

Development and validation of the maternal role adaptation system model (MRASM) to improve breastfeeding success

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ABSTRACT

Introduction: The success of breastfeeding is a critical indicator of comprehensive adaptation during the maternal transition. Existing theoretical models address maternal adaptation separately, resulting in a lack of integration in predicting breastfeeding success. This research aimed to develop and validate the Maternal Role Adaptation System Model (MRASM) using Structural Equation Modeling.

Methods: A cross-sectional study was conducted with 150 postpartum women recruited through purposive sampling from five community health centers in East Java, Indonesia. Eight latent constructs measured using validated instruments: focal stimuli (breast pain, fatigue, nutrition), contextual stimuli (spousal and healthcare support, information access, economic status), residual stimuli (social norms, cultural values, beliefs), coping mechanisms, emotional responses, self-concept, role function, and breastfeeding success. Data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS) via Smart-PLS 4.0.

Results: The MRASM demonstrated excellent psychometric properties (Cronbach's $\alpha > 0.678$, composite reliability > 0.802 , AVE > 0.508). Environmental stimuli (focal, contextual, and residual) significantly influenced maternal coping mechanisms, which in turn affected emotional responses, self-concept, and role function. Emotional responses ($\beta = 0.356$, $p = 0.001$) and self-concept ($\beta = 0.268$, $p < 0.001$) are the strongest predictors of breastfeeding success, explaining 26.7% of outcome variance. These findings provide healthcare professionals with specific intervention targets: managing physical symptoms, enhancing coping resources, and supporting maternal emotional well-being and self-efficacy.

Conclusions: MRASM integrates Roy's and Mercer's models to address postpartum adaptation holistically, providing healthcare professionals with an evidence-based framework to support maternal role transition and breastfeeding success.

Keywords: breastfeeding success; maternal role adaptation; mercer's theory; postpartum care; roy adaptation model

Introduction

Despite well-documented benefits of breastfeeding for maternal and child health, only 44% of infants globally are exclusively breastfed during the first six months, far below World Health Organization recommendations (World Health Organization, 2016). This gap persists across geographical and economic boundaries, indicating fundamental challenges in maternal adaptation during the critical postpartum

period (Kiwuso, 2023; Zhu, Gupta, and Pérez-Escamilla, 2025).

Mothers face multifaceted barriers, including physical discomfort (breast pain, fatigue, nutritional deficiencies), psychological challenges (anxiety, depression, reduced self-efficacy), and inadequate support systems (Dessi et al., 2024; García, Coó, and Valdés, 2024). Current interventions often address these factors in isolation, lacking comprehensive theoretical frameworks that account for the complex interplay



between environmental stimuli, coping mechanisms, and adaptive outcomes (Parker et al., 2020; Cousins et al., 2023).

Existing theoretical models—Roy's Adaptation Model and Mercer's Maternal Role Attainment Theory—provide valuable but separate perspectives (Brown et al., 2021; Agustina and Saputri, 2023; Nurbaeti et al., 2023). Roy's model conceptualizes adaptation through four modes (physiological-physical, self-concept, role function, and interdependence) responding to focal, contextual, and residual stimuli (Hosseini and Soltanian, 2022). Mercer's theory describes sequential stages of maternal role development (Elochukwu and Oluchi, 2023). In high-income countries such as the United States, United Kingdom, and Australia, exclusive breastfeeding rates remain similarly suboptimal (ranging from 24-46% at six months) despite advanced healthcare infrastructure, suggesting that breastfeeding challenges transcend resource availability and reflect deeper gaps in maternal adaptation support systems (Victora et al., 2016; Rollins et al., 2016). However, no validated model has integrated these frameworks to address breastfeeding success as an adaptation outcome specifically.

The Maternal Role Adaptation System Model (MRASM) addresses this theoretical gap by synthesizing Roy's and Mercer's theories into a comprehensive framework. MRASM uniquely positions coping mechanisms as central mediators between environmental stimuli and adaptive outcomes, offering targeted intervention pathways for healthcare professionals. This integration enables systematic assessment of focal stimuli (physical symptoms), contextual stimuli (social support), and residual stimuli (cultural beliefs) while accounting for their collective

influence on breastfeeding success through emotional responses, self-concept, and role function.

This study aimed to develop and validate the Maternal Role Adaptation System Model (MRASM) using an SEM-PLS approach.

The model illustrates hypothesized relationships between three types of environmental stimuli (Focal Stimuli/X1, Contextual Stimuli/X2, and Residual Stimuli/X3), Coping Mechanisms (X4), three adaptive modes (Emotional Responses/X5, Self-Concept/X6, and Role Function/X7), and Breastfeeding Success (Y). Arrows indicate directional pathways to be tested through structural equation modeling. Detailed descriptions of construct indicators are provided in Table 2

Materials and Methods

Research Design

A cross-sectional observational study design was employed to develop and validate the MRASM. The study measured eight latent variables: Focal Stimuli (X1), Contextual Stimuli (X2), Residual Stimuli (X3), Coping Mechanisms (X4), Emotional Responses (X5), Self-Concept (X6), Role Function (X7), and Breastfeeding Success (Y) with their respective indicators as detailed in the measurement instruments section. The study received ethical approval from the Health Research Ethics Committee of Institut Ilmu Kesehatan Nahdlatul Ulama Tuban (Protocol Number: 103/0084223523/LEPK.IIKNU/VI/2025). It was conducted in accordance with the principles of the Declaration of Helsinki.

Setting and Context

The study was conducted in East Java, Indonesia, a region characterized by diverse socioeconomic conditions and strong cultural traditions surrounding

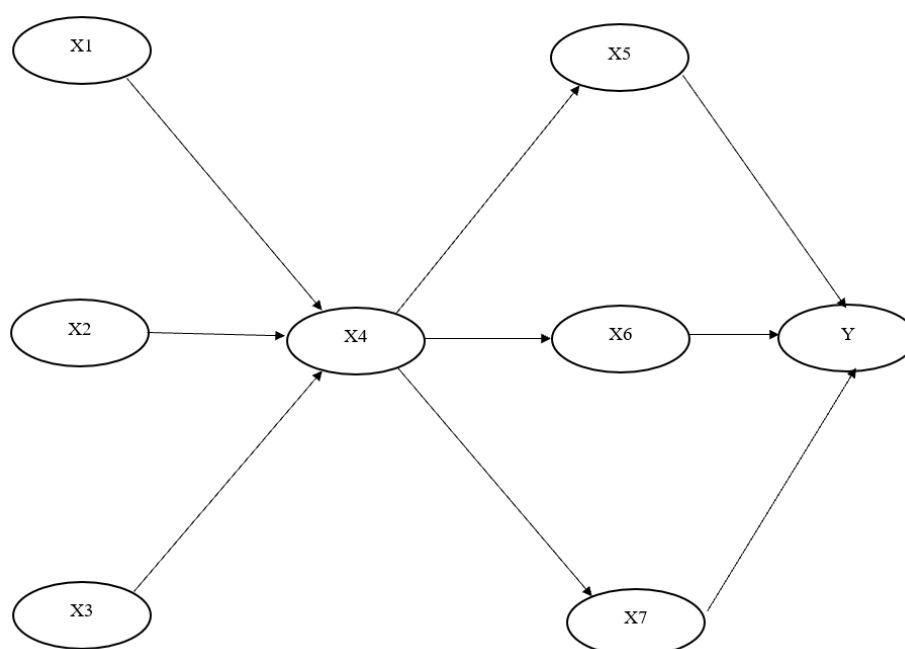


Figure 1. Demographic Characteristics of Study Participants (N=150)

childbirth and breastfeeding practices. The Indonesian healthcare system provides universal health coverage through the National Health Insurance (JKN), which covers maternal and child health services, including antenatal care, delivery services, and postpartum follow-up.

Participants and Sampling

The target population consisted of postpartum mothers transitioning to their maternal role during the critical adaptation period. The sample included postpartum mothers at 14-42 days post-delivery, a period when breastfeeding patterns and maternal role adaptation are being established. Inclusion criteria required participants to be postpartum mothers aged 18-45 years, with singleton pregnancy resulting in live birth, full-term delivery (≥ 37 weeks gestation), expressed intention to breastfeed during prenatal period, ability to communicate fluently in Indonesian language, and willingness to participate and provide informed consent.

Exclusion criteria included mothers with medical contraindications to breastfeeding (HIV infection, active tuberculosis, or use of medications incompatible with breastfeeding), infants with congenital anomalies affecting feeding ability, mothers experiencing severe postpartum complications requiring intensive medical care, those with a history of severe psychiatric disorders or undergoing current psychiatric treatment, and mothers who delivered via emergency cesarean section with complications.

Purposive sampling was employed to ensure participants met the specified criteria and represented diverse socioeconomic backgrounds across East Java health centers. This non-probability approach was chosen to maximize theoretical relevance by targeting mothers in the critical adaptation window (14-42 days postpartum) when breastfeeding patterns are being established, and maternal role adaptation is most dynamic. The sample selection process involved three stages: First, five community health centers (Puskesmas) were purposively selected from urban and rural areas in East Java to ensure socioeconomic diversity. Second, postpartum mother lists were obtained from each health center's maternal-child health registry. Third, research assistants screened potential participants against inclusion/exclusion criteria during routine postpartum visits or home visits, approaching eligible mothers sequentially until the target sample size ($n=150$) was achieved across all sites. Written informed consent was obtained from all participants before enrollment. The sample size was calculated based on the rule of thumb for structural equation modeling, requiring a minimum of 5-10 observations per estimated parameter. With 30 indicators included in the measurement model, a minimum sample size of 150 participants was determined to ensure sufficient statistical power (>0.80) to detect

moderate effect sizes (0.3) at the $\alpha = 0.05$ significance level.

Measurement Instruments

The study employed validated instruments to measure eight latent constructs representing different aspects of maternal adaptation and breastfeeding success. Focal Stimuli were measured using breast pain intensity assessed on a 0-10 Numerical Rating Scale, breastfeeding fatigue measured using the Multidimensional Fatigue Inventory-20, and dietary adequacy evaluated through a 24-hour dietary recall with nutritional analysis. Contextual Stimuli included spousal support calculated using the Partner Support Scale for Breastfeeding, healthcare provider support assessed using the Healthcare Provider Support Questionnaire, information access evaluated using the Breastfeeding Information Access Scale, and economic status categorized by monthly household income levels.

Residual Stimuli comprised social norms regarding breastfeeding assessed using Social Norms Scale, cultural values measured through Cultural Values in Breastfeeding Scale, personal perceptions evaluated using Maternal Perceptions of Breastfeeding Scale, and breastfeeding beliefs assessed through Iowa Infant Feeding Attitude Scale. Coping Mechanisms were measured through stressor appraisal using the Primary Appraisal Scale, coping strategies using the Brief COPE Inventory, and coping resources using the Coping Resources Inventory for Stress.

All instruments underwent rigorous validation for Indonesian populations through a three-phase process. First, forward translation from English to Indonesian was conducted by two independent bilingual translators, followed by reconciliation to produce a unified version. Second, back-translation into English was performed by a third independent translator, and semantic equivalence was verified by comparing it with the original instruments. Third, content validity was assessed by an expert panel comprising five maternal health specialists, two psychologists, and three lactation consultants who rated each item's relevance using a 4-point scale (Content Validity Index > 0.80 for all instruments). A pilot study involving 30 postpartum mothers (separate from the main study sample) was conducted to assess internal consistency reliability; all instruments achieved Cronbach's alpha values ≥ 0.70 . Minor wording adjustments were made based on pilot participants' feedback before final administration to the study sample ($N=150$).

Instrument Validation

All instruments underwent rigorous validation for Indonesian populations through standard translation and back-translation procedures, followed by content validity assessment conducted by expert panels comprising maternal health specialists, psychologists, and lactation consultants. Internal consistency reliability was confirmed with Cronbach's alpha values ≥ 0.70 for all scales.

Data Collection Procedures

Data collection was conducted between June and July 2025. Trained research assistants (four midwives and two nurses who completed a two-day training workshop on study protocols, ethical procedures, and standardized questionnaire administration) collected data through face-to-face interviews. Participants were recruited through two primary channels: (1) during routine postpartum check-ups at community health centers (*Puskesmas*), and (2) through scheduled home visits coordinated with local integrated health post (*Posyandu*) cadres who helped identify eligible mothers in the community. Data collection sessions lasted approximately 45-60 minutes per participant and were conducted in private rooms at health facilities or in participants' homes to ensure confidentiality. Research assistants read each questionnaire item aloud and recorded responses on standardized forms, providing clarification when needed while avoiding leading questions. Informed consent was obtained through a comprehensive process in which eligible mothers were approached by trained research assistants, supplied with detailed study information, given the opportunity to ask questions, and asked to sign written informed consent forms before participation.

Statistical Analysis

Data analysis was conducted using SmartPLS 4.0 software through Structural Equation Modeling with Partial Least Squares (SEM-PLS). The measurement model (outer model) was evaluated by assessing convergent validity through factor loadings greater than 0.5 and average variance extracted (AVE) above 0.5. Discriminant validity was established using the Heterotrait-Monotrait Ratio (HTMT) below 0.85. Construct reliability was verified by Cronbach's alphas exceeding 0.6 and composite reliabilities exceeding 0.7. The structural model (inner model) was evaluated by examining the significance of path coefficients; t-statistics greater than 1.96 and p-values less than 0.05 indicated statistical significance.

Multivariate analysis was conducted to examine the influence of independent variables on resilience. Before regression analysis, the statistical assumptions of normality, multicollinearity, heteroscedasticity, and autocorrelation were tested. This study employed the

Kolmogorov-Smirnov test to assess normalcy. The results revealed a normal distribution, $p > 0.05$ for mental well-being factors (including depression, anxiety, and stress) and physical activity variables associated with resilience ($p = 0.368$). Multicollinearity testing indicated no multicollinearity, with Tolerance > 0.1000 and VIF < 10.00 for all independent variables (depression: Tolerance = 0.338, VIF = 2.956; anxiety: Tolerance = 0.369, VIF = 2.711; stress: Tolerance = 0.365, VIF = 2.739; physical activity: Tolerance = 0.972, VIF = 1.029). The heteroscedasticity test utilizing scatterplots indicated the absence of heteroscedasticity; no discernible pattern (wavy, expanding, then contracting) was observed, and the data points were distributed both above and below zero on the Y-axis. The Durbin-Watson test demonstrated the absence of autocorrelation (Durbin-Watson = 1.764), which falls within the acceptable range ($Du = 1.758 < 1.764 < 4 - Du = 2.242$). This study employed multiple linear regression analysis to examine the simultaneous impact of independent factors (X) on dependent variables (Y) and to evaluate the individual effect of each independent variable on the dependent variable.

Ethical considerations

Before participants' involvement, the researchers obtained written informed consent and assured the confidentiality of the data. The study has received approval and ethical clearance from the Health Research Ethics Committee (KEPK) of the Health Polytechnic of the Ministry of Health Yogyakarta, under approval number DP.04.03/e-KEPK.1/456/2024.

Results

Demographic Characteristics

A total of 150 postpartum mothers participated (mean age 20-45 years, 72.0%). Most had secondary education (46.0%) and were homemakers (82.0%), reflecting traditional maternal roles in the study population (Table 1).

Measurement Model Evaluation

The MRASM demonstrated excellent psychometric properties. All factor loadings exceeded 0.5 (range: 0.540-0.928), and AVE values surpassed 0.5 (range: 0.508-0.778), confirming convergent validity.

Table 1. Demographic Characteristics of Study Participants (N=150)

Characteristic	Category	n	%
Age	17-25 years	41	27.3
	20-45 years	108	72.0
	46-55 years	1	0.7
Education	Elementary	14	9.3
	Junior High	34	22.7
	Senior High	69	46.0
	Higher Education	33	22.0
Occupation	Homemaker	123	82.0
	Private Employee	10	6.7
	Civil Servant	2	1.3
	Entrepreneur	15	10.0

Table 2. Measurement Model Assessment Results

Construct	Key Indicators	Factor Loading Range	AVE	Cronbach's α	CR
Focal Stimuli	Breast Pain, Fatigue, Nutrition	0.708-0.848	0.576	0.678	0.802
Contextual Stimuli	Spousal Support, Healthcare Support	0.540-0.826	0.508	0.675	0.802
Residual Stimuli	Social Norms, Cultural Values, Beliefs	0.603-0.823	0.531	0.722	0.817
Coping Mechanisms	Stressor Appraisal, Responses, Resources	0.804-0.904	0.742	0.828	0.896
Emotional Responses	Anxiety, Stress, Depression	0.674-0.794	0.563	0.742	0.837
Self-Concept	Self-Esteem, Self-Efficacy, Body Image	0.837-0.928	0.778	0.857	0.913
Role Function	Role Adaptation, Acceptance, Competence	0.697-0.858	0.568	0.751	0.840
Breastfeeding Success	Early Initiation, Technique, Frequency	0.682-0.807	0.582	0.855	0.893

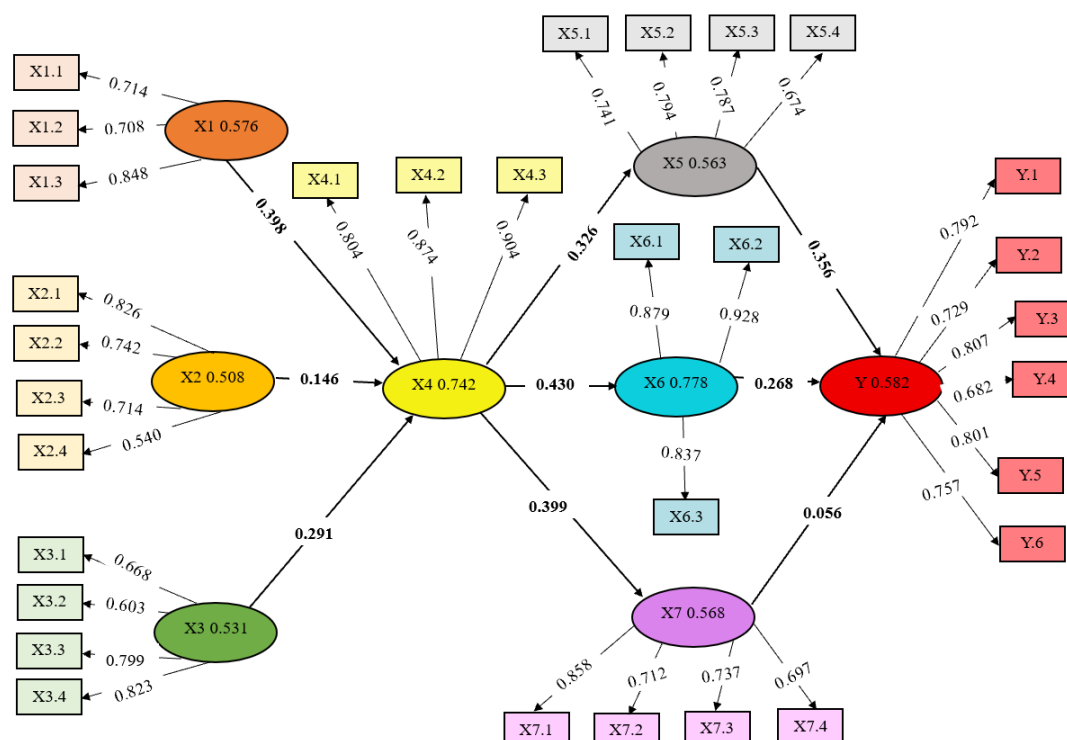


Figure 2 Measurement Model (Outer Model) of MRASM

Cronbach's alpha (0.675-0.857) and composite reliability (0.802-0.913) values indicated strong internal consistency. Discriminant validity was established with all HTMT values below 0.85 (highest: 0.630 between Coping Mechanisms and Focal Stimuli) (Table 2).

The figure 2 displays the relationships between latent constructs and their indicators, along with their factor loadings. All indicators demonstrated adequate factor loadings (>0.5), confirming the measurement model's convergent validity. Detailed factor loadings, AVEs, and reliability statistics are presented in Table 2.

Structural Model Assessment

The MRASM explained substantial variance in key outcomes: Coping Mechanisms ($R^2 = 0.414$), Breastfeeding Success ($R^2 = 0.267$), Self-Concept ($R^2 = 0.185$), and Role Function ($R^2 = 0.159$). All Q^2 values were positive, confirming predictive relevance.

Hypothesis testing revealed eight significant pathways. Focal stimuli most strongly predicted coping mechanisms ($\beta = 0.398$, $p < 0.001$), followed by residual stimuli ($\beta = 0.291$, $p < 0.001$) and contextual stimuli ($\beta = 0.146$, $p = 0.026$). Coping mechanisms significantly influenced self-concept ($\beta = 0.430$, $p < 0.001$), role

function ($\beta = 0.399$, $p < 0.001$), and emotional responses ($\beta = 0.326$, $p = 0.010$). Emotional responses ($\beta = 0.356$, $p = 0.001$) and self-concept ($\beta = 0.268$, $p < 0.001$) directly predicted breastfeeding success. Role function did not significantly predict breastfeeding success ($\beta = 0.056$, $p = 0.384$) (Table 3).

Table 3 presents both direct and indirect effects in the MRASM. The direct effects section shows relationships between stimulus types and coping mechanisms, between coping mechanisms and adaptive modes, and between adaptive modes and breastfeeding success, with corresponding R^2 values indicating explained variance. The indirect effects section demonstrates significant mediation pathways in which stimuli influence breastfeeding success by sequentially affecting coping mechanisms and adaptive modes. Five of six tested indirect pathways achieved statistical significance, confirming the mediating role of coping mechanisms and adaptive processes in the model.

The figure 3 illustrates the validated structural pathways with standardized path coefficients and R^2 values indicating explained variance for each endogenous construct. Solid lines represent statistically significant relationships ($p < 0.05$), while the dashed line indicates a

Table 3. Structural Model Assessment Results

Pathway Type	Path	β	t-value	p-value	R ²	Decision
Direct Effects on Coping Mechanisms					0.414	
	Focal Stimuli → Coping Mechanisms	0.398***	4.748	<0.001		Supported
	Contextual Stimuli → Coping Mechanisms	0.146*	2.230	0.026		Supported
	Residual Stimuli → Coping Mechanisms	0.291***	4.235	<0.001		Supported
Direct Effects on Adaptive Modes						
	Coping Mechanisms → Emotional Responses	0.326*	2.594	0.010	0.106	Supported
	Coping Mechanisms → Self-Concept	0.430***	5.574	<0.001	0.185	Supported
	Coping Mechanisms → Role Function	0.399***	5.091	<0.001	0.159	Supported
Direct Effects on Breastfeeding Success					0.267	
	Emotional Responses → Breastfeeding Success	0.356**	3.307	0.001		Supported
	Self-Concept → Breastfeeding Success	0.268***	3.651	<0.001		Supported
	Role Function → Breastfeeding Success	0.056	0.870	0.384		Not Supported
Indirect Effects on Breastfeeding Success						
	Focal Stimuli → Coping → Emotional → BF Success	0.046*	2.189	0.029		Supported
	Focal Stimuli → Coping → Self-Concept → BF Success	0.046**	3.254	0.001		Supported
	Contextual Stimuli → Coping → Emotional → BF Success	0.017	1.816	0.070		Not Supported
	Contextual Stimuli → Coping → Self-Concept → BF Success	0.017	2.015	0.044		Supported
	Residual Stimuli → Coping → Emotional → BF Success	0.034*	2.204	0.028		Supported
	Residual Stimuli → Coping → Self-Concept → BF Success	0.034*	3.014	0.003		Supported

non-significant pathway (Role Function → Breastfeeding Success). Detailed path coefficients, t-values, p-values, and direct/indirect effects are presented in Table 3.

Discussions

Principal Findings and Theoretical Comparison

This study successfully developed and validated the Maternal Role Adaptation System Model (MRASM), demonstrating its effectiveness as an integrated theoretical framework for understanding breastfeeding success. The model's psychometric excellence (all validity and reliability criteria met) and substantial explanatory power (26.7% variance in breastfeeding outcomes)

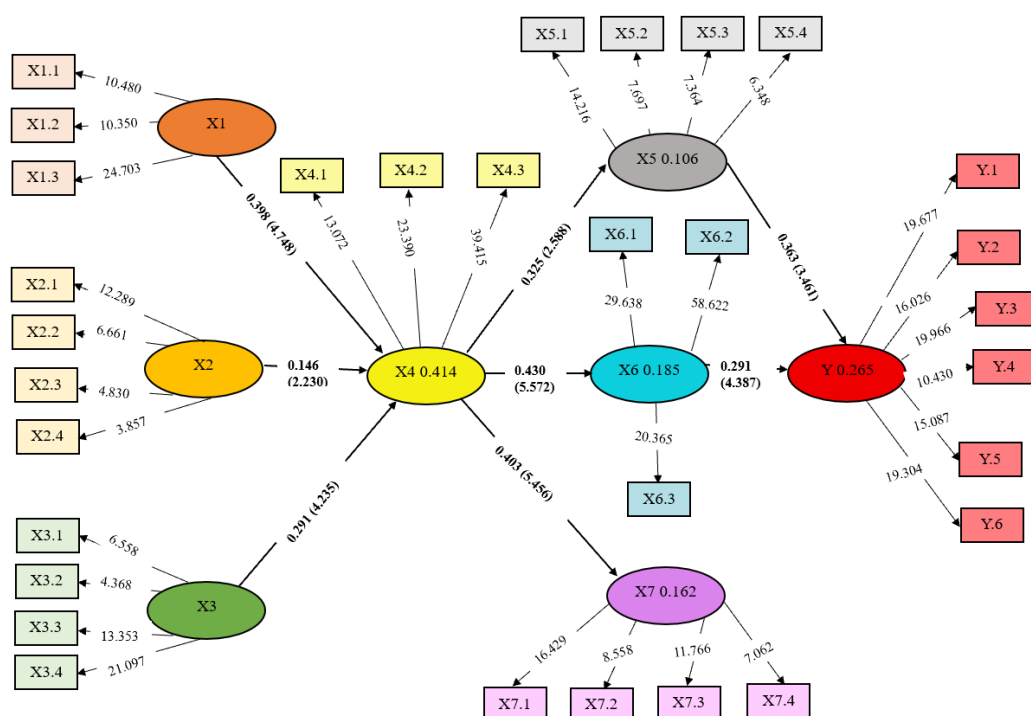


Figure 3 Final Structural Model

position MRASM as a significant advancement in maternal health theory.

The model's variance explanation aligns with established maternal health frameworks, where complex psychosocial processes typically account for 20-35% of outcome variance (Escribano et al., 2024; Ray and Rayens, 2024). This comparability validates MRASM's theoretical rigor while its unique integration of Roy's and Mercer's theories addresses a critical gap: no previous model has systematically linked environmental stimuli, coping mechanisms, and breastfeeding-specific outcomes within a unified framework.

The finding that focal stimuli most strongly influenced coping mechanisms ($\beta = 0.398$, $p < 0.001$) underscores the primacy of physical symptom management in postpartum adaptation. This result extends Roy's Adaptation Model by quantifying the relative importance of focal, contextual, and residual stimuli in the breastfeeding context. The significant, though lesser, effect of contextual stimuli ($\beta = 0.146$, $p = 0.026$) suggests that while social support matters, immediate physical challenges demand priority attention in early postpartum care.

The substantial effect of residual stimuli ($\beta = 0.291$, $p < 0.001$) demonstrates that cultural values, social norms, and personal beliefs shape maternal coping responses. In the Indonesian context, where traditional postpartum practices and extended family involvement are normative, this finding underscores the need for culturally sensitive interventions that honor local beliefs while promoting evidence-based practices (Masaba, Mmusi-Phetoe, and Mokula, 2021).

Emotional and Self-Concept Pathways to Breastfeeding Success

The strongest direct predictor of breastfeeding success was emotional responses ($\beta = 0.356$, $p = 0.001$), followed by self-concept ($\beta = 0.268$, $p < 0.001$). These findings illuminate the psychological mechanisms underlying lactation outcomes and align with extensive literature documenting detrimental effects of maternal anxiety, stress, and depression on breastfeeding duration and exclusivity (Ambekar, Havale, and Deshmukh, 2024; García, Coó, and Valdés, 2024).

The significant self-concept pathway validates Mercer's emphasis on maternal confidence and self-efficacy as determinants of successful role attainment. Interestingly, role function did not directly predict breastfeeding success ($\beta = 0.056$, $p = 0.384$), suggesting that functional role adaptation operates through emotional and cognitive pathways rather than as a direct mechanism. This finding refines theoretical understanding by positioning self-concept and emotional well-being as more proximal determinants of breastfeeding outcomes.

MRASM's identification of coping mechanisms as a central mediator (influencing emotional responses, self-concept, and role function simultaneously) represents a novel theoretical contribution. This mediating structure suggests that interventions targeting coping resources—stressor appraisal skills, problem-solving strategies, and access to support—may yield cascading benefits across multiple adaptation domains.

Implications for Nursing and Community Health

MRASM provides healthcare professionals with an evidence-based framework for comprehensive postpartum care. Clinical implications include: (1) prioritizing physical symptom relief (breast pain management, fatigue reduction, nutritional support) to optimize maternal coping capacity; (2) implementing routine psychological screening and support for anxiety, depression, and stress; (3) delivering anticipatory guidance that strengthens maternal self-efficacy and positive self-concept; and (4) integrating culturally appropriate interventions that respect local beliefs while promoting optimal breastfeeding practices.

The model's emphasis on coping mechanisms suggests that interventions should focus on enhancing maternal problem-solving skills, stress management, and access to instrumental support, rather than solely on providing information. Healthcare systems should adopt holistic approaches that recognize the interconnected nature of physical, psychological, and social factors in maternal adaptation.

For community health programs, MRASM indicates that peer support networks, lactation consultant services, and family education initiatives should address multiple adaptation domains simultaneously. The significant role of residual stimuli highlights the importance of engaging family members and community leaders in breastfeeding promotion efforts, particularly in culturally diverse settings.

The model's implications extend to policy and family engagement levels. At the policy level, MRASM provides evidence for integrating comprehensive maternal adaptation assessments into routine postpartum care protocols, allocating resources for mental health screening and lactation support services, and developing culturally tailored community-based interventions that address focal, contextual, and residual stimuli simultaneously. Healthcare administrators can use MRASM to design training programs that equip providers with skills to assess and support all adaptation domains. For family participation, the model's emphasis on contextual stimuli (particularly spousal support, $\beta=0.826$ loading) and residual stimuli (cultural values, social norms) underscores the critical role of partners and extended family members. Healthcare providers should implement family-centered interventions that: (1) educate partners about physical and emotional

challenges mothers face during breastfeeding; (2) teach family members how to provide practical support (meal preparation, household tasks, infant care assistance); (3) address cultural beliefs that may hinder optimal breastfeeding practices through respectful dialogue with grandmothers and other influential family members; and (4) create support networks involving fathers, mothers-in-law, and siblings to build comprehensive support systems. By engaging multiple family members and aligning traditional practices with evidence-based care, MRASM facilitates sustainable adaptation outcomes that extend beyond individual maternal capacity.

Several limitations warrant acknowledgment. The cross-sectional design precludes establishing causal relationships; longitudinal studies are needed to examine the temporal dynamics of maternal adaptation and identify critical intervention windows. The purposive sampling strategy and single-region focus limit generalizability to populations with different cultural backgrounds or healthcare systems. The relatively short postpartum period studied (14-42 days) may not capture longer-term adaptation processes evolving throughout the first year.

Future research should employ longitudinal designs with repeated measures to establish causality and examine model stability over time. Cross-cultural validation studies are needed to assess MRASM's applicability across diverse populations. Intervention research testing theory-driven programs based on MRASM's pathways would provide evidence for clinical implementation. Finally, qualitative studies exploring mothers' lived experiences of adaptation processes would enrich theoretical understanding and inform culturally nuanced interventions.

Conclusion

The Maternal Role Adaptation System Model represents a significant advancement in understanding the complex processes underlying maternal adaptation and breastfeeding success. The model's strong psychometric properties and substantial explanatory power provide a solid foundation for clinical applications and future research. The findings emphasize the critical importance of comprehensive approaches that address physical symptoms, enhance coping mechanisms, support emotional well-being, and strengthen maternal self-concept. Healthcare providers should adopt holistic intervention strategies that recognize the interconnected nature of maternal adaptation processes and provide culturally sensitive support that acknowledges the diverse factors influencing maternal role transition. MRASM offers actionable pathways for engaging families, particularly partners and extended family members, as active participants in maternal adaptation support while providing policymakers with evidence-based frameworks for resource allocation, training

program development, and community health initiatives targeting focal, contextual, and residual factors simultaneously. Future research should employ longitudinal designs to establish causal relationships and examine the model's effectiveness across different cultural contexts and healthcare systems.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request. Data sharing is subject to institutional review board approval and participant consent requirements. All data have been de-identified to protect participant privacy.

Authors' contributions

All authors contributed substantially to this research. The primary author conceptualized the study, developed the theoretical framework, supervised data collection, conducted statistical analysis, and drafted the manuscript. Co-authors participated in study design, instrument validation, data interpretation, and critical revision of the manuscript. All authors read and approved the final manuscript.

Declaration of Interest

The authors declare no conflicts of interest regarding this research.

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