

Chronicity, Severity, and Timing of Maternal Depressive Symptoms: Relationships With Child Outcomes at Age 5

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Abstract

The relationships between severity, chronicity, and timing of maternal depressive symptoms and child outcomes were examined in a cohort of 4,953 children. Mothers provided self-reports of depressive symptoms during pregnancy, immediately postpartum, and when the child was 6 months old and 5 years old. At the age 5 follow-up, mothers reported on children's behavior and children completed a receptive vocabulary test. Results suggest that both the severity and the chronicity of maternal depressive symptoms are related to more behavior problems and lower vocabulary scores in children. The interaction of severity and chronicity of maternal depressive symptoms was significantly related to higher levels of child behavior problems. Timing of maternal symptoms was not significantly related to child vocabulary scores, but more recent reports of maternal depressive symptoms were associated with higher rates of child behavior problems.

Many studies have documented the association between maternal depression and adverse outcomes in children. Studies with clinical samples of depressed parents, focused primarily on mothers, have shown elevated rates of depression in children as well as anxiety and disruptive behavior disorders (reviewed in Downey & Coyne, 1990; Hammen, 1999). Studies with community samples of women with self-reported symptoms of depression have also shown adverse outcomes in children. These latter studies included infants, toddlers, and children of varying ages, and virtually all measures of the children's affect and behaviors showed evidence of maladaptive reactions to their mothers' dysphoria (reviewed in Downey & Coyne; Gelfand & Teti, 1990).

The consistency of detrimental effects across numerous samples and methodologies has doubtless suggested that maternal depressive symptoms invariably have a negative impact on children's behavior. However, most of the studies have been cross-sectional in design, and they provide little information about the nature of maternal depression and how often it leads to problems for children. Depression is extremely heterogeneous in its manifestations, ranging from mild and transitory mood distress that is entirely normal to persisting and severe depressed mood accompanied by somatic, cognitive, and behavioral disturbances that impair normal role functioning. In between these extremes may be chronic but relatively mild symptoms or one or more periods of intense symptoms of various durations with normal functioning in between. Lack of clinical information about the features and history of depressive symptoms in the community studies plus the relative paucity of longitudinal studies of children of depressed or dysphoric mothers make it difficult to characterize the nature of depression and its consequences.

There are three separate but typically confounded characteristics of maternal depression that require

clarification: its severity, its chronicity, and the timing of the children's exposure to it. Greater severity of depressive symptoms is likely to be accompanied by greater impairment of functioning. Several studies have suggested that the severity and chronicity of maternal depression rather than its diagnosis per se are related to children's outcomes (e.g., Keller et al., 1986; Sameroff, Barocas, & Seifer, 1984). Hammen (1991) reported that children whose mothers had more depressive episodes were themselves more likely to have more severe diagnoses. Warner, Mufson, and Weissman (1995), in their most recent offspring study, demonstrated that only recurrent, early-onset major depression in the parent was significantly associated with major depression in the offspring.

In a recent study focused on mothers with depressive symptoms and their infants, Campbell, Cohn, and Meyers (1995) demonstrated that relatively fewer positive interactions between mothers and their babies were observed only among women whose symptoms had persisted through 6 months postpartum. Those who were depressed at 2 months postpartum but whose depressions remitted over time did not differ from nondepressed comparison women. Frankel and Harmon (1996), in their study of parent-child observations, found that many depressed women did not perform differently in laboratory tasks with their children than nondepressed women; however, those who had more severe or chronic depressions were seen as significantly less emotionally available and had higher rates of insecurely attached children than women with episodic depression only. Also, Teti and colleagues (Teti, Gelfand, Messinger, & Isabella, 1995) found that the most chronically and severely depressed women had infants and preschoolers with insecure attachments marked by less coherent and organized strategies.

The relative importance of the chronicity and severity of maternal depression is somewhat difficult to gauge from previous studies. This is because chronicity and severity are commonly confounded—higher levels of depressive symptoms generally last longer than mild depressions, and their distinct relationships with child functioning have not been assessed. It is important, nevertheless, to try to untangle the two dimensions, because they may have somewhat different theoretical and treatment implications.

In order to examine these two properties of depression separately, a longitudinal study is required that includes multiple assessments of maternal symptoms. The present study represents a unique sample of women and their children studied over a 5-year period during which maternal depressive symptoms were assessed at four points—during pregnancy, immediately postpartum, 6 months postpartum, and at 5 years. The sample is well suited to the study of the issue of chronicity and severity, because it is large enough ($N = 4,953$) to include adequate numbers of women who vary in the characteristics of their depressive experiences. Clinical samples and most community studies have been much too small to adequately explore variability in depression features. Finally, the issue of the timing of maternal depression in relation to children's development is also important to address. There may be relatively more crucial periods during which exposure to a withdrawn or irritable mother has negative consequences for a child. It might be predicted, for example, that the period of the first months of life is especially important because maternal depression may impair the development of secure attachment. To date, there are several studies that have linked concurrent maternal depression and infant attachment (e.g., Campbell, Cohn, Meyers, Ross, & Flanagan, 1993; Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985; Teti et al., 1995). However, only two studies of which we are aware have examined the timing of exposure to maternal depression over a longer period. One prospective study of 131 mothers found that maternal depression reported at 14 months postpartum was more predictive of child behavior disturbance than was maternal depression reported at either 27 or 42 months postpartum (Ghodsian, Zajicek, & Wolkind, 1984). In a retrospective study, Alpern and Lyons-Ruth (1993) found that type of child maladjustment was differentially associated with timing of maternal symptoms, such that postpartum-only depression was more associated with anxiety symptoms and recent depression-only predicted hyperactivity symptoms. The sample was nonclinical, low income, and high adversity and relied on retrospective accounts of depression. In the present study, by restricting the timing of

exposure to the first 5 years of the child's life and controlling for the confound of chronicity of symptoms, we present a prospective but limited test of this question.

The goals of the present analyses, therefore, were to examine preliminary questions about severity, chronicity, and timing of maternal depressive symptoms in relation to children's behavioral and cognitive functioning at age 5. Specifically, we examined (a) the relationship between severity of maternal depressive symptoms and child outcomes, (b) the relationship between chronicity of maternal depressive symptoms and child outcomes, and (c) the interaction between maternal depressive symptom severity and chronicity as it related to child outcomes. We also examined the strength of the association between child outcomes and maternal depressive symptoms reported at different times during the child's early development. Both behavior problems and cognitive functioning measures were included as child outcomes, because both variables have been shown to be sensitive to maternal depression (e.g., Lyons-Ruth, Connell, & Grunebaum, 1990; Murray, 1992; Whiffen & Gotlib, 1989). In addition, demographic risk factors associated with maternal depressive symptoms were included as statistical controls in our analyses.

Method

Participants

The participants in this study were 4,953 mothers and their children born between 1981 and 1984 at the Mater Misericordiae Mother's Hospital in Queensland, Australia (Keeping et al., 1989). The goal of the original study was to examine social factors and children's health and development. Mothers in this sample completed interviews and questionnaires about themselves and their children at four different times—during pregnancy, 3 to 4 days after the birth of their children, 6 months after the birth of their children, and when their children were 5 years of age. In addition, the children were directly assessed for cognitive functioning at age 5. Children in this sample were representative of individuals born in public hospitals in Queensland and therefore represented a relatively lower socioeconomic sector (working and lower middle class) of the population of Australia.

The 4,953 participants included in this study are those children in the cohort who were followed up through the age of 5 years. Of these children, 2,596 (52%) were male and 2,357 (48%) were female. The large majority (92%) were of Caucasian ethnicity. Their mothers' mean age at the time of birth was 25.4 years ($SD = 5.0$), and their mean birth order was 1.99 ($SD = 1.06$). Family yearly income was reported at a mean of 3.6 ($SD = 0.92$) on the following scale: 1 = \$0–\$5,199; 2 = \$5,200–\$10,399; 3 = \$10,400–\$15,599; 4 = \$15,600–\$20,799; 5 = \$20,800–\$25,999; and 6 = \$26,000 or more (all in Australian dollars). Mothers' education was reported at a mean of 4.28 ($SD = 1.29$) on the following scale: 1 = preschool, 2 = primary school, 3 = started secondary school, 4 = completed Grade 10, 5 = completed Grade 12, 6 = completed business, nursing, or secretarial college, and 7 = completed university. Mothers in the sample reported a mean of 0.31 ($SD = 0.61$) changes in marital status over the course of the 5 years of follow-up.

The children who were followed to age 5 represented approximately 70% of the participants who were born into the cohort. Those children lost to follow-up differed significantly from the retained participants in terms of mothers' age (lost, $M = 24.32$ years, $SD = 5.3$; retained, $M = 25.38$ years, $SD = 5.0$), mothers' parity (lost, $M = 2.12$, $SD = 1.4$; retained, $M = 2.03$, $SD = 1.2$), family income (lost, $M = 2.77$, $SD = 1.1$; retained, $M = 3.08$, $SD = 1.1$), and mothers' education (lost, $M = 4.13$, $SD = 1.1$; retained, $M = 4.27$, $SD = 1.1$). Compared to those who remained in the study, mothers lost to follow-up were also significantly more likely to be single at the time of their entrance into the study (38% vs. 20%) and to report more depressive symptoms at the time of their child's birth (lost, $M = 1.17$, $SD = 1.5$; retained, $M = 0.89$, $SD = 1.3$). Because of this pattern of attrition, the results of this study may provide a conservative estimate of the true association between maternal depressive symptoms and child outcome.

Measures

Depressive symptoms

Maternal depressive symptoms were indicated by self-report on the seven depression items of the Delusions-Symptoms-States Inventory of Bedford and Foulds (1978):

I have been so miserable that I have had difficulty sleeping.

I have been depressed without knowing why.

I have gone to bed not caring if I never woke up.

I have been so low in spirit that I have sat up for ages doing absolutely nothing.

The future seems hopeless.

I have lost interest in just about everything.

I have been so depressed that I have thought of doing away with myself.

Mothers completed the Delusions-Symptoms-States Inventory four times, as noted earlier. A response of “—some of the time,” “—most of the time,” or “—all of the time” to a depression item from the Delusions-Symptoms-States Inventory indicated that a symptom of depression had been endorsed by the mother. The internal consistency (alpha) of the depression items of the Delusions-Symptoms-States Inventory ranged from .71 to .81 across the four administrations of this measure.

The Delusions-Symptoms-States Inventory had been chosen as the measure of maternal mental health for the Mater Misericordiae hospital birth cohort study because it was a valid screening instrument for mental health (e.g., Bedford & Foulds, 1977) and did not include symptoms that might be confused with the effects of pregnancy or childbirth. The Delusions-Symptoms-States Inventory is comparable to other validated self-report instruments that are known to be screens for major depressive episodes. For example, five of its seven items overlap with the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), and four items overlap with the Center for Epidemiological Studies Depression Scale (Radloff, 1977). In addition, the Delusions-Symptoms-States Inventory depression items include one explicit suicidal item and two hopelessness items that typically predict suicidal thoughts. These types of items identify significant depression and have been found to be the self-report items that distinguish major depression from dysthymic disorder (Steer, Beck, Brown, & Berchick, 1987).

Using data from the age 5 follow-up of this cohort, we compared the mothers' ratings of depressive symptoms on the Delusions-Symptoms-States Inventory with the mothers' self-report of mental health treatment. Mothers who reported high levels of depressive symptoms on the Delusions-Symptoms-States Inventory were six times as likely to have received treatment for mental health problems than were mothers who reported low levels of depressive symptoms, $\chi^2(1, N = 4,856) = 192.8, p < .00001$.

We also administered the Delusions-Symptoms-States Inventory and the Beck Depression Inventory to two separate samples of individuals to assess the convergent validity of these measures. In one U.S. sample of 112 female undergraduates, the Beck Depression Inventory and the Delusions-Symptoms-States Inventory were significantly correlated ($r = .78, p < .01$). And in a recent follow-up of a subsample of 450 mothers from the Mater Misericordiae hospital cohort, a significant correlation ($r = .75, p < .01$) was obtained between the Delusions-Symptoms-States Inventory and the Beck

Depression Inventory. The significance and the level of these correlations suggest that the Delusions-Symptoms-States Inventory is a valid self-report measure of depressive symptoms.

Severity of maternal depressive symptoms was defined in two ways for the purposes of the present study. We established a continuous measure of severity that reflected the maximum number of depressive symptoms (from 0 to 7) ever reported on a single administration of the Delusions-Symptoms-States Inventory ($M = 1.7$, $SD = 1.7$). For some analyses, we also operationalized categories of maternal symptoms severity for each Delusions-Symptoms-States Inventory administration as follows: Women who endorsed two or three symptoms of depression were considered to have a moderate level of depressive symptoms, and women who endorsed four or more symptoms of depression were considered to have a severe level of depressive symptoms. Using the Beck Depression Inventory data and the Delusions-Symptoms-States Inventory data from our recent follow-up of a subsample of these mothers ($n = 450$), we noted that women in the Delusions-Symptoms-States Inventory category of moderate had a mean Beck Depression Inventory score of 11, and women in the Delusions-Symptoms-States Inventory category of severe had a mean Beck Depression Inventory score of 19. According to scoring guidelines for the Beck Depression Inventory, a score of 11 falls in the mild to moderate depression range, and 19 falls in the moderate to severe range (Beck, Steer, & Garbin, 1988). These Beck Depression Inventory scores were significantly different from one another, $t(137) = 7.66$, $p < .001$. In addition, both the moderate, $t(417) = 11.28$, $p < .001$, and severe, $t(400) = 21.92$, $p < .001$, groups had significantly higher mean Beck Depression Inventory scores than the other women in the subsample.

For the assessment of chronicity, a continuous measure was operationally defined according to the number of Delusions-Symptoms-States Inventory administrations (from 0 to 4) on which the mother reported either moderate or severe levels of depressive symptoms ($M = 0.7$, $SD = 1.0$). Because the measure of chronicity is in part dependent on the measure of severity, these two variables are highly correlated ($r = .81$).

In part to counteract the potential issue of collinearity in our analyses, and in part to tease apart the distinct relationships between severity versus chronicity of maternal depressive symptoms and child outcome, we also created four nonoverlapping comparison groups on the basis of maternal Delusions-Symptoms-States Inventory scores. These groups represented orthogonal measures of the severity (moderate vs. severe) and chronicity (one report of at least moderate level vs. two or more reports) of maternal depressive symptoms and allowed for a comparison of the following types of maternal depressive symptoms in terms of their relationships with child outcome: (a) neither severe nor chronic, (b) chronic but not severe, (c) severe but not chronic, and (d) both chronic and severe.

For analyses examining the timing of depressive symptoms, it was essential to control for the relative factors of severity and chronicity. Timing, therefore, was defined within a restricted range of severity and chronicity: Children of mothers who reported a severe level of depressive symptoms on only a single administration of the Delusions-Symptoms-States Inventory (i.e., during pregnancy only, at birth only, at 6 months only, or at 5 years only) were compared with one another, as were children of mothers who reported a moderate level of depressive symptoms on only a single administration of the Delusions-Symptoms-States Inventory.

Child behavior problems

A total behavior problem scale score ($\alpha = .90$, $M = 14.9$, $SD = 8.5$) was obtained from mothers' reports on a subset of 33 items from the Child Behavior Checklist (Achenbach, 1991) when the child was 5 years of age. This shortened form of the Child Behavior Checklist was used for the purposes of reducing the time required for questionnaire administration. Items for the shortened form were chosen on the basis of face validity as those most likely to be relevant to the behavioral functioning of 5-year-old children. The full range of child behavior problems—aggression, oppositional behavior,

hyperactivity, anxiety, withdrawal, and depression—was reflected in these items. In a sample of 76 mothers of 5-year-olds in Australia, the total behavior problem score from this shortened form correlated .98 with the total behavior problem score obtained from the standardized Child Behavior Checklist form developed by Achenbach (Bor et al., 1997).

Child cognitive functioning

At the age of 5, the children who were assessed directly completed the Peabody Picture Vocabulary Test–Revised (Dunn & Dunn, 1981). Research assistants who administered the Peabody test were blind to the hypotheses of the study. The Peabody test is a standardized measure of vocabulary development that does not rely on expressive language skills. Raw scores were converted to standard scores based on chronological age norms ($M = 99.6$, $SD = 13.6$). Peabody vocabulary data were available on 3,767 children; because of staffing patterns or scheduling difficulties, not all children could be tested directly. Children who did not take the Peabody test were not significantly different from those who did in terms of behavior problem scores, $t(4951) = 0.26$, $p = .80$; maternal education, $t(4937) = 0.71$, $p = .48$; family income, $t(4948) = 1.41$, $p = .16$; gender, $t(4964) = 0.76$, $p = .45$; or maternal depressive symptom chronicity scores, $t(4964) = 1.75$, $p = .08$. Children without Peabody test data had more changes in mother's marital status, $t(4964) = 5.29$, $p < .001$, mothers with a younger maternal age at birth, $t(4964) = 4.14$, $p < .001$, and lower birth order, $t(4929) = 4.49$, $p < .001$, than did children for whom the Peabody test data were available. In addition, those without Peabody test data had higher maternal depressive symptom severity scores, $t(4964) = 3.80$, $p < .001$, than those children for whom these data were available. Therefore, our analyses may represent a conservative test of the association between maternal depressive symptoms and child cognitive functioning.

Results

Multiple regression analyses were performed to examine the relationship between the severity and chronicity of maternal depressive symptoms and child outcomes. Child outcomes included behavior problems (Child Behavior Checklist scores) and cognitive functioning (Peabody test scores). Analyses of covariance (ANCOVAs) were also performed to assess the relationships between these child outcomes and maternal depressive symptom severity, chronicity, and timing. Initial analyses separated by gender revealed similar patterns of results for boys and girls. Therefore, rather than presenting all the results for each gender separately, we combined the data for both genders and included gender as a statistical control in our analyses. All analyses presented included the following variables as statistical controls or covariates: gender and birth order of child, mother's age and education, family income, and number of changes in mother's marital status.

Severity of Depressive Symptoms

First we examined the relationship between the severity of the worst maternal depressive symptoms and child behavior problems and cognitive functioning. In these regression analyses, the covariates were entered as a block in the first step, and the highest maternal depressive symptom severity scores were then entered as the predictor in the second step. Betas for covariates and depressive symptom severity, as well as the significance of these variables, are shown in Table 1. Severity of maternal depressive symptoms made a significant contribution to the prediction of both total behavior problem scores and Peabody vocabulary scores in this sample. The direction of the relationship was as predicted—the higher the maternal depressive severity score, the more the behavior problems and the lower the vocabulary scores for the children. It should be noted that although the relationship was statistically significant, the percentage of the variance in Peabody test scores explained by the severity of maternal depressive symptoms was close to zero.

Table 1
Severity of Maternal Depressive Symptoms and Child Outcomes at Age 5

Block	Variables entered	β	ΔF	<i>df</i>	Change in R^2
Behavior problems score					
1	Gender	-.09***	27.25***	6, 4897	.032
	Parity	-.05**			
	Mother age	-.06**			
	Mother education	-.04*			
	Marital status changes	.03			
	Family home	-.09***			
2	Maternal symptoms severity	.26***	342.29***	1, 4896	.063
Peabody vocabulary score					
1	Gender	.04**	64.85***	6, 3705	.095
	Parity	-.15***			
	Mother age	.16***			
	Mother education	.18***			
	Marital status changes	.00			
	Family income	.12***			
2	Maternal symptoms severity	-.05**	11.08**	1, 3704	.003

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

Severity of Maternal Depressive Symptoms and Child Outcomes at Age 5

Chronicity of Depressive Symptoms

Next we examined the relationship between chronicity of mothers' depressive symptoms and child behavior problems and cognitive functioning. As in the analyses for severity, in these regression analyses covariates were entered as a block in the first step, and maternal depressive symptom chronicity scores were then entered in the second step (see Table 2). Chronicity of maternal depressive symptoms was significantly related to Child Behavior Checklist total behavior problem scores. Chronicity was also related to Peabody vocabulary scores. Again, the direction of the relationship was as predicted—more chronic maternal depressive symptoms were associated with higher levels of child behavior problems and lower scores on the receptive vocabulary test. Again, the percentage of variance in Peabody test scores explained by maternal depressive symptoms was close to zero.

Table 2
Chronicity of Maternal Depressive Symptoms and Child Outcomes at Age 5

Block	Variables entered	β	ΔF	<i>df</i>	Change in R^2
Behavior problems score					
1	Covariates (see Table 1)				
2	Maternal symptom chronicity	.25***	330.86***	1, 4896	.061
Peabody vocabulary score					
1	Covariates (see Table 1)				
2	Maternal symptom chronicity	-.05**	8.06**	1, 3704	.002

** $p < .01$. *** $p < .001$.

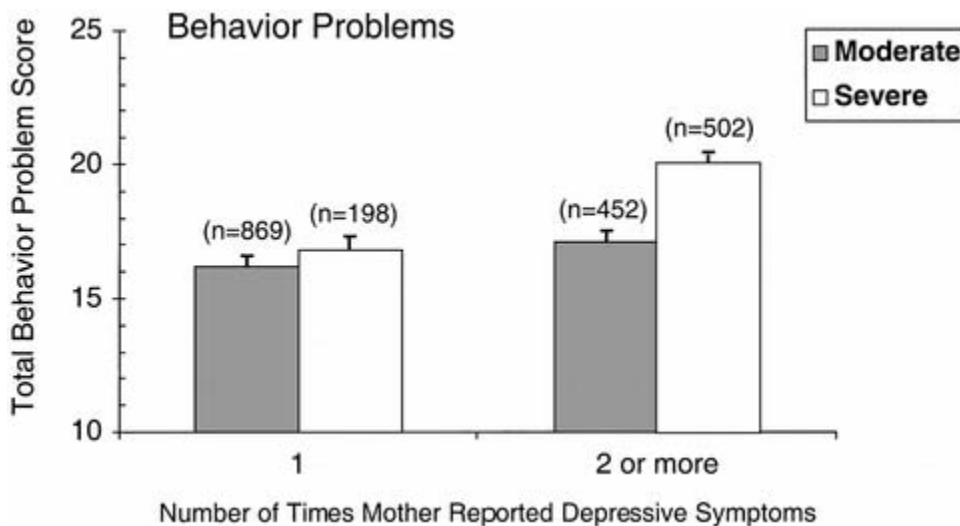
Chronicity of Maternal Depressive Symptoms and Child Outcomes at Age 5

Severity \times Chronicity Interactions

Additional regression analyses were undertaken to examine whether chronicity and severity of maternal depressive symptoms might interact in their prediction of child outcomes. In these analyses, covariates were entered as a block in the first step, severity and chronicity were then entered as a block in the second step, and the Severity \times Chronicity interaction term was entered in the last step.

The interaction term was not significant in predicting Peabody test scores, $\Delta F(1, 3702) = 0.37, p = .55$, for the children in this sample. However, the interaction of severity and chronicity of maternal depressive symptoms was significant in predicting total behavior problem scores, $\Delta F(1, 4894) = 3.90, p < .05$, with a beta of $-.08$ and a ΔR^2 of $.001$.

To better interpret this interaction finding and to counteract the problem of collinearity in the above analysis (chronicity and severity correlated $.81$), we examined maternal depressive symptom severity, chronicity, and their interaction in four nonoverlapping —mother depressed— comparison groups. As outlined in the Method section, these groups represented orthogonal measures of the severity (moderate vs. severe) and chronicity (one report of at least a moderate level vs. two or more reports) of maternal depressive symptoms, allowing for a comparison of the following types of maternal depressive symptoms in relation to child outcome: (a) neither severe nor chronic, (b) chronic but not severe, (c) severe but not chronic, and (d) both chronic and severe. Mean behavior problem scores for these groups are presented in Figure 1. A 2×2 ANCOVA revealed a significant Severity \times Chronicity interaction in relation to child behavior problems, $F(1, 2011) = 6.53, p < .05, d = .11$. Post hoc Duncan multiple comparisons revealed that the children whose mothers had experienced both chronic and severe depressive symptoms had significantly more behavior problems than the children in the other three maternal depressive symptom comparison groups.



Severity and chronicity of maternal depression as related to child behavioral and cognitive functioning.

Timing of Depressive Symptoms

As noted, timing was assessed for those women who had only a single elevated score in order to avoid confounding timing with severity and chronicity. ANCOVAs were performed that controlled for gender and birth order of child, mother's age and education, family income, and number of changes in mother's marital status. In these analyses, the main effect of timing of moderate levels of maternal depressive symptoms on child behavior problems was significant, $F(3, 881) = 2.87, p < .05, d = .19$, as was the main effect of timing of severe levels of mother depressive symptoms, $F(3, 205) = 5.54, p < .01, d = .33$. Duncan multiple range tests revealed that behavior problem scores were higher for children whose mothers reported moderate levels of depressive symptoms only at 6 months ($n = 167, M = 17.21, SD = 8.3$) or at 5 years ($n = 236, M = 17.17, SD = 8.7$) than for children whose mothers reported moderate levels only during pregnancy ($n = 273, M = 15.38, SD = 8.7$) or at birth ($n = 206, M = 15.42, SD = 8.6$). In addition, there was a significantly higher level of behavior problems in children whose mothers reported severe levels of depressive symptoms only at age 5 ($n = 97, M = 19.51, SD = 10.0$) than in children whose mothers reported severe levels only during pregnancy ($n = 47, M = 14.91, SD = 8.2$), only at birth ($n = 29, M = 14.93, SD = 7.6$), or only at 6 months of age ($n =$

33, $M = 13.36$, $SD = 8.2$). There were no significant relationships between the timing of moderate maternal depressive symptoms, $F(3, 655) = 2.48$, $p = .06$, or severe maternal depressive symptoms, $F(3, 153) = 0.91$, $p = .44$, and child Peabody test scores.

Discussion

Although several studies have suggested that chronicity and severity must be taken into account in assessing the relationship between maternal depressive symptoms and children's outcomes, this is the first study of which we are aware that has separately evaluated these typically overlapping or confounded features on a longitudinal sample. Moreover, previous studies have not examined the relative importance of these maternal depression characteristics, nor have they indicated whether severity and chronicity would interact in their prediction of children's outcomes. Previous studies have also rarely addressed the issue of the importance of the timing of the maternal depressive symptoms and whether the child's age at exposure in the early years is differentially related to child outcomes.

Several of these questions were explored in a large community sample of women reporting on their depressive symptoms on four occasions in their children's early development. With respect to the severity of maternal depressive symptoms, there was a significant relationship with both children's behavioral problem scores and their receptive vocabulary scores, such that increasingly severe reported depressive symptoms were associated with increasingly negative outcomes. Regarding chronicity, there was a similar pattern for behavioral problem scores and for Peabody test scores. When chronicity and severity were examined together, a significant interaction occurred for child behavior problems but not for child cognitive functioning. Children whose mothers' depressive symptom history was characterized as both chronic and severe had higher levels of behavior problems than did the other children in the sample. The combination of severity and chronicity appears to be potent in relation to child behavior outcome. Timing of depressive symptoms—based on data from women with a single episode of elevated symptoms—appeared to be only modestly related to behavior problems scores and unrelated to Peabody vocabulary scores. The most pronounced relationships were noted between child behavior outcome and maternal depressive symptoms reported at the child's age of 5 years, with little apparent relationship between child behavior problems and one-time maternal depressive symptoms reported during pregnancy or immediately postpartum.

The overall results confirm results obtained with clinical as well as other nonclinical samples indicating significant associations between maternal depressive symptoms and negative outcomes in children's behavior and cognitive functioning (reviewed in Downey & Coyne, 1990; Gelfand & Teti, 1990; Hammen, 1999). The effect sizes for Peabody vocabulary scores were small. The results suggest that demographic factors such as maternal education are more strongly related to child cognitive functioning than are maternal depressive symptoms.

The effect sizes for behavior problems were small to medium in size. This may be due to the fact that this study was based on a community sample rather than a treatment-seeking sample and that attrition may have resulted in more conservative estimates of the true association between maternal depressive symptoms and child behavior outcomes. Statistical significance does not necessarily imply clinical significance of results, especially when sample sizes are large. To better assess the clinical significance of our results we completed follow-up analyses in which we examined the relationship between maternal depressive symptoms and behavior problem scores higher than the 90th percentile. These analyses revealed that over 30% of children of mothers who reported severe, chronic depressive symptoms had scores higher than the 90th percentile on the Child Behavior Checklist, compared to fewer than 5% of the children whose mothers did not report depressive symptoms. (Note that these are percentiles for this sample, not t-score-based percentiles, because t scores were not

available for the abbreviated form of the Child Behavior Checklist used in this study.)

The relationships between severity, chronicity, and timing of maternal depressive symptoms and child behavior problems were significant when maternal age, child birth order and gender, maternal education, family income, and mothers' changes in marital status were controlled. This significance suggests that these relationships with child outcome are not due solely to social risks associated with maternal depressive symptoms. However, it is important to emphasize that the present study cannot claim that the depressive symptoms were the direct cause of the negative impact on children. This study is not an experiment, and therefore we cannot assess causal relations between maternal depressive symptoms and child outcomes. It has been argued that the negative effects of parental depression on children reflect a multifactorial process that may include not only biological or genetic mechanisms but also correlated risk factors such as stress, marital difficulties, poor-quality parent-child relationships, as well as mutual influences between children's behavior and maternal mood (e.g., Cummings & Davies, 1994; Goodman, Brogan, Lynch, & Fielding, 1993; Hammen, 1991, 1999). The current study does not address these more complex processes and relationships between maternal depression and child outcome.

The results of the present study should also be interpreted in light of the limitations of the measures. The measure of maternal depressive symptoms is not well known, which makes it difficult to compare the results with those of other samples for which more standard measures were used. Moreover, the relationship of elevated scores to clinical diagnoses and actual duration of depression remains to be studied. We also acknowledge that because of relatively infrequent testing, especially in the child's early years, some women might have been called "nondepressed" who actually experienced periods of depressive symptoms that were undetected. A further issue is that depressive symptoms as measured in the present study may not necessarily be specific to depression diagnoses and, as with any self-report depression scale, may be elevated in the presence of other psychiatric disorders and even medical problems.

A question can also be raised concerning our focus on the term chronicity and how well our measures reflect this concept. Chronicity implies that the symptoms the mothers reported are long lasting and were in place continuously from one follow-up period to the next. In fact, repeated reports of maternal depressive symptoms in our study might reflect the recurrence of symptoms rather than their chronicity. This is a particular concern when a long period of time exists between maternal reports of symptoms, as in the case of the extended time period between the 6-month and the 5-year follow-ups. In response to this concern, we completed additional analyses of the chronicity of maternal depressive symptoms that excluded the age 5 maternal symptom data, and our results were highly similar. Although it is not possible to disentangle chronicity from recurrence with our available data, it appears that our findings do reflect, in large part, the relationship between chronicity of maternal depressive symptoms and child outcomes.

An additional methodological weakness of this study is that behavior problem scores based on the Child Behavior Checklist were provided by the mothers rather than independent judges. Also, at the age 5 assessment, the behavior problem data were collected at the same time as maternal depressive self-report scores. Some studies have suggested that depressed mothers exaggerate symptoms in their children and that the apparent association between maternal and child symptoms might be somewhat spurious. However, a review of the research by Richters (1992) suggests that there is no clear evidence for negative distortion or bias as such, and indeed, several studies have shown that depressed women are actually more accurate in detecting true disorders in their children than are nondepressed women (e.g., Conrad & Hammen, 1989; Weissman et al., 1987). Thus, mothers' reports of child functioning should not be discounted—and the finding of somewhat similar patterns of association between maternal depressive symptoms and children's receptive vocabulary scores obtained through objective testing further bolsters the validity of the results. Nonetheless, we

acknowledge that multiple informants would have provided a more complete picture of child functioning, and a replication of these results based on multiple informant data would be an important goal for future research.

The evaluation of timing of maternal depressive symptoms was limited to those women who experienced a single elevated depression score so as not to confound timing with chronicity of depressive symptoms. It may be that the larger issue of timing concerns broad periods such as preschool, school age, or adolescence and also that more persisting depressive symptoms rather than a single episode of elevated scores during a particular period might be differentially related to child outcomes.

Despite these measurement and design shortcomings, the multiple assessments and large sample allowed some disentangling of the crucial dimensions of maternal depressive symptom severity, chronicity, and timing. Our results underscore the utility in examining the dimensions of both chronicity and severity of maternal depressive symptoms as they relate to child behavior problems.

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