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Mother-infant interaction and postpartum mental health: A study on promoting maternal emotional bonding through psychological nursing care

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Abstract

A psychologically-oriented mother-infant interaction intervention programme was evaluated for its effectiveness in enhancing maternal mental health and mother-infant bonding. A prospective cohort study was conducted with 80 postpartum women, divided into an intervention group (n=43) and a routine care group (n=37) based on willingness to participate. The intervention group received psychological nursing in addition to standard postpartum care. Outcomes were assessed using the Edinburgh Postnatal Depression Scale (EPDS), Maternal Attachment Inventory (MAI), and CARE-Index. Post-intervention, the intervention group exhibited significantly lower EPDS scores and higher MAI scores compared to the routine care group, along with improved maternal sensitivity, emotional responsiveness, and interactive coordination. Factors influencing bonding included intervention compliance, spousal support, and prenatal psychological preparation. Early participation in the intervention and improved interaction quality were key predictors of better postpartum mental health. These findings highlight the importance of early psychological support, consistent programme participation, and family involvement in promoting maternal well-being and fostering stronger mother-infant relationships.. *(Afr J Reprod Health 2025; 29 [5]: 120-130)*

Keywords: Mother-infant interaction; Postpartum depression; Psychological nursing care; Emotional bonding; Multivariate analysis

Résumé

Un programme d'intervention psychologique axé sur l'interaction mère-enfant a été évalué pour son efficacité à améliorer la santé mentale maternelle et le lien affectif mère-enfant. Une étude de cohorte prospective a été menée auprès de 80 femmes en post-partum, réparties en un groupe d'intervention (n = 43) et un groupe de soins de routine (n = 37), en fonction de leur volonté de participer. Le groupe d'intervention a bénéficié de soins psychologiques en plus des soins post-partum standard. Les résultats ont été évalués à l'aide de l'Échelle de dépression postnatale d'Édimbourg (EPDS), de l'Inventaire d'attachement maternel (MAI) et de l'Index CARE. Après l'intervention, le groupe d'intervention a présenté des scores EPDS significativement plus faibles et des scores MAI plus élevés que le groupe de soins de routine, ainsi qu'une sensibilité maternelle, une réactivité émotionnelle et une coordination interactive améliorées. Les facteurs influençant le lien affectif comprenaient l'observance de l'intervention, le soutien du conjoint et la préparation psychologique prénatale. Une participation précoce à l'intervention et une meilleure qualité des interactions étaient des facteurs prédictifs clés d'une meilleure santé mentale post-partum. Ces résultats soulignent l'importance d'un soutien psychologique précoce, d'une participation régulière aux programmes et de l'implication de la famille pour promouvoir le bien-être maternel et renforcer la relation mère-enfant. *(Afr J Reprod Health 2025; 29 [5]: 120-130).*

Mots-clés: Interaction mère-enfant ; Dépression post-partum ; Soins infirmiers psychologiques ; Lien affectif ; Analyse multivariée

Introduction

Postpartum depression (PPD) is a common perinatal mental health concern, with a global average prevalence rate of 19.18%[1]. Research indicates that PPD significantly disrupts maternal caregiving behaviors and mother-infant relationships, affecting infant emotional, cognitive, and social development[2]. Recent epidemiological surveys reveal an increasing global incidence of PPD, reaching over 30% in developing countries. This has emerged as a critical public health issue necessitating the establishment of effective prevention and intervention systems[3].

The quality of mother-infant interaction is a crucial factor affecting postpartum mental health. Extensive research confirms that positive mother-infant interaction promotes maternal emotional

adaptation and reduces the risk of PPD[4]. Studies indicate that early mother-infant interaction plays a decisive role in establishing secure attachment, which is fundamental to infant psychological development[5]. However, current clinical interventions for mother-infant interaction often focus primarily on basic parenting skills guidance, lacking a systematic psychological nursing perspective.

A bidirectional causal relationship exists between PPD and mother-infant interaction disorders. Research shows that mothers with PPD tend to exhibit negative touching behaviors during infant interaction, with infants displaying emotional distancing. Maternal depression and anxiety symptoms significantly influence mother-infant interaction patterns, affecting infant development[6]. Psychological nursing care, as an intervention modality, shows promising results in improving postpartum mental health. Studies indicate that psychological intervention has moderate effectiveness in preventing PPD among non-depressed women, particularly for primiparas[7]. However, these studies generally present several limitations: first, intervention protocols lack standardization and systematization, compromising intervention quality; second, assessment indicators are often singular, failing to comprehensively reflect intervention outcomes; third, there is insufficient in-depth analysis of key factors influencing intervention effectiveness[8,9].

Research has shown that maternal attachment anxiety and psychological flexibility (behavioral awareness and valued action) significantly impact the quality of mother-infant emotional bonding. Higher attachment anxiety and lower psychological flexibility weaken mother-infant bonding quality, emphasizing the importance of psychological intervention in promoting early mother-infant relationships[10]. However, current clinical practice lacks systematic assessment and intervention tools for mother-infant emotional bonding. Particularly in the Chinese cultural context, developing culturally appropriate emotional bonding interventions remains an urgent challenge[11]. Additionally, the role of spousal support in postpartum mental health has gained increasing attention. Studies reveal a significant negative correlation between spousal support levels and postpartum depression scores. Higher spousal support significantly reduces PPD risk and improves quality of life[12,13].

Based on the current research status, there is an urgent need to establish a systematic, standardized mother-infant interaction intervention programme. This programme should feature: (1) coverage of a continuous time window from pregnancy through postpartum; (2) integration of psychological nursing concepts with specific operational techniques; (3) emphasis on building family support systems; (4) adoption of multidimensional assessment methods. Therefore, this study aims to investigate the clinical effectiveness of a psychologically-oriented mother-infant interaction intervention program in promoting postpartum maternal emotional bonding and mental health, and to analyze key factors influencing intervention outcomes, providing evidence-based support for clinical practice.

Methods

This study was approved by the Medical Ethics Committee of Lixin County People's Hospital (Approval No.:), and all participants provided written informed consent.

The study population consisted of postpartum women who received obstetric care at Lixin County People's Hospital between January 2023 and January 2025. Participants were divided into an intervention group (n=43) and a routine care group (n=37) based on their willingness to receive psychological nursing intervention.

Inclusion criteria included: age 20-40 years; singleton full-term pregnancy (37-42 weeks gestation); absence of severe pregnancy complications; basic comprehension and communication abilities; planned delivery and six-month follow-up at our hospital; and voluntary participation with informed consent from both the mother and family members.

Exclusion criteria included: history of psychiatric disorders or current psychiatric medication use; previous history of postpartum depression; severe complications during pregnancy or delivery; newborns with serious illness or malformation; major family changes or special stressful events; and inability to complete six-month follow-up.

Table 1: Baseline characteristics of study participants in both groups

Characteristic	Intervention Group (n=43)	Control Group (n=37)	t/χ2	P-value
Age (years)	28.6±4.2	29.1±4.5	t=-0.527	0.612
Primipara [n(%)]	26 (60.5)	21 (56.8)	χ2=0.113	0.737
Education level [n(%)]			χ2=0.142	0.986
≤Junior high school	5 (11.6)	4 (10.8)		
High school/technical	12 (27.9)	11 (29.7)		
College/university	22 (51.2)	19 (51.4)		
≥Postgraduate	4 (9.3)	3 (8.1)		
Employment status [n(%)]			χ2=0.156	0.925
Full-time	28 (65.1)	23 (62.2)		
Part-time	8 (18.6)	7 (18.9)		
Housewife	7 (16.3)	7 (18.9)		
Delivery mode [n(%)]			χ2=0.014	0.906
Vaginal delivery	10 (23.3)	22 (59.5)		
Cesarean section	33 (76.7)	15 (40.5)		

The demographic characteristics of both groups are summarized in Table 1. No statistically significant differences were found between the two groups in terms of age, parity, educational background, employment status, or delivery method (P>0.05).

All nursing staff participating in the study received standardized training on psychological assessment techniques, mother-infant interaction guidance skills, and implementation of intervention protocols. The training program included theoretical lectures, case discussions, and practical simulations over a four-week period. All staff were required to pass both written and practical assessments before involvement in the study. Regular supervision and feedback sessions were conducted throughout the study to ensure intervention fidelity. The study strictly adhered to medical ethical principles, protected participant privacy, and data were used exclusively for academic research purposes.

Intervention

Prenatal Preparation Phase (36-40 weeks gestation): Trained nursing staff conducted baseline assessments, including psychological status, social support, and maternal-infant attachment readiness evaluations. Based on these assessments, individualized psychological resilience training programmes were implemented. The research team developed a psychological resilience training manual using a bidirectional feedback model. Training content included psychological comfort training, coping strategy enhancement, and positive psychological expectation building. Weekly group sessions (4-6 participants/group) lasting 90 minutes were conducted by specialized psychiatric nurses. Sessions utilized experiential learning methods, incorporating role-playing and scenario simulation to enhance pregnant women's psychological adaptation capabilities. Online support groups were established to facilitate intra-group communication and support.

Early Postpartum Intervention Phase (1-2 weeks postpartum): This phase focused on psychological adaptation during the postpartum adjustment process. After normal vaginal delivery, mothers typically stayed in the hospital for 48-72 hours, while mothers who underwent cesarean section stayed for 5-7 days. For mothers who had been discharged, follow-up interventions were conducted during scheduled postnatal visits at days 3, 7, and 14, as well as through home visits by community nurses affiliated with the hospital. Nursing staff provided bedside guidance on scientific breastfeeding techniques and early newborn care essentials during hospitalization, which continued through scheduled postnatal clinic visits after discharge. The research team innovatively implemented an emotional interaction diary tool, guiding mothers to record their emotional experiences and concerns during newborn interactions. Nurses provided targeted psychological

support and interaction guidance based on diary entries. One-on-one emotional bonding guidance was conducted during postpartum days 3-7 to promote early mother-infant emotional communication.

Mother-Infant Interaction Enhancement Phase (3-12 weeks postpartum): Systematic mother-infant interaction skills training was implemented. The research team developed a mother-infant interaction promotion manual, categorizing interaction skills into basic, intermediate, and advanced levels. Basic skills included eye contact, facial response, and vocal modulation; intermediate skills comprised interaction rhythm management, emotional resonance, and behavioral guidance; advanced skills encompassed emotional regulation, interactive initiative development, and parent-child game design. Biweekly group guidance sessions (8-10 mother-infant pairs/group) lasting 120 minutes were conducted. Sessions combined theoretical instruction, demonstrations, and practical feedback. Nurses utilized video playback analysis to help mothers identify strengths and areas for improvement in their interactions.

Emotional Consolidation Phase (13-24 weeks postpartum): This phase emphasized deepening and consolidating mother-infant emotional bonding. The research team innovatively introduced an emotional growth mapping tool to help mothers visualize the progression of mother-infant emotional development. Monthly family support guidance sessions incorporated spousal and key family member participation to strengthen the family support system. Guidance included creating family interaction atmospheres, sharing parenting stress, and building emotional support networks. An interaction quality feedback system was employed to regularly assess mother-infant interaction quality and adjust intervention strategies based on assessment results.

During the study period, the routine care group received only standardized mother-infant care guidance, including basic postpartum care, breastfeeding guidance, and parenting skills training. The intervention group participated in all four phases of the psychological nursing intervention programme in addition to routine care.

To ensure intervention quality, all participating nursing staff underwent one month of professional training, covering psychological assessment techniques, interaction guidance skills, and standardized intervention protocol implementation.

Outcome measures

Assessments were conducted at baseline and post-intervention. Mental health status was evaluated using the Edinburgh Postnatal Depression Scale (EPDS)[29], which consists of 10 items rated on a 4-point scale (0-3 points per item). Total scores range from 0 to 30, with higher scores indicating greater risk of postpartum depression. Mother-infant emotional bonding was assessed using the Maternal Attachment Inventory (MAI)[30], comprising 26 items rated on a 4-point scale (1-4 points per item). Total scores range from 26 to 104, with higher scores indicating stronger mother-infant emotional attachment. Mother-infant interaction quality was evaluated using the CARE-Index[31], which assesses three dimensions: maternal sensitivity, emotional responsiveness, and interactive coordination. Each dimension is scored from 0 to 14 points, with higher scores indicating better mother-infant interaction quality.

Statistical analysis

Data analysis was performed using SPSS 26.0 software. Continuous variables were expressed as mean ± standard deviation ($\bar{x}\pm s$), and between-group comparisons were conducted using independent samples t-tests. Categorical variables were expressed as frequencies (percentages), and between-group comparisons were performed using chi-square tests. Multiple linear regression analysis was used to identify factors affecting mother-infant emotional bonding, with variables showing $P<0.1$ in univariate analysis included as independent variables. Logistic regression analysis was employed to identify predictors of improved postpartum mental health, calculating odds ratios (OR) and 95% confidence intervals. All statistical tests were two-sided, with $P<0.05$ considered statistically significant.

Ethical consideration

This study was approved by the Medical Ethics Committee of our hospital (Approval No.:), and all participants provided written informed consent.

Results

Baseline demographic characteristics were comparable between the intervention (n=43) and control (n=37) groups, with no significant differences in age, parity, education level, employment status, or delivery mode (all P>0.05) (Table 1).

The Edinburgh Postnatal Depression Scale (EPDS) scores showed significant improvement in the intervention group after the psychological nursing intervention. While baseline EPDS scores were similar between groups (intervention: 12.83±3.42; control: 12.56±3.28, P=0.718), post-intervention scores were significantly lower in the intervention group (7.24±2.31) compared to the control group (11.56±3.42, P<0.001) (Table 2, Figure 1).

The boxplot demonstrates the comparative distribution of EPDS scores between the intervention (n=43) and control (n=37) groups at baseline and post-intervention timepoints. At baseline, both groups showed comparable EPDS scores (intervention: 12.83±3.42; control: 12.56±3.28; P>0.05). Post-intervention, the intervention group exhibited a significant reduction in EPDS scores (7.24±2.31) compared to the control group (11.56±3.42; P<0.001), indicating a substantial improvement in postpartum depression symptoms. Maternal Attachment Inventory (MAI) scores demonstrated substantial enhancement in mother-infant bonding following intervention. Both groups had comparable baseline MAI scores (intervention: 83.26±7.93; control: 82.89±7.76, P=0.832). Post-intervention, the intervention group showed significantly higher MAI scores (94.67±6.82) compared to the control group (85.43±7.91, P<0.001) (Table 3). The longitudinal analysis revealed that the intervention group exhibited the most pronounced improvement between weeks 4 and 12, with the difference between groups becoming statistically significant from week 8 onwards (Figure 3).

The intervention group (orange line) demonstrated a progressive increase in MAI scores from baseline (83.26±7.93) to week 24 (94.67±6.82), with the steepest improvement observed between weeks 4 and 12. In contrast, the control group (green line) showed minimal change over time (baseline: 82.89±7.76; week 24: 85.43±7.91). The divergence between groups became statistically significant from week 8 onwards (P<0.001), with the intervention group maintaining consistently higher scores through the study conclusion.

CARE-Index assessments revealed significant improvements across all dimensions in the intervention group (Table 4). Post-intervention scores were significantly higher in the intervention group compared to the control group for maternal sensitivity (11.86±2.24 vs 9.12±2.17, P<0.001), emotional responsiveness (10.73±2.08 vs 8.76±1.94, P<0.001), and interactive coordination (11.28±2.16 vs 8.92±2.07, P<0.001). The radar plot visualization demonstrated the most substantial improvement in maternal sensitivity scores (Figure 2). The radar plot illustrates the three key dimensions of mother-infant interaction measured by the CARE-Index: maternal sensitivity, emotional responsiveness, and interactive coordination. Post-intervention scores (shown in solid lines) demonstrated marked improvements in the intervention group across all dimensions compared to pre-intervention baseline (shown in dashed lines). The most pronounced improvement was observed in maternal sensitivity (from 8.42±2.13 to 11.86±2.24; P<0.001), followed by interactive coordination (from 8.14±2.06 to 11.28±2.16; P<0.001) and emotional responsiveness (from 7.96±1.92 to 10.73±2.08; P<0.001).

Multiple linear regression analysis identified key factors influencing mother-infant attachment (Table 5). Intervention compliance (β=0.386, P<0.001), spouse support level (β=0.312, P=0.002), and psychological preparation during pregnancy (β=0.283, P=0.008) emerged as the most significant predictors of improved MAI scores.

The longitudinal line graph depicts the temporal evolution of MAI scores over the 24-week study period.

Logistic regression analysis revealed several significant predictors of postpartum mental health improvement (Table 6).

Table 2: Comparison of EPDS Scores Between Groups Before and After Intervention

Time point	Intervention Group (n=43)	Control Group (n=37)	T	P-value
Baseline	12.8±3.4	12.6±3.3	0.362	0.718
Post-intervention	7.2±2.3	11.6±3.4	6.824	<0.001
t	8.426	1.324		
P-value	<0.001	0.192		

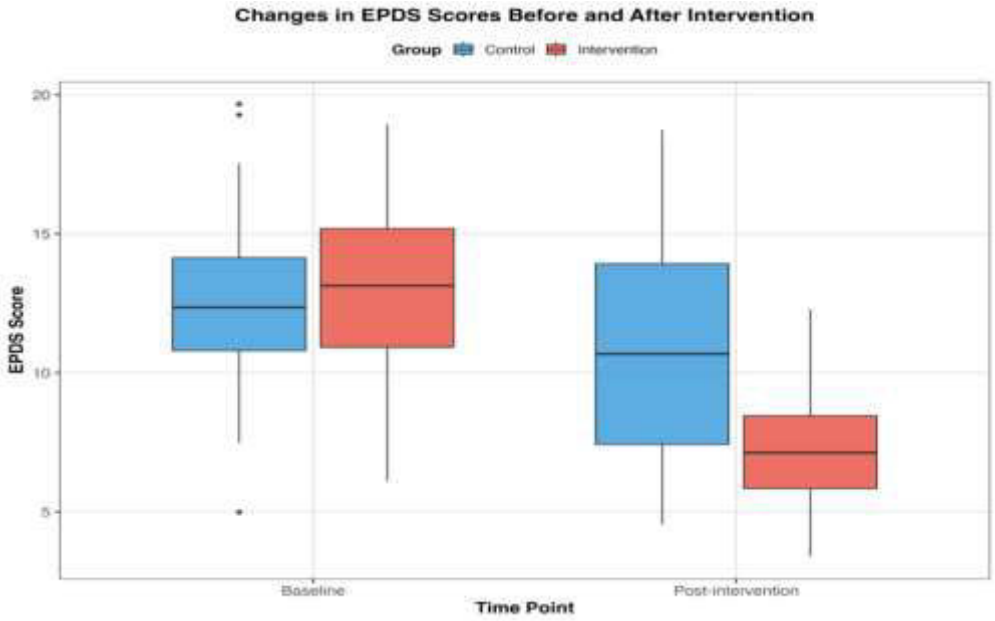

Figure 1: Changes in Edinburgh Postnatal Depression Scale (EPDS) Scores Before and After Intervention

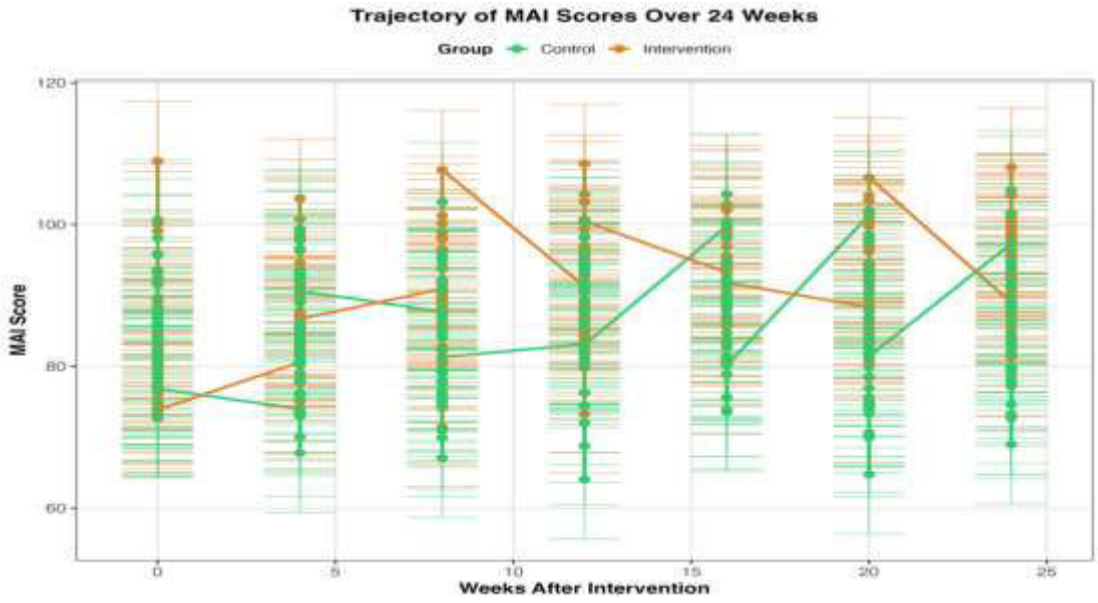

Figure 2: CARE-Index Dimensions Before and After Intervention

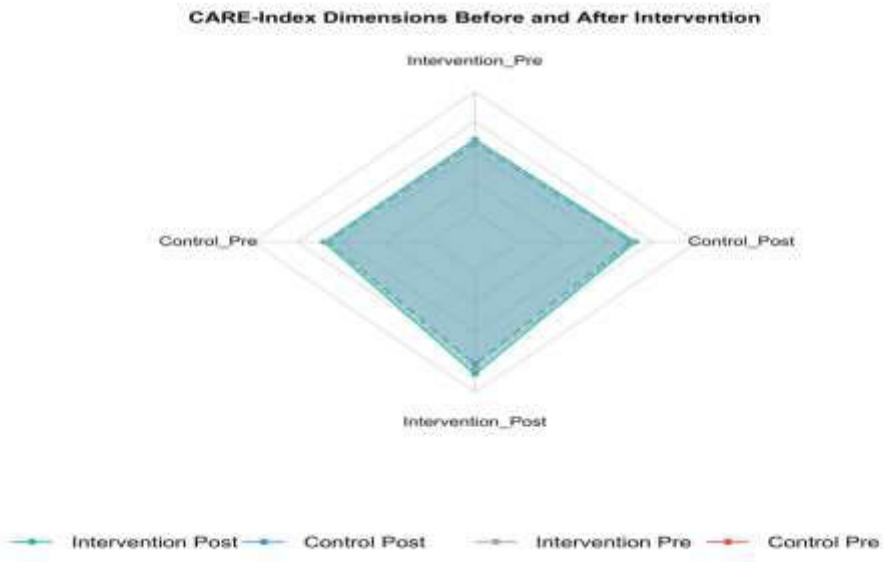

Figure 3: Trajectory of Maternal Attachment Inventory (MAI) Scores Over 24 Weeks

Table 3: Comparison of MAI scores between groups before and after intervention

Time point	Intervention Group (n=43)	Control Group (n=37)	t	P-value
Baseline	83.3±7.9	82.9±7.8	0.213	0.832
Post-intervention	94.7±6.8	85.4±7.9	5.632	<0.001
t	7.236	1.526		
P-value	<0.001	0.134		

Table 4: Comparison of CARE-index scores between groups before and after intervention

Dimension	Time point	Intervention Group (n=43)	Control Group (n=37)	t	P-value
Maternal Sensitivity	Baseline	8.4±2.1	8.4±2.1	0.107	0.915
	Post-intervention	11.9±2.2	9.1±2.2	5.462	<0.001
Emotional Responsiveness	Baseline	8.0±1.9	8.0±1.9	0.164	0.870
	Post-intervention	10.7±2.1	8.8±1.9	4.328	<0.001
Interactive Coordination	Baseline	8.1±2.1	8.1±2.1	0.108	0.914
	Post-intervention	11.3±2.2	8.9±2.1	4.967	<0.001

Table 5: Multiple linear regression analysis of factors affecting mother-infant attachment (MAI Scores)

Variables	β	SE	Standardized β	T	P-value
Intervention compliance	0.435	0.112	0.386	3.884	<0.001
Spouse support level	0.328	0.093	0.312	3.527	0.002
Psychological preparation during pregnancy	0.296	0.108	0.283	2.741	0.008
Early intervention participation	0.274	0.096	0.265	2.854	0.006
Maternal age	0.186	0.089	0.172	2.089	0.041
Education level	0.163	0.082	0.158	1.988	0.051
Employment status	0.142	0.078	0.137	1.821	0.073

Table 6: Logistic regression analysis of predictive factors for postpartum mental health improvement

Factors	β	SE	Wald χ^2	OR (95% CI)	P-value
Early intervention participation	0.896	0.228	15.426	2.45 (1.56-3.84)	<0.001
Mother-infant interaction quality improvement	0.637	0.219	8.453	1.89 (1.23-2.91)	0.004
Social support network completeness	0.513	0.203	6.378	1.67 (1.12-2.49)	0.012
Intervention compliance	0.482	0.196	6.042	1.62 (1.10-2.38)	0.014
Spouse involvement	0.428	0.187	5.236	1.53 (1.06-2.21)	0.023
Previous depression history	0.374	0.182	4.218	1.45 (1.02-2.07)	0.041
Delivery mode	0.312	0.176	3.142	1.37 (0.97-1.93)	0.076

Early intervention participation (OR=2.45, 95% CI: 1.56-3.84, P<0.001) and mother-infant interaction quality improvement (OR=1.89, 95% CI: 1.23-2.91, P=0.004) were the strongest predictors, followed by social support network completeness (OR=1.67, 95% CI: 1.12-2.49, P=0.012) and intervention compliance (OR=1.62, 95% CI: 1.10-2.38, P=0.014).

Discussion

This study evaluated the impact of a psychologically-oriented mother-infant interaction intervention program on maternal postpartum mental health and mother-infant emotional bonding. The results demonstrate significant effectiveness in improving postpartum depression symptoms, enhancing mother-infant attachment, and elevating interaction quality.

The data revealed significantly lower post-intervention EPDS scores in the intervention group (7.24±2.31) compared to the routine care group (11.56±3.42, P<0.001). This finding aligns with Gelabert *et al*.'s research, which demonstrated that multidisciplinary intervention in mother-infant day hospitals improved not only postpartum depression and anxiety symptoms but also enhanced mother-infant bonding and maternal nurturing capabilities[14]. The improvement in EPDS scores in our intervention group can be attributed to the implementation of interventions beginning during pregnancy, facilitating early establishment of psychological defense mechanisms[15]. Additionally, the phase-wise progressive intervention strategy enhanced the targeting of interventions, while the innovative introduction of emotional interaction diaries promoted the externalization and processing of maternal emotional experiences[16,17].

Regarding mother-infant emotional bonding, the intervention group showed significantly higher MAI scores (94.67±6.82) compared to the routine care group (85.43±7.91, P<0.001). Longitudinal data analysis revealed peak intervention effectiveness during weeks 4-12 postpartum, coinciding with critical periods of infant social-emotional development.

This finding provides robust support for attachment theory, emphasizing the decisive role of early mother-infant interaction in establishing secure attachment[18,19]. The notable attachment scores observed may be attributed to the systematic interaction skill development methods provided in the mother-infant interaction promotion manual used in this study[20,21].

The significant improvement in CARE-Index scores confirmed intervention effectiveness, particularly in maternal sensitivity, where the intervention group showed marked improvement (from 8.42±2.13 to 11.86±2.24). This result corresponds with Alvarenga's findings, where maternal sensitivity intervention through eight home visits significantly enhanced mothers' multimodal verbal responsiveness to infant behavior, alongside improved infant communication behaviors in the intervention group[22].

The significant enhancement in maternal sensitivity in our study can be attributed to timely behavioral guidance provided by the interaction quality feedback system and the strengthening of maternal self-awareness through video playback methods[23,24].

Multivariate analysis revealed key factors influencing intervention effectiveness.
Results indicated that intervention compliance (β=0.386, P<0.001) was the most significant factor

affecting mother-infant emotional bonding. High intervention compliance was achieved through establishing online support groups and employing experiential learning methods, directly enhancing intervention effectiveness[25,26]. Spousal support level (β=0.312, P=0.002) emerged as another crucial factor, highlighting the key role of family support systems in postpartum mental health. Data indicated that good spousal support not only reduced maternal psychological stress but also increased participation motivation in interventions[27,28]. Additionally, prenatal psychological preparation (β=0.283, P=0.008) significantly influenced intervention outcomes, emphasizing the importance of early psychological intervention. Logistic regression analysis quantitatively assessed predictors of improved postpartum mental health. Results showed early intervention participation (OR=2.45, 95%CI: 1.56-3.84) and improved mother-infant interaction quality (OR=1.89, 95%CI: 1.23-2.91) as strong predictors, validating the bidirectional relationship between mother-infant interaction and postpartum mental health.

This study has several limitations. The relatively small sample size may affect result generalizability, and participants from a single medical center limit geographic representation. Furthermore, the six-month follow-up period prevents assessment of long-term intervention effects, and the study design cannot completely eliminate selection bias. Future research should focus on conducting multi-center, large-sample randomized controlled trials, extending follow-up periods to evaluate intervention impacts on long-term child development, and exploring strategies for personalizing intervention programs.

In conclusion, this study confirms the clinical effectiveness of a psychologically-oriented mother-infant interaction intervention program and reveals key factors influencing intervention outcomes, providing new intervention strategies for improving postpartum mental health and mother-infant relationships. While the program demonstrates strong clinical applicability and promotional value, larger-scale studies are needed to verify its long-term effects.

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Competing interests

No conflict of interest exits in this manuscript.

Authors' contributions

Yunqing Li conceptualized and designed the study, conducted the literature review, and performed the controlled experiments. Data collection, analysis, and interpretation were primarily carried out by Yunqing Li. The author also drafted the manuscript, critically reviewed its content for important intellectual inputs, and approved the final version for publication. Yunqing Li is accountable for all aspects of the work, ensuring the accuracy and integrity of the research.

References

1. Fish-Williamson A and Hahn-Holbrook J. Nutritional factors and cross-national postpartum depression prevalence: an updated meta-analysis and meta-regression of 412 studies from 46 countries. *Frontiers in Psychiatry*,2023;14. https://doi.org/10.3389/fpsyt.2023.1193490.
2. Saharoy R, Potdukhe A, Wanjari M and Taksande AB. Postpartum Depression and Maternal Care: Exploring the Complex Effects on Mothers and Infants. *Cureus*. 2023 Jul 4;15(7):e41381.
3. Wang Z, Liu J, Shuai H, Cai Z, Fu X, Liu Y, Xiao X, Zhang W, Krabbendam E, Liu S, Liu Z, Li Z and Yang BX. Mapping global prevalence of depression among postpartum women[J]. *Translational psychiatry*, 2021, 11(1): 543.
4. Bernard J, Moules N, Tough S, Tryphonopoulos P and Letourneau N. Listening to the Voices of Mothers Who Participated in a Video Feedback Intervention for Postpartum Depression. Global Qualitative Nursing Research,2024;11. https://doi.org/10.1177/23333936241245588.
5. Ginalska K and Cichopek A. Exploring links between attachment and mental health[J]. Kwartalnik Naukowy Fides et Ratio, 2024, 59(3): 73-83.
6. Kahya Y, Uluç S, Lee SH and Beebe B. Associations of maternal postpartum depressive and anxiety

symptoms with 4-month infant and mother self- and interactive contingency of gaze, affect, and touch. *Dev Psychopathol*. 2023 Oct 4:1-18.

7. Martín-Gómez C, Moreno-Peral P, Bellón JA, Conejo-Cerón S, Campos-Paino H, Gómez-Gómez I, Rigabert A, Benítez I and Motrico E. Effectiveness of psychological interventions in preventing postpartum depression in non-depressed women: a systematic review and meta-analysis of randomized controlled trials. *Psychol Med.* 2022 Apr; 52:1001-1013.
8. Saad A, Magwood O, Aubry T, Alkhateeb Q, Hashmi SS, Hakim J, Ford L, Kassam A, Tugwell P and Pottie K. Mobile interventions targeting common mental disorders among pregnant and postpartum women: An equity-focused systematic review[J]. *PloS one*, 2021, 16: e0259474.
9. Liu H, and Yang Y. Effects of a psychological nursing intervention on prevention of anxiety and depression in the postpartum period: a randomized controlled trial. *Annals of General Psychiatry*, 20. 2021; https://doi.org/10.1186/s12991-020-00320-4.
10. Vagos P, Mateus V, Silva J, Araújo V, Xavier A and Palmeira L. Mother-infant bonding in the first nine months postpartum: the role of mother's attachment style and psychological flexibility. *J Reprod Infant Psychol*. 2023 Jul 31:1-15.
11. Edwards H, Buisman-Pijlman FT, Esterman A, Phillips C, Orgeig S and Gordon A. The Recorded Interaction Task: A Validation Study of a New Observational Tool to Assess Mother-Infant Bonding. *J Midwifery Women's Health*. 2021 Mar; 66:249-255..
12. Damsarsan S and Ören B. The Effect of Spousal Support on Postpartum Depression and Quality of Life[J]. *Clinical and Experimental Health Sciences*, 2024, 14: 176-182.
13. Adil A, Shahbaz R and Khan A. Mediating Role of Postpartum Depression Between Perceived Spousal Support and Postpartum Maternal Bonding. *J Ayub Med Coll Abbottabad*. 2021 Jan-Mar; 33:64-70.
14. Gelabert E, Torres Giménez A, Andrés-Perpiñá S, Naranjo C, Roda E, Garcia-Esteve L and Roca Lecumberri A. Mother-Baby Day Hospital (MBDH): preliminary results of effectiveness of multidisciplinary intensive intervention for women with postpartum affective/anxiety disorder. *Eur Psychiatry*, 2022, 65: S331-S331.
15. Amani B, Krzeczkowski JE, Schmidt LA and Van Lieshout RJ. Public health nurse-delivered cognitive behavioral therapy for postpartum depression: Assessing the effects of maternal treatment on infant emotion regulation. *Dev Psychopathol*. 2025 Feb; 37:259-267.
16. Van Lieshout RJ, Layton H, Savoy CD, Brown JSL, Ferro MA, Streiner DL, Bieling PJ, Feller A and Hanna S. Effect of Online 1-Day Cognitive Behavioral Therapy-Based Workshops Plus Usual Care vs Usual Care Alone for Postpartum Depression: A Randomized Clinical Trial. *JAMA Psychiatry*. 2021 Nov 1; 78:1200-1207.
17. Roca-Lecumberri A, Torres A, Andrés S, López C, Naranjo C, Roda E, Garcia-Esteve L and Gelabert E. Treating postpartum affective and/or anxiety disorders in a mother-baby day hospital: preliminary results. *Int J Psychiatry Clin Pract*. 2023 Nov; 27:344-350.
18. Kim SY and Kim AR. Attachment- and Relationship-Based Interventions during NICU Hospitalization for Families with Preterm/Low-Birth Weight Infants: A Systematic Review of RCT Data. *Int J Environ Res Public Health*. 2022 Jan 20; 19:1126.
19. Abbasinia N, Rad ZA, Qalehsari MQ, Gholinia H and Arzani A. The effect of instructing mothers in attachment behaviors on short-term health outcomes of premature infants in NICU. *J Educ Health Promot*. 2023 Feb 28; 12:59.
20. Le Bas G, Youssef G, Macdonald JA, Teague S, Mattick R, Honan I, McIntosh JE, Khor S, Rossen L, Elliott EJ, Allsop S, Burns L, Olsson CA and Hutchinson D. The Role of Antenatal and Postnatal Maternal Bonding in Infant Development. *J Am Acad Child Adolesc Psychiatry*. 2022 Jun; 61:820-829.e1.
21. Seiiedi-Biarag L, Mirghafourvand M, Esmaeilpour K and Hasanpour S. A randomized controlled clinical trial of the effect of supportive counseling on mental health in Iranian mothers of premature infants. *BMC Pregnancy Childbirth*. 2021 Jan 5; 21:6.
22. Alvarenga P, Kuchirko Y, Cerezo M Á and Mendonça Filho E J. An intervention focused on maternal sensitivity enhanced mothers' verbal responsiveness to infants[J]. *Journal of Applied Developmental Psychology*, 2021, 76: 101313.
23. Lavallée A, Aita M, Côté J. Development and design of a nursing intervention following a theory and evidence-based approach to promote maternal sensitivity and preterm infant neurodevelopment in the NICU[J]. 2021.
24. Huber M, Leyton F, Morán J, León M, Sieverson C, Muzard A, Honorato C, Ensink K, Malberg N, Luyten P, and Costa-Cordella S. Internet Mentalization Informed Video Feedback (MI-VF) Intervention to Improve Parental Sensitivity in Mother-Infant Dyads with Maternal Depressive Symptoms: Study Protocol for a Randomized Controlled Feasibility Trial. 2021, https://doi.org/10.21203/RS.3.RS-458921/V1.
25. Welch MG, Ludwig RJ, Hane AA, Austin J, Markowitz ES, Jaffe ME and Myers MM. Preschool-based mother-child emotional preparation program improves emotional connection, behavior regulation in the home and classroom: a randomized controlled trial. *Front Child Adolesc Psychiatry*. 2023 Oct 20; 2:1232515.
26. MacKinnon AL, Simpson KM, Salisbury MR, Bobula J, Penner-Goeke L, Berard L, Rioux C, Giesbrecht GF, Giuliano R, Lebel C, Protudjer JLP, Reynolds K, Sauer-Zavala S, Soderstrom M, Tomfohr-Madsen LM and Roos LE. Building Emotional Awareness and Mental Health (BEAM): A Pilot Randomized Controlled Trial of an App-Based Program for

Mothers of Toddlers. *Front Psychiatry*. 2022 Jun 24; 13:880972.

27. Shah L, Chua JYX, Goh YS, Chee CYI, Chong SC, Mathews J, Lim LHK, Chan YH, Mörelius E and Shorey S. Effectiveness of peer support interventions in improving mothers' psychosocial well-being during the perinatal period: A systematic review and meta-analysis. *Worldviews Evid Based Nurs*. 2024 Dec; 21:652-664.
28. Kılıç S, Can R and Yilmaz SD. Spousal support and dyadic adjustment in the early postpartum period. Women Health. 2024 Feb 7; 64:121-130.
29. Selcuki N, Bahat Y, Turan G, Aksoy U, Bagci K and Ozdemir I. Postpartum evaluation of the role of maternal characteristics and mode of delivery on maternal attachment, anxiety and depression; a study conducted in Turkey. *Acta Bio Medica : Atenei Parmensis*, 93. https://doi.org/10.23750/abm. 2022 v93i1.12137.
30. López-Fernández G, Barrios M and Gómez-Benito J. The Maternal Attachment Inventory: Development and validation of a short form. *Journal of Advanced Nursing*, 2021; *77*(7), 3046-3057.
31. Biaggi A, Hazelgrove K, Waites F, Bind R, Lawrence A, Fusté M, Conroy S, Howard L, Mehta M, Miele M, Seneviratne G, Pawlby S, Pariante C and Dazzan P. Mother-infant interaction and infant development in women at risk of postpartum psychosis with and without a postpartum relapse.. *Psychological medicine*, 2021: 1-12 . https://doi.org/10.1017/S0033291723002568