Factorial Structures of Postpartum Bonding Questionnaire (PBQ): A Systematic Review

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Abstract

Background
Postpartum Bonding Questionnaire (PBQ) is a remarkable tool to assess impairments in the mother-infant bonding. The purpose of the present study was to review the factorial structure of the PBQ cross different versions.

Materials and Methods
The search strategy was implemented on databases of Medline (via PubMed), Scopus, Cochran library and Web of Science through electronic databases. The quality assessment was fulfilled by COSMIN checklist.

Results: The four factors were identified in original English version of PBQ. Theses consisted of "impaired bounding", "rejection and anger", "anxiety about care of the baby", and "risk of abuse". Three-factor-solution was confirmed by other English versions. In the Italian version of PBQ, three factors emerged including "annoyance and anger toward the infant", "detachment and rejection" and "anxiety about infant care". In the Spanish version of the PBQ, four factors including "impaired bonding", "anxiety about care", "lack of enjoyment and affection for the baby", and "rejection and risk of abuse". Three studies assessed factorial structure of Japanese version of PBQ. In the first Japanese version, four factors with 14 items were emerged including "impaired bonding ", "rejection and anger" and "anxiety about care", and "lack of affection". In second adapted Japanese version, exploratory factor analysis (EFA) identified a three factor solution: "mother's annoyance with anger toward their baby", "lack of affection" and" rejection and fear". The third version identified one-single solution. In the German version, one single factor emerged that explained 31 of the total variance.

Conclusion
Original English version of PBQ was not confirmed in Japanese, Italian, Spanish and other English versions.

Key Words: Factor Analysis, Postpartum Bonding Questionnaire, Systematic review.

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1- INTRODUCTION

The mother-infant bonding has been shown to be of the active postpartum procedures (1). According to the observations, some mothers after giving birth are unable to bonding with their babies. Mother's feeling of indifference after giving birth for the first time with their newborns has been reported to be about 40%, while first time hugging and even failing to feel pleasure in the interaction of mother with her infant has been estimated at 3% (2). The mother-infant bonding is related to the emotional dimension of the mother and infant relationship, and has a biological basis. This bonding is formed during pregnancy and is vital for the infancy cognitive development. Many experts have identified mother-infant bonding as an adaptive and biocompatible mechanism (3). Reportedly, the survival chance of newborns might be elevated as a result of true mother-infant bonding (4, 5). Such a relationship between mother and infant start during pregnancy and will be more concrete after giving birth (6).

The disruption of postpartum mother-infant interactions affects infant's socio-emotional, behavioral, and cognitive development, and is associated with complications including growth failure, psychosocial disorder, separation anxiety disorder, avoidant personality disorder, delinquency, educational problems or borderline mental disability (1, 7). Various factors may impair mother-infant bonding, including factors related to infant (post term birth, preterm, physical problems and restlessness of infant), and factors related to the parents, especially the mother (attachment style, unwanted pregnancy social support network, miscarriage history physical disorder, depression, postpartum stress, depression and anxiety and other mental problems of mother (3, 8-11). Several questionnaires have been designed and developed to assess maternal bonding in both pregnancy and postpartum such as Postpartum Bonding Questionnaire (PBQ)(12). The Maternal Antenatal Attachment Scale (MAAS) (13) (Condon 1993), and the Mother-Infant Bonding Questionnaire (MIBQ) (14). Researchers are more willing to use PBQ among existing tools. This reliable, validated tool is widely used in a number of countries for identifying problems in the mother-infant relationship during the postpartum period. The PBQ has been constructed for the postpartum period, the MAAS for the mother-infant attachment during pregnancy, the MIBQ for both pregnancy and postpartum periods (15). The PBQ was constructed by Brockington et al. in 2001 for the early detection of mother-infant bonding, which consists of four subscales "impaired mother-infant bonding", "rejection and anger", "anxiety about care", and the "risk of abuse". These questions are rated on a 6-point Likert scale ranging from 0 (always) to 5 (never) (12). PBQ is a valid and sensitive instrument to screen infant-mother disorder.

However factorial structure is controversial. None of the studies confirmed original factorial structure is four-factor solution. Three studies identified four-factor solution (1, 12, 16), but their factors composition and meaning partially overlapped the original version. There were two studies with three-factor solution (6, 17, 18), and two with single-factor solution (2, 19). The purpose of the present study was to review the factorial structure of the PBQ to provide comprehensive information to health providers' crossover world.

2- MATERIALS AND METHODS

2-1. Method

This systematic review covered all trials predominantly assessing psychometric features (factor structure) of the PBQ. The search strategy was implemented on

databases of Medline (via PubMed), Scopus, Cochran library and Web of Science by keywords: (Postpartum Bonding Questionnaire OR PBQ) AND (Reliability OR Validity OR Psychometrics OR Positive Predictive Value OR Negative Predictive Value OR Valid OR Sensitivity OR Specificity OR Factor Analysis OR EFA OR CFA OR Confirmatory Factor Analysis OR Exploratory Factor Analysis), without any language and date restrictions. The articles were analyzed to detect non-retrieval through electronic databases.

2-2. Data extraction

Two separate reviewers selected relevant articles by studying all searched abstracts, followed by reviewing the relevant full text in detail to extract required data using standardized data extraction form (**Table.1**). The quality assessment was fulfilled by COSMIN checklist (20), including internal consistency, reliability, and measurement error, content validity, and structure validity, hypothesis testing, cross cultural, criterion, responsiveness, interpretability and generalizability. However, in this study, we only reported 7 structure validity including seven items (**Table.2**).

3- RESULTS

Eight studies included into systematic reviews. Characteristic of eight studies shown in **Table.1**. **Figure.1** display how studies were selected to be included in systematic review. English original version was conducted by Brockington et al. (12) in 2001 in England. They conducted an exploratory factor analysis (EFA) on an 84- item questionnaire in a sample of 104 normal or depressed women with normal bonding or bonding disorder. Four factors with 25 items were found. Principal component analysis (PCA) explained 50% of total variance. Factor one was called "impaired bonding and explained 34% of the variance", factor two was labeled

"rejection and anger", and explained 8% of the variance, factor three explained 3.7% of the variance, and was called "anxiety about care of the baby", and the last factor accounted for 3.4% of the variance, and was named "risk of abuse". In another English version, Wittkowski et al. (17), conducted both EFA, and Confirmatory factor analysis (CFA). The finding of three and four factor-solution was not appropriately fitted with data. Value for three-factor solution after deleting two items related to factor "abuse" was good (Chi square $(X2) = 1,326.37$, degrees of freedom (df)=230, p<0.001. The Root Mean Square Error of Approximation (RMSEA) = 0.19).

However, other indications were lower acceptable value (goodness of fit index (GFI) =0 .57, CFA=0.57, adjusted goodness of fit index (AGFI) =0.45, and standardized root mean square residual (SRMR) = 0.65). EFA assessed three and four factors solution. Three- factor solution was considered as the most stable solution. The first three eigenvalues were 11.26, 2.04, and 1.42 explained 51.18%, 9.26%, and 6.48%, respectively. Three factors emerged including "impaired bonding", "anxiety and irritability", and "anxiety about child care responsibility".

Busonera et al. (6) conducted an explanatory factor analysis through PCA with oblique rotation method on a sample of 123 pregnant Italian women. Three factors were identified based on the scree plot. The first three eigenvalues were 8.69, 2.78, and 1.89, accounting for 53% of total variance. The first factor with 10 items accounted for 34.7% of variance, and was called "annoyance and anger toward the infant", the second factor with nine items accounted for 11.11% of variance, and was labeled "detachment and rejection", and the third factor with six items accounted for 7.57% and was named "anxiety about infant care".

In the Spanish version, Garcia-Esteve et al. (1) performed EFA on a sample of Spanish women during postpartum. Kaiser Olkin coefficient was 0.92, and Bartlett's was significant (p<0.001), indicating a significant relationship between items. Five factors were found based on eigenvalue greater than 1; while scree plot suggested two to five factors. Given the results of scree plot, eigenvalues greater than 1 and the psychological interpretability, a four-factor-solution was considered as best meaningful solution.

The four factors accounted for 52.9% of total variance. The first factor with eight items, "impaired bonding" accounted for 33.2% of variance, the second factor "anxiety about care" with eight items accounted for 29.4% of variance, the third factor with five factors accounted for 5.7% of variance and is called "a lack of enjoyment and affection for the baby" and the fourth factor with five items accounting for 4.6% described "rejection and risk of abuse". Factor structure of Japanese version of PBQ was assessed in three studies. Suetsugu et al. (16) conducted exploratory factor analysis through weighted least squares with Promax rotation. A series of EFA resulted in four factors with 14 items. The first three factors called "impaired bonding", "rejection and anger", and "anxiety about care" are similar to original scale. Only fifth factor had a different name labeled 'lack of affection'.

Ohashi et al. (18) conducted an EFA after delivery identified a three- factor- solution. The first factor was composed of 13 items (11 items with loading factor above 0.3, and 2 items with loading factor that barely reached loading factor 0.3) was named "mother's annoyance with anger toward their baby", the second factor with six items was named "lack of affection", and the third factor with five items was labeled "rejection and fear". They also conducted a CFA of EFA-derived model of their data to replicate the findings on a subgroup of patients (n=192). The ratio of Chi-square to the degree of freedom (CMIN/DF) was 2.88 which is low recommended value of 5. Other indicators were CFI=0.74 and RMSEA=0.10, which are considered above the suggested threshold. Some covariances were drawn between the error term basis of modification index (MI) that improved model CMIN/df=2.28, CFI=0.82, and RMSEA=0.08.

In the second study performed by Kaneko and Honjo, the original four-factor-solution was not confirmed. They conducted an EFA on a sample of 1,786 Japanese mothers who presented at a public health center for their infants 3-month check-up. Six factors had an eigenvalue more than 1. EFA identified six eigenvalues more than 1. However, the first factor had a prominent eigenvalue and there was a breakout between the first and second factor. Authors suggested a one-factor solution that explained 23.9% of total variance. Nine items had low loading factor, therefore they were deleted and again an EFA was conducted on 16 items. Single-factor solution accounted for 30 % of variance (2).

In the German version, factorial structure of PBQ was assessed using PCA on a sample of 862 subjects. Original four – factor-solution of BPQ was not confirmed. On the basis of scree plot, seven factors had an eigenvalue greater than 1. However, authors suggested single factor solution because a sharp drop was observed between the first and second factor on scree plot. This single factor explained 23.9% of total variance (19).

Table- 1: Characteristics of eight studies included in systematic review

Authors, Reference Area of study, Year	Age, year	Sampling method and Sample size.	Type of studies	Timing administration of test	Main result
Brockington et al. (12), England, 2001	17-43	104 normal or depressed women with normal bonding or bonding disorder.	Cross-sectional	Post-partum	Four factors "impaired bonding", "rejection and anger", "anxiety about care of the baby" and "risk of abuse".
Wittkowski et al. (17), British, 2010	29	Not mentioned, n=132	Cross-sectional	Post-partum	According to CFA, Four and three factor solution were not appropriately fitted with data. EFA using CFA presented three- factor solutions as the most stable solution.
Busonera et al. (6), Italy, 2017	20-43	Not mentioned, n=123	Longitudinal	During pregnancy	Three factors identified as "annoyance and anger toward the infant, "detachment and rejection", and "anxiety about infant care".
Garcia-Esteve et al. (1), Spain, 2016	34	Not mentioned, n=840	Longitudinal study	During postpartum	Four factors "impaired bonding", "anxiety about care", "a lack of enjoyment and affection for the baby", and "rejection and risk of abuse".
Suetsugu et al. (16), Japan, 2015	30	Not mentioned, the first sampling n=244 weeks after delivery, Second sample n=199, 6 weeks after delivery.	Cross-sectional	4 weeks after delivery	Four factors with 14 items "impaired bonding", "rejection and anger", and "anxiety about care", and "lack of affection".
Ohashi et al. (17), Iapan, 2016	30	Random sample	Not mentioned	One month after child birth	According to three factor solution, "Mother's annoyance with anger toward their baby", "lack of affection" and "rejection and fear". CFA confirmed EFA-derived model after some covariance were drawn between the error term bases of modification index.
Kaneko and Honjo (2), Japan, 2014	29	Not mentioned, n=1786	Not mentioned	Infant's 3 months check-up	Single factor solution with 16 items explained 31% of total variances.
Reck et al. (19), Germany, 2006	33	Not mentioned, n=862	Longitudinal prospective study	First three months after child birth	Single factor solution with 16 items explained 23.9% of total variance.

EFA: Explanatory Factor analysis; CFA; confirmatory factor analysis.

Table-2: The quality assessment was fulfilled by COSMIN checklist (20).

Authors, Area of study, Year	Items						
	1	2	3	4	5	6	7
Brockington et al. (12), England, 2001	🙂(Unclear)	🔴(No)	🔴(No)	Small	🔴(No)	EFA	🔴(No)
Wittkowski et al. (17), British, 2010	🙂(Unclear)	🔴(No)	🔴(No)	🟢(Yes)	🔴(No)	EFA and CFA	🔴(No)
Busonera et al. (6), Italy, 2017	🙂(Unclear)	🔴(No)	🔴(No)	Slightly small	🔴(No)	EFA	🔴(No)
Garcia-Esteve et al. (1), Spain, 2016	🙂(Unclear)	🔴(No)	🔴(No)	🟢(Yes)	🔴(No)	EFA	🔴(No)
Suetsugu et al. (16), Japan, 2015	🙂(Unclear)	🔴(No)	🔴(No)	🟢(Yes)	🔴(No)	EFA	🔴(No)
Ohashi et al. (17), 2016, Japan	🙂(Unclear)	🟢(Yes)	🟢(Yes)	🟢(Yes)	🔴(No)	EFA and CFA	🔴(No)
Kaneko and Honjo (2), Japan, 2014	🙂(Unclear)	🔴(No)	🔴(No)	🟢(Yes)	🔴(No)	EFA	🔴(No)
Reck et al. (19), 2006, Germany	🙂(Unclear)	🔴(No)	🔴(No)	🟢(Yes)	🔴(No)	EFA	🔴(No)

🟢Yes, 🔴No, 🙂Unclear.

EFA: Explanatory Factor analysis; CFA; confirmatory factor analysis.

1-"Does the scale consist of effect indicators, i.e. is it based on a reflective model?"
2- "Was the percentage of missing items given"?
3- "Was there a description of how missing items were handled?"
4- "'Was the sample size included in the analysis adequate?'"
5- "Were there any important flaws in the design or methods of the study?"
6- "for CTT: Was exploratory or confirmatory factor analysis performed?"
7-"for IRT: Were IRT tests for determining the (uni-) dimensionality of the items performed"?
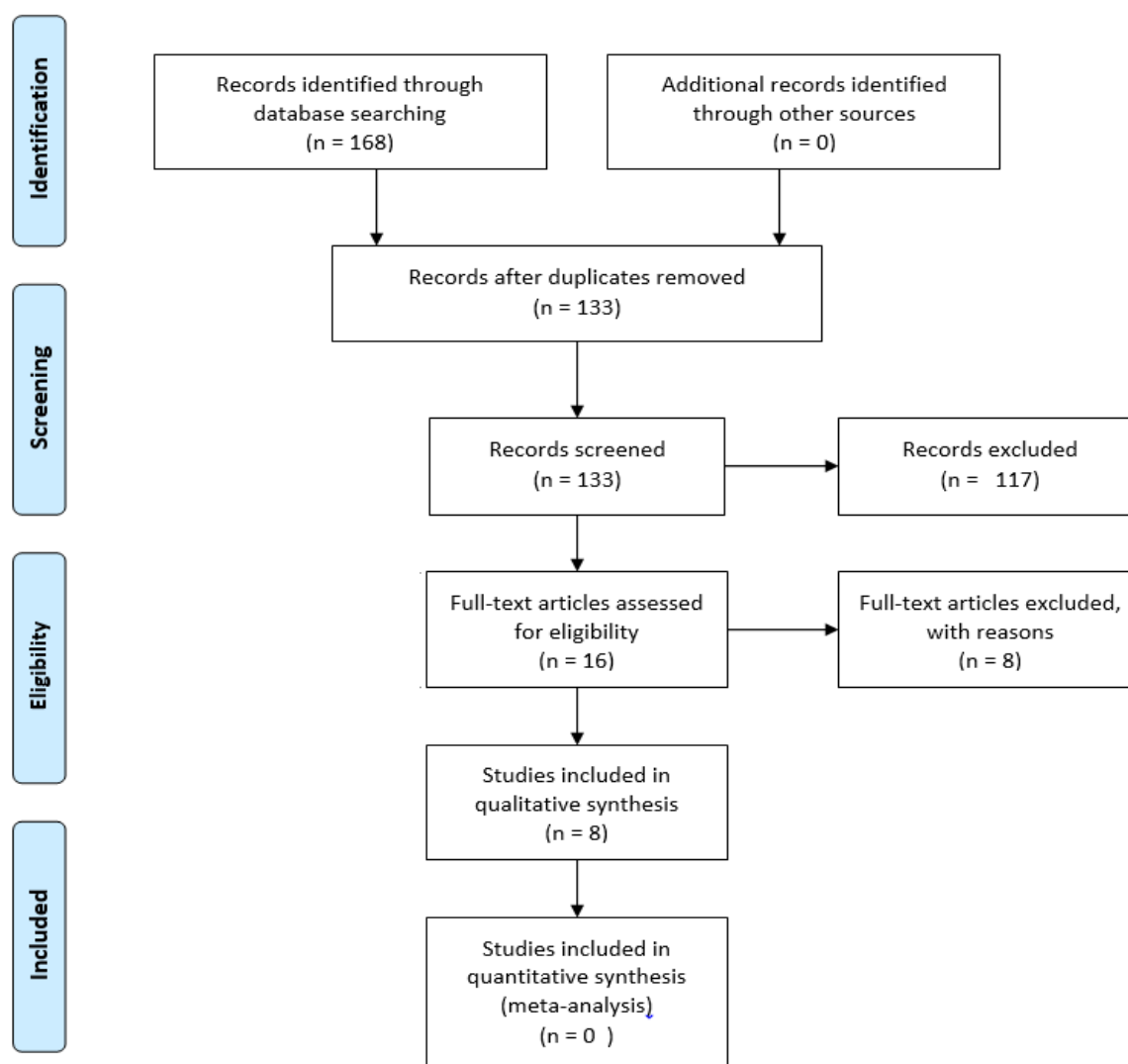
Fig1: Flow diagram of study selection in present meta-analysis.

4- DISCUSSION

To our knowledge, this is the first systematic review in the world to assess factor structure of PBQ. It is a remarkable tool in perinatology and psychopathology, is psychometrically sound and is easy to use in detection of early impairments in the mother-infant bonding. The factorial structure of PBQ is controversial as it is a widely used instrument in evaluating the mother-infant bonding quality (6). The four factors were identified in the original English version. These consisted of "impaired bonding", "rejection and anger", "anxiety about care of the baby" and "risk of abuse" (12). Studies included in systematic review had different factorial structure, three studies with four factors (1, 12, 16), three with three factors (6, 17, 18), and two with one factor (2, 19), and has not been confirmed original four-factor-solution. Two studies, suggested shortened version (14 or 16 items) of the PBQ (16, 19). However, it is noteworthy that reducing the number of items in an instrument may adversely impact its validity and reliability. Gap found in factor structures in different studies may be reflective of the difference in culture and population and translation or may be

related to different rotation methods (Promax vs. Varimax), and different extraction methods (weighted least square vs principle component analysis). The importance of the father-child relation was emphasized in several studies (6).

4-1. Limitations and suggestions for future studies

One useful area for future work is to assess psychometric properties of PBQ in men. There are several methods to assess adequacy of sample size of rule of thumb and Monte Carlo Basis of rule of thumb, it is recommended to have at least five cases for each item to conduct an EFA. Therefore, sample size in some studies seems to be insufficient. Sample size was 123 in Busonera that appears to be insufficient (6). Also, they did not report KMO that was considered as an indice to assess adequacy of sample size. Percentage of missing items and how they were handled was not reported in any of the studies included in this systematic review. These studies assessed factorial structure in Japanese, German, Italy, and German population. Future studies should assess factorial structure in other communities. As far as we know, there are no studies that assessed psychometric properties in adolescent, single mothers, low level education and income. Therefore, further works should be performed in these subgroups.

5- CONCLUSION

Original English version of PBQ was not confirmed in Japanese, Italian, Spanish, German and other English version. However, PBQ has an appropriate factor structure to measure early mother-infant relation disorder in this version. There is a need to replicate factorial structure of PBQ in other communities.

6- CONFLICT OF INTEREST: None.

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