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REVIEW ARTICLE

Mother-child bonding assessment tools☆

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KEYWORDS
Mother-child relations;
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Abstract
Objective: To identify and describe research tools used to evaluate bonding between mother and child up to one year of age, as well as to provide information on reliability and validity measures related to these tools.
Data source: Research studies available on PUBMED, LILACS, ScienceDirect, PsycINFO and CINAHL databases with the following descriptors: mother-child relations and mother infant relationship, as well as the expressions validity, reliability and scale.
Data synthesis: 23 research studies were selected and fully analyzed. Thirteen evaluation research tools were identified concerning mother and child attachment: seven scales, three questionnaires, two inventories and one observation method. From all tools analyzed, the Prenatal Attachment Inventory presented the higher validity and reliability measures to assess mother and fetus relation during pregnancy. Concerning the puerperal period, better consistency coefficients were found for Maternal Attachment Inventory and Postpartum Bonding Questionnaire. Besides, the last one revealed a higher sensibility to identify amenable and severe disorders in the affective relations between mother and child.
Conclusions: The majority of research tools are reliable to study the phenomenon presented, although there are some limitations regarding the construct and criterion related to validity. In addition to this, only two of them are translated into Portuguese and adapted to women and children populations in Brazil, being a decisive gap to scientific production in this area.

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PALAVRAS-CHAVE
Relações mãe-filho;
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Reprodutibilidade dos testes

Instrumentos de avaliação do vínculo entre mãe e bebê

Resumo
Objetivo: Identificar os instrumentos utilizados na avaliação do vínculo entre mãe e bebê com até um ano de vida, descrevê-los e fornecer informações sobre suas medidas de confiabilidade, validade e adaptação para o contexto brasileiro.
Fonte de dados: Trata-se de um estudo de revisão integrativa realizado com base nas publicações contidas nas bases de dados PUBMED, LILACS, ScienceDirect, PsycINFO e CINAHL. Utilizaram-se os descritores *mother-child relations* e *mother infant relationship*, e as expressões *validity*, *reliability* e *scale*. Selecionaram-se 23 pesquisas, que foram lidas em sua integralidade.
Síntese dos dados: Foram identificados 13 instrumentos de avaliação do apego entre mãe e bebê: sete escalas, três questionários, dois inventários e um método de observação. Do total de ferramentas analisadas, o Prenatal Attachment Inventory apresentou maior validade e confiabilidade para analisar a relação entre a mãe e o feto durante a gestação. Quanto ao período puerperal, foram encontrados melhores coeficientes de consistência interna para o Maternal Attachment Inventory e o Postpartum Bonding Questionnaire. Além disso, esse último revelou elevada sensibilidade para identificar disfunções leves e graves nas relações afetivas entre mãe e bebê.
Conclusões: Verificou-se que a maioria dos instrumentos é confiável para estudar o fenômeno em questão. Contudo, foram evidenciadas limitações com relação à validade de construto e de critério. Ademais, apenas dois estão traduzidos e adaptados para a população de mulheres e crianças brasileiras, sendo portanto uma lacuna encontrada na produção científica nessa área.

Introduction

The establishment of bonding between mother and child is a physical and psychological need of babies, which provides comfort and protection. Thus, the mother is considered the safe haven for the establishment of the first emotional attachments of the child, which will reflect on all future social relations.[1] The Theory of Attachment developed by Bowlby[2] suggests there is a human need to develop close emotional bonds, with the biological function of survival of the species, from the fetal period until old age. In childhood, these emotional interactions are primarily developed with parents in order to impart comfort, protection, affection, and love. In adolescence and adulthood, they are enhanced and modified, and new bonds with significant others are developed and incorporated.

The quality of the bond between mother and baby exerts direct influence on the child's mental health. Therefore, this relationship should be warm, intimate, continuous, and affectionate, providing pleasure and comfort for both.[2] However, the attachment of parents to their children is not instantaneous and instinctive. It is an ongoing process, initiated during pregnancy, in which the fetus becomes part of everyday life of the pregnant woman more intensely, consisting of fantasies, desires, dreams, and representations of models of motherhood.[3,4] The woman's understanding of her attachment to her child affects the skills required to understand and respond to the child's needs.[2]

Thus, the interactions between parents and children influence the structure of affective ties developed by the child since birth.[5] Therefore, it is important to evaluate the quality of this relationship, especially in the first year of the baby's life, in order to identify possible disorders in this bonding and prevent future consequences for the child's mental health.

A review performed in 2010, aimed at describing the main instruments used to analyze the relationship between mother and child, retrieved a total of ten tools. Although there is a variety of tools to study this phenomenon, there is a scarcity of models adapted to the context of Brazilian mothers and babies younger than 1 year. The same study found only one inventory suitable for the aforementioned population, but this tool does not apply to the context of children younger than 1 year.[6] This shows the importance of verifying recent advances in terms of cross-cultural adaptation of tools to study bonding between mother and child in the Brazilian context.

Selecting the most appropriate tool for a particular study requires verification of its psychometric properties: validity and reliability. The first refers to the capacity of the tool to precisely verify what is to be measured, whereas the second comprises its accuracy to measure a certain event.[7,8] Using inaccurate tools to measure the relationship between mother and child will produce controversial and questionable data. It is necessary to know the characteristics of the several tools and possibilities for use in the context of Brazilian mothers and babies in detail, considering the peculiarities of this population.

Therefore, the aim of this article was to identify the tools used in the assessment of the bonding between the mother and baby younger than 1 year, to describe them, and to ascertain their reliability and validity.

Method

This is an integrative review study conducted in the publications found in the following databases: PubMed (U.S. National Library of Medicine), LILACS (Latin American Literature on Health Sciences), ScienceDirect (Elsevier Database), PsycINFO (American Psychological Association), and CINAHL (Cumulative Index to Nursing and Allied Health Literature).

The review was designed to answer the following research question: are the tools used to analyze the bonding between mother and child younger than 1 year accurate and reliable?

The search for the studies was performed from January to April 2013 using the following descriptors: (1) mother-child relations, (2) mother-infant relationship and its expressions, (3) validity, (4) reliability, and (5) scale. The detailed search is shown in Figure 1.

A total of 67 studies reported the use of a tool to assess the bonding between mother and child (inclusion criterion 1), and therefore were analyzed for the second inclusion criterion: investigations showing results regarding the psychometric properties of the used tools. After verification of these aspects, 47 studies did not answer the question that conducted this study. Thus, 23 articles were included in this review. Case reports, theses, dissertations, research reports, editorials, letters to the editor, short communications, and review studies were excluded.

The reliability and validity of the tools found in the included studies were assessed. Reliability is usually investigated through stability, internal consistency, and inter-rater agreement on the scores of the tool.[7,8] Stability

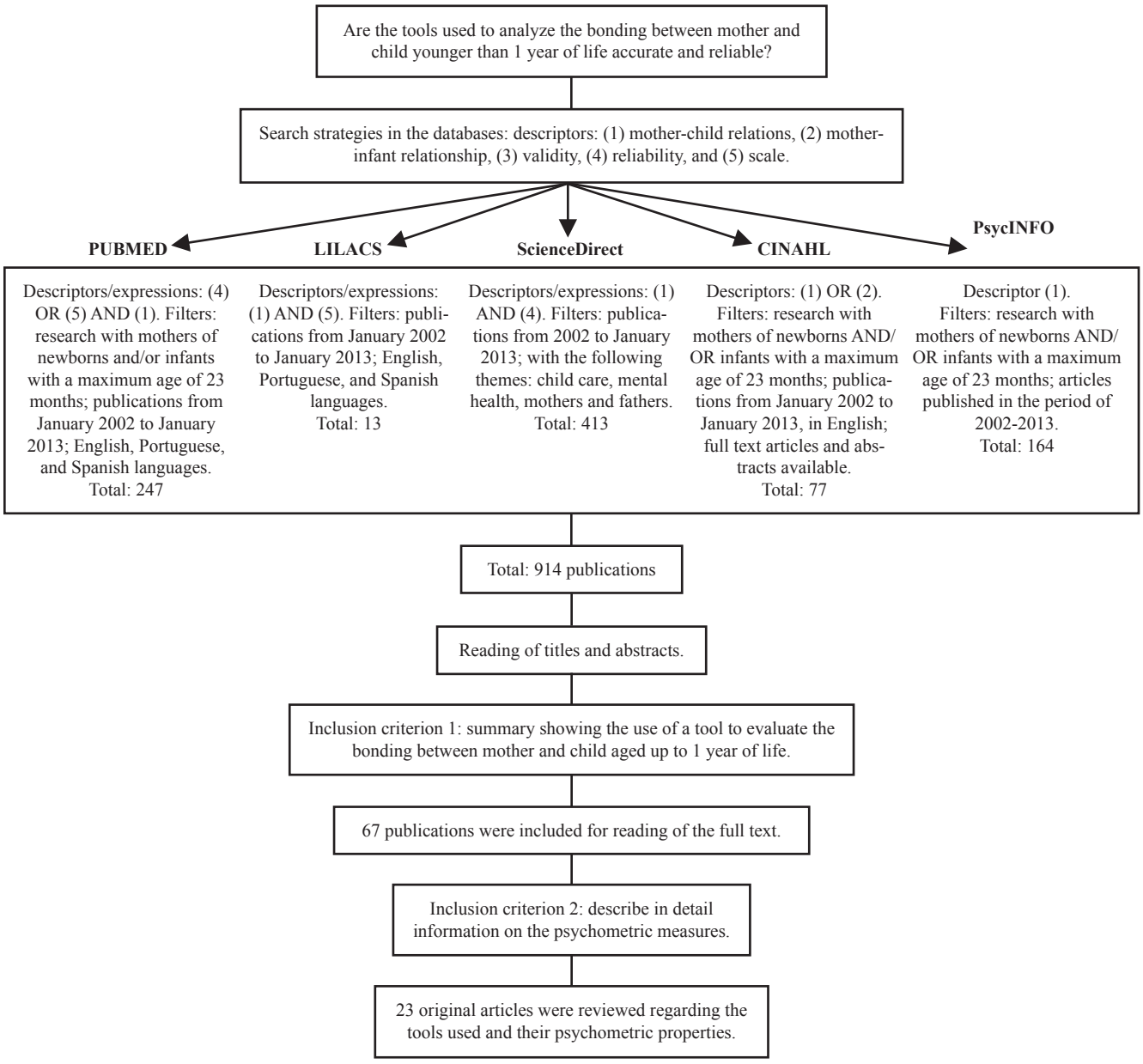

Figure 1 Flowchart for article selection

refers to the degree of similarity of the results obtained in two measurements performed on different occasions. It is measured based on the test-retest coefficient of reliability. Internal consistency is assessed through Cronbach's alpha (α) index. Nunnally suggests that a tool is reliable if the alpha value (α) is at least 0.70.[9] Furthermore, values above 0.80 show high internal consistency.[10] To assess agreement between evaluators, the kappa coefficient is used (k≥0.60).[11] In addition to the aforementioned, tool validity was also verified using the content criterion and construct validity.[7,8]

Results and discussion

The studies described the bond between mother and child during pregnancy and postpartum period. Thirteen tools were identified: seven scales, three questionnaires, two inventories, and an observation method. Of the investigated tools, nine can be used in the first year after birth, and four during pregnancy. A questionnaire is composed by two appropriate versions to puerperal and gestational period. The data are organized into two categories: mother-child relationship during pregnancy and bond between mother and child in the postpartum period. The psychometric properties of the tools used during pregnancy are shown in Tables 1 and 2.

Mother-child bonding during pregnancy

Two scales were identified for pregnant women: Maternal Fetal Attachment Scale (MFAS)[12,13,17,18] and Maternal Antenatal Attachment Scale (MAAS).[14] The first consists of 23 indicators divided into five subscales: self-differentiation and differentiation of the fetus, interaction with the fetus, attributing characteristics to the fetus, donating oneself and taking responsibility. It can be used for mothers (MFAS) and fathers (Paternal Fetal Attachment Scale [PFAS]), and aims to measure the attachment between the parents and the fetus.[20] It has been adapted for Sweden[12] and Turkey[18]

The internal consistency of the MFAS ranged from α=0.82 to α=0.92.[13,17,18] The paternal version ranged from α=0.85 to α=0.86.[17,18] These results corroborate the findings of the original version, whose total reliability was α=0.85.[20]

Table 1 Data on the validity of assessment tools of bonding between mother and baby during pregnancy

Instrumentos	Tipo	Estudos	Propriedades Psicométricas: Validade
MFAS/PFAS	Scale	Sjögren *et al*[12]	Construct validity: Factorial analysis (FA): five factor model (concern for the health and behavior of the fetus, mental preparation for caring for the child, the experience of pregnancy, experience with fetal movements, and baby's name).
		Shin, Kim[13]	Criterion validity – Concurrent validity: correlation with MFAS-MAI: r=0.46 (p<0.01).
MAAS	Scale	Gomez, Leal[14]	Construct validity: two-factor model. Adjusted version showed better reliability: maternal with 17 items and paternal with 14 items.
PAI	Inventory	Gau, Lee[15]	Construct validity: FA: 1-factor model.
		Damato[16]	Criterion validity – Concurrent validity: PAI-MAI Correlation (r=0.38).

MAI, Maternal Attachment Inventory; MFAS, Maternal Fetal Attachment Scale; MAAS, Maternal Antenatal Attachment Scale; PAI, Prenatal Attachment Inventory; PFAS, Paternal Fetal Attachment Scale.

Table 2 Data on the reliability of assessment tools of bonding between mother and baby during pregnancy

Tools	Type	Studies	Psychometric properties: reliability
MFAS/PFAS	Scale	Shin, Kim[13]	Internal consistency: MFAS: α=0.92
		Seimyr *et al*[17]	Internal consistency: MFAS: total α=0.82; MFAS subscales: variation of α=0.50 to α=0.70; PFAS: total α=0.85; and PFAS subscales: variation of α=0.40 to α=0.80.
		Ustunsoz *et al*[18]	Internal consistency of the translated version and adapted to Turkish culture: MFAS (α=0.82) and PFAS (α=0.86).
MAAS	Scale	Gomez, Leal[14]	Internal consistency: maternal: α=0.78 and paternal: α=0.73. Stability (test-retest): test: r=0.69 (maternal) and r=0.80 (paternal).
MAMA	Questionnaire with subscales	Figueiredo *et al*[19]	Internal consistency and coefficient of bipartition (split-half): MAMA total: α=0,85 and split-half r=0.86; Subscale: body image: α=0.74 and split-half r=0.76; Subscale: somatic symptoms: α=0.62 and split-half r=0.65; Subscale: marital relationship: α=0.75 and split-half r=0.75; Subscale: attitudes toward sex: α=0.82 and split-half r=0.80; Subscale: attitudes toward the pregnancy and the baby: α=0.48 and split-half r=0.54.
PAI	Inventory	Gau, Lee[15]	Internal consistency: α=0.89.
		Damato[16]	Internal consistency total PAI: α=0.89.

MAI, Maternal Attachment Inventory; MFAS, Maternal Fetal Attachment Scale; MAAS, Maternal Antenatal Attachment Scale; MAMA, Maternal Adjustment and Maternal Attitudes (PPMAMA, Postpartum Maternal Adjustment and Maternal Attitudes); PAI, Prenatal Attachment Inventory; PFAS, Paternal Fetal Attachment Scale.

Regarding the coefficients of the subscales, the variation found in the reviewed studies[17,18] was similar to that found in the validation of the original version (α=0.52 – α=0.73).[20] This demonstrates that the tool is reliable to assess the relationship between the parents and the fetus, although it has limitations in its subscales.

Regarding construct validity, a study on the feelings of fathers and mothers regarding the infant showed, through factorial analysis (FA), a five-factor model for this scale.[12] Another study with two groups of women presented distinct two- and three-factor models. The solutions resulting from this analysis did not correspond to the original MFAS subscales and were different in the two groups.[21] The FA aims to reduce the number of dimensions necessary to describe data derived from a large number of measures. These dimensions are defined by a correlation matrix, whose coefficients must show values >0.30.[22] The findings related to the FA of MFAS showed to be divergent between the reviewed studies and the original version. These results suggest problems related to construct validity.

There was moderate concurrent validity between the MFAS and the Maternal Attachment Inventory (MAI), but the correlation coefficient was lower than adequate (r≥0.70).[8]

This scale is adapted and validated for the population of Brazilian women. However, only its abstract is available for reading and, therefore, the research was not included in this review. The study was developed with 300 women with gestational ages of 6-9 months. The author notes that the Brazilian version of MFAS showed acceptable internal consistency, but also had limitations in its semantic content, showing restrictions regarding its validity.[23]

The MAAS consists of two versions: maternal, with 19 items, and paternal, with 16. The scale has two components: quality and duration of the bond. The items are answered through a five-point scale. High scores indicate a positive attachment and greater parental concern for the fetus.[24]

With regard to the psychometric properties, MAAS has been validated for Portuguese women with acceptable internal consistency. Moreover, the test-retest reliability of the paternal version was higher than the maternal version, but both were below the value considered adequate (r≥0.85). Additionally, a two-factor model[14] was found. Originally, this scale also showed two dimensions and had higher levels of reliability, α=0.82 and α=0.83 for the maternal and paternal versions, respectively.[24]

Also concerning the assessment of attachment between mother and child during pregnancy, a questionnaire (Maternal Adjustment and Maternal Attitudes [MAMA]) and an inventory (Prenatal Attachment Inventory [PAI]) were identified. The MAMA aims to evaluate the adjustment and maternal attitudes during pregnancy. It is self-administered, consisting of 60 items divided into five aspects: body image, somatic symptoms, marital relationship, attitudes regarding sex, and attitudes related to the pregnancy and the baby. The items are answered through a four-point scale: 1) never/not at all; 2) rarely/a little; 3) a lot; 4) very much. It has two versions: prenatal and postpartum.[25]

The MAMA is available for the context of Portuguese mothers and has a reliability index of the total scale close to the original version (α=0.89), considered reliable.[25] However, the internal consistency of the Portuguese subscales was lower than that found in the original MAMA, described as follows: body image: α=0.89; somatic symptoms: α=0.83; marital relationship: α=0.81; attitudes toward sex: α=0.95; and attitudes related to the pregnancy and baby: α=0.84.[25]

Another study using the PAI and MAMA, in their original versions, also showed greater internal consistency in the mentioned subscales when compared to the Portuguese version (body image: α=0.76; somatic symptoms: α=0.66; marital relationship: α=0.87; attitudes toward sex: α=0.84, and attitudes related to the pregnancy and fetus: α=0.68).[26] This shows that the subscales of the adapted version for Portuguese women need refinement.

For the split-half correlation coefficient of MAMA, it was observed that attitudes related to the pregnancy and baby, as well as somatic symptoms, had, respectively, r=0.54 and r=0.65.[19] The latter showed an even lower result in the original version (r=0.58).[25] The split-half coefficient or estimated Spearman-Brown reliability refers to the correlation between the components of the two halves of a scale. Values closer to 1.0 show high consistency between the halves of the tool and the test in its entirety.[27,28] The subscales of the Portuguese version of the MAMA that adequately represent the construct related to attitudes and adjustments of the mother during pregnancy (split-half correlation r≥0.70) were: body image, marital relationship, and sex-related attitudes.[19] These findings corroborate the results found in the original study, whose correlation was r=0.72 (body image), r=0.74 (marital relationship), r=0.82 (attitudes toward sex), and r=0.73 (attitudes related to the pregnancy and the fetus).[25]

However, in the study by Figueiredo,[19] the latter dimension showed a correlation measure that was lower than the expected minimum. This suggests that, in the Portuguese version, the attitudes related to pregnancy and fetus (r=0.48), together with somatic symptoms (r=0.62),[19] appear to demonstrate problems regarding the verification of the same construct of the other subscales and, therefore, they need revision.

The PAI measures the affectionate feelings of the mother in relation to the fetus. It consists of 21 items that are answered based on a four-point Likert scale. Higher scores indicate greater attachment of mother to the fetus.[26] This inventory demonstrated higher levels of internal consistency in the two reviewed studies (α=0.89)[15,16] when compared to the original version (α=0.81),[26] demonstrating that the tool is reliable.

Regarding the construct validity, the FA showed that one factor accounted for 79.0% of total variance.[15] The study about the original version demonstrated a five-dimension model, and factor 1 – consisting of 11 items that address preparation for childbirth, fantasies, affection, and interaction – accounted for 50.0% of the variance. Furthermore, this research showed adequate concurrent validity between PAI and MFAS, whose correlation coefficient was r=0.72.[26]

Mother-child attachment after the birth

The evaluation of the mother's emotional response in relation to the baby in the postpartum period was the objective of most tools. The most frequently used tools will be

discussed: Postpartum Bonding Questionnaire (PBQ),[29-35] Mother-Infant Bonding Scale (MIBS),[31,34,36-38] Parent-to-infant Attachment Questionnaire (PAQ),[31,39-41] and MAI.[13,16] Tables 3 and 4 provide data on the validity and reliability of the identified tools.

The PBQ was the most often used questionnaire in the reviewed studies. This tool aims to identify problems in the mother-baby relationship based on four components: 1) weakened bonding, 2) rejection and pathological rage, 3) anxiety about the baby/anxiety about caring for the baby, and 4) imminent abuse/risk of abuse.[42] It has been translated and adapted for the German, Dutch, and Chinese cultures. It is a reliable tool to identify dysfunctions in relationships with their children, according to the alpha coefficients of the German[29,35] and Dutch[31] versions. These values corroborate the findings of the original study, whose reliability coefficients ranged from α=0.74 to α=0.95.[42] Therefore, the PBQ has adequate internal consistency.

Regarding predictive validity, adaptation for use in Chinese women showed adequate sensitivity to identify damage in the relationship with the baby.[33] Moreover, it was observed that subscales 1 and 2 showed high sensitivity to identify problems in the bonding between mother and child, and rejection.

The abovementioned results corroborate findings regarding the validation of the original tool, wherein component 1, weakened bonding, showed to be sensitive to identify mothers with mild dysfunction in the mother-child relationship; and subscale 2, rejection and pathological rage, showed high sensitivity to identify women with severe problems related to rejection of the baby. The remaining components of the PBQ did not demonstrate high sensitivity.[42]

Other authors have used the original version and found similar results, given that the components 1 and 2 were respectively sensitive to identify mothers with some kind of disorder in the mother-child bonding and to identify women that show rejection of the baby. The other factors of the PBQ did not show enough predictive validity to verify additional problems in the mother-child relationship.[30]

The PBQ can be an important tool for the primary care professional, as one of its features is its use in community healthcare facilities.[42] The basic health units (BHUs) have flaws regarding the approach of psychosocial aspects involving the mother-child relationship. Some authors suggest that it is essential to train these professionals to work with the mental health of women during pregnancy and the postpartum period, to promote quality of life for parents and their children.[43]

The MIBS can be used in the first weeks after the child's birth up to 4 months postpartum to identify difficulties experienced by the mother in establishing a relationship

Table 3 Data on the validity of assessment tools of bonding between mother and baby during the postpartum period

Instrumentos	Estudos	Propriedades Psicométricas: Medidas de validade
PBQ	Reck *et al*[29]	CV: PBQ and EPDS: r=0.43 (25 items) and r=0.41 (16 items), with *p*<0.001. FA: one-factor model. Nine items showed non-significant factorial load and were therefore removed from the German version.
	Bronckington *et al*[30]	PV: WB: (E=0.68, S=0.82); RR: (E=0.95, S=0.88); A: (E=0.64, S=0.61). IA showed low sensitivity.
	Van Bussel *et al*[31]	CV: PBQ – total PAQ: 8th–12th week after birth: (ρ=-0.67); 20th–25th week (ρ=-0.63). Total PBQ – MIBS: 8th–12th week (ρ=0.60) and 20th–25th week (ρ=0.56)
	Wittkowski *et al*[32]	Construct validity: FA: three-factor model.
	Siu *et al*[33]	PV: Total PBQ: S=74% and Sp=100%; S1: S=84% and Sp=90%; S2: any rejection by the mother of the baby: S=89% and Sp=94%; and pathological rage: S=77% and Sp=68%; S3: S=59% and Sp=90%; S4: rage of any intensity: S=41% and Sp=93%; and moderate to severe: S=50% and Sp=94%.
MIBS	Van Bussel *et al*[31]	CV: total MIBS – MPAS: (immediately after birth) – ρ=-0.50 and (2 to 4 days after birth) – ρ=-0.45.
	Wittkowski *et al*[34]	CV: MIBS – PBQ immediately after birth and 2 to 4 days after birth.
	Taylor *et al*[36]	Construct validity: FA: two-factor structure.
	Bienfait M *et al*[37]	PV: S=0.90 to detect alterations in the mother-baby bonding and Sp=0.80.
PAQ	Van Bussel *et al*[31]	CV: PAQ - PBQ (ρ=-0.67 and ρ=-0.63); total PAQ - MIBS (ρ=-0.50 and ρ=-0.45).
	Scapesi *et al*[39]	FA - Italian version: six-factor model: time with the baby, competence, anxiety, workload activities, indifference, and pleasure with closeness.
	Feldstein *et al*[40]	CV: PAQ - AQS (r=0.39).
	Condon *et al*[41]	FA: 3-factor model for parents of babies aged 6 and 12 months.
MAI	Shin, Kim[13]	CV: MAI - MFAS: r=0.46 (*p*<0.01); MSS: r=0.62 (*p*<0.01). FA: 3-factor model. Correlation of total MAI with the three factors ranged from r=0.52 to r=0.92.
	Damato[16]	CV: PAI - MAI (r=0.38).

CV, concurrent validity; PV, predictive validity; FA, factorial analysis; WB, weakened bonding; RR, rejection and pathological rage; A, anxiety; IA, imminent abuse; S1, scale 1; S2, scale 2; S3, scale 3; S4, scale 4; S, sensitivity; Sp, specificity; EPDS, Edinburgh Postnatal Depression Scale; MAI, Maternal Attachment Inventory; MIBS, Mother-Infant Bonding Scale; MFAS, Maternal Fetal Attachment Scale; MPAS, Maternal Postpartum Attachment Scale; PAI, Prenatal Attachment Inventory; PAQ, Parent-to-infant Attachment Questionnaire (MPAQ, maternal version, and PPAQ, paternal version); PBQ, Postpartum Bonding Questionnaire.

Table 4 Data on the reliability of assessment tools of bonding between mother and baby during the postpartum period

Tools	Studies	Psychometric properties: measures of reliability
PBQ	Reck *et al*[29]	IC: version with 25 items: α=0.85; WB: α=0.78; RR: α=0.68; A: α=0.34; and RA: α=0.20. IC: version with 16 items: α=0.85; WB: α=0.81; RR: α=0.75; A: α=0.32; RA: α=0.34.
	Van Bussel *et al*[31]	IC: total PBQ (8th-12th week) α=0.87 and α=0.78 (20th-25th)
	Wittkowski *et al*[32]	IC - PBQ: factor 1-α=0.94; factor 2-α=0.93; and factor 3-α=0.72.
	Wittkowski *et al*[34]	IC of PBQ: total: α=0.76 and α=0.77; S1-α=0.79; S2 and S3 - α=0.63.
	Moehler *et al*[35]	IC of PBQ: α=0.79.
MIBS	Van Bussel *et al*[31]	IC: total MIBS (immediately after birth) α=0.67 and α=0.58 (2 to 4 days after birth).
	Wittkowski *et al* [34]	IC: α=0.55 (immediately after birth) and α=0.49 (2 to 4 days after birth).
	Taylor *et al*[36]	Version with 8 items (α=0.71).
	Figueiredo *et al*[38]	IC total scale: α=0.44; S1: α=0.69; S2: α=0.57; and S3: α=0.23. Total scale - split-half (r)=0.52; S1 r=0.52; S2 r=0.45; and S3 r=0.28. Correlation test-retest (Spearman): ρ=0.49.
PAQ	Van Bussel *et al*[31]	IC: total PAQ: (8th-12th weeks after birth) α=0.75 and (20th-25th weeks after birth) α=0.68.
	Scapesi *et al*[39]	IC: total PAQ: α=0.77.
	Feldstein *et al*[40]	IC: MPAQ - α=0.79; PPAQ - α=0.85.
	Condon *et al*[41]	IC: Overall: 6 months of baby (?) - α=0.81; 12 months - α=0.78.
MAI	Shin, Kim[13]	IC: total MAI: α=0.94; Factor 1 (MAI): α=0.94; Factor 2 (MAI): α=0.91; and Factor 3 (MAI): α=0.65.
	Damato[16]	IC (MAI): α=0.92 and α=0.93.

MAI, Maternal Attachment Inventory; MIBS, Mother-Infant Bonding Scale; PAQ, Parent-to-infant Attachment Questionnaire (MPAQ, maternal version, and PPAQ, paternal version); PBQ, Postpartum Bonding Questionnaire; IC, internal consistency; WB, weakened bonding; RR, rejection and pathological rage; A, anxiety about the baby; RA, risk of abuse; MC, maternal components; BC, baby components; CD, components of dyad; S1, subscale 1; S2, subscale 2; S3, subscale 3.

with the baby. It consists of eight adjectives divided into three aspects: positive, negative, and confused attachment. Negative adjectives have inverted scoring. High scores indicate problems in the mother-infant bonding.[36]

Regarding psychometric properties, studies using MIBS found a less than ideal (α≥0.70) internal consistency. However, validation research of the original version of the MIBS showed acceptable internal consistency (α=0.71), and a two-factor model.[36]

Regarding criterion validity, the aforementioned scale had high sensitivity to detect mothers with bonding alterations in relation to their children[37] and moderate concurrent validity with PBQ[34] and MPAS.[31] However, in this latter case, the correlation was negative, so that high attachment scores in the MIBS are correlated with low scores in the MPAS.[31] This scale has an inverted score for the negative aspects related to attachment, so higher scores demonstrate difficulties in the bonding between mother and child.[36] These findings suggest that the versions for other cultures have limitations regarding reliability, but they show predictive and concurrent validity, albeit moderately.

The attachment disorders detected by the MIBS are related to the fact that, in the postpartum period, women have more mood swings, which may compromise the establishment of bonding with the child. Depression is a predictor of emotional problems in the relationship between mother and baby.[43] In the presence of this disease, women tends to not respond satisfactorily to the needs of the child, whether they be physical, such as food, maintenance of body temperature, and promoting the child's comfort, or emotional, such as the needs of communication, affection, and love from the mother toward her child.[44-45]

The PAQ is a questionnaire consisting of 19 items organized into three subscales: quality of the attachment (QA), absence of hostility (AH), and pleasure in interaction (PI). This tool is designed to assess the mother's emotional response in relation to the baby, especially in the first year of life.[46] It was used in four investigations, two of which are related to the adaptation and validation for the Dutch[31] and Italian[39] cultures. All publications that used this tool showed acceptable levels of reliability. However, the Dutch version, when used for mothers of infants aged 8-12 weeks, showed problems regarding reliability. The use of this version is appropriate for babies aged between 4 and 5 months.[31]

As for the original version, the PAQ showed higher internal consistency than that found in the mentioned versions (α=0.78 - 4-week and 8-month babies, and α=0.79, 4-month babies).[46] However, other authors found a higher internal consistency than that of the original version.[41] These findings support the reliability of this instrument. Regarding construct validity, a six-factor model in the Italian version was found.[39] In contrast, other authors have disclosed a three-dimension model for mothers of Dutch babies.[41] These latter findings corroborate the results of the original version of the tool, whose FA resulted in a three-factor model.[46]

The MAI is used to measure the attachment between mother and child. It consists of 26 items, organized into a four-point Likert scale. Higher scores indicate greater attachment between mother and baby.[47] It has been translated and adapted for Korean[13] and Brazilian[48] female populations. In the latter case, the validation was conducted for mothers of children aged between 6 and 13 years and showed high reliability (α=0.90).[48] The internal consistency

of the original version (α=0.85 – 4-week babies, α=0.76 – 4-month babies, and α=0.85 – 8-month babies)[47] showed lower values than those found in two other studies, with α>0.90.[13,16] Thus, the MAI is a robust tool to measure the attachment between mother and baby.

Other tools were less frequently mentioned in studies on the relationship between mother and baby in the postpartum period. They are: Global Rating Scales (GRS),[49] Barkin Index of Maternal Functioning (BIMF),[50] Parent-Child Early Relational Assessment (PCERA),[51] Postpartum Maternal Attachment Scale (PMAS),[52] and Brown Scale of Interactions.[53] All demonstrated high internal consistency, except the GRS, whose study described no measure of reliability.[49] Most items from the Brown Scale showed high interobserver agreement (*kappa*>0.85).[53] As for measures of concurrent validity, the GRS showed correlation with the Infant-Toddler Home Inventory[49] and the BIMF showed correlation with the Gratification Check List, the Short-Form Health Survey Mental Functioning component, and the Hamilton Depression Rating Scale.[50]

Final considerations

The subscale of attitudes related to pregnancy and the fetus, and somatic symptoms (MAMA) showed problems related to the verification of the same construct in other dimensions of this questionnaire.

The PAI showed criterion and construct validity, in addition to a high reliability index. In contrast, the MFAS showed limitations regarding construct validity. The translation and adaptation for the Brazilian population of mothers and babies has been performed, but this study is not available for electronic access.

As for the postpartum period, the MAI showed better reliability coefficients, but its Brazilian version has not been validated for mothers of children younger than one year. The PBQ was sensitive to identify mothers with mild dysfunction regarding the attachment with their children and women with severe problems related to rejection of their baby. The Portuguese and Dutch versions of the MIBS showed inadequate internal consistency.

Finally, it was observed that most tools show high precision when measuring maternal-infant attachment, but some have limitations regarding their validity. Moreover, the majority have not been translated and adapted for the Brazilian population. Thus, it is necessary to adapt and validate these tools, considering the specific characteristics of Brazilian mothers and babies in the first year of life.

Conflicts of interest

The authors declare no conflicts of interest.

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