Midwifery 55 (2017) 15–22

Contents lists available at ScienceDirect

Midwifery

journal homepage: www.elsevier.com/locate/midw

Psychometric properties of the Postpartum Bonding Questionnaire and correlates of mother–infant bonding impairment in Italian new mothers

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ARTICLE INFO

Keywords:
Postpartum Bonding Questionnaire
Infant care
Bonding disorders
Mother–child relations
Perinatal psychopathology
Reliability and validity

ABSTRACT

Objective: impaired maternal bonding is a risk factor for problems with infant well-being and development. The investigation of perinatal variables related to disorders of the mother–infant relationship as well as the administration of reliable and valid screening tools to new mothers in the postpartum can help identify early signs of a disturbed mother–child relationship. The Postpartum Bonding Questionnaire (PBQ) has been shown to be a valid screening instrument, but its dimensional structure is still controversial. An analysis of the literature demonstrated the need for research into the perinatal correlates of the quality of mother-newborn bonding as measured by the PBQ, and for information about the reliability and validity of the Italian version of the questionnaire.

Aim: to (a) carry out preliminary analysis of the psychometric properties of an Italian version of the PBQ and (b) explore how mother–infant disturbances are related to relevant perinatal psychological variables.

Design: the research design consisted of a prenatal and a postnatal phase.

Setting: prenatal education classes delivered in public and private institutions.

Participants: 123 pregnant Italian women were recruited from prenatal education classes.

Measurements: in the prenatal period participants completed a questionnaire measuring maternal-fetal attachment; at the postnatal assessment (3 months postpartum) participants completed the Italian PBQ together with measures of mother–infant attachment, the couple's adjustment and maternal psychological well-being. Exploratory factor analysis was used to investigate the factor structure of the PBQ. Internal consistencies were evaluated using Cronbach's alpha. Nomological validity was assessed via Pearson correlations.

Findings: a three-factor model provided the most meaningful representation of the PBQ data, with one factor reflecting annoyance and anger towards the infant, another reflecting detachment and rejection and the third reflecting anxiety about infant care. Internal consistencies were good. Impaired mother-infant bonding was negatively correlated with prenatal and postnatal mother–infant attachment and couple adjustment, as well as being positively correlated with maternal depressive symptoms.

Key conclusions and implications for practice: the Italian PBQ is a reliable, valid screening instrument and can be used for research, including transcultural comparisons in perinatal psychiatry. It can also be used clinically to detect signs of a disordered mother–child relationship. Knowledge of the variables generally associated with mother-infant bonding problems combined with data from postpartum administration of the PBQ could be used in midwifery to develop preventive programmes based on the specific needs of new mothers.

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http://dx.doi.org/10.1016/j.midw.2017.08.011
Received 26 August 2016; Received in revised form 22 August 2017; Accepted 28 August 2017

Introduction

For new parents constructing a relationship with the 'real baby' is one of the core psychological processes of the postpartum period (Stern, 1995). Although the foundations for this relationship are laid in the prenatal period, it is with the birth that the parental bond with the child becomes concrete (Taylor et al., 2005; Tambelli et al., 2014). Parental bonding, far from being an innate and automatic process, depends on a variety of factors, including the characteristics of the child, the parents' psychosocial resources, environmental factors and so on. The belief that all mothers are genetically programmed to love and nurture babies unconditionally has been called into question because of observations that sometimes mothers can be reluctant to take care of their offspring (Hoffenkamp et al., 2012). When the mother experiences a persistent negative feeling towards her child it is possible to speak of a 'disorder of the mother–child relationship' (Bramante and Brockington, 2016). Crucial symptoms of this disorder are regret at having had the child, hostility to the baby - including extremes of hatred and rage, a marked sensation of relief on separation from the child, attempts to escape from the dyadic relationship context, requesting that someone else take care of the baby and a desire that the child should somehow go away (Brockington, 2006b; Bramante and Brockington, 2016). Research has shown that impaired early bonding with the mother is a risk factor for problems with infants' emotional, behavioural and cognitive development (Murray et al., 2003; DeKleyn and Greenberg, 2008; Lyons-Ruth and Jacobvitz, 2008; Pawlby et al., 2008), which makes the quality of the early mother–child relationship central to perinatal psychiatry (Brockington, 2004). Timely assessment of potential bonding problems can be very important from both a predictive and a preventive perspective.

Sophisticated methods of investigating mother–infant interactions, mostly based on observation and interview, have been developed for use in perinatal psychological and psychiatric research. Observation and interview are crucial aspects of midwifery care of the postpartum patient, particularly with regard to identification of adjustment problems; however it is time-consuming to collect and code the data and to do so requires specific training (Klier, 2006; van Bussel et al., 2010). The clinician or the investigator may not have the time to use such time-consuming methods. This means that despite the problems associated with self-report methodologies (e.g. social desirability bias, subjectivity), maternal self-report questionnaires dealing with the mother's emotional, cognitive and behavioural responses to her infant are useful because they are shorter and quicker to administer.

Among the self-report questionnaires dealing with characteristics of the early mother-infant bond are some developed specifically to assess attachment, e.g. the Maternal Postpartum Attachment Scale and the Postpartum Maternal Attachment Scale (Condon and Corkindale, 1998; Nagata et al., 2000). Brockington uses the term 'bonding' instead of the expression 'mother–child relationship' and stresses the difference between mother–infant bonding and the attachment a mother has to her child (Brockington et al., 2006a, pp. 238–239). Attachment is a fundamental aspect of the mother–child relationship, but the latter is not entirely accounted for by the former. Brockington's research team developed the Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001), a screening instrument specifically designed to detect disorders of the early mother–child relationship.

The PBQ items were derived from draft screening instruments being developed concurrently by two UK university teams. The two draft questionnaires were combined to give an initial set of 84 items that was administered to a group of 218 women, including mothers from the general population, mothers of babies with fetal abnormalities and depressed mothers. Principal component analysis (PCA) was used to reduce the initial set of 84 items to a set of 25 items representative of four factors that are clinically relevant to disorders of the mother–infant relationship and together account for more than 50% of the variance: *impaired bonding*, *rejection and anger*, *anxiety about care* and *risk of abuse* (Brockington et al., 2001). Brockington et al. also interviewed a subsample of 51 new mothers using the third edition of the Structured Interview for Pregnancy-related Disorders (later named the Birmingham Interview for Maternal Mental Health, BIMMH; Brockington, 1996) to assess the presence of bonding disorders. New mothers were assigned to diagnostic groups and, by comparing scores on the PBQ and BIMMH, Brockington et al. demonstrated that the PBQ was a specific and sensitive method of detecting maternal bonding disorders in both depressed and healthy mothers, as well as establishing cut-off points for each subscale (Brockington et al., 2001; Wittkowski et al., 2010). The PBQ was subsequently validated in a clinical sample of 125 women who were all suffering from some kind of mother–infant bond disorder as well as comorbid mental disorders (Brockington et al., 2006a). All participants in the validation study were also interviewed using the fifth edition of the BIMMH and assigned to diagnostic groups. On the basis of comparison of PBQ and BIMMH results from the new sample the authors recommended that the cut-off points of two of the four subscales should be altered.

Since its publication many studies have made use of the PBQ (e.g. Edhborg et al., 2005; Moehler et al., 2006; Hoffenkamp et al., 2012; Muzik et al., 2013; Mitchell et al., 2015; Kerstis et al., 2016; Tikotzky, 2016). Because the questionnaire has been shown to be a sensitive and valid method of screening for early mother–child bonding disorders it has been widely used in clinical centres in numerous countries (Brockington, 2007; Garcia-Esteve et al., 2015; Mitchell et al., 2015).

However, the factor structure of the PBQ is controversial; no study has been able to confirm the original four-factor structure. A Japanese group (Suetsugu et al., 2015) reported that their data had a four-factor structure, but the composition and meaning of their factor only partially overlapped with the descriptions of Brockington et al. (2001, 2006a). Another study reported that the PBQ had a three-factor structure (Wittkowski et al., 2010), but most have concluded that PBQ data can be represented effectively using a single general factor (Reck et al., 2006; Kaneko and Honjo, 2014; Garcia-Esteve et al., 2015). On the basis of their factor analyses some of these authors proposed the use of a shorter form of the questionnaire, composed of 16 (Reck et al., 2006; Kaneko and Honjo, 2014) or 14 items (Suetsugu et al., 2015).

To date the psychometric properties of the Italian version of the PBQ have not been described. Our research aimed to fill this gap, as we consider it important to have a tool that can be used in clinical and in research settings to provide a rapid assessment of early difficulties in the mother–child relationship.

Method

Aim and hypotheses

The aim of this study was to gather preliminary data on the reliability and validity of an Italian version of the PBQ from a sample of new mothers. Our intentions were to examine the factor structure and internal consistency of the questionnaire and to explore how mother–infant relational variables were related to perinatal psychological variables. In other words, we wanted to investigate the nomological network of the Italian PBQ.

Our first hypothesis was that the four-factor model proposed by Brockington et al. (2001) would also apply to the Italian translation of the PBQ (*Hypothesis 1*).

We examined the associations between disturbances in the mother–infant relationship and related constructs, namely prenatal and postnatal maternal attachment, dyadic adjustment and postnatal depressive symptoms.

The bond that a pregnant woman develops with her unborn baby has been described as *prenatal maternal–fetal attachment* (Condon, 1993; Cranley, 1981; Müller, 1993, 1996). Doan and Zimerman (2003, p. 110) proposed a working definition of prenatal attachment as 'an abstract concept representing the affiliative relationship between a

parent and fetus, which is potentially present before pregnancy, is related to cognitive and emotional abilities to conceptualise another human being, and develops within an ecological system'. Prenatal maternal attachment to the fetus can affect not only the course of the pregnancy, but also the transition to motherhood and the postnatal mother–child relationship (Müller, 1996; Siddiqui and Hägglöf, 2000; Huth-Bocks et al., 2004) and hence the functioning of the family and the baby's psychological development (Dazzi and Zavattini, 2011; Lyons-Ruth and Jacobvitz, 2008; Sroufe, 2005; Weinfield et al., 2008). A poor mother–fetus relationship is one of the predictors of a poor mother–infant bond (Bramante and Brockington, 2016) and on this basis, we hypothesised that PBQ score would be negatively correlated with prenatal maternal–fetal attachment as measured by the Maternal Antenatal Attachment Scale (MAAS; Condon, 1993) (*Hypothesis 2*).

The mother's feeling of attachment to her infant in the postnatal period is considered to be at the heart of the mother–infant bond. According to Condon and Corkindale (1998), this attachment underpins several maternal dispositions, such as the desire to interact with the infant (rather than be separated from or avoid him or her), tolerance as acceptance (rather than rejection), protection, availability and responsiveness to the infant's needs. Inspired by this theoretical framework, we hypothesised that PBQ score would be negatively correlated with mother–infant attachment as measured by the Maternal Postpartum Attachment Scale (MPAS; Condon and Corkindale, 1998) (*Hypothesis 3*).

A good couple relationship is considered protective during stressful periods such as the transition to parenthood (Velotti et al., 2011; Castellano et al., 2014). The mother-infant bond can be enhanced if the relationship between the two new parents is close, satisfying and characterised by consensus on relevant issues. We therefore hypothesised that PBQ score would be negatively correlated with dyadic adjustment as measured by the Dyadic Adjustment Scale (DAS; Spanier, 1976) (*Hypothesis 4*).

The mother's mental health can influence the early mother–infant relationship and infant interaction experiences in many ways (Brockington, 2004; Reck et al., 2004; Grussu and Bramante, 2016; Agostini and Minelli, 2016; Bramante and Brockington, 2016) so we hypothesised that PBQ score would be positively correlated with the depression in the postnatal period as measured with the Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) (*Hypothesis 5*).

Measures

Prenatal instruments

Questionnaire on sociodemographic characteristics and pregnancy-related variables

an *ad hoc* questionnaire designed to provide basic information such as age of the expectant mother, her marital status, her educational level, the gestational age of the fetus, her parity and pregnancy planning.

Maternal Antenatal Attachment Scale (MAAS; Condon, 1993 Italian version by Busonera et al., 2016)

a measure of maternal–fetal attachment comprising 19 items in a variety of response formats. It assesses two dimensions: quality of attachment (11 items) and intensity of preoccupation (8 items). Global scores range from 19 to 95 with higher scores indicating greater attachment to the fetus. Reported Cronbach's alpha values for the scale as a whole range between 0.69 and 0.87 (Condon, 1993; Schwerdtfeger and Nelson Goff, 2007; van Bussel et al., 2010; Lauriola et al., 2010; Mako and Deak, 2014; Busonera et al., 2016).

Postnatal instruments

Questionnaire on childbirth, infant and postnatal variables

an *ad hoc* questionnaire designed to provide basic postnatal information such as sex of the baby, the method of birth, the feeding method and the difficulty of the birth.

Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001 Italian version by Montirosso et al., 2009)

a 25-item measure designed to assess early mother–child bonding disorders. Responses are given on a six-point scale (from 'never' to 'always'). The original version consists of four subscales: impaired bonding (12 items), rejection and anger (7 items), anxiety about care (4 items) and risk of abuse (2 items). It has been recognised that relying on just two items to assess a construct, as in the case of the risk of abuse subscale, is problematic; three is considered the acceptable minimum (Marsh et al., 1998; Little et al., 1999; Emons et al., 2007). The PBQ also yields a total score between 0 and 125. The items describing a positive mother–infant relationship (e.g. 'I feel close to my baby', 'I love to cuddle my baby') are scored in the opposite direction from those that indicate some form of problem in the dyad (e.g. 'My baby irritates me', 'I wish my baby would somehow go away') and higher scores indicate a more impaired mother-child bond. The authors proposed that a threshold ≥ 26 should be used to identify a bonding disorder, with a threshold of ≥ 40 for severe disturbance of the bond (Brockington et al., 2006a; Garcia-Esteve et al., 2015). Brockington et al. (2001) reported that the four subscales had short-term, test-retest reliabilities (Pearson's *r*) of 0.95, 0.95, 0.93 and 0.77 in a sample of 30 mothers. Subsequent studies have reported internal consistencies (Cronbach's α) varying from 0.76 to 0.87 for the scale as a whole, 0.76–0.79 for the impaired bonding subscale, 0.63-0.75 for the rejection and anger subscale, 0.34–0.64 for the anxiety about care subscale and 0.20–0.36 for the risk of abuse subscale (Reck et al., 2006; Wittkowski et al., 2007; van Bussel et al., 2010; Kaneko and Honjo, 2014; Suetsugu et al., 2015). The external validity of the scale has been demonstrated by correlations with other measures of mother–infant bonding, with measures of maternal postnatal attachment to the baby, with postpartum depression and with maternal perception of the child's temperament (Edhborg et al., 2005; Reck et al., 2006; Wittkowski et al., 2007; van Bussel et al., 2010; Kaneko and Honjo, 2014; Suetsugu et al., 2015).

The Italian adaptation of the PBQ, edited by Rosario Montirosso, Claudia Fedeli, Livio Provenzi and Ian Brockington was developed using the back-translation procedure. The questionnaire was translated into Italian and the accuracy of the translation was verified by re-translating it into English; this second translation was carried out by a bilingual expert in perinatal psychiatry. The back-translation was revised with the author of the original instrument (Ian Brockington).

Maternal Postpartum Attachment Scale (MPAS; Condon and Corkindale, 1998 Italian version by Scopesi et al., 2004)

a measure of mother-infant attachment consisting of 19 items to which responses are given using a two-, three-, four- or five-point scale. Condon and Corkindale (1998) identified three factors accounting for variance in scores: pleasure in interaction with the infant (5 items), absence of hostility towards the infant (5 items) and quality of mother–infant attachment (9 items). Total scores range from 19 to 95, with higher scores indicating greater postnatal maternal attachment to the baby. The MPAS has been shown to have acceptable reliability (Cronbach's alpha for the total score varied from 0.75 to 0.79; test-retest reliability $r = 0.86$, $p < .001$) (Condon and Corkindale, 1998; Scopesi et al., 2004; van Bussel et al., 2010).

Dyadic Adjustment Scale (DAS; Spanier, 1976 Italian version by Gentili et al., 2002)

a measure of dyadic adjustment, defined by Spanier (1976, p. 17) as

'a process, the outcome of which is determined by the extent of troublesome dyadic differences, interpersonal tensions and personal anxiety, dyadic satisfaction, dyadic cohesion, and consensus on matters of importance to dyadic functioning'. It consists of 32 items in a variety of response formats that are organised into four subscales: Consensus (13 items), Satisfaction (10 items), Cohesion (5 items) and Affective expression (4 items).Total dyadic adjustment scores range from 0 to 151. All the subscales have an internal consistency of at least α = 0.73 (Affective expression) and the scale as a whole has α = 0.96 (Spanier, 1976).

Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977 Italian version by Fava, 1981)

a screening test for symptoms of depression, consisting of 20 items to which responses are given using a four-point Likert scale. Scores range from 0 to 60, with higher scores indicating the presence of more severe symptoms of depression. The CES-D has been found to have acceptable reliability (Cronbach's alpha varied from 0.85 to 0.95) (see Balsamo and Saggino, 2007).

Data collection

Data were collected between February 2014 and December 2015. There were two assessments, the first took place between the second and third trimester of pregnancy i.e. from 20 weeks onwards. This time period was chosen because it is when the pregnant woman begins to feel fetal movements clearly; earlier in the pregnancy they can be confused with the woman's visceral sounds. Being able to perceive the movements of the fetus clearly, combined with the now obvious bodily changes and access to ultrasound images of the fetus makes it easier for the woman to perceive the fetus as a well-defined presence within her psychic space (Candelori et al., 1991; Stern, 1995; DiPietro et al., 2004, 2006). In choosing when to carry out the postnatal assessment we took into account that a parent's perception of their parenting may change in a positive or negative direction during the first few months after the birth. It is thought that by about the fourth month after the birth the woman's representation of herself as a mother has broadly stabilised and is defined in the context of a fairly realistic perception of her baby (Mercer and Ferketich, 1995; Stern, 1995; Hudson et al., 2001; Nyström and Ohrling, 2004).

The Time 1 questionnaire was distributed during prenatal education classes. A researcher from the team set out the goals and methods of the study. Women who agreed to participate were asked to provide written, informed consent, complete the prenatal questionnaire and return it to the researcher. The questionnaire included a box in which participants were asked to provide contact details (telephone number or email address) if they were willing to take part in the postnatal phase of the study. The Time 2 questionnaire was administered via the Internet, using the Google Drive platform.

Data analysis

The analyses were conducted with the SPSS 20 software and α was set at .05. First of all we computed descriptive statistics - means, standard deviation, skewness and kurtosis - for the variables describing the sample and for PBQ score. Categorical variables were described using absolute frequencies and percentages. To test Hypothesis 1, that the Italian PBQ shared the four-factor structure proposed for the original English language PBQ (Brockington et al., 2001) we investigated the latent dimensionality of the questionnaire, by conducting PCA with an oblique rotation. The final factor solution was determined by examining the scree plot, eigenvalues, factor loadings and cumulative variance accounted for by the models. We calculated the Pearson correlations between the extracted factors. The internal consistency of the emergent structure was evaluated using Kline's (2000) criteria for Cronbach's alpha (α ≥ 0.9 = excellent; 0.7 ≤ α < 0.9 = good; 0.6 ≤ α < 0.7 = acceptable; 0.5 ≤ α < 0.6 = poor; α < 0.5 = unacceptable). Assessments of the validity of hypotheses 2 to 5 were based on investigations of the nomological validity of the PBQ, which was assessed via Pearson correlations; 95% confidence intervals (CIs) were also calculated.

Participants

A total of 123 women participated in the prenatal and postnatal phases of the study. They were recruited from prenatal education classes held at public centres. Participants were required to be at least 20 years old, at least 20 weeks pregnant, of Italian nationality and to speak Italian as their first language. Women less than 20 years old were excluded because a teenage pregnancy may be particularly stressful, and this might affect the development of mother-infant attachment (Bloom, 1995; Gau and Lee, 2003; Della Vedova et al., 2008). Women with poor prenatal diagnosis and/or severe pregnancy-related complications were also excluded. Both primiparous and multiparous women were included.

Ethical statements

The research described here was approved by the Ethical Committee of the Department of Pedagogy, Psychology, Philosophy of the University of Cagliari, in accordance with the Declaration of Helsinki. Participation was voluntary and the information provided was anonymous and confidential. Written, informed consent was obtained from all participants.

Findings

Characteristics of participants and other descriptive statistics

Most participants were aged 28–35 years (54.5%), married (65.0%), held a university degree (35.0%), had planned their pregnancy (75.6%), were expecting their first child (87.0%) and were in the third trimester of pregnancy at the first assessment (73.2%) (see Table 1).

Information from the postnatal assessment indicated that 68 of the women (55.3%) had given birth to a boy and 55 (44.7%) to a girl. Over a third of the sample (36.6%) had a natural childbirth with analgesia and most (57.7%) were breastfeeding. Women were asked to evaluate how difficult the birth had been using a five-point Likert scale ranging from 1 (*easy*) to 5 (*difficult*); most of the new mothers indicated an intermediate level of difficulty (score of 3) (see Table 2).

The mean total PBQ score was 10.22 (*SD* = 9.21; skew = 2.02, kurtosis = 5.26).

Factors structure of the PBQ

On the basis of the scree plot, which showed a substantial break after three factors (first five eigenvalues: 8.69, 2.78, 1.89, 1.56, 1.31), the factor loadings and the cumulative variance accounted for by the model (53.46%), we forced the extraction of three factors. Table 3 shows the results of the PCA. Factor 1 included 10 items (2, 5, 7, 10, 13, 14, 15, 17, 20, 21) and accounted for 34.78% of the variance; Factor 2 included 9 items (1, 3, 4, 6, 8, 9, 11, 16, 23) and accounted for 11.11% of the variance; Factor 3 ed 6 items (12, 18, 19, 22, 24, 25) and accounted for 7.57% of the variance. The correlations between factors ranged from *r* = .18 (F2 and F3) to *r* = .34 (F1 and F3). Cronbach's alphas for the three subscales that emerged from the PCA were α = .87 (good), α = .86 (good) and α = .73 (good) for factors 1 to 3 respectively; the PBQ scale as a whole had excellent internal consistency (α = .91), according to Kline's (2000) criteria.

Table 1
Sociodemographic characteristics and pregnancy-related variables.

	Total (*N* = 123)
Age groups	
20–27	6 (4.9%)
28–35	**67 (54.5%)**
36–43	49 (39.8%)
Marital status	
Married	**80 (65.0%)**
Cohabiting	38 (30.9%)
Engaged	4 (3.3%)
Educational level	
Middle school	6 (4.9%)
High school	41 (33.3%)
University degree	**43 (35.0%)**
Postgraduate	31 (25.2%)
Gestational age	
Second trimester	33 (26.8%)
Third trimester	**90 (73.2%)**
Parity	
Primiparae	**107 (87.0%)**
Multiparae	15 (12.2%)
Pregnancy planning	
Planned	**93 (75.6%)**
Unplanned	30 (24.4%)

Note: Numbers may not add up to 123 because of missing data.

Table 2
Childbirth, infant and postnatal variables.

	Total (*N* = 123)
Sex of the baby	
Male	**68 (55.3%)**
Female	55 (44.7%)
Type of giving birth	
Natural childbirth	39 (31.7%)
Natural with analgesia	**45 (36.6%)**
Caesarean section	37 (30.1%)
Other	2 (1.6%)
Type of feeding	
Breastfeeding	**71 (57.7%)**
Artificial feeding (baby bottle)	19 (15.4%)
Mixed (breastfeeding and baby bottle)	33 (26.8%)
Childbirth difficulty	
1 = easy	15 (12.2%)
2	21 (17.1%)
3	**38 (30.9%)**
4	26 (21.1%)
5 = difficult	23 (18.7%)

Note: Numbers may not add up to 123 because of missing data.

External validity of the PBQ

PBQ score was negatively correlated with scores on the MAAS prenatal attachment scale, the MPAS postpartum mother-to-infant attachment scale and the DAS dyadic adjustment scale; these results support hypotheses 2, 3 and 4 respectively. PBQ score was also positively correlated with CES-D score, which provides support for hypothesis 5 (see Table 4).

Discussion

The availability of psychometrically sound, easy-to-administer instruments for detecting early disorders of the mother–infant relationship is of great importance to research in perinatology and psychopathology. Although the PBQ is widely used to assess the quality of the mother-infant relationship its factorial structure remains open to question.

Our aim was to provide a preliminary assessment of the psychometric properties of an Italian version of the PBQ, in particular its factor structure, internal consistency and external validity.

Overall we succeeded in substantiating the hypothesised relationships between the PBQ and theoretically related constructs, thus providing evidence of its external validity. Specifically, PBQ score was negatively correlated with prenatal attachment, postnatal mother–infant attachment and dyadic adjustment in the couple's relationship. PBQ score was also positively correlated with a measure of maternal symptoms of depression. These findings are in line with earlier research studies (Moehler et al., 2006; Reck et al., 2006; van Bussel et al., 2010; Høivik et al., 2013; Kaneko and Honjo, 2014; Dubber et al., 2015; Garcia-Esteve et al., 2015; Suetsugu et al., 2015).

Table 3
Pattern Matrix (Principal Component Analysis with Oblimin rotation) of the Italian PBQ (N = 123).

Items		F1	F2	F3	h^2
21.	*My baby annoys me*	**.85**	-.09	-.01	.67
15.	*I resent my baby*	**.78**	.09	-.11	.60
14.	*I feel angry with my baby*	**.73**	-.00	-.03	.52
5.	*I regret having this baby*	**.73**	.10	-.08	.55
2.	*I wish the old days when I had no baby would come back*	**.67**	.30	-.04	.63
17.	*I wish my baby would somehow go away*	**.66**	.16	-.09	.49
10.	*My baby irritates me*	**.64**	-.13	.33	.62
7.	*My baby winds me up*	**.58**	-.17	.36	.56
13.	*I feel trapped as a mother*	**.57**	.34	.08	.60
20.	*I am afraid of my baby*	**.41**	-.04	.23	.28
11.	*I enjoy playing with my baby*	.18	**.76**	-.04	.67
1.	*I feel close to my baby*	.10	**.70**	.26	.69
4.	*I love to cuddle my baby*	.26	**.68**	-.00	.63
9.	*I feel happy when my baby smiles or laughs*	-.14	**.67**	-.15	.42
8.	*I love my baby to bits*	.18	**.67**	-.15	.51
6.	*The baby does not seem to be mine*	.09	**.60**	.25	.53
16.	*My baby is the most beautiful baby in the world*	-.04	**.57**	-.00	.31
3.	*I feel distant from my baby*	.34	**.57**	.29	.77
23.	*I feel the only solution is for someone else to look after my baby*	-.18	**.56**	.43	.50
25.	*My baby is easily comforted*	-.07	-.03	**.75**	.53
24.	*I feel like hurting my baby*	-.15	.14	**.71**	.50
12.	*My baby cries too much*	.29	-.13	**.62**	.56
19.	*My baby makes me feel anxious*	.35	-.07	**.55**	.53
22.	*I feel confident when caring for my baby*	.13	.34	**.40**	.41
18.	*I have done harmful things to my baby*	.23	.11	**.35**	.27

Note: Bold font indicates major factor loadings. The original items and the original item numbering are presented. A copy of the Italian questionnaire can be obtained by requesting it to Rosario Montirosso rosario.montirosso@bp.lnf.it

Table 4
Correlations for PBQ score with measures of prenatal and postnatal attachment, dyadic adjustment in couple's relationship, depression, mother's evaluation of infant's behaviour (*N* = 123).

Scales	Mother-infant bonding impairment (PBQ total score)	
	r	*95% CI*
Maternal prenatal attachment (MAAS)	-.27**	-.41, -.12
Mother-to-infant attachment (MPAS)	-.88**	-.92, -.82
Dyadic adjustment (DAS)	-.29**	-.41, -.18
Depression (CES-D)	.63**	.47, .76

** $p < .001$;

PCA of the PBQ data failed to replicate the four-factor structure of the original version of the scale (Brockington et al., 2001). A three-factor structure was identified as the most meaningful solution. Factor 1 represented 10 items, of which six (2, 7, 10, 13, 15, 17) belonged to the original impaired bonding subscale, three (5, 14, 21) to the rejection and anger subscale and one (20) to the anxiety about care subscale (Brockington et al., 2001). Some of the items that make up this factor appear to be indicators of maternal annoyance with the newborn, whereas others seem to be indicators of resentment and anger towards the infant, or regret at having had a child. Factor 2 included 9 items, of which five (1, 6, 8, 9, 16) belonged to the original impaired bonding subscale and four (3, 4, 11, 23) to the rejection and anger subscale. Most of the items making up this dimension are indicators of rejection of the infant, or detachment from it. Factor 3 represented 6 items, three (19, 22, 25) belonging to the original anxiety about care subscale, two (18, 24) to the risk of abuse subscale and one (12) to the impaired bonding subscale. These items reflect maternal anxiety about providing care for the infant and low parenting self-efficacy. The high internal consistency of the three PCA-generated subscales was reflected in the values of Cronbach's alpha.

Overall the results showed that the Italian version of the PBQ has good psychometric properties and may be used in the Italian cultural context to assess early mother–infant relational difficulties. The validity of Brockington et al. (2001)'s four-factor model of the scale was not confirmed; instead three factors emerged from the PCA. These could be labelled as 'annoyance and anger', 'detachment and rejection', 'anxiety about infant care'. As we pointed out in the Introduction, no published study has replicated the four-factor structure described by Brockington et al. (2001, 2006a). Our results continue this pattern, as the number, composition and significance of the factors emerging from our analyses differ significantly from those obtained by the authors of the original PBQ. These differences may be due to cultural factors that are difficult to define, but they could also be due to the differences in the samples analysed or linked to the translation of the questionnaire. Our failure to detect Brockington et al.'s fourth factor, 'risk of abuse', in our data may be related to the translation of the two items that make up this factor. In the original PBQ they are item 18, '*I have done harmful things to my baby*' and item 24, '*I feel like hurting my baby*'. In the Italian translation these two items describe feelings of insecurity and incompetence or inadequacy that are experienced many new mothers, especially primiparae, in relation to their ability to care for their newborn. It seems likely that this is why they cluster with other items related to 'anxiety about infant care'. Given the inconsistency of the factor structure of the PBQ in its various versions we agree with previous recommendations (Reck et al., 2006; Kaneko and Honjo, 2014; Garcia-Esteve et al., 2015) that comparisons of results obtained using different versions are best made on the basis of total PBQ score. The high external validity of total PBQ score with respect to theoretically related constructs suggests that such comparisons would be valid.

We are aware that the recommended minimum sample for factor analysis of a questionnaire is five times the number of items (e.g. Bryant and Yarnold, 1995); in the case of PBQ, which has 25 items, this would be 125 subjects. Our sample was slightly smaller than this (N = 123) and so our findings about the psychometric characteristics of the Italian PBQ must be considered preliminary. Our next goal is to recruit a larger sample of new mothers to enable us to explore the factor structure of the questionnaire using both exploratory and confirmatory factor analysis. Nevertheless this preliminary information about the psychometric properties of the Italian PBQ should help to promote further research and facilitate cross-cultural comparisons on issues related to mother–infant relationships. The Italian PBQ should also be useful in clinical settings as a means of detecting early signs of disturbance in the mother–child relationship.

As well as providing evidence of the external validity of the Italian PBQ, the correlation analyses also provide information about how the perinatal psychological factors considered are related to impairment of the mother-infant relationship. This information could enable health care professionals to detect risk factors for a disordered mother–child relationship at an early stage. It could also be used to help develop prevention and support programs based on the specific needs of expectant and new mothers. For instance, knowledge that particular qualities of the mother-newborn relationship are negatively associated with maternal-fetal attachment during pregnancy could be used to inform prevention programs. The existence of correlations between attachment during pregnancy and the quality of the mother-infant relationship after birth indicates that interventions to support mothers should begin during the prenatal period. Similarly, the existence of negative correlations between qualities of the mother-infant relationship and postpartum adjustment in the parental couple's relationship suggests that there is a need to enhance the couple dimension, involving new fathers in any program that is intended to support transition to parenthood.

A limitation of this study is that the Italian PBQ was tested in a non-pathological sample. Further research should be conducted on a clinical sample consisting of new mothers with mother–infant relationship disorders. Furthermore, not only our sample was drawn from the non-clinical population, it was characterised by several factors protective against disorders of the mother-infant relationship the presence of which could call into question the generalisability of the findings. All of the women were recruited from antenatal education classes which guaranteed them specialist support (including psychological support) up to the child's first birthday. All the participants experienced pregnancy as part of a couple, none was adolescent and most were fairly well educated. Further research should involve psychosocial risk groups such as adolescents, single mothers, those with a low level of education and mothers who have not attended antenatal education classes. Finally, given that the importance of the father-child relationship from an early stage is widely recognised (Baldoni, 2005; Di Folco and Zavattini, 2014), an interesting objective for future research would be to adapt the PBQ for use with men and explore its functioning in a sample of new-fathers.

Funding

This research was not supported by any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

Data presented in this paper are part of a larger longitudinal research project on the topic of the transition to parenthood. We are grateful to the managers of the ASLs of Cagliari, Sassari and Chieti, Italy, along with physicians, psychologists and midwives of their structures, which have helped to make possible to realize the study. Our special thanks go to the women who provided survey data.

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