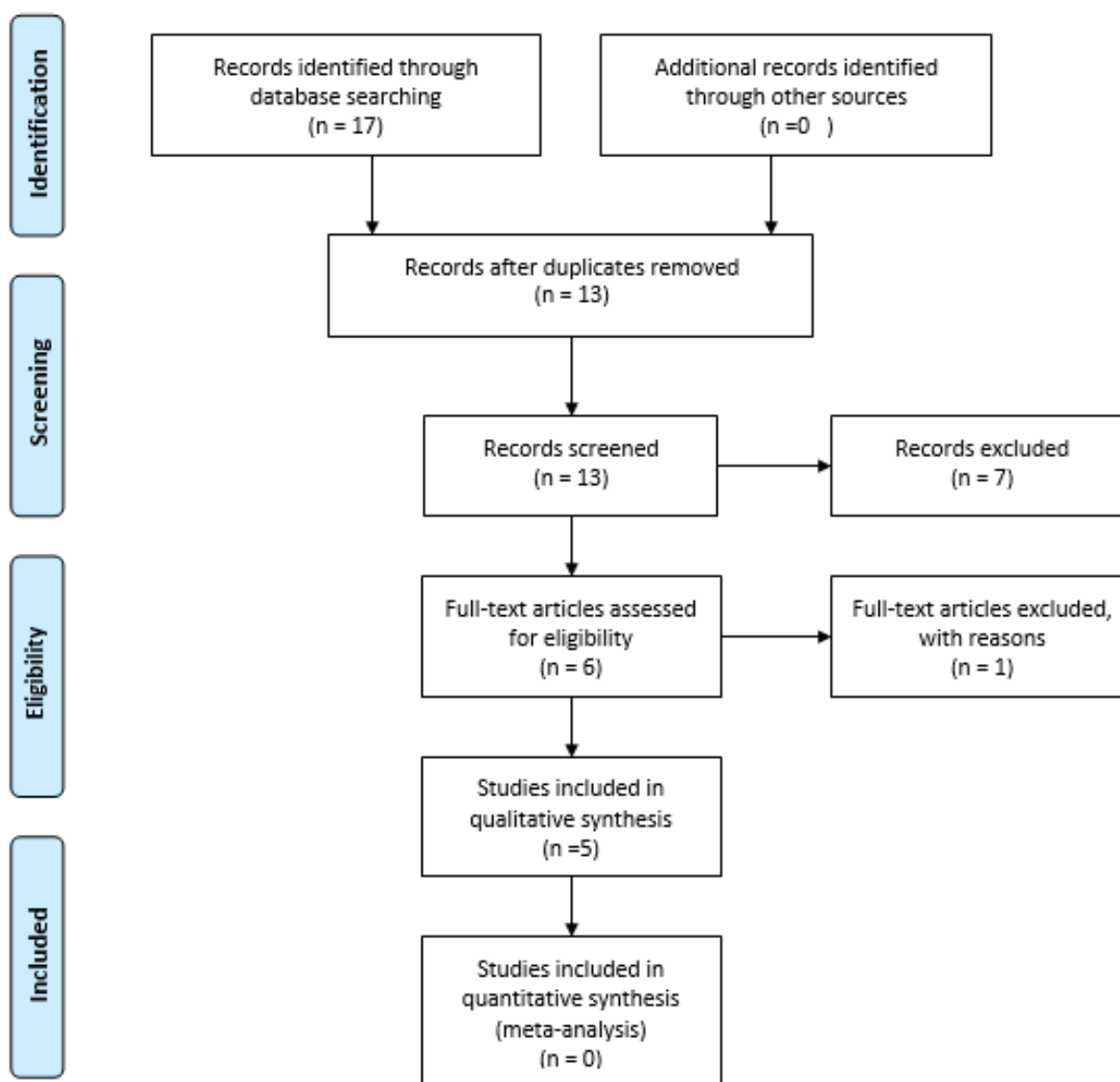
### 2-4. Inclusion and exclusion criteria

Studies were included if their primary aim of studies were to assess the psychometric characteristics of Breastfeeding Attrition Prediction Tool (BAPT). Also, studies were excluded if questionnaire was only assessed using Item Response Theory (IRT).

### 3- RESULTS

Seventeen studies were identified using three English database searching; 13 studies remained after duplicates removed;

7 out of 13 studies were excluded after screening title and abstract; and 6 full-text were examined for eligibility. One study was excluded because questionnaire was only assessed using Item Response Theory (IRT). Finally, 5 studies included in qualitative synthesis. **Figure.1** shows process of selection of included studies into systematic review. **Table.1** shows the baseline characteristics of 5 studies included into systematic review (*pleas see the table at the end of paper*).



**Fig.1:** PRISMA flowchart of present study.

### 3-1. Validity

Validity were assessed using content validity, construct validity (exploratory factor analysis and confirmatory factor analysis) and Criterion validity

#### 3-1-1. Content validity

In Persian version responses of 10 experts were calculated using the Content Validity Ratio (CVR), and Content validity index (CVI). Based on Lawshe table, CVR should be equal or more than 0.62 for 10 expert. In Persian version, CVR was 0.63 to 1, which consider in normal range according to Lawshe table with exception of four items of SPS (CVR < 0.62). Three items were removed from scale (La Leche League, a pediatrician, and a childbirth educator), and one item was changed; because in Iran, health center's personnel teach to women how to breastfeeding during pregnancy, in term "hospital nurse" was changed to health center's personnel (17). In Turkish version, validity content was assessed using CVI; CVI for each item was assessed by academic professors and ranged from 0.6 to 1. Total CVI was 0.99. Interclass coefficient correlation (ICC) was tested to assess an agreement among the expert that was 0.77. Two items was removed from SPS subscale due to have lower value than acceptable limitations (0.8-1). These items were La Leche league and Childbirth Educator (16).

#### 3-1-3. Factorial analysis

Prediction of Brestfeeding Attrition was developed by Janke et al. in 1992 (15). The exploratory factor analysis (EFA) was conducted using principal component analysis (PCA) with varimax rotation. The Scree plot was performed on attitude-related items. A three-factor solution accounted 35% of the variance total. The lowest and highest factor loading was 0.40 and 0.69, respectively. These factors called negative breast-feeding sentiment (NBS), negative formula breastfeeding sentiment

(NFS), and positive breastfeeding sentiment (PBS). In control item, the scree plot supported a single-factor solution with eight items. This factor labeled breast-feeding (BFC). These factors explained 41.3 of the variance. One item conceptually did not fit to questionnaire. In subjective norm related items, factor analysis items, two factors were identified. These factors explained 58% of total variances. The first factor related to source of professional support (PS). Factor loading of PS ranged from 0.52 to 0.87. The second factor represent subjective norm such as mother, sister, mother-in low, baby's father and friend. Factor loading of the second factor ranged from 0.51 to 0.78 (15).

In Turkish version (14), the Kaiser-Meyer-Olkin coefficient was 0.88, which showing adequacy of sample size and Bartlett test was significant ( $\chi^2 = 1516.47$ ,  $P < 0.001$ ), suggesting correlation among items is suitable to perform a factor analysis. Exploratory factor analysis (EFA) was conducted on 49 items (2 items was removed). The first three eigenvalues for SPS, PBS, and BFC was 9.3, 4.9, 3.7, accounting 13.2%, 9.8%, 9.7% of total variance, respectively. Last factor, NBS accounted 9.2% of variances. Last factor, NBS, accounted 9.2% of variances. These four factors accounted 42% of total variances. EFA followed by confirmatory Factor analysis (CFA). Factor loads for BPC subscale ranged from 0.61 to 0.72, from 0.33 to 0.65 for NBS subscale, 0.27 to 0.76 for PBS, and from 0.48 to 0.90 for SPS subscale. Chi-square to degrees of freedom ratio ( $\chi^2/df$ ) was 0.26, which showing a suitable fit. Also, Root mean squared error of approximation (RMSEA=0.000), and Normed fit index (NFI=0.9), Comparative fit index (CFI=1), Non-normed fit index (NNFI=1.64), showed a suitable fit. However, some fit indices Goodness of fit index (GFI=0.8) were not satisfactory (16).

In Persian version (17), EFA conducted on 49 items. The Kaiser-Meyer-Olkin (KMO) coefficient was 0.822 and Bartlett test for sphericity was significant ( $P < 0.001$ ). Data extraction method was Principal component analysis (PCA) with varimax rotation. Software was set to extract four factors as proposed by original version. The four factors were identified as same as original version. These factors explained 35.27% of the variance. EFA followed by factor analysis. Four factors model was satisfactory fit to the data. Factor loads for BPC subscale ranged from 0.31 to 0.79, from 0.27 to 0.74 for NBS subscale and from 0.23 to 0.6 for PBS (17).

In second American version (18), KMO was 0.75. EFA conducted on 49 items and yield a four-factor solution. These four factors explained 39% of the total the variances. All items correctly loaded on the proposed control factor (BFC) of the original scale with exception item "there is nothing that will stop me from breastfeeding". This item was not loaded on any another. This factor was removed from scale. Item "baby's father" showed a low factor loading (0.36) on second factor (SPS). However, the item was not deleted due to concern about poor validity of scale in future research work. Items on the third and fourth factors was correctly loaded. Authors decided to conduct a secondary factor analysis was analysis was conducted "to further clarify the factors within PBS and NBS". A two-factor model was identified that explained 38 of total variances; 13 items loaded on the first factors except for item "easy to tell how much baby gets" that was deleted. Also item "fussy baby" was deleted from the second factor (16).

### 3-1-4. discriminate women

In Persian version, mean of BFC was difference between women with and without breastfeeding ( $p < 0.001$ ) (17).

### 3-1-5. Predictive validity

In Persian version, women with exclusive breastfeeding than women without exclusive breastfeeding had higher total score of BAPT and the BFC at 20 weeks of postpartum (17). In Turkish version, among four subscales of BAPT only mean score of PBS and SPS were significantly difference among mother with exclusive breastfeeding ( $n=296$ ) compared to theses with bottle-feeding ( $n=31$ ) at eight weeks of postpartum (16). In original version, two factors were identified in subjective norm related items. There were: "sources of professional support (PS)", and FFS (mother, sister, Baby's father, mother-in law and friend). Findings of t- test showed only (FFS but not PS) was associated with feeding method at 6 and 16 weeks (15). Predictive validity was measured a stepwise discriminant function and showed that only two subscale NBS and control correctly predicted breastfeeding status in 66% of cases at eight weeks (18). In third American version, none of four subscale was not able to significantly predict breastfeeding status when administrated in the third trimester of pregnancy and in post-partum period (19).

### 3-2. Reliability

In original American version, the Cronbach alpha was 0.75 for NBS, 0.73 for NFS and 0.70 for PBS, and 0.75 for BFC (15). In Turkish version, the cronbach alpha was 0.88 for overall scale. Cronbach alpha for subscale was 0.80 for PBS, 0.82 for NBS, 0.92 for SPS, and 0.87 for BFC, which considered moderate to excellence reliability (16). In Persian versions, the Cronbach alpha was 0.77 for whole scale. The cronbach alpha for subscale was in a range from 0.65 to 0.86. The item-subscale correlation was assessed. Six item had a correlation  $< 0.3$ . However, items were not deleted (17). In second American version, the Cronbach alpha was calculated for both original and modified version (after deleting three items), reliability scale was increased after deleting three items. In

modified version, the cronbach alpha of modified version was ranged from 0.76 to 0.86 (18). In third American version, in a sample of woman in the third trimester of pregnancy, the cronbach alpha was 0.845 for PBS, 0.673 for NBS, 0.753 for SPS and 0.868 for BFC. The Cronbach alpha was 0.840 for PBS, 0.831 for NBS, 0.815 for SPS, and 0.875 for BFC in a sample of postpartum women. Test-retest reliability was measured using paired t-test. There was not any significant difference between two administrations (third trimester of pregnancy and post-partum) (19).

#### 4- DISCUSSION

The beneficial effects of breastfeeding have been well documented for both mothers and infants. Some of advantages for breast milk are available, free of charge and free of bacterial contamination decreasing low birth weight and infant mortality (14). To our knowledge, this is the first systematic review to assess psychometric properties of BAPT. We aimed to provide comprehensive information to health provider and researcher about validity and reliability of BAPT versions used in three different countries USA, Iran, and Turkey.

In Janke et al.'s study, a four-factor solution was identified and cronbach alpha was 0.75 for NBS, 0.73 for NFS and 0.70 for PBS, 0.75 for BFC (15). In Karayağiz Muslu et al.'s study, four-factor accounted 42% of total variances. Cronbach alpha was 0.88 for overall scale (16). In Dick et al.'s study, these four factors explained 39% of the total the variances. Cronbach alpha of modified version was ranged from 0.76 to 0.86 (18). In Evans et al.'s study, none of four-subscale was not able to significantly predict breastfeeding status when administrated in the third trimester of pregnancy and in post-partum period (19). All cronbach alpha coefficient (both overall and subscale) were in excess of 0.7

except for subscale "NBS" in American version (19), and subscale PBS in Persian version (17). Also, of five studies that were assessed, one study by Evans et al. (19), reported reliability using test-retest. According to COSMIN checklist, retest-test reliability should be assessed using ICC while it was assessed by paired t-test. In American version, any significant difference were not between two administrations (the third trimester of pregnancy and post-partum) according to paired t-test. This finding showed that attitude to breastfeeding did not change between the third trimester of pregnancy and post-partum (19).

In prior studies by Dick et al. (18), and Janke (15), BAPT predicted breastfeeding status at postpartum period. In contrast to above studies, none of four subscales were not able to significantly predict breastfeeding status when administrated in the third trimester of pregnancy and in post-partum period (19). Of five studies included into systematic review, four studies reported construct validity. construct validity was confirmed by factor analysis. The first factor analysis was conducted on Prediction of Brest-feeding Attrition tool developed by Janke in 1992 in America (15).

According to the scree plot, three factors were identified on attitude-related items. These factors called negative breast-feeding sentiment (NBS), negative formula breast-feeding sentiment (NFS), positive breast-feeding sentiment (PBS). One factor solution was identified in control-related item. Two factors identified in subjective-related items (15). In Turkish version of BAPT, EFA was conducted on 49 items identified four factors. These four factors accounted 42% of the total variances. CFA also showed a suitable fit to the data (16). In Persian version, EFA conducted on 49 items. Software was set to extract four factors as proposed by original version. The four factors were identified as same as

original version. These factors explained 35.27% of the variance. EFA followed by factor analysis. Four factors model was satisfactory fit to the data (17). In second American version, EFA conducted on 46 items and yield a four- factor solution. These four factors explained 38% of total the variances (18). Overall total variance ranged from 0.38 to 42% that considered low.

#### 4-1. Limitation

Results of previous studies (15, 17-19, 21) may be affected by response biases, because self-report instrument of BAPT used in studies. Mortazavi et al.'s study (17) in Iran in which researcher team was concerned due to high number of questions in BAPT and demographic questionnaire, women would answer with low accuracy and precision, therefore it was asked from women to complete questionnaire at home. The BAPT take almost 15-minute time to complete. In one hand, something it is difficult to complete BAPT questionnaire a busy postpartum unit. In others hand, shortening the instrument may effect on psychometric properties, however, deleting some of items from American version improved its reliability while instrument adequately predicted breastfeeding stop. Only three version of TBAT (American, Persian and Turkish) was detected. Psychometric properties of BAPT should be measured in other version. Methodological quality of studies was poor to fair according to COSMIN checklist. Therefore, future study should be designed. According to this checklist. The modified BAPT may be a valid and reliable instrument to use both research and clinic to identify breastfeeding mothers who are at risk of breastfeeding stop.

#### 5- CONCLUSIONS

Four factors were identified in Turkish, Persian and English version. Overall, the

findings of systematic review supported that BAPT may be a valid (content, predictive and construct validity), and reliable (internal consistency and re-test reliability) instrument to use in both researches and clinics to identify mothers who are at risk of breastfeeding stop.

**6- CONFLICT OF INTEREST:** None.

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**Table-1:** The characteristic and quality of five studies included into systematic review.

Authors, Reference, Year, Area of study	Age, year	Sample size	Study population	Setting	Type of studies	Timing administration of test	Outcomes	A	B	C	D	E	F	G	H	I	J	K
Janke, References (13), 1992, USA	28	6 weeks n=228 6 weeks n=211	Women postpartum	Unclear	Methodologic study	At 6 and 16 weeks	Cronbach's alpha was .75 for NBS, .73 for NFS and .70 for PBS, .75 for BF. A four-factor solution accounted 35% of the variance total.	2			3	3						
Karayağiz Muslu et al., References (14) 2011, Turkey	27.03 ±5.90	Sampling method not mentioned/ n=490	Pregnant women	Multi central	Not mentioned	The third trimester of pregnancy	Cronbach's alpha was 0.88 for overall scale four factor accounted 42% of total variances.	2			3	4	1	3			2	2
Mortazavi et al., References (15) 2015, Iran	26.17 ± 4.4.	Convenience sampling/n=369	Pregnant women	Multi central	Longitudinal study	Gestational age >28	These factors explained 35.27% of the variance. Cronbach's alpha was 0.77 for whole scale.	2			3	4	0	2	2		2	2
Dick et al., References (16) 2004, USA	< 15	Not mention/ sample size n=269	Postpartum women	Multi central	-	Postpartum	These four factors explained 39% of the total the variances. Cronbach's alpha of modified version was ranged from 0.76 to 0.86.	2				4						1
Evans, References (17) 2004, USA	57 (49%) in the 27- to 30	Not mention/ Third trimester pregnancy n =141 Postpartum n=121	Pregnancy women and postpartum women	Single center	Longitudinal study	Trimester pregnancy / Postpartum	Cronbach's alpha was 0.845 for PBS, 0.673 for NBS, 0.753 for SPS and 0.868 for BFC. none of four subscale was not able to significantly predict breastfeeding status when administrated in the third trimester of pregnancy and in post-partum period.	2							2		2	1

Empty boxes=not applicable, 0=poor, 1=good, 2= fair, 3=good and 4=excellent. A: Internal consistency; B: Reliability; C: Measurement error; D: Content validity; E: Structural validity, F: Hypothesis testing; G: Cross cultural; H: Criterion; I: responsiveness; J: Interpretability; K: Generalizability; NFS: Negative formula breastfeeding sentiment; PBS: Positive breastfeeding sentiment; BF: Breast-feeding; NBS: Negative breastfeeding sentiment; SPS, Social and professional support.