Translation and validation of the maternal fetal attachment scale in bahasa Indonesia version

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Abstract

Background: Maternal–fetal attachment (MFA) refers to the emotional bond between a pregnant woman and her unborn child, influencing maternal behaviors and fetal outcomes. The Maternal Fetal Attachment Scale (MFAS) is widely used to assess MFA; however, cultural adaptation is necessary to ensure its validity across different populations.
Purpose: This study aimed to translate, culturally adapt, and validate the MFAS for use in Bahasa Indonesia with adequate psychometric properties.
Methods: A cross-sectional study was conducted among 250 pregnant women attending antenatal clinics in West Java, Indonesia. The MFAS was translated following Beaton et al.'s cross-cultural adaptation guidelines. Content validity was evaluated using the Content Validity Index (CVI) and expert review. Construct validity was assessed through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Reliability was examined using Cronbach's alpha and the Intraclass Correlation Coefficient (ICC).
Results: The Bahasa Indonesia MFAS showed excellent content validity (S-CVI = 1.00). EFA revealed a unidimensional structure explaining 40.76% of the variance, with factor loadings ranging from 0.43 to 0.88. CFA demonstrated good model fit (CFI > 0.90; RMSEA ≤ 0.08). The scale showed high internal consistency (Cronbach's alpha = 0.899) and good test–retest reliability (ICC = 0.779).
Conclusion: The Bahasa Indonesia version of the MFAS is a valid and reliable instrument for assessing maternal–fetal attachment and can be effectively used in maternal health research and clinical practice.

Keywords: maternal fetal attachment scale; maternal health; maternal-fetal attachment; prenatal care; psychometric validation

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Introduction

Maternal-fetal attachment (MFA) refers to the emotional bond that develops between a mother and her unborn child during pregnancy. This bond plays a critical role in fostering maternal behaviors that positively impact both maternal and infant well-being (Trombetta et al., 2021). Research highlights that strong MFA is associated with healthier prenatal behaviors, including adherence to medical advice, optimal nutrition, regular physical activity, and reduced substance use, all of which contribute to better pregnancy outcomes (Gobel, 2020; McNamara et al., 2019). These behaviors collectively enhance fetal development, reduce the risk of complications, and improve maternal mental health. Conversely, low maternal-fetal attachment has been linked to adverse outcomes, such as increased maternal stress, suboptimal prenatal care, and postpartum depression (Lima et al., 2024). Maternal stress during pregnancy has been identified as a significant predictor of low birth weight and preterm delivery, often mediated by elevated cortisol levels (Hudson et al., 2020). Furthermore, low MFA is associated with diminished maternal responsiveness postpartum, which can negatively affect early infant development and attachment patterns (Rossen et al., 2017). Therefore,

understanding and addressing factors influencing MFA are critical for improving maternal and neonatal health outcomes.

Cultural and psychosocial factors significantly influence the development of maternal–fetal attachment (MFA). For example, studies suggest that cultural norms related to pregnancy, maternal roles, and social support systems shape how mothers perceive and bond with their unborn child (Sacchi et al., 2021). In collectivist societies, where extended family support is emphasized, maternal stress levels may be lower, positively influencing MFA, whereas in more individualistic contexts, limited community support may contribute to higher stress and weaker attachment (da Rosa et al., 2021). Recognizing these cultural nuances is essential for developing culturally sensitive interventions to promote MFA.

Accurate measurement of MFA is therefore critical in maternal health research. Instruments such as the Maternal-Fetal Attachment Scale (MFAS) and the Prenatal Attachment Inventory (PAI) are widely used to assess the strength of maternal bonding during pregnancy and have been applied in several Indonesian studies to examine MFA in relation to maternal psychological well-being, prenatal adaptation, and health-related behaviors. Despite their growing use in Indonesia, these instruments require rigorous cultural adaptation and psychometric validation to ensure their relevance and accuracy within local contexts (Branjerdporn et al., 2017). For instance, the MFAS emphasizes behaviors such as talking or singing to the fetus, which may not be culturally normative or consistently practiced in some Indonesian settings, highlighting the need for culturally appropriate validation.

The Maternal Fetal Attachment Scale (MFAS), developed by Cranley (1981), is a widely used instrument for assessing maternal–fetal attachment (MFA) across five behavioral dimensions. The scale has been validated in various languages and cultural settings, supporting its usefulness in cross-cultural research (McNamara et al., 2019; Trombetta et al., 2021). However, a culturally adapted and psychometrically validated Bahasa Indonesia version of the MFAS is not yet available. This gap is critical given that maternal attachment behaviors are shaped by sociocultural norms, family structures, and beliefs that differ from the Western contexts in which the MFAS was originally developed. Without cultural adaptation, MFAS items may not fully capture attachment expressions among Indonesian women, potentially resulting in measurement bias. Therefore, translation and validation of the MFAS into Bahasa Indonesia are essential to ensure accurate assessment and to support maternal health research and practice in Indonesia.

In Indonesia, maternal health remains a public health priority due to persistently high maternal and neonatal mortality rates. The World Health Organization reported that Indonesia has one of the highest maternal mortality ratios in Southeast Asia, with a substantial proportion of deaths attributable to preventable factors, including inadequate antenatal care utilization The World Health Organization (WHO, 2020). Addressing this challenge requires a holistic approach that integrates not only physical health but also psychological and emotional dimensions of pregnancy.

Maternal–fetal attachment (MFA) has been identified as a key psychosocial factor influencing maternal health behaviors and pregnancy outcomes. Previous studies have shown that stronger MFA is associated with improved adherence to antenatal care, healthier lifestyle behaviors during pregnancy, and better maternal mental health (Suryaningsih et al., 2020; Posada et al., 2018). These findings underscore the importance of accurately assessing MFA within maternal health programs. However, the absence of a culturally validated MFA measurement tool in Indonesia limits the ability to systematically evaluate this construct and to design evidence-based interventions. Therefore, validating the MFAS in the Indonesian context is essential to support research, clinical assessment, and policy efforts aimed at improving maternal and neonatal outcomes.

Although tools like the MFAS have the potential to provide critical insights into maternal mental health and attachment, directly applying instruments developed in different cultural contexts may lead to inaccuracies. This is primarily due to linguistic nuances and cultural differences that could affect how items are understood and interpreted (Beaton et al., 2000; Sousa & Rojjanasrirat, 2011). For instance, cultural norms in Indonesia, such as the emphasis on family involvement during pregnancy and the role of traditional beliefs in maternal care, may shape maternal behaviors and attitudes in ways not captured by instruments developed in Western contexts (Herwansyah et al., 2022). Translation and validation processes are therefore essential to adapt instruments like the MFAS for use in Indonesia, ensuring they maintain both reliability and validity within the local population (Clark & Watson, 2016).

The lack of standardized and culturally relevant tools to assess maternal-fetal attachment in Indonesia represents a significant gap in maternal health research. While some studies have explored maternal mental health and attachment in the Indonesian context, the absence of validated instruments limits the ability of researchers and healthcare providers to accurately measure and address these constructs (Kamarudin et al., 2024). Translation and validation of the MFAS into Bahasa Indonesia would address this gap by providing a psychometrically sound tool for assessing maternal-fetal attachment in Indonesian women. This process involves rigorous methodology, including forward and backward translation, content validation, pilot testing, and psychometric evaluation, to ensure cultural appropriateness and statistical reliability (Connelly, 2022).

By developing a culturally adapted version of the MFAS, healthcare providers and researchers in

Table 1. Content Validity Index for Parent Attachment Scale Based on Aiken's Value Formula

Item	Examiner 1 Value (R)	S = R - Lo	Examiner 2 Value (R)	S = R - Lo	Examiner 3 Value (R)	S = R - Lo	Examiner 4 Value (R)	S = R - Lo	Examiner 5 Value (R)	S = R - Lo	∑S	V
1	4	3	4	3	4	3	4	3	4	3	15	1.00
2	3	2	4	3	4	3	4	3	4	3	14	0.93
3	4	3	4	3	4	3	4	3	4	3	14	0.93
4	3	2	4	3	4	3	4	3	4	3	14	0.93
5	4	3	4	3	4	3	4	3	4	3	14	0.93
6	4	3	4	3	4	3	3	2	4	3	14	0.93
7	4	3	4	3	4	3	4	3	3	2	14	0.93
8	3	2	4	3	4	3	4	3	4	3	14	0.93
9	3	2	4	3	4	3	4	3	4	3	14	0.93
10	4	3	4	3	4	3	4	3	4	3	15	1.00
11	3	2	4	3	4	3	4	3	4	3	14	0.93
12	4	3	4	3	4	3	4	3	4	3	14	0.93
13	3	2	4	3	4	3	4	3	4	3	14	0.93
14	4	3	4	3	4	3	4	3	4	3	14	0.93
15	4	3	4	3	4	3	4	3	4	3	15	1.00
16	4	3	4	3	4	3	4	3	4	3	15	1.00
17	3	2	4	3	4	3	4	3	4	3	14	0.93
18	4	3	4	3	4	3	4	3	4	3	15	1.00
19	3	2	4	3	4	3	4	3	4	3	14	0.93
20	4	3	4	3	4	3	4	3	4	3	15	1.00
21	3	2	4	3	4	3	4	3	4	3	14	0.93
22	4	3	4	3	4	3	4	3	4	3	15	1.00
23	3	2	4	3	4	3	4	3	4	3	14	0.93
24	4	3	4	3	4	3	4	3	4	3	15	1.00

Note: Items with a CVI ≥ 0.93 were considered valid, indicating excellent content validity.

Indonesia could gain deeper insights into maternal-fetal attachment and its determinants, facilitating the design of targeted interventions to improve maternal and neonatal outcomes. For example, culturally appropriate antenatal education programs that strengthen maternal-fetal attachment could be implemented to address psychological distress and promote healthy behaviors during pregnancy (Gonzales Jr & Barcelo, 2023). This study aims to fill the existing gap by translating the MFAS into Bahasa Indonesia and validating its psychometric properties in a population of pregnant Indonesian women, thus contributing to the development of evidence-based maternal health interventions.

Materials and Methods

Study design

The objective of this investigation was to translate, adapt, and validate the Maternal Fetal Attachment Scale (MFAS) into the Bahasa Indonesia version through the use of a cross-sectional design. The research endeavored to evaluate the psychometric properties of the translated scale by means of a structured process that included translation, validation, and reliability assessment.

Sample

The participants were pregnant women attending antenatal care clinics in West Java, Indonesia, at the time of data collection. Eligible participants were women aged 18 years or older, able to read and understand Bahasa Indonesia, and willing to provide informed consent. To ensure adequate experience of maternal–fetal attachment, only women in the second and third trimesters of pregnancy (≥14 weeks of gestation) were included, as MFA is considered more stable and perceptible after fetal movements are commonly experienced. Women with diagnosed mental disorders or cognitive impairments were excluded from the study.

Table 2. Factors loading of MFAS

Item	Factor Load-ing	Eigenvalue	Variance Explained (%)
1	0.76	0.465	40.54
2	0.88		
3	0.65		
4	0.66		
5	0.58		
6	0.76		
7	0.83		
8	0.65		
9	0.66		
10	0.47		
11	0.51		
12	0.43		
13	0.49		
14	0.63		
15	0.81		
16	0.55		
17	0.72		
18	0.77		
19	0.61		
20	0.67		
21	0.64		
22	0.71		
23	0.73		
24	0.68		

Table 3. CFA results for the MFAS Scale

Domain	χ^2	χ^2/df	RMSEA	SRMR	CFI	NNFI	GFI
Differentiation from the baby	38.87	1.991	0.081	0.062	0.915	0.917	0.918
Interaction with the baby	37.91	1.956	0.075	0.062	0.932	0.919	0.943
Attribution of attributes to the ba-by	39.01	1.912	0.081	0.061	0.927	0.921	0.932
Role-playing	38.76	1.965	0.074	0.060	0.922	0.923	0.933

Table 4. Reliability of MFAS

Domain	Cronbach's Alpha	Item-Total Correla-tion Range(n = 144)	Intraclass Correlation Co-efficient (ICC) (n = 72)
Differentiation from the Baby	0.899	0.456 – 0.687	0.775
Interaction with the Ba-by	0.925	0.533 – 0.728	0.765
Attribution of Attributes to the Baby	0.901	0.516 – 0.730	0.780
Role-Playing	0.913	0.603 – 0.786	0.779

Parity was not used as an inclusion or exclusion criterion, allowing participation of both primigravida and multigravida women. This approach was adopted to capture a broad range of maternal experiences and to enhance the generalizability of the psychometric evaluation of the MFAS across different reproductive histories.

The sample size was determined based on the recommended ratio of 5–10 participants per item for factor analysis (Costello & Osborne, 2005). Given that the MFAS comprises 24 items, a minimum of 120 participants was required for exploratory factor analysis (EFA). A total of 250 participants were recruited, providing an adequate sample size for

both EFA and confirmatory factor analysis (CFA), consistent with recommendations for psychometric validation studies (Worthington & Whittaker, 2006).

Instrument

The Maternal Fetal Attachment Scale (MFAS) was developed by Cranley (1981) to assess the degree of emotional attachment a pregnant woman has toward her unborn fetus. The MFAS consists of 24 items rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), yielding total scores from 24 to 120, with higher scores indicating stronger maternal–fetal attachment. The original instrument demonstrated good internal consistency, with a Cronbach's alpha of 0.85. Since its development, the MFAS has been widely used in academic and clinical research and validated across diverse populations and cultural contexts, supporting its reliability and applicability for research purposes when appropriately cited. Validation studies of the MFAS have involved diverse demographic groups, including variations in age, gestational age, parity, educational level, and cultural background, consistently demonstrating reliable psychometric performance.

Procedure

Translation process

The translation procedure followed the cross-cultural adaptation guidelines proposed by Beaton et al. (2000) o ensure linguistic accuracy and cultural relevance. Initially, two independent multilingual translators translated the MFAS into Bahasa Indonesia. This step aimed to preserve the conceptual meaning of the original items while accommodating linguistic differences. A council of specialists then reviewed and synthesized the two forward translations into a single preliminary version.

The council of specialists consisted of five experts: two senior midwifery lecturers with extensive experience in antenatal care, one obstetrician specializing in maternal health, one clinical psychologist with expertise in perinatal mental health, and one nursing researcher experienced in psychometric instrument development. During this stage, all translation decisions, discrepancies, and cultural considerations were systematically documented in written review notes and item-by-item comparison forms.

Particular attention was given to items referring to behaviors such as verbal interaction with the fetus (e.g., talking or singing) and psychological differentiation of the fetus as an individual, which may be expressed differently in Indonesian cultural and religious contexts. These items were rephrased using culturally familiar expressions that reflect common maternal practices in Indonesia, such as internal communication, prayer, or emotional reflection, while preserving their original conceptual intent. No items were removed or added during this process.

Back-translation was subsequently conducted by two bilingual translators who were independent of the initial translation process and blinded to the original MFAS. This step aimed to identify inconsistencies or conceptual deviations in the synthesized Bahasa Indonesia version.

Validation

Content validity

The content validity of the translated Maternal Fetal Attachment Scale (MFAS) was assessed using the Content Validity Index (CVI) by the same expert panel, consisting of three obstetricians and two psychologists. The CVI is commonly used to assess item and scale validity. Items having a CVI score of ≥0.78 met content validity requirements (Polit et al., 2007). This rigorous methodology guarantees that the instrument correctly captures the targeted ideas and is suitable for the target demographic. The expert panel assessed instrument content using Kappa statistics to measure inter-rater agreement. Kappa values evaluate agreement beyond chance, improving comprehension of experts' conclusions. Abstract concept evaluation involves thorough theoretical preparation and systematic expert assessment to improve content validity (Polit et al., 2007). The theoretical framework led domain conceptualization and item generation to fit with research constructs. The first step was a comprehensive literature analysis and theoretical mapping to identify maternal-fetal attachment domains. This stage influenced the instrument's first draft. In the second phase, five nursing healthcare experts and scientific researchers rated each item's relevance and lucidity on a four-point scale from 1 (totally irrelevant) to 4 (extremely appropriate). The experts were notified of instrument modifications and clarifications to offer informed input. Their ratings helped refine the instrument by identifying and correcting content gaps. Expert input improved the content validity of the translated MFAS, making it a trustworthy tool for measuring maternal-fetal attachment in the target demographic. Iterative expert consultation and statistical validation verify the instrument's completeness and relevance.

Construct Validity

For the purpose of determining the underlying factor structure of the Maternal Fetal Attachment Scale (MFAS), an exploratory factor analysis (EFA) was carried out. For the purpose of identifying hidden factors that have an effect on observable data, EFA is a statistical method. A method known as principal axis factoring was utilized in this investigation for the purpose of component extraction. This method is particularly well-suited for data that might not satisfy the assumption of multivariate normality. The retention of factors was evaluated using both statistical and visual methods. Keeping components that have eigenvalues greater than one was recommended by the Kaiser criterion (Kaiser, 1960)

due to the fact that these components adequately explain a significant portion of the variation in the dataset. Additionally, a scree plot was investigated in order to ascertain the optimal number of components that should be preserved in the event that the slope of the eigenvalue becomes flat (Cattell, 1985). These techniques ensured that the identification of factors was both reliable and significant. The exploratory factor structure was validated through the use of CFA following the EFA. CFA conducts a comparison of the factor structure of the assumed model with the facts that can be observed (da Rosa et al., 2021). The model's fit was evaluated using multiple fit indices in great detail. According to Bentler (1990), a model was considered to have a good fit when both the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) were greater than 0.90. According to Hu and Hu and Bentler (1999), the Root Mean Square Error of Approximation (RMSEA) was calculated, and values that were lower than 0.06 indicated that the match was of a satisfactory quality. According to Kline (2023), a suitable match was also determined by the Standardized Root Mean Square Residual (SRMR), which was found to be within the range of 0.08 to 0. When taken as a whole, these indices provide a complex evaluation of the validity of the factor structure, so ensuring that the model is trustworthy for any future research or practical applications.

Reliability Testing

The internal consistency of the scale was evaluated with the use of Cronbach's alpha, which is a statistical measure that determines how closely linked the items are to one another as a group. High levels of Cronbach's alpha indicate that there is a high degree of internal consistency, which indicates that all of the items evaluate the same notion. According to Tavakol and Dennick (2011), the Cronbach's alpha should be at least 0.70, although this may change depending on the context of the scale and the purpose. For the purpose of determining the dependability of each item, the correlation between each item and the overall score was evaluated. This stage is responsible for identifying components that are not contributing to the build and have poor performance. Because low item-total correlations may indicate duplication or irrelevance, the items in question ought to be modified or removed in order to enhance the reliability of the scale (Field, 2024). The Intraclass Correlation Coefficient (ICC) was utilized in order to evaluate the stability of the scale over a period of two weeks. ICC is used to evaluate test-retest reliability, which refers to the consistency of two measurements that were carried out at different times. A high level of dependability is indicated by an ICC score of 1, which indicates that the results are dependable when the conditions are consistent. According to Koo and Li (2016), this phase is critical because it ensures that the scale accurately repesents the construct of interest on a constant basis.

Data Analysis

In order to evaluate the psychometric properties of the instrument, data analysis was conducted using IBM SPSS Statistics Version 25 and IBM SPSS AMOS Version 26 under an institutional licensed software. The CVI values for each item and the scale were computed in order to evaluate the content validity of the scale. It uses expert consensus to determine whether or not the items in question are reflective of the concept that is being investigated (Polit & Beck, 2006). An exploratory factor analysis, also known as EFA, was then utilized in order to ascertain the factor structure of the instrument. According to Tabachnick et al. (2007), principal component analysis with varimax rotation was used to extract components, with the components that had eigenvalues greater than one being retained.CFA is able to validate the factor structure that was identified by EFA. The CFI, TLI, and RMSEA model fit indices were computed by AMOS computer. The model's ability to match the data was quantified by these metrics (Kline, 1999). The Cronbach's alpha statistic, which assesses how effectively different scale items measure the same notion, was utilized in order to evaluate the reliability of the internal consistency. It was determined that values greater than 0.70 were acceptable for reliability (DeVellis & Thorpe, 2021). The Intraclass Correlation Coefficient (ICC) was used to quantify the stability of the instrument over time in order to evaluate the reliability of the test-retest. Koo and Li (2016) found that an ICC greater than 0.75 suggested an excellent level of dependability.

Ethical Considerations

The study was approved by the STIKes Cirebon Institutional Review Board (IRB) (Approval Number: 0189ETIK) for ethical reasons. Before enrolling any participant, we made sure to get their written informed permission. The study maintained strict secrecy and all participants were asked to voluntarily participate. Feedback regarding the research procedure and the instrument was solicited from participants.

Results

Content validity

Content validity of the translated Maternal–Fetal Attachment Scale (MFAS) was assessed using the Content Validity Index (CVI) based on expert ratings calculated with Aiken's V formula. Five experts independently evaluated each item for clarity and relevance using a four-point rating scale. The scale-level CVI (S-CVI) for both clarity and relevance was 1.00, indicating excellent overall content validity.

All 24 original items were retained in the final Bahasa Indonesia version, and no items were removed during the expert review process. Minor wording modifications were made to several items to enhance semantic clarity and cultural appropriateness while preserving their original conceptual meaning. These revisions mainly involved items related to maternal–fetal interaction

and role-taking behaviors, which required contextual adjustment to reflect common maternal practices in Indonesia.

After revision, all items achieved an Aiken's V value of ≥ 0.93, demonstrating strong item-level content validity (Table 1).

Cultural adaptation incorporated key Indonesian sociocultural values related to motherhood, including spiritual reflection, religious practices such as prayer, collective family orientation, and the perception of pregnancy as a moral and emotional responsibility. In this context, maternal–fetal attachment is often expressed through internal reflection, prayer, and emotional awareness rather than explicit verbal interaction. These cultural considerations were integrated into item wording to ensure experiential and conceptual equivalence without altering the underlying construct of maternal–fetal attachment.

Construct validity

Good construct validity is demonstrated by the Maternal-Fetal Attachment Scale (MFAS), with factor loadings ranging from 0.43 to 0.88. With a Kaiser-Meyer-Olkin (KMO) value of 0.941, which indicates sampling adequacy, the sample was considered suitable for factor analysis. The data were deemed suitable for factor analysis since Bartlett's test of sphericity yielded a significant result ($X^2 = 2136.32$, $P < 0.001$). An eigenvalue greater than 1 was found in one principal component, which accounted for 40.76 percent of the total variance. It follows that the MFAS must be one-dimensional. Table 2 shows that the factor loadings for all items were in the range of 0.43 to 0.88.

The confirmatory factor analysis (CFA) further validated the structure of the MFAS. The model fit indices for the domains were within acceptable thresholds, suggesting good model fit. Table 3 summarizes the CFA results for each domain of the MFAS. All domains achieved a χ^2/df value below 2, indicating an excellent model fit. RMSEA values for all domains were within the acceptable range (≤0.08), signifying a close approximation of the model to the observed data. SRMR values were all ≤0.062, indicating low residuals and a good model fit. Both indices exceeded 0.90 for all domains, showing a strong comparative and incremental fit of the model. GFI values for all domains were above 0.90, confirming the adequacy of the model fit.

Reliability

The Cronbach's alpha coefficient of the MFAS scale was 0.899, and the intraclass correlation coefficient (ICC) for test-retest reliability was 0.779. The item-total correlations ranged between 0.456 and 0.687, while the item-total score correlations for the measure were between 0.533 and 0.728 (Table 4).

Discussion

This study aimed to translate, culturally adapt, and validate the Maternal–Fetal Attachment Scale (MFAS) for use among pregnant women in Indonesia. The findings demonstrate that the Bahasa Indonesia version of the MFAS exhibits strong psychometric properties, including excellent content validity, high internal consistency, acceptable test–retest reliability, and satisfactory construct validity. These results support the suitability of the instrument for assessing maternal–fetal attachment (MFA) within the Indonesian cultural context.

The construct validity analysis revealed a unidimensional factor structure, explaining 40.76% of the total variance, which differs from the original five-factor model proposed by Cranley (1981), The original MFAS conceptualized MFA as a multidimensional construct encompassing differentiation of self from the fetus, interaction with the fetus, attributing characteristics to the fetus, giving of self, and role-taking. In contrast, the Indonesian version suggests that these dimensions converge into a single overarching construct representing a holistic emotional bond between the mother and the fetus. This finding indicates that, within the Indonesian context, MFA may be perceived less as a set of distinct behavioral domains and more as an integrated emotional experience.

Such structural differences are consistent with findings from previous cross-cultural validation studies of the MFAS. For example, the Turkish adaptation identified a three-factor structure, which was attributed to sociocultural perceptions of motherhood and fetal personhood (Golbasi et al., 2015). Similar reductions or modifications in factor structure have been reported in other cultural settings, highlighting that the manifestation and interpretation of maternal–fetal attachment are culturally embedded. In collectivist societies such as Indonesia, maternal roles are strongly influenced by family values, religious beliefs, and social expectations, which may lead women to perceive attachment-related behaviors as inseparable components of a unified emotional connection rather than as distinct actions or cognitions.

The translation and semantic adaptation process may have also contributed to the observed structural differences. Although all original MFAS items were retained, subtle shifts in meaning during translation—particularly in items related to psychological differentiation or attributing individual characteristics to the fetus—may have influenced how participants interpreted and responded to these items. Such semantic nuances are well-documented challenges in cross-cultural instrument adaptation and may affect item clustering in factor analysis. These findings underscore the importance of culturally grounded validation rather than direct adoption (Sacchi et al., 2021), instruments developed in Western contexts.

Despite differences in factor structure, the Bahasa Indonesia MFAS demonstrated excellent reliability, with a Cronbach's alpha of 0.899 and good test–retest stability (ICC = 0.779). These values are comparable to, or exceed, those reported

in previous international studies, including the original MFAS (α = 0.85) and validations conducted in European populations Sacchi et al. (2021). The strong reliability indicators suggest that the scale consistently measures the MFA construct among Indonesian women.

The availability of a valid and reliable MFAS is particularly important given the established role of maternal–fetal attachment in influencing maternal behaviors and pregnancy outcomes. Previous studies have shown that higher MFA is associated with better adherence to antenatal care, healthier lifestyle behaviors, reduced pregnancy-related anxiety, and improved neonatal outcomes, including optimal birth weight and reduced risk of preterm birth (Posada et al., 2018; Trombetta et al., 2021). Conversely, low MFA has been linked to adverse outcomes such as postpartum depression and difficulties in early mother–infant bonding. Therefore, the validated Indonesian MFAS provides a valuable tool for identifying women at risk of low attachment and for informing early psychosocial interventions.

Furthermore, the findings reinforce the adaptability of the MFAS across linguistic and cultural contexts. Similar to adaptations conducted in Brazil and other countries Lima et al. (2022) the Indonesian version maintains the conceptual integrity of MFA while reflecting local cultural meanings. This adaptability is essential for maternal health research, where culturally sensitive measurement tools are needed to guide evidence-based clinical practice and policy development.

Overall, the Bahasa Indonesia version of the MFAS represents a psychometrically sound instrument that captures the emotional bond between pregnant women and their unborn children within the Indonesian sociocultural framework. Its use can facilitate more accurate assessment of maternal–fetal attachment in both research and clinical settings, supporting the development of target (Shieh et al., 2021; Kołomańska-Bogucka et al., 2022).

Implications for Clinical Practice

The findings underscore the importance of integrating MFAS assessments into routine prenatal care, as they provide valuable insights into the emotional connection between expectant mothers and their unborn children. Early identification of mothers with low attachment scores allows healthcare professionals to tailor interventions that address specific emotional or psychological challenges. These targeted interventions, such as individualized counselling sessions or structured educational programs, are designed to enhance MFA by promoting maternal awareness, emotional bonding, and positive perceptions of the pregnancy. Such improvements in MFA have a cascading effect on overall maternal well-being, reducing stress, anxiety, and depression, which are often associated with poor attachment. Additionally, strengthened maternal-fetal bonds are linked to better neonatal outcomes, including healthier birth weights, more consistent breastfeeding practices, and improved infant emotional development. By fostering secure attachment bonds during pregnancy, these interventions also set the stage for stronger mother-infant relationships post-birth, supporting the infant's psychological and emotional resilience in the long term. Therefore, routine MFA assessments serve as a proactive tool in prenatal care, bridging gaps in maternal and child health and contributing to more holistic and effective perinatal care strategies.

Limitations

Despite its strengths, this study acknowledges limitations, including potential self-report biases in MFAS responses, where participants may answer in socially desirable ways. Future research could address this limitation by integrating complementary methods, such as observational or physiological assessments, for a more holistic understanding of MFA (Røhder et al., 2020). Additionally, validating the MFAS in specific subpopulations, such as high-risk pregnancies, would confirm its generalizability (da Rosa et al., 2021). Longitudinal studies examining the impact of MFA on child development outcomes could further elucidate the importance of early attachment interventions.

Conclusion

The Maternal-Fetal Attachment Scale (MFAS) is a critical tool for advancing maternal and fetal health research and practice. Its applications extend beyond clinical use, serving as a valuable resource in understanding the complexities of maternal behaviors and emotional connections during pregnancy. The MFAS facilitates the exploration of attachment processes, providing insights into how maternal attitudes, feelings, and actions towards the fetus can impact maternal health outcomes and fetal development. In academic research, the MFAS contributes to broader inquiries into psychological and physiological factors influencing pregnancy, including stress, anxiety, and maternal well-being. It enables researchers to evaluate the effectiveness of interventions aimed at enhancing maternal-fetal bonding and mitigating risks associated with poor attachment. Moreover, the MFAS supports cross-disciplinary studies, bridging fields such as psychology, obstetrics, and pediatrics, to explore how maternal-fetal attachment predicts postnatal parenting behaviors and child development. Clinically, the MFAS informs healthcare providers in tailoring prenatal care plans to address attachment-related concerns. By identifying mothers with lower attachment scores, clinicians can implement targeted strategies, such as counseling or educational programs, to strengthen the mother-fetus relationship. Overall, the MFAS is an indispensable instrument that not only enhances individual care but also contributes to advancing evidence-based practices and policies in maternal

and child health.

Declaration of Interest

All authors declare no conflict of interest.

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine, 25*(24), 3186.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), https://escholarship.org/content/qt2mk8r49v/qt2mk8r49v.pdf.

Branjerdporn, G., Meredith, P., Strong, J., & Garcia, J. (2017). Associations between maternal-foetal attachment and infant developmental outcomes: A systematic review. *Maternal and Child Health Journal, 21*, 540– https://doi.org/10.1007/s10995-016-2138-2.

Cattell, R. B. (1985). Intelligence and g: An imaginative treatment of unimaginative data. *Behavioral and Brain Sciences, 8*(2), 227 https://doi.org/10.1017/S0140525X00020471

Clark, L. A., & Watson, D. (2016). Constructing validity: Basic issues in objective scale development. In A. E. Kazdin (Ed.), Methodological issues and strategies in clinical research (4th ed., pp. 187–203). *American Psychological Association.* https://doi.org/10.1037/14805-012.

Connelly, L. M. (2022). Measurement instrument validity. *Medsurg Nursing, 31*(1), 63–64.

Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical assessment, research, and evaluation, 10*(1). https://doi.org/10.7275/jyj1-4868

Cranley, M. S. (1981). Development of a tool for the measurement of maternal attachment during pregnancy. *Nursing Research, 30*(5), 281-284, September 1981.

da Rosa, K. M., Scholl, C. C., Ferreira, L. A., Trettim, J. P., da Cunha, G. K., Rubin, B. B., da Luz Martins, R., dos Santos Motta, J. V., Fogaça, T. B., & Ghisleni, G. (2021). Maternal-fetal attachment and perceived parental bonds of pregnant women. *Early Human Development, 154*, https://doi.org/10.1016/j.earlhumdev.2021.105310.

DeVellis, R. F., & Thorpe, C. T. (2021). Scale development: Theory and applications. Sage publications. https://www.columbusstate.edu/academic-affairs/_docs/eduf_syllabus.pdf

Field, A. (2024). Discovering statistics using IBM SPSS statistics. Sage publications limited. https://vlb-content.vorarlberg.at/fhbscan1/330900091084.pdf

Gobel, F. A. (2020). Effect of video and lecture methods on personal hygiene and dental health status of primary school students in West Sinjai District, Sinjai Regency, 2019. *Jurnal Mitrasehat,* 74–85.

Golbasi, Z., Ucar, T., & Tugut, N. (2015). Validity and reliability of the T urkish version of the M aternal A ntenatal A ttachment S cale. *Japan Journal of Nursing Science, 12*(2), 154-161. https://doi.org/10.1111/jjns.12052

Gonzales Jr, A. M., & Barcelo, T. I. (2023). Quality of prenatal care and maternal fetal attachment among primigravid mothers in the Philippines: A cross sectional study. *Midwifery, 127*, https://doi.org/10.1016/j.midw.2023.103842

Herwansyah, H., Czabanowska, K., Kalaitzi, S., & Schröder-Bäck, P. (2022). The utilization of maternal health services at primary healthcare setting in Southeast Asian Countries: A systematic review of the literature. *Sexual & Reproductive Healthcare, 32*, https://doi.org/10.1016/j.srhc.2022.100726

Hudson, P., Hagedoorn, L., & Bubeck, P. (2020). Potential linkages between social capital, flood risk perceptions, and self-efficacy. *International Journal of Disaster Risk Science, 11*(3), 251-262. https://doi.org/10.1007/s13753-020-00259-w

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1– https://doi.org/10.1080/10705519909540118

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*(1), 141–151. https://doi.org/10.1177/001316446002000116

Kamarudin, S. S., Idris, I. B., Ahmad, N., & Sharip, S. (2024). Exploring Asian maternal experiences and mHealth needs for postpartum mental health care. *Digital Health, 10*, https://doi.org/10.1177/20552076241292679

Kline, R. B. (1999). Book review: Psychometric theory. *Journal of Psychoeducational Assessment, 17*(3), 275–280. https://doi.org/10.1177/073428299901700307

Kline, R. B. (2023). Principles and practice of structural equation modeling. Guilford publications. https://journals.library.ualberta.ca/csp/index.php/csp/article/download/29418/21439

Kołomańska-Bogucka, D., Micek, A., & Mazur-Bialy,

A. I. (2022). The COVID-19 pandemic and levels of physical activity in the last trimester, life satisfaction and perceived stress in late pregnancy and in the early puerperium. *International journal of environmental research and public health, 19*(5), 3066. https://doi.org/10.3390/ijerph19053066

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Lima, C. de A., Brito, M. F. S. F., Pinho, L. de, Andrade, J. S., Santos, V. M., Marôco, J., & Silveira, M. F. (2024). Psychometric evaluation of the Brazilian version of the Maternal-Fetal Attachment Scale. *Estudos de Psicologia (Campinas), 41*, e210144. https://doi.org/10.1590/1982-0275202441e210144

Lima, C. de A., Brito, M. F. S. F., Pinho, L. de, Leão, G. M. M. S., Ruas, S. J. S., & Silveira, M. F. (2022). Abbreviated version of the Maternal-Fetal Attachment Scale: Evidence of validity and reliability. *Paidéia (Ribeirão Preto), 32,* e3233. https://doi.org/10.1590/1982-4327e3233

McNamara, J., Townsend, M. L., & Herbert, J. S. (2019a). A systemic review of maternal wellbeing and its relationship with maternal fetal attachment and early postpartum bonding. *PloS One, 14*(7), https://doi.org/10.1371/journal.pone.0220032

World Health Organization. (2020). Ending childhood dental caries: WHO implementation manual. World Health Organization.

Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health, 29*(5), 489–497. https://doi.org/10.1002/nur.20147

Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health, 30*(4), 459–467. https://doi.org/10.1002/nur.20199

Posada, G. E., Trumbell, J. M., Lu, T., & Kaloustian, G. (2018). III. The organization of attachment behavior in early childhood: Links with maternal sensitivity and child attachment representations. *Monographs of the Society for Research in Child Development, 83*(4), 35–59. https://doi.org/10.1111/mono.12390

Røhder, K., Væver, M. S., Aarestrup, A. K., Jacobsen, R. K., Smith-Nielsen, J., & Schiøtz, M. L. (2020). Maternal-fetal bonding among pregnant women at psychosocial risk: The roles of adult attachment style, prenatal parental reflective functioning, and depressive symptoms. *PloS One, 15*(9), https://doi.org/10.1371/journal.pone.0239208

Rossen, L., Hutchinson, D., Wilson, J., Burns, L., Allsop, S., Elliott, E. J., Jacobs, S., Macdonald, J. A., Olsson, C., & Mattick, R. P. (2017). Maternal bonding through pregnancy and postnatal: Findings from an Australian longitudinal study. *American Journal of Perinatology, 34*(08), 808–817. https://doi.org/10.1055/s-0037-1599052

Sacchi, C., Miscioscia, M., Visentin, S., & Simonelli, A. (2021a). Maternal–fetal attachment in pregnant Italian women: multidimensional influences and the association with maternal caregiving in the infant's first year of life. *BMC Pregnancy and Childbirth, 21,* 1–8. https://doi.org/10.1186/s12884-021-03964-6

Shieh, D., Li, Q., Shi, J. M., & Tovar, S. (2021). The Shieh Score as a risk assessment tool for hospital-acquired pressure injuries: a retrospective cohort study. *Advances in Skin & Wound Care, 34*(3), 132-138. https://doi.org/10.1097/01.ASW.0000732736.89356.cb

Sousa, V. D., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice, 17*(2), 268–274. https://doi.org/10.1111/j.1365-2753.2010.01434.x

Suryaningsih, E. K., Gau, M.-L., & Wantonoro, W. (2020). Concept analysis of maternal-fetal attachment. *Belitung Nursing Journal, 6*(5), 157–164. https://doi.org/10.33546/bnj.1194

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). Using multivariate statistics (Vol. 5, pp. 481-498). Boston, MA: pearson. https://www.pearsonhighered.com/assets/preface/0/1/3/4/0134790545.pdf

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*, 53. https://doi.org/10.5116/ijme.4dfb.8dfd

Trombetta, T., Giordano, M., Santoniccolo, F., Vismara, L., Della Vedova, A. M., & Rollè, L. (2021). Pre-natal attachment and parent-to-infant attachment: A systematic review. *Frontiers in Psychology, 12,* http://dx.doi.org/10.3389/fpsyg.2021.620942

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist, 34*(6), 806–838. https://doi.org/10.1177/0011000006288127