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## RESEARCH ARTICLE

# Infants of mothers with early remitted clinical depression and mothers with no postpartum depression: Adaptive functioning in the second year of life

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## Abstract

Whether and how remitted clinical depression in postpartum motherhood contributes to poor infant adaptive functioning is inconclusive. The present longitudinal study examines adaptive functioning in infants of mothers diagnosed as clinically depressed at 5 months but remitted at 15 and 24 months. Fifty-five U. S. mothers with early, remitted clinical depression and 132 mothers without postpartum depression completed the Vineland Adaptive Behavior Scales about their infants at 15 and 24 months. Between groups, mothers were equivalent in age, ethnicity, marital status, and receptive vocabulary (a proxy for verbal intelligence), and infants were equivalent in age and distribution of gender. Controlling for maternal education and parity, mothers with early, remitted clinical depression and mothers with no postpartum depression rated their infants similarly on communication, daily living skills, and socialization. Mothers with early, remitted clinical depression rated their infants poorer in motor skills. Girls were rated more advanced than boys in communication at 24 months and daily living skills at 15 and 24 months. Rated infant adaptive behavior skills increased from 15 to 24 months. With exceptions, adaptive functioning in infants may be robust to early, remitted maternal depression, and adaptive functioning presents a domain to promote positive development in this otherwise vulnerable population.

## KEYWORDS

adaptive functioning, infancy, maternal clinical depression

## 1 | INTRODUCTION

Infants face innumerable and varied challenges in early development, and they cope with those challenges by making appropriate adaptations (Lazarus, 1999). In human infancy, mothers constitute children's primary

social environment, shaping brain and behavior (Bornstein, 2019; Curley & Champagne, 2016). Being reared by a parent with depression may challenge infant development (Seifer & Dickstein, 2000), and depression in new mothers is an all-too-common postpartum condition: In the United States, between 7% and 17% of postpartum women

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experience a major depressive episode (Gavin et al., 2005; Shorey et al., 2018). Research suggests that the prevalence of postpartum depression diagnoses and symptoms ranges from 8% (e.g., Europe) to 26% (e.g., Middle East) globally (Shorey et al., 2018).

Mothers with clinical depression tend to engage in less responsive and more harsh or withdrawn caregiving than mothers with no depression (Lovejoy et al., 2000) and may create environments that uniquely contest their infants' normal development (J. H. Goodman, 2019). Importantly, depression is vastly heterogeneous; one study identified 1,030 unique symptom profiles in 3,703 individuals with major depressive disorder diagnoses (Fried & Nesse, 2015). Accordingly, parenting behaviors, parent-child interactions, and child outcomes in the context of parental depression are heterogeneous (S. H. Goodman et al., 2020). Still, research suggests that children of mothers with depression fare worse than age-mates untouched by maternal depression on a variety of developmental outcomes (Farewell et al., 2021; S. H. Goodman, 2020), and depressed parenting may be one pathway through which maladaptive outcomes in children occur (Bornstein et al., 2021; Lovejoy et al., 2000). Importantly, timing, chronicity, and severity of maternal depression are important determinants of child outcomes (Brennan et al., 2000; Urizar & Muñoz, 2022). Considering the prevalence of maternal depression, a thorough understanding of diverse effects in young children and of short- and long-term impacts on children's adaptive functioning is critical. To contribute to this understanding, the current study focuses on the impact of early, remitted maternal clinical depression (i.e., diagnoses at 5 months that had fully remitted by 15 and 24 months) on later child adaptive functioning.

## 1.1 | Infant-rearing environment fostered by mothers with depression

Early caregiving provides the first opportunities for infants to learn to regulate their experiences with the environment (Bornstein, 2023), and so infants of parents with depression are at special developmental risk (J. H. Goodman, 2019). Less competent parenting and genetic transmission of risk together shape development such that children of mothers with depression tend to have poorer physical, social, and cognitive outcomes than their unexposed peers (S. H. Goodman, 2020; S. H. Goodman et al., 2020). Face-to-face interaction occurs less frequently in depressed than nondepressed mother-child dyads, and when interactions do occur mothers with depression speak to their children less, are slower to respond to their children's vocalizations, and exhibit speech with different acoustic features (e.g., lower mean pitch) and content (Breznitz & Sherman,

## Relevance and Key Findings

- Mothers with early, remitted clinical depression and mothers with no postpartum depression rated their infants similarly on communication, daily living skills, and socialization adaptive behaviors, and rated infant adaptive behaviors in both groups increased from 15 to 24 months, suggesting that some forms of adaptive functioning and their development may be robust to early, remitted maternal depression.
- However, mothers with early, remitted clinical depression rated their infants lower in motor skills than mothers with no postpartum depression; sensitivity analyses indicated that this difference may be attributable to maternal antidepressant medication use during pregnancy.
- Consistent with previous research and in support of the internal validity of the study, mothers reported that girls were more advanced than boys in adaptive communication at 24 months and daily living skills at 15 and 24 months.

1987; Herrera et al., 2004; Lam-Cassettari & Kohlhoff, 2020; Scheiber et al., 2022). Mothers with depression also display more negative affect and less positive affect, and such withdrawn and/or intrusive behaviors can impede mothers' ability to react sensitively to infants' cues (Dix & Moed, 2019). Infants of mothers with depression show increased withdrawal and avoidance, averted gaze, and low positive affect, all behaviors which have been interpreted as efforts to buffer against their mothers' negative state (Field et al., 2006).

## 1.2 | Adaptive functioning in children of depressed mothers

Adaptive functioning is a vital biopsychological construct that refers to the individual's active modifications to cope effectively with the demands of their environments. Adaptation fulfills a central developmental and evolutionary promise through the individual's becoming better suited, or fit, to the environment. A logical reaction in infants of mothers with depression might be accommodations in their adaptive behavioral development. Adaptive functioning in early childhood is noteworthy because it predicts both adaptive functioning and psychological symptoms in adolescence (Bornstein et al., 2013a). On these grounds,

close scrutiny of adaptive behaviors in infants of mothers with depression is warranted.

To measure infant adaptive functioning, we used the Vineland Adaptive Behaviors Scales (VABS; Sparrow et al., 1984); research supports their reliability and validity (e.g., Johnson et al., 1992; Kamphaus, 1987; Scattone et al., 2011) and they are foremost among 200 adaptive behavior assessment instruments (diSibio, 1993; Kamphaus, 1987). The VABS measure everyday activities and interpersonal relationships and include skills in communication, daily living, socialization, and motor functions. Research has examined associations between maternal depression symptoms and child adaptive behaviors (with child adaptive behaviors measured by the VABS and related instruments; Bayley Scales of Infant Development, Field, 1992; Kaplan et al., 2014; Knoche et al., 2007). One example study examined the effects of a mental health treatment program with a sample of low-income Latina mothers and their 34-month-olds (Mennen et al., 2015). Children of mothers who reported symptoms of depression received lower scores on the socialization scale of the VABS at baseline than children of mothers with no depression, and, although all children enrolled in the program improved, a Time by Depression interaction revealed that children of mothers with symptoms of depression gained in daily living skills more slowly than children of mothers with no depression. To our knowledge, however, only one small-*N* study has focused on the participation of mothers with clinical diagnoses of depression. In 15 clinically depressed and 16 non-depressed matched Turkish dyads, toddlers of mothers with depression scored more poorly on the VABS communication domain (Öztop & Uslu, 2007). Taken together, the few studies that have examined relations between maternal depression and child adaptive behaviors suggest one or more areas of compromised adaptive functioning in children of mothers with depression. However, methodological limitations, such as variation in the assessment and measurement of maternal depression, the timing and contexts of child outcome assessments, and failures to match comparison groups of mothers on sociodemographic characteristics, interfere with clear interpretations of putative risks posed by maternal depression to infant and child adaptive development.

### 1.3 | Remission in maternal depression and child outcomes

Approximately 13% of mothers with postpartum depression symptoms remit within 3 years after birth (Putnick et al., 2020). Still, no studies have examined the development of children's early adaptive functioning following their mothers' remission from depression. Such study

designs would tell us about the unique long-term effects of early exposures. Despite remission, moreover, maladaptive emotional states may persist in mothers: A meta-analysis reported that, even when partially remitted, depression is associated with a mother's attenuated ability and motivation to synchronize with her young child's emotional state (Lovejoy et al., 2000). Maladaptive outcomes diminish with remission of maternal depression in some, but not all, children and for some, but not all, developmental outcomes (Gunlicks & Weissman, 2008; Weissman et al., 2014). In some cases, children of parents in remission exhibit the same levels of distress and disturbance as children of parents who had partially remitted or not remitted (Timko et al., 2002). Additional research is necessary to ascertain domains and levels of adaptive functioning of children of mothers with postpartum depression in remission to ensure that adaptive functioning is assessed and that those children and families are not being overlooked for otherwise potentially beneficial intervention services.

### 1.4 | The present study

We sought to shed light on child adaptive functioning of mothers with remitted clinical depression. In our study, mothers were diagnosed with clinical depression at 5 months and had fully remitted by 15 and 24 months. Consistent with the extant but limited literature, we hypothesized that children of mothers with remitted depression would exhibit differential effects in their adaptive functioning. For example, compared to mothers with no postpartum depression, mothers with early, remitted depression would rate their infants lower in socialization (Mennen et al., 2015) and communication (Öztop & Uslu, 2007).

We collected maternal reports of infant adaptive behaviors across the second year of life (15 and 24 months) for several reasons. First, the second year is a period of rapid development in language comprehension and production, daily living, socialization, and motor skills (Kagan, 2013). Second, even small individual and group differences in infancy may grow into substantial differences over time (Bornstein, 2014), and findings of differences in infancy afford key opportunities and targets for early intervention (García et al., 2021). Third, assessing adaptive behaviors after the first postpartum year facilitates distinguishing postpartum blues (and other transient disturbances associated with new parenthood; Javadifar et al., 2016) from clinical depression (Miller, 2002). Finally, the second year provides a mother with sufficient time to settle into her role, including ample opportunities to observe and understand her infant's behaviors (Verhoeven et al., 2019).

We examined individual-order consistency (stability) and group mean-level consistency (continuity) through the second year of life in the adaptive behaviors of children of previously clinically depressed and nondepressed mothers. Consistent with existing research on adaptive behaviors in infancy (Sparrow et al., 1984), we expected to observe moderate to strong stabilities for all VABS in children in both groups. Furthermore, we expected to observe discontinuity for all VABS, such that infant communication, daily living skills, socialization, and motor skills would increase from 15 to 24 months. However, we hypothesized that infants of mothers with early, remitted depression would demonstrate smaller gains in daily living skills from 15 to 24 months than infants of mothers with no postpartum depression (Mennen et al., 2015).

We also examined gender differences in children's adaptive functioning. Previous research using the VABS, and the greater literature describing trends in communication, daily living, socialization, and motor skills by gender (Bornstein et al., 2005; Bornstein & Hahn, 2007; Prior et al., 1993), led us to expect that girls would be deemed better adapted than boys.

Compared to the extant literature, the present study was optimized to assess and compare the role of early experience with clinical depression on the development of adaptive functioning in infants of mothers with early, remitted clinical depression and no postpartum depression. First, rather than rely on self-report questionnaire measures of depression symptoms in mothers, we selected into the depressed group only mothers diagnosed with clinical depression. Second, to determine potential unique effects of early, remitted maternal depression, we selected mothers who were clinically depressed when their infants were 5 months of age but had fully remitted by 15 and 24 months. Third, to obviate potential variation in sociodemographic characteristics between the two groups, we recruited and included only middle-SES families and sociodemographically equivalent mothers across the two groups. Fourth, to account for potential biases in maternal reports of child adaptive functioning, we included controls for maternal education and child birth order.

## 2 | METHODS

### 2.1 | Recruitment

Mothers (older than 20 years) were initially recruited through mass mailings, women's groups, and newspaper advertisements from the Washington, DC metropolitan area in the United States. In addition, birth records

were collected from the Washington, DC metropolitan area in the United States, and new mothers were contacted. The recruitment materials that targeted depressed mothers indicated that the study was about postpartum depression and child development and included details about the longitudinal nature of the study.

### 2.2 | Selection procedures and criteria

Between 1 and 5 months postpartum, the Beck Depression Inventory-II (BDI-II; Beck et al., 1996) was mailed to 536 mothers who expressed interest in the study through recruitment efforts. Of 461 women who returned the BDI-II, 316 with low ( $<7$ ) and high scores ( $>12$ ) were invited to participate at 5 months postpartum in the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 2001). On the basis of the SCID interview, mothers diagnosed as having had depression (major depression, minor depression, dysthymia, or depressive disorder not otherwise specified [DD-NOS]<sup>1</sup>) were selected into the clinically depressed group ( $n = 121$ ). Mothers without depression diagnoses were selected into the nondepressed group ( $n = 195$ ). (See [Supplemental Materials](#) for CONSORT Flow Diagram.)

The SCID-I was administered again to all mothers at infant ages 15 and 24 months; SCID-I interviewers at 15 and 24 months were blind to previous diagnoses of the mothers. Re-administration of the SCID-I revealed that the majority of mothers diagnosed as clinically depressed at 5 months had fully remitted by 15 and 24 months. Full remission was determined by at least 2 months in which there were no significant symptoms of depression. There were 77 mothers with SCID-I data at 5, 15, and 24 months, of whom only 11 mothers had a diagnosis of depression at 15 months and another 11 mothers with a diagnosis of depression at 24 months. However, only six mothers had persistent depression across all time points. We used data for mothers who were diagnosed as clinically depressed at 5 months and had fully remitted by 15 and 24 months for the depressed group. In all, 55 mothers with early clinical depression in remission (henceforth referred to as the "early, remitted depression group") and 132 mothers with no postpartum depression (henceforth referred to as the "nondepressed group") provided some or all data.

### 2.3 | Sample characteristics

All infants were term and healthy with no known genetic disorders or birth complications. Infants averaged  $M = 5.17$  months ( $SD = .26$ ),  $M = 14.99$  months ( $SD = .36$ ), and



**TABLE 1** Descriptive statistics by nondepressed group and early, remitted depression group.

Sample characteristics	Descriptive statistics				Statistics	Effect size
	Nondepressed		ERD			
	M	SD	M	SD		
Infant age at 5 months	156.71 days	6.80	159.05 days	9.41	$F(1,185) = 2.91, p = .08$	$\eta^2 = .002$
Infant gender (% female)	41.9%		52.8%		$\chi^2(1,184) = .17, p = .19$	Cramer's V = .177
% Firstborns	14.6%		47.0%		$\chi^2(1,185) = 6.10, p = .01$	Cramer's V = .020
Maternal age	32.38	4.45	32.68	4.71	$F(1,183) = .17, p = .68$	$\eta^2 = .001$
Maternal ethnicity					$\chi^2(4,182) = 1.79, p = 0.77$	Cramer's V = .087
% European American	71.3%		66.0%			
% African American	10.9%		17.0%			
% Asian American	4.7%		5.7%			
% Mixed or Other Ethnicity	3.9%		1.9%			
% Latina American	9.3%		9.4%			
Maternal education					$\chi^2(2,184) = 5.93, p = .04$	Cramer's V = .046
Partial college or less	17.1%		28.6%			
Completed college	34.9%		39.6%			
Completed graduate program	48.1%		30.4%			
Marital status (% married)	93.0%		85.7%		$\chi^2(1,185) = 2.50, p = .11$	Cramer's V = .776

Note: Nondepressed = No Postpartum Depression Group. ERD = Early, Remitted Depression Group.

$M = 24.34$  months ( $SD = .42$ ) at the three assessments. Across the two groups, the majority (61.6%) of infants were firstborn. Across the two groups, mothers averaged 32.47 years ( $SD = 4.52$ ), and the majority were married (90.8%); 69.7% were non-Hispanic European American, 13.0% African American, 9.3% Latina American, 4.9% Asian American, and 3.2% mixed or other ethnicity; 20.5% had partial college or less, 36.8% had completed college, and 42.7% had completed university graduate programs.

No problems with normality or outliers in distributions of variables were found in preliminary analyses. The sample characteristics for the two groups are presented in Table 1. There were no differences in maternal or infant age, maternal marital status, or maternal ethnicity between the early, remitted depression and nondepressed groups. Maternal education, coded into three categories, differed between the groups; the early, remitted depression group had a higher percentage of less than college-educated mothers (28.6%) than the nondepressed group (17.1%), and a lower percentage of college graduates (30.4%) compared to the nondepressed group (48.1%). The percentages of infants who were firstborn also differed between groups; 47.0% of infants in the early, remitted depression group and 14.6% of infants in the nondepressed group were firstborns.

We examined the early, remitted depression group in greater detail. This group ( $n = 55$ ) consists of 39 mothers with major depression (70.9%), 12 mothers with minor depression (21.8%), and four mothers with DD-NOS (7.5%).

The average number of depression symptoms at 5 months was  $M = 5.34$  ( $SD = 1.91$ , range = 2–9). The average depression episode duration at 5 months was  $M = 6.16$  weeks ( $SD = 4.41$ , range = 2–20). Depression severity, available only for 38 mothers at 5 months, was 42.1% mild, 55.3% moderate, and 2.6% severe.

Twenty-two percent of the early, remitted depression group reported being on antidepressant medication during pregnancy, including selective serotonin reuptake inhibitors (SSRIs;  $n = 11$ ) and norepinephrine-dopamine reuptake inhibitors ( $n = 1$ ). Twenty-eight percent reported being in therapy ( $n = 15$ ), of which three also reported being on medication during pregnancy. The average BDI-II scores for the early, remitted depression group were  $M = 21.85$  ( $SD = 6.97$ ) and for the non-depressed group  $M = 3.73$  ( $SD = 1.95$ ),  $t(1,185) = 27.48, p < .001$ . The correlations between depressive symptoms at 5, 15, and 24 months were small to moderate in both the early, remitted depression group and the non-depressed group (see Table 2).

The study was conducted according to guidelines established in the Declaration of Helsinki, with written informed consent obtained from a parent for each infant before any assessment or data collection. All procedures involving human subjects in this study were approved by the National Institutes of Health (NIH) Clinical Center, Eunice Kennedy Shriver National Institute of Child Health and Human Development Institutional Review Board under Protocol 02-CH-0278 (NIH Clinical Trials Identifier: NCT00044174).

**TABLE 2** Correlations between Beck Depression Inventory-II scores across time for the nondepressed and early, remitted depression groups.

	15 months	24 months
ERD		
5 months	.42**	.31*
15 months		.56***
Nondepressed		
5 months	.38***	.18*
15 months		.23**

Notes: ERD = Early, Remitted Depression Group; Nondepressed = No Postpartum Depression Group; Ns (Early, Remitted Depression) = 55; Ns (Nondepressed) = 132.

\* $p \leq .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

## 2.4 | Measures

### 2.4.1 | Maternal depression

The Beck Depression Inventory (BDI-II; Beck et al., 1996) is a 21-item (4-point scale ranging from 0 to 3) self-report measure of the presence and degree of depressive symptoms consistent with the DSM-IV and not an instrument for specifying a clinical diagnosis.

The Structured Clinical Interview for DSM-IV Axis I Disorders—Non-patient research version (SCID-I; First et al., 2001) is a semi-structured interview administered by a trained mental health professional and designed to make major DSM-IV Axis I diagnoses. The diagnostic flow of the interview used for this study consisted of the SCID-I Overview, Mood Episodes, Psychotic Screening, and Modules D to J (Mood Disorders, Substance Use, Anxiety, Somatoform, Eating, Adjustment, and Optional Disorders). At 5 months, the definition of “current” episode of major depression was changed to “within the lifetime of the child.” At 15 and 24 months, the questions pertained to “current” symptoms as well as depressive episodes since the time of the last interview.

### 2.4.2 | Adaptive behavior

At 15 and 24 months, mothers reported on their infants’ adaptive behaviors. The Vineland Adaptive Behavior Scales, Interview Edition, Survey Form (VABS; Sparrow et al., 1984) is used to assess children’s adaptive behavior performance, not ability, in four areas: communication, daily living, socialization, and motor skills. The VABS consist of a semi-structured interview administered to the parent or caregiver (here, mothers) by a trained interviewer. The duration of the

interview is between 20 and 60 min. The interviewer uses the *Survey Form Record Booklet* to record item scores and observations during the administration of the interview.

The VABS are appropriate for individuals aged newborn to 18 years, 11 months and low-functioning adults. Validity of the VABS is well supported (e.g., Johnson et al., 1992; Scattone et al., 2011; Sparrow et al., 1984). The VABS consist of 297 adaptive behavior items organized into five domains: 67 communication items in three subdomains: receptive, expressive, and written; 92 daily living items in three subdomains: personal care, domestic tasks, and community responsibilities; 66 socialization items in three subdomains: interpersonal relationships, play skills, and coping skills; 36 motor items in two subdomains: gross motor and fine motor; and 36 maladaptive behavior items (appropriate only for older children and not used in the present study). Item scores reflect whether or not the individual performs the activity described: A score of 2 indicates *yes, usually*, a score of 1 indicates *sometimes or partially*, and a score of 0 indicates *no, never*. Scores indicating that the individual has no opportunity to perform the activity (N) or that the respondent does not know whether the individual performs the activity (DK) can be applied. The VABS have acceptable reliability (Kamphaus, 1987): Test-retest reliability ( $n = 484$  retested over 17 days) is .88, and inter-administrator reliability ( $n = 160$  for two interviewers over an interval of 8 days) is .74.

### 2.4.3 | Verbal intelligence

At 5 months, trained administrators assessed maternal receptive vocabulary as a proxy for maternal verbal intelligence. The Peabody Picture Vocabulary Test—Revised (PPVT-R; Dunn & Dunn, 1981) contains up to 175 vocabulary words. For each word presented, the mother chose one of four pictures to indicate the meaning of the word. Standard scores with a possible range of 40–160 ( $M = 100$ ,  $SD = 15$ ) were obtained on the basis of the mother’s age. The median split-half reliability coefficient for 828 adults ranging from 19 to 40 years of age is .82 (Dunn & Dunn, 1981).

## 2.5 | Covariates

We examined the descriptive statistics and group differences (see Table 1) to make an informed selection of candidate covariates. Maternal education was significantly associated with three outcome variables, daily living skills at 15 months and motor skills at 15 and 24

months,  $F(2,172) = 4.55$ ,  $p = .012$ ;  $F(2,172) = 4.27$ ,  $p = .016$ ;  $F(2, 176) = 3.58$ ,  $p = .030$ , and hence maternal education was used as a covariate. Mothers in the two groups did not differ on PPVT-R,  $F(1, 183) = .51$ ,  $p = .47$ . Correlations of the PPVT-R and adaptive behavior scales ranged from  $r_s = -.03$  to  $.29$ , with only one indicator accounting for more than 5% of the variance (communication scale at 24 months,  $r = .29$ ). Given these findings, PPVT-R was not used as a covariate. Further analysis revealed that firstborns were rated lower on motor skills at 24 months ( $M = 96.85$ ,  $SD = 12.48$ ) than laterborns ( $M = 101.88$ ,  $SD = 13.55$ ),  $F(1, 178) = 6.23$ ,  $p = .01$ , and hence birth order was used as a covariate.

## 2.6 | Plan of analysis

We first present descriptive statistics and stability estimates across ages 15 to 24 months for VABS by group. Stability was assessed by Pearson partial correlation coefficients, controlling for maternal education and child birth order. We then report continuity across child age and the effects of group and gender as well as 2-way interactions (Age X Group, Age X Gender) for the VABS administered at 15 and 24 months, employing repeated-measures Analysis of Covariance (RM-ANCOVA), controlling for maternal education and child birth order. Child age was treated as a within-subjects variable, and group status (early, remitted depression vs. nondepressed) was treated as a between-subjects variable. There were no significant Group X Gender or Age X Group X Gender interactions. Although norm-referenced scores are appropriate and useful clinically, VABS raw scores were used in the current study, considering our interest in change across time (i.e., 15–24 months) in the early, remitted depression and nondepressed groups. Last, to have complete data across the time points for the outcome variables, we imputed missing data using series means separately for the two groups (see [Supplemental Materials](#) for details). The results presented below are based on imputed data.

## 3 | RESULTS

### 3.1 | Descriptive statistics and stability

Table 3 presents descriptive statistics and developmental stability from 15 to 24 months for all VABS for the two groups. As expected, the majority of adaptive behavior scales were moderately to strongly stable. The early, remitted depression group and nondepressed group were equally stable for all VABS.

**TABLE 3** Descriptive statistics and stability across time for vineland adaptive behavior scales raw scores for the early, remitted depression group/nondepressed group.

Vineland Adaptive Behavior Scales	Descriptive statistics				Stability
	15 months		24 months		Partial $r$
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Communication scale					
ERD	26.66	4.78	45.86	9.32	.64***
Nondepressed	27.32	4.64	47.88	8.64	.46***
Daily living skills scale					
ERD	19.90	4.70	35.62	8.38	.55***
Nondepressed	19.77	4.72	36.21	9.13	.48***
Socialization scale					
ERD	36.75	3.88	45.33	6.06	.29*
Nondepressed	36.79	3.24	46.37	6.15	.09*
Motor skills scale					
ERD	27.19	4.13	37.08	4.99	.45**
Nondepressed	27.80	4.24	38.48	5.31	.46***

Notes: ERD = Early, Remitted Depression Group. Nondepressed = No Postpartum Depression Group.  $N_s$  (Early, Remitted Depression) = 55 for 15 months and 24 months;  $N_s$  (Nondepressed) = 132 for 15 months and 24 months. Stabilities were calculated partialing maternal education and child birth order. Raw scores are not directly interpretable across domains.

\* $p \leq .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

### 3.2 | Child age, depression group, and gender continuity

Table 4 presents results of RM-ANCOVAs of group and gender from 15 to 24 months for all VABS. Only significant effects are reported.

#### 3.2.1 | Communication scale

The RM-ANCOVA revealed a main effect for child age with a large effect size ( $\eta^2_p = .577$ ): Mothers reported infant communication skills improved from 15 to 24 months ( $EMM = 27.15$ ,  $SE = .38$ ;  $EMM = 37.60$ ,  $SE = .45$ , respectively). The RM-ANCOVA revealed main effects for child gender with a medium to large effect size ( $\eta^2_p = .075$ ), and an Age X Gender interaction with a small to medium effect size ( $\eta^2_p = .054$ ). In consideration of the Age X Gender interaction, we explored the effect of child gender at each of the two ages. Pairwise comparisons showed that gender was not significant at 15 months,  $t(1,173) = -1.72$ ,  $p = .088$ ,  $\eta^2_p = .018$ , but was significant at 24 months,  $t(1,178) = -2.61$ ,  $p < .01$ ,  $\eta^2_p = .039$ : Girls scored higher than boys at the older age ( $EMM = 49.713$ ,  $SE = 1.04$ ;  $EMM = 44.12$ ,  $SE = .99$ , respectively).



**TABLE 4** RM-ANCOVA results for vineland adaptive behavior scales raw scores from 15 to 24 months for the full sample.

	Communication		Daily living skills		Socialization		Motor skills	
	<i>F</i>	$\eta^2_p$	<i>F</i>	$\eta^2_p$	<i>F</i>	$\eta^2_p$	<i>F</i>	$\eta^2_p$
Child age	232.54***	.577	156.74***	.470	66.78***	.274	192.24***	.521
Group	1.84	.177	.53	.003	.67	.004	4.05*	.022
Gender	14.36***	.075	7.73**	.042	1.81	.010	1.43	.008
Age $\times$ group	1.53	.01	.46	.003	.55	.003	.85	.005
Age $\times$ gender	10.12**	.054	5.87	.032	.63	.004	.31	.001

Notes: Ns (Early, Remitted Depression Group) = 55 for 15 months and 24 months; Ns (Nondepressed Group) = 132 for 15 months and 24 months. RM-ANCOVAs were conducted with maternal education and child birth order as covariates.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

### 3.2.2 | Daily living skills scale

The RM-ANCOVA revealed a main effect for child age with a large effect size ( $\eta^2_p = .470$ ): Mothers reported infant daily living skills improved from 15 to 24 months ( $EMM = 19.68$ ,  $SE = .42$ ;  $EMM = 35.60$ ,  $SE = .79$ , respectively). There was also a main effect of gender with a small to medium effect size ( $\eta^2_p = .042$ ): Girls scored higher than boys ( $EMM = 28.80$ ,  $SE = .75$ ;  $EMM = 26.47$ ,  $SE = .68$ ).

### 3.2.3 | Socialization scale

The RM-ANCOVA revealed a main effect for child age with a large effect size ( $\eta^2_p = .274$ ): Mothers reported infant socialization skills improved from 15 to 24 months ( $EMM = 36.70$ ,  $SE = .32$ ;  $EMM = 45.58$ ,  $SE = .55$ , respectively).

### 3.2.4 | Motor skills scale

The RM-ANCOVA revealed a main effect of child age with a large effect size ( $\eta^2_p = .521$ ): Mothers reported infant motor skills improved from 15 to 24 months ( $EMM = 27.15$ ,  $SE = .38$ ;  $EMM = 37.60$ ,  $SE = .45$ , respectively). There was also a main effect of group such that mothers in the early, remitted depression group rated their infants as significantly lower in motor skills ( $EMM = 31.62$ ,  $SE = .61$ ) compared to mothers' ratings of infants in the nondepressed group ( $EMM = 33.12$ ,  $SE = .38$ ). The effect size was small ( $\eta^2_p = .022$ ).

## 3.3 | Sensitivity analyses

Supplemental Table 1 presents RM-ANCOVA results for the effects of maternal antidepressant medication use during pregnancy on all VABS in the early, remitted depression group. Infants in the early, remitted depression group

whose mothers reported medication use during pregnancy scored lower on the motor skills scale ( $M = 32.96$ ,  $SD = .32$ ) than infants whose mothers reported no medication use during pregnancy ( $M = 38.16$ ,  $SD = 1.32$ ) at 24 months only. The effects of maternal medication use on all other VABS were nonsignificant.

Supplemental Table 2 presents RM-ANCOVA results for the effects of receiving psychotherapy postpartum on all VABS in the early, remitted depression group. A significant interaction emerged between child age and maternal psychotherapy for the socialization scale. Although there was no socialization difference in infants at 15 months of age between the group of mothers who received therapy and the group that did not ( $M = 36.92$ ,  $SD = 1.65$ ,  $M = 36.63$ ,  $SD = .76$ , respectively), at 24 months infants whose mothers reported receiving therapy were rated as nominally higher in socialization ( $M = 45.35$ ,  $SD = 2.54$ ) than infants whose mothers did not receive therapy ( $M = 44.77$ ,  $SD = .89$ ).

## 4 | DISCUSSION

Maternal depression is a major public health issue (Bauman et al., 2020), and depression in mothers is associated with poor outcomes in children in some developmental domains, but not others (S. H. Goodman, 2020). The present study investigated the unique effects of early, remitted clinical depression in mothers (i.e., mothers who were clinically depressed at 5 months but had remitted by 15 and 24 months) on children's later adaptive behaviors.

Multiple domains of children's adaptive behavior at two ages were evaluated. Mothers in the two groups did not differ in age, ethnicity, marital status, and verbal intelligence; infants did not differ in age; and analyses controlled for group differences in maternal education and child birth order. At 15 and 24 months, mothers with early, remitted clinical depression and no postpartum depression rated their infants similarly on communication, daily

living skills, and socialization adaptive behaviors; however, mothers with early, remitted clinical depression rated their infants significantly lower on the motor skills than did mothers with no postpartum depression. Moreover, infants' adaptive behaviors were stable, but increased, from 15 to 24 months, and girls outpaced boys in some domains of adaptive functioning. These findings are discussed in detail below.

#### 4.1 | Adaptive behavior domain similarities and differences in infants of mothers with early, remitted clinical depression and no postpartum depression

Mothers with early, remitted clinical depression and no postpartum depression rated their infants as similarly adapted at 15 and 24 months in their communication, daily living skills, and socialization, as assessed by the VABS. Moreover, infants in the two groups exhibited similar patterns of individual-level consistency (stability) in their adaptive behaviors across time. Taken together, the similar results across groups are unlike those for other developmental domains, such as temperament/personality (Edhborg et al., 2000; Kim et al., 2020; Tikotzky et al., 2010), where infants of mothers with depression have been shown to be at a disadvantage. These findings therefore indicate that some domains of child development may be robust to the otherwise negative effects of early, non-persistent maternal depression, that remission of early maternal clinical depression may benefit child development (perhaps through mechanisms like augmented parenting cognitions or practices), or that children selectively recover from early deleterious effects of maternal depression (Garber et al., 2011; Weissman et al., 2014). Whichever, adaptive behaviors offer promise of compensatory actions in otherwise disadvantaged children as well as developmental domains on which clinicians might capitalize in therapy or intervention to promote positive child development.

Of course, deficits in communication, daily living skills, and socialization could still emerge later in development (as sleeper effects; Goldstein & Bornstein, 2018; Maurer et al., 2007) in children faced with early environmental stressors such as maternal clinical depression (Garcia Coll et al., 1998). For example, older children (34 months compared to the current sample of 15 to 24 months) of mothers with depression symptoms scored lower in Socialization and achieved gains more slowly in daily living skills than children of nondepressed mothers (Mennen et al., 2015). Of note, 29.3% of the early, remitted clinically depression group in the present study was diagnosed with minor depression or DD-NOS, depression was classified as mild

in severity for 42.1% of mothers, and depression had fully remitted by 15 and 24 months. Infant adaptive behaviors might be impacted in samples of mothers with more severe and persistent clinical presentations (Netsi et al., 2018), and future research is warranted in these areas.

Even with otherwise equivalent groups and the controls, mothers with early, remitted clinical depression rated their infants significantly lower on motor skills than mothers with no postpartum depression. Of note, the observed effect was small in size. However, small effect sizes are valuable from a public health perspective (and the public health impact of clinical depression in postpartum motherhood is well established), and small effect sizes early in life can aggregate and cumulate to large effects later in life (Bornstein, 2014). Other studies have reported motor skills deficits in infants of mothers with depression, and evidence suggests that these effects may be accounted for by maternal antidepressant medication use during pregnancy (e.g., Golding et al., 2014; Grove et al., 2018; Hanley et al., 2013). Accordingly, in sensitivity analyses, we found that infants whose mothers reported medication use during pregnancy were rated as lower in motor skills than infants whose mothers reported no medication use during pregnancy at 24 months only. Furthermore, we found at 24 months that infants whose mothers reported receiving therapy were rated as nominally higher in socialization than infants whose mothers did not receive therapy. This effect needs to be investigated further as the difference in means was nominal with a large variation in the small sample size, but the results are nonetheless suggestive of potential beneficial effects on specific infant outcomes for infants of mothers receiving psychotherapy. Considering evidence of the predictive validity of infant motor skills for later optimal cognitive development (Adolph & Robinson, 2015; Bornstein et al., 2013b) and developmental cascades in adaptive behavior deficits from early childhood to behavioral adjustment in adolescence (Bornstein et al., 2013a), longitudinal research specifically designed to test the effects of maternal antidepressant medication use during pregnancy on infant motor skills development is needed (e.g., Malm et al., 2016).

#### 4.2 | Child age and gender

Aside from depression, other noteworthy (and predicted) age and gender effects emerged in this study. First, consistent age effects showed expected developmental discontinuities in infants' communication, daily living skills, socialization skills, and motor skills. Infants' adaptive functioning in all these domains improved from 15 to 24 months, regardless of group status. Second, mothers rated girls higher than boys in communication at 24 months and

daily living skills at 15 and 24 months. These findings are consistent with previous research on gender differences in maternal reports of adaptive behaviors in infancy and likely reflect differences in the biology and socialization of infant boys and girls (Alexander & Wilcox, 2012; Bornstein, 2013; Voyer et al., 2021). It is noteworthy in this regard that different infant childcare experiences predict different adaptive behaviors in girls and boys (Bornstein & Hahn, 2007). Given that the observed age and gender effects in the present study are consistent with the literature on normative adaptive behaviors across infancy, these results support the validity of the current research. Future research and clinical assessment and intervention should pay greater attention to gender differences in children's adaptive functioning.

### 4.3 | Strengths, limitations, and future directions

Considering the unique characteristics of the samples and the controls incorporated in the design and analyses, the present findings contribute to understanding the development of adaptive behavior and specific effects of early, remitted maternal clinical depression on child development. Strengths of this study also include diagnoses of clinical depression rendered by a licensed clinician, participation of sociodemographically equivalent mothers and infants across groups, and sociodemographic controls for maternal education and child birth order. In addition, the analyses of stability and continuity and examination of gender broaden our understanding of, and raise questions about, the nature and course of adaptive functioning in infants of mothers with early, remitted clinical depression.

Certain design factors of the present study should be considered as potential limitations. First, the VABS is a semi-structured interview administered to the mother by a trained interviewer, and it is possible that evolving depression status may have affected maternal judgments of their children. For example, rated stability for socialization in infants of mothers with early, remitted depression (partial  $r = .09$ ) was not significantly different from stability for socialization in infants of mothers with no postpartum depression (partial  $r = .29$ ), but the coefficient for socialization in infants of mothers with early, remitted depression was small in size. Future research would benefit from multi-method designs including observational assessments of infant adaptive behaviors (e.g., Bayley Scales of Infant and Toddler Development, Fourth Edition; Bayley & Aylward, 2019) and replication of our findings in larger samples. Second, the sample of mothers was middle-SES and largely non-Hispanic European American with term,

healthy infants. The interpretation of findings should be met with an understanding that homogeneous samples allow for precision in effect estimates and the population to which generalizations can be validly made, but simultaneously limit generalizability to populations with dissimilar characteristics (Jager et al., 2017). Notably, children's adaptive behaviors vary, in part, as a function of their environmental exposures, including region, culture, and childcare setting (Altman & Mills, 1990; Bornstein et al., 2005; Bornstein & Hahn, 2007). Differences in SES, for example, may be particularly impactful; infants and young children in families with lower SES score more poorly on adaptive behavior scales than children in families with higher SES (Arterberry et al., 2007; Syrengelas et al., 2014). Exposure to maternal depression may exacerbate socioeconomic risk. As such, the findings in the present study may underestimate true effects in some populations. It is possible that including a sample with a greater socioeconomic risk could show stronger effect sizes, and possibly a more pervasive effect of maternal depression, even remitted, on infant adaptive functioning across the early years. Third, protective factors were not the focus of the current research. It is possible that infant adaptive functioning for motor skills may have differed in the early, remitted clinical depression group by the quality of the mother-infant relationship, mothers' focus on promoting infant motor skills, or other group differences (Hummel & Kiel, 2015). Furthermore, the majority of mothers (90.8%) were married, with no differences in marital status between groups. It is possible that the presence and involvement of a co-parent may have buffered against the negative impact of maternal depression on infant adaptive behaviors. In fact, mothers diagnosed as depressed at 5 months had fully remitted at 15 and 24 months, and strong support systems guard against poor prognostic outcomes in depression (Buckman et al., 2021). Another unmeasured possibility is that co-parents were also depressed, which would have further negatively impacted the infant rearing environment (i.e., assortative mating; Flint, 2023; Matthews & Reus, 2001). Future work would benefit from considering the role of co-parents and the social network in both positively affecting (e.g., provision of emotional and instrumental support) and negatively affecting (e.g., an additional insult to the rearing environment) infant development in the context of maternal depression. Finally, in current research, we found that mothers with early, remitted clinical depression rated their infants poorer in motor skills than did mothers with no postpartum depression. We found no group differences in maternal ratings of communication, daily living skills, and socialization. With the current design, we are unable to conclude that remission alone accounts for the observed results; for example, it is possible that infant adaptive behaviors are not impacted by 15 and 24 months

even in persistently depressed mothers. Future research would thus benefit from expanding the clinical sample to include a third group of mothers diagnosed with persistent depression (i.e., clinically depression at 5, 15, and 24 months).

## 5 | CONCLUSION

Considering high prevalence estimates of maternal depression worldwide and a substantial body of research demonstrating intergenerational transmission of depression, researchers need to develop a clearer understanding of specific affected developmental domains in offspring of depressed mothers and whether affected domains can recover with remission of maternal depression. In the current study, children of mothers with and without early, remitted clinical depression were no different in their adaptive communication, daily living skills, and socialization. Both groups of children also showed similar individual-level consistency (stability) and group-level inconsistency (discontinuity) over time in adaptive communication, daily living skills, and socialization. However, an association between early, remitted clinical depression in mothers and poor adaptive motor skills in their young children emerged. Sensitivity analyses indicated that this effect persisted only in infants of mothers who used antidepressant medication during pregnancy. Findings suggest that infants of mothers who use antidepressant medication during pregnancy should be screened for motor skills deficits, and they may benefit from early intervention in motor skills. Future research in maternal postpartum depression and its effects on infant development should include diagnoses of maternal depression by licensed clinicians, account for medication use, implement adequate controls, feature extended longitudinal designs, and broaden the scope of outcomes assessed.

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## CONFLICT OF INTEREST STATEMENT


The authors declare no conflicts of interest.

## DATA AVAILABILITY STATEMENT

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

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## ENDNOTE

<sup>1</sup> In the DSM-IV, major depression was defined as five or more symptoms of depression (including depressed mood or anhedonia) for 2 weeks or more, causing significant distress or impairment. For a diagnosis of minor depression, only two to four symptoms of depression were required. Criteria for major or minor depression excluded manic or hypomanic episodes. Dysthymia was specified by the predominance of depressed mood for at least 2 years, without an interruption in symptoms for 2 months or more. In addition to depressed mood, two or more symptoms of dysthymia were required, causing significant distress or impairment. Criteria for dysthymia excluded manic, hypomanic, or mixed episodes or major depressive disorder in the first 2 years. DD-NOS reflected presentation of depressed mood with clinically significant impairments that did not meet criteria for duration or severity as specified in the diagnosis of major or minor depression or dysthymia.

## REFERENCES

- Adolph, K. E., & Robinson, S. R. (2015). Motor development. In L. S. Liben, U. Müller, & R. M. Lerner, Eds., *Handbook of child psychology and developmental science: Cognitive processes*. (pp. 113–157). John Wiley & Sons, Inc. <https://doi.org/10.1002/9781118963418.childpsy204>
- Alexander, G. M., & Wilcox, T. (2012). Sex differences in early infancy. *Child Development Perspectives*, 6(4), 400–406. <https://doi.org/10.1111/j.1750-8606.2012.00247.x>
- Altman, J. S., & Mills, B. C. (1990). Caregiver behaviours and adaptive behavior development of very young children in home care and daycare. *Early Child Development and Care*, 62(1), 87–96. <https://doi.org/10.1080/0300443900620106>
- Arterberry, M. E., Bornstein, M. H., Midgett, C., Putnick, D. L., & Bornstein, M. H. (2007). Early attention and literacy experiences predict adaptive communication. *First Language*, 27(2), 175–189. <https://doi.org/10.1177/0142723706075784>
- Bauman, B. L., Ko, J. Y., Cox, S., D'Angelo, D. V., Warner, L., Folger, S., Tevendale, H. D., Coy, K. C., Harrison, L., & Barfield, W. D. (2020). Vital signs: Postpartum depressive symptoms and provider discussions about perinatal depression—United States, 2018. *MMWR. Morbidity and Mortality Weekly Report*, 69(19), 575–581. <https://doi.org/10.15585/mmwr.mm6919a2>
- Bayley, N., & Aylward, G. P. (2019). *Bayley scales of infant and toddler development*. (4th ed.). NCS Pearson.
- Beck, A. T., Steer, R. A., & Brown, G. (1996). *Beck depression inventory—II*. American Psychological Association. <https://doi.org/10.1037/t00742-000>



- Bornstein, M. H. (2013). Parenting X gender X culture X time. In W. B. Wilcox, & K. K. Kline, Eds., *Gender and parenthood: Biological and social scientific perspectives*. (pp. 91–119). Columbia University Press.
- Bornstein, M. H. (2014). Human infancy...and the rest of the lifespan. *Annual Review of Psychology*, 65(1), 121–158. <https://doi.org/10.1146/annurev-psych-120710-100359>
- Bornstein, M. H. (2019). Parenting infants. In M. H. Bornstein, (Ed.), *Handbook of parenting. Vol. 1. Children and parenting*. pp. 3–55 (3rd ed., Routledge, 2019).
- Bornstein, M. H., (2023). Parenting science and emotion regulation: Principles, effects, determinants, and supports. In I. Roskam, J. Gross, & M. Mikolajczak, Eds., *Emotion regulation and parenting*. (pp. 3–34). Cambridge University Press.
- Bornstein, M. H., Giusti, Z., Leach, D. B., & Venuti, P. (2005). Maternal reports of adaptive behaviours in young children: Urban-rural and gender comparisons in Italy and United States. *Infant and Child Development*, 14(4), 403–424. <https://doi.org/10.1002/icd.414>
- Bornstein, M. H., & Hahn, C. (2007). Infant childcare settings and the development of gender-specific adaptive behaviors. *Early Child Development and Care*, 177(1), 15–41. <https://doi.org/10.1080/03004430500317192>
- Bornstein, M. H., Hahn, C.-S., & Suwalsky, J. T. D. (2013a). Developmental pathways among adaptive functioning and externalizing and internalizing behavioral problems: Cascades from childhood into adolescence. *Applied Developmental Science*, 17(2), 76–87. <https://doi.org/10.1080/10888691.2013.774875>
- Bornstein, M. H., Hahn, C.-S., & Suwalsky, J. T. D. (2013b). Physically developed and exploratory young infants contribute to their own long-term academic achievement. *Psychological Science*, 24(10), 1906–1917. <https://doi.org/10.1177/0956797613479974>
- Bornstein, M. H., Manian, N., & Henry, L. M. (2021). Clinically depressed and typically developing mother-infant dyads: Domain base rates and correspondences, relationship contingencies and attunement. *Infancy*, 26(6), 877–900. <https://doi.org/10.1111/inf.12427>
- Brennan, P. A., Hammen, C., Andersen, M. J., Bor, W., Najman, J. M., & Williams, G. M. (2000). Chronicity, severity, and timing of maternal depressive symptoms: Relationships with child outcomes at age 5. *Developmental Psychology*, 36(6), 759–766. <https://doi.org/10.1037/0012-1649.36.6.759>
- Breznitz, Z., & Sherman, T. (1987). Speech patterning of natural discourse of well and depressed mothers and their young children. *Child Development*, 58(2), 395–400. <https://doi.org/10.2307/1130516>
- Buckman, J. E., Saunders, R., O'Driscoll, C., Cohen, Z. D., Stott, J., Ambler, G., Gilbody, S., Hollon, S. D., Kendrick, T., Watkins, E., Wiles, N., Kessler, D., Chari, N., White, I. R., Lewis, G., & Pilling, S. (2021). Is social support pre-treatment associated with prognosis for adults with depression in primary care? *Acta Psychiatrica Scandinavica*, 143(5), 392–405. <https://doi.org/10.1111/acps.13285>
- Curley, J. P., & Champagne, F. A. (2016). Influence of maternal care on the developing brain: Mechanisms, temporal dynamics and sensitive periods. *Frontiers in Neuroendocrinology*, 40, 52–66. <https://doi.org/10.1016/j.yfrne.2015.11.001>
- diSibio, M. (1993). Conjoint effects of intelligence and adaptive behavior on achievement in a nonreferred sample. *Journal of Psychoeducational Assessment*, 11(4), 304–313. <https://doi.org/10.1177/073428299301100401>
- Dix, T., & Moed, A. (2019). Parenting and depression. In M. H. Bornstein, (Ed.), *Handbook of parenting. Vol. 4. Special conditions and applied parenting*. pp. 449–483 (3rd ed., Routledge).
- Dunn, L. M., & Dunn, L. M. (1981). *Peabody picture vocabulary test—revised manual*. American Guidance Service.
- Edhborg, M., Seimyr, L., Lundh, W., & Widström, A.-M. (2000). Fussy child—difficult parenthood? Comparisons between families with a “depressed” mother and non-depressed mother 2 months postpartum. *Journal of Reproductive and Infant Psychology*, 18(3), 225–238. <https://doi.org/10.1080/713683036>
- Farewell, C. V., Melnick, E., & Leiferman, J. (2021). Maternal mental health and early childhood development: Exploring critical periods and unique sources of support. *Infant Mental Health Journal*, 42(4), 603–615. <https://doi.org/10.1002/imhj.21925>
- Field, T. (1992). Infants of depressed mothers. *Development and Psychopathology*, 4(1), 49–66.
- Field, T., Hernandezreiff, M., & Diego, M. (2006). Intrusive and withdrawn depressed mothers and their infants. *Developmental Review*, 26(1), 15–30. <https://doi.org/10.1016/j.dr.2005.04.001>
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2001). *Structured clinical interview for DSM-IV-TR Axis I disorders, research version, non-patient edition (SCID-I/NP)*. Biometrics Research, New York State Psychiatric Institute.
- Flint, J. (2023). The genetic basis of major depressive disorder. *Molecular Psychiatry*, 28, 1–12. <https://doi.org/10.1038/s41380-023-01957-9>
- Fried, E. I., & Nesse, R. M. (2015). Depression is not a consistent syndrome: An investigation of unique symptom patterns in the STAR\*D study. *Journal of Affective Disorders*, 172, 96–102. <https://doi.org/10.1016/j.jad.2014.10.010>
- Garber, J., Ciesla, J. A., McCauley, E., Diamond, G., & Schloedt, K. A. (2011). Remission of depression in parents: Links to healthy functioning in their children: Remission of depression in parents. *Child Development*, 82(1), 226–243. <https://doi.org/10.1111/j.1467-8624.2010.01552.x>
- García, J. L., Heckman, J. J., & Ronda, V. (2021). *The lasting effects of early childhood education on promoting the skills and social mobility of disadvantaged African Americans* (No. w29057). National Bureau of Economic Research.
- García Coll, C., Buckner, J. C., Brooks, M. G., Weinreb, L. F., & Bassuk, E. L. (1998). The developmental status and adaptive behavior of homeless and low-income housed infants and toddlers. *American Journal of Public Health*, 88(9), 1371–1374. <https://doi.org/10.2105/AJPH.88.9.1371>
- Gavin, N. I., Gaynes, B. N., Lohr, K. N., Meltzer-Brody, S., Gartlehner, G., & Swinson, T. (2005). Perinatal depression: A systematic review of prevalence and incidence. *Obstetrics & Gynecology*, 106(5 Part 1), 1071–1083. <https://doi.org/10.1097/01.AOG.0000183597.31630.db>
- Golding, J., Emmett, P., Iles-Caven, Y., Steer, C., & Lingam, R. (2014). A review of environmental contributions to childhood motor skills. *Journal of Child Neurology*, 29(11), 1531–1547. <https://doi.org/10.1177/0883073813507483>
- Goldstein, S. B., & Bornstein, M. H. (2018). Sleeper effect. In M. H. Bornstein, M. E. Arterberry, K. L. Fingerman, & J. E. Lansford, Eds., *The SAGE encyclopedia of lifespan human development*. (pp. 2015–2017). SAGE Publications, Inc. <https://doi.org/10.4135/9781506307633.n748>



- Goodman, J. H. (2019). Perinatal depression and infant mental health. *Archives of Psychiatric Nursing*, 33(3), 217–224. <https://doi.org/10.1016/j.apnu.2019.01.010>
- Goodman, S. H. (2020). Intergenerational transmission of depression. *Annual Review of Clinical Psychology*, 16(1), 213–238. <https://doi.org/10.1146/annurev-clinpsy-071519-113915>
- Goodman, S. H., Simon, H. F., Shambraw, A. L., & Kim, C. Y. (2020). Parenting as a mediator of associations between depression in mothers and children's functioning: A systematic review and meta-analysis. *Clinical Child and Family Psychology Review*, 23, 427–460. <https://doi.org/10.1007/s10567-020-00322-4>
- Grove, K., Lewis, A. J., & Galbally, M. (2018). Prenatal antidepressant exposure and child motor development: A meta-analysis. *Pediatrics*, 142(1), e20180356. <https://doi.org/10.1542/peds.2018-0356>
- Gunlicks, M. L., & Weissman, M. M. (2008). Change in child psychopathology with improvement in parental depression: A systematic review. *Journal of the American Academy of Child & Adolescent Psychiatry*, 47(4), 379–389. <https://doi.org/10.1097/CHI.0b013e3181640805>
- Hanley, G. E., Brain, U., & Oberlander, T. F. (2013). Infant developmental outcomes following prenatal exposure to antidepressants, and maternal depressed mood and positive affect. *Early Human Development*, 89(8), 519–524. <https://doi.org/10.1016/j.earlhumdev.2012.12.012>
- Herrera, E., Reissland, N., & Shepherd, J. (2004). Maternal touch and maternal child-directed speech: Effects of depressed mood in the postnatal period. *Journal of Affective Disorders*, 81(1), 29–39. <https://doi.org/10.1016/j.jad.2003.07.001>
- Hummel, A. C., & Kiel, E. J. (2015). Maternal depressive symptoms, maternal behavior, and toddler internalizing outcomes: A moderated mediation model. *Child Psychiatry & Human Development*, 46, 21–33. <https://doi.org/10.1007/s10578-014-0448-4>
- Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). II. More than just convenient: The scientific merits of homogeneous convenience samples. *Monographs of the Society for Research in Child Development*, 82(2), 13–30. <https://doi.org/10.1111/mono.12296>
- Javadifar, N., Majlesi, F., Nikbakht, A., Nedjat, S., & Montazeri, A. (2016). Journey to motherhood in the first year after child birth. *Journal of Family & Reproductive Health*, 10(3), 146–153.
- Johnson, L. J., Cook, M. J., & Kullman, A. J. (1992). An examination of the concurrent validity of the Battelle Developmental Inventory as compared with the Vineland Adaptive Scales and the Bayley Scales of Infant Development. *Journal of Early Intervention*, 16(4), 353–359. <https://doi.org/10.1177/105381519201600406>
- Kagan, J. (2013). *The second year*. Harvard University Press. <https://doi.org/10.4159/harvard.9780674181410>
- Kamphaus, R. W. (1987). Conceptual and psychometric issues in the assessment of adaptive behavior. *The Journal of Special Education*, 21(1), 27–35. <https://doi.org/10.1177/002246698702100107>
- Kaplan, P. S., Danko, C. M., Everhart, K. D., Diaz, A., Asherin, R. M., Vogeli, J. M., & Fekri, S. M. (2014). Maternal depression and expressive communication in one-year-old infants. *Infant Behavior and Development*, 37(3), 398–405. <https://doi.org/10.1016/j.infbeh.2014.05.008>
- Kim, Y., Bird, A., Peterson, E., Underwood, L., Morton, S. M. B., & Grant, C. C. (2020). Maternal antenatal depression and early childhood sleep: Potential pathways through infant temperament. *Journal of Pediatric Psychology*, 45(2), 203–217. <https://doi.org/10.1093/jpepsy/jsaa001>
- Knoche, L. L., Givens, J. E., & Sheridan, S. M. (2007). Risk and protective factors for children of adolescents: Maternal depression and parental sense of competence. *Journal of Child and Family Studies*, 16, 684–695. <https://doi.org/10.1007/s10826-006-9116-z>
- Lam-Cassettari, C., & Kohlhoff, J. (2020). Effect of maternal depression on infant-directed speech to prelinguistic infants: Implications for language development. *PloS one*, 15(7), e0236787. <https://doi.org/10.1371/journal.pone.0236787>
- Lazarus, R. S. (1999). *Stress and emotion: A new synthesis*. Springer.
- Lovejoy, M. C., Graczyk, P. A., O'Hare, E., & Neuman, G. (2000). Maternal depression and parenting behavior. *Clinical Psychology Review*, 20(5), 561–592. [https://doi.org/10.1016/S0272-7358\(98\)00100-7](https://doi.org/10.1016/S0272-7358(98)00100-7)
- Malm, H., Brown, A. S., Gissler, M., Gyllenberg, D., Hinkka-Yli-Salomäki, S., McKeague, I. W., Weissman, M., Wickramaratne, P., Artama, M., Gingrich, J. A., & Sourander, A. (2016). Gestational exposure to selective serotonin reuptake inhibitors and offspring psychiatric disorders: A national register-based study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(5), 359–366. <https://doi.org/10.1016/j.jaac.2016.02.013>
- Mathews, C. A., & Reus, V. I. (2001). Assortative mating in the affective disorders: A systematic review and meta-analysis. *Comprehensive Psychiatry*, 42(4), 257–262. <https://doi.org/10.1053/comp.2001.24575>
- Maurer, D., Mondloch, C. J., & Lewis, T. L. (2007). Sleeper effects. *Developmental Science*, 10(1), 40–47. <https://doi.org/10.1111/j.1467-7687.2007.00562.x>
- Mennen, F. E., Pohle, C., Monro, W. L., Duan, L., Finello, K. M., Ambrose, S., Poulsen, M. K., & Arroyo, W. (2015). The effect of maternal depression on young children's progress in treatment. *Journal of Child and Family Studies*, 24(7), 2088–2098. <https://doi.org/10.1007/s10826-014-0010-9>
- Miller, L. J. (2002). Postpartum depression. *JAMA*, 287(6), 762–765. <https://doi.org/10.1001/jama.287.6.762>
- Netsi, E., Pearson, R. M., Murray, L., Cooper, P., Craske, M. G., & Stein, A. (2018). Association of persistent and severe postnatal depression with child outcomes. *JAMA Psychiatry*, 75(3), 247–253. <https://doi.org/10.1001/jamapsychiatry.2017.4363>
- Öztop, D., & Uslu, R. (2007). Behavioral, interactional and developmental symptomatology in toddlers of depressed mothers: A preliminary clinical study within the DC:0-3 framework. *The Turkish Journal of Pediatrics*, 49(2), 171–178.
- Prior, M., Smart, D., Sanson, A., & Oberklaid, F. (1993). Sex differences in psychological adjustment from infancy to 8 years. *Journal of the American Academy of Child & Adolescent Psychiatry*, 32(2), 291–305. <https://doi.org/10.1097/00004583-199303000-00009>
- Putnick, D. L., Sundaram, R., Bell, E. M., Ghassabian, A., Goldstein, R. B., Robinson, S. L., Vafai, Y., Gilman, S. E., & Yeung, E. (2020). Trajectories of maternal postpartum depressive symptoms. *Pediatrics*, 146(5), Article e20200857. <https://doi.org/10.1542/peds.2020-0857>
- Scattone, D., Raggio, D. J., & May, W. (2011). Comparison of the vineland adaptive behavior scales, and the Bayley scales of infant and toddler development. *Psychological Reports*, 109(2), 626–634. <https://doi.org/10.2466/03.10.PR0.109.5.626-634>
- Scheiber, F. A., Ryckman, K. K., & Demir-Lira, Ö. E. (2022). Maternal depressive symptoms and maternal child-directed speech: A

- systematic review. *Journal of Affective Disorders*, 297, 194–207. <https://doi.org/10.1016/j.jad.2021.10.015>
- Seifer, R., & Dickstein, S. (2000). Parental mental illness and infant development. (pp. 145–160) In C. H. Zeanah, (Ed.), *Handbook of infant mental health*. The Guilford Press.
- Shorey, S., Chee, C. Y. I., Ng, E. D., Chan, Y. H., San Tam, W. W., & Chong, Y. S. (2018). Prevalence and incidence of postpartum depression among healthy mothers: A systematic review and meta-analysis. *Journal of Psychiatric Research*, 104, 235–248. <https://doi.org/10.1016/j.jpsychires.2018.08.001>
- Sparrow, S. S., Balla, D. A., & Cicchetti, D. V. (1984). *Vineland adaptive behavior scales*. American Guidance Service.
- Syngelas, D., Kalampoki, V., Kleisiouni, P., Konstantinou, D., & Siahianidou, T. (2014). Gross motor development in full-term Greek infants assessed by the Alberta Infant Motor Scale: Reference values and socioeconomic impact. *Early Human Development*, 90(7), 353–357. <https://doi.org/10.1016/j.earlhumdev.2014.04.011>
- Tikotzky, L., Chambers, A. S., Gaylor, E., & Manber, R. (2010). Maternal sleep and depressive symptoms: Links with infant negative affectivity. *Infant Behavior and Development*, 33(4), 605–612. <https://doi.org/10.1016/j.infbeh.2010.07.012>
- Timko, C., Cronkite, R. C., Berg, E. A., & Moos, R. H. (2002). Children of parents with unipolar depression: A comparison of stably remitted, partially remitted, and nonremitted parents and nondepressed controls. *Child Psychiatry and Human Development*, 32(3), 165–185. <https://doi.org/10.1023/A:1017924421229>
- Urizar, G. G., jr., & Muñoz, R. F. (2022). Role of maternal depression on child development: A prospective analysis from pregnancy to early childhood. *Child Psychiatry and Human Development*, 53(3), 502–514. <https://doi.org/10.1007/s10578-021-01138-1>
- Verhoeven, M., van Baar, A., & Deković, M. (2019). Parenting toddlers. In M. H. Bornstein, (Ed.), *Handbook of parenting. Vol. 1. Children and parenting*. pp. 56–80) (3rd ed., Routledge.
- Voyer, D., Saint Aubin, J., Altman, K., & Gallant, G. (2021). Sex differences in verbal working memory: A systematic review and meta-analysis. *Psychological Bulletin*, 147(4), 352–398. <https://doi.org/10.1037/bul0000320>
- Weissman, M. M., Wickramaratne, P., Pilowsky, D. J., Poh, E., Hernandez, M., Batten, L. A., Flament, M. F., Stewart, J. W., & Blier, P. (2014). The effects on children of depressed mothers' remission and relapse over 9 months. *Psychological Medicine*, 44(13), 2811–2824. <https://doi.org/10.1017/S003329171400021X>

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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