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## Tightly Linked Systems: Reciprocal Relations Between Maternal Depressive Symptoms And Maternal Reports of Adolescent Externalizing Behavior

**Joseph P. Allen,**  
University of Virginia

**Nell Manning,** and  
University of Virginia

**Jess Meyer**  
Yale University

### Abstract

The frequently observed link between maternal depressive symptoms and heightened maternal reporting of adolescent externalizing behavior was examined from an integrative, systems perspective using a community sample of 180 adolescents, their mothers, fathers, and close peers, assessed twice over a three-year period. Consistent with this perspective, the maternal depression-adolescent externalizing link was found to reflect not simply maternal reporting biases, but heightened maternal sensitivity to independently observable teen misbehavior as well as long-term, predictive links between maternal symptoms and teen behavior. Maternal depressive symptoms predicted relative increases over time in teen externalizing behavior. *Child effects* were also found, however, in which teen externalizing behavior predicted future relative increases in maternal depressive symptoms. Findings are interpreted as revealing a tightly-linked behavioral-affective system in families with mothers experiencing depressive symptoms and teens engaged in externalizing behavior, and further suggest that research on depressive symptoms in women with adolescent offspring should now consider offspring externalizing behaviors as a significant risk factor.

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A longstanding concern regarding maternal reports of misbehavior by their offspring is the strikingly consistent correlation of those reports with mothers' *own* levels of depressive symptoms (Chilcoat & Breslau, 1997; Richters, 1992; Youngstrom, Loeber, & Stouthamer-Loeber, 2000). This correlation is particularly a concern for adolescents because maternal reports increase in clinical significance as teens' reliability as reporters of their own behavior comes into increasing question (Achenbach, McConaughy, & Howell, 1987; De Los Reyes & Kazdin, 2005). Even more importantly, though, the link between maternal depressive symptoms and maternal report of teens' externalizing behavior raises fundamental questions about ongoing perceptual and interactional processes within families experiencing these symptoms (Constance Hammen, Shih, & Brennan, 2004), particularly as these processes become subject to the unique developmental challenges that accompany efforts to parent adolescents.

A sizeable body of research to date has focused on two primary competing hypotheses to explain the troubling correlation between maternal depressive symptoms and maternal reports about teen behavior: one assuming a maternal reporting bias, and the other assuming that mothers who are experiencing depressive symptoms are seeing real externalizing behavior that their own symptoms have helped create. This study utilized a multi-reporter, cross-lagged, two-wave design to examine a third, more integrative perspective: that externalizing teen behavior, maternal reports of this behavior, and maternal depressive symptoms are *all* reflections of a tightly linked behavioral-affective system characterized by multiple reciprocal influence processes. This perspective suggests that *both* of the competing explanations for the maternal depressive symptoms-teen externalizing behavior link are likely accurate: In a tightly-linked system levels of teen externalizing behavior may be influenced by maternal symptoms, while mothers experiencing depressive symptoms may display heightened sensitivity (which may or may not be biased) to teen misbehavior. In addition, however, such a tightly linked system also suggests an important third process: maternal depressive symptoms may be linked to teen externalizing behavior in part because of *child effects* in which maternal mental health is negatively influenced by teen externalizing behavior, particularly as growing teens become increasingly forceful actors within their families.

### The Reporting Bias Hypothesis

The reporting bias hypothesis has been premised on the notion that mothers experiencing depressive symptoms overestimate or overreport their teens' behavior, perhaps as a result of mood-congruent biases in recall stemming from mothers' own depressive symptoms (Youngstrom et al., 2000). In childhood, a number of studies have found evidence of mothers who are experiencing depressive symptoms reporting more child misbehavior than teachers (Briggs-Gowan, Carter, & Schwab-Stone, 1996; Chilcoat & Breslau, 1997; Fergusson, Lynskey, & Horwood, 1993; Richters, 1992). Several studies in adolescence find that mothers experiencing depressive symptoms report higher levels of offspring externalizing behavior than do other reporters (Najman et al., 2000; Youngstrom et al., 2000). Even more than in childhood, however, reporting-bias studies *in adolescence* face a relativistic problem: Given that adolescent behavior is multifaceted and occurs across multiple contexts, how does one decide upon the appropriate standard against which to judge maternal reports? Mothers experiencing depressive symptoms may report higher levels of teen externalizing behavior than do other reporters, but perhaps these mothers are privy to information not available to these reporters.

At earlier ages, teacher reports and independent home observations are helpful in resolving this issue. With the developmental changes of adolescence, however, the utility of these sources falls off. In adolescence, most teachers observe only small samples of any given teen's behavior and their reports thus become far less informative. Similarly, brief home observations are not likely to capture most forms of adolescent externalizing behavior. In contrast, reports from close peers in adolescence offer a promising additional comparison point against which to assess potential maternal reporting biases—a vantage point that is not particularly available at younger ages. Similarly, paternal reports may also become increasingly valuable in adolescence as assessment of behavior becomes rooted more in the adolescent's meeting objective social criteria, to which fathers are as likely to be as privy as mothers in many cases. Thus far, peer reports have received almost no consideration and paternal reports only minimal consideration in efforts to explore whether potential maternal reporting biases in adolescence reflect real biases, or simply maternal reports about behavior which is not easily observed from any single alternative vantage point.

A related issue that has received almost no empirical attention to date is the question of whether mothers experiencing depressive symptoms may, in addition to any potential biases

toward higher levels of reporting, also be less reliable and more erratic in their reporting, if their symptoms make it more difficult for them to accurately observe a teens' behavior. Whereas a bias hypothesis would imply that depressive symptoms would tend to predict higher levels of maternal symptom reports, an unreliability effect would be assessed by examining whether the relation between maternal and other reports of teen externalizing behavior decreased (i.e., were moderated) as levels of maternal depressive symptoms increased.

### Maternal Depressive Symptoms as Cause of Teen Externalizing Behavior Hypothesis

The major alternative to the reporting bias hypothesis has been that heightened reports of teen externalizing behavior by mothers experiencing depressive symptoms reflect *accurate* observations of behaviors that the teens simply do not report, but that are real and that the mothers may themselves be partly creating. There is a good deal of evidence *in childhood* that maternal depressive symptoms precede and predict child externalizing behavior, including evidence from prenatal, cross-lagged, and experimental designs (Downey & Coyne, 1990; Elgar, Curtis, McGrath, Waschbusch, & Stewart, 2003; Luoma et al., 2001; Munson, 1998; Radke-Yarrow, Nottelmann, Martinez, Fox, & et al., 1993; Spieker, Larson, Lewis, Keller, & Gilchrist, 1999; Weissman et al., 2006). One explanation for this relationship is that mothers who are experiencing depressive symptoms employ less effective parenting behavior and expose their children to negative cognitions, behaviors, and affect that lead them to behave in more externalizing fashion, which the mothers are then particularly well-positioned to observe (Forehand & McCombs, 1988; Goodman & Gotlib, 1999). Under these conditions, child externalizing behavior may even be directed *particularly* toward mothers experiencing depressive symptoms, in part because children may find interactions with them to be highly frustrating, and these mothers in turn may be least able to deal effectively with these behavioral challenges.

In adolescence, several pieces of evidence lend some support to this explanation. The presence of maternal depressive symptoms has been *concurrently* associated with adolescent externalizing behavior (Garber & Little, 2001; Grant et al., 2000), even when externalizing behavior is assessed by independent observers (Lizardi, Klein, & Shankman, 2004). Further, mothers experiencing such symptoms have been found to have more conflictual interactions with their teens—interactions that could potentially account for lower levels of teen social skills, greater frustration, and greater subsequent externalizing behavior (Forehand & McCombs, 1988; Constance Hammen, Shih et al., 2004). Youth with mothers experiencing depressive symptoms also typically report higher levels of their own externalizing behavior than do their teachers, providing further support for the view that maternal depressive symptoms may lead to less easily-observed adolescent externalizing behavior (Youngstrom et al., 2000). Thus far, however, although a cross-sectional association is clear and a theoretical argument can be made that maternal depressive symptoms will predict increases over time in adolescent externalizing behavior, this prediction has received scant empirical attention in adolescence.

### Child Effects on Maternal Depressive Symptoms

While these two explanations of the depressive symptom-externalizing behavior link—the maternal bias hypothesis, and the maternal depressive symptoms as cause of externalizing behavior hypothesis—have each received significant attention, a third potential explanation for this link has received far less attention: Maternal depressive symptoms may be a *response* to maternal perceptions of teen externalizing behavior. The idea that children can influence their parents' is well-established in general terms (Bell, 1979; Belsky, 1984), and as the adolescent becomes a formidable actor within the family issues of reciprocal influence

become increasingly prominent (Kerr & Stattin, 2003; Kerr, Stattin, Crouter, & Booth, 2003).

Gross and colleagues (Gross, Shaw, & Moilanen, 2008) note that the presence of reciprocal parent-child effects is likely to depend critically on the specific developmental period being assessed. In early and middle childhood, equivocal evidence has been found of child externalizing behavior predicting future increases in maternal depressive symptoms, with some studies finding these effects only for girls (Jaffee & Poulton, 2006), others only for boys (Gross et al., 2008). Tight linkages have been observed in levels of *internalizing* symptoms between mothers and their offspring in childhood and adolescence (Ge, Conger, Lorenz, Shanahan, & Elder, 1995; C. Hammen, Burge, & Adrian, 1991).

In adolescence, teen externalizing behavior, with all its force, fury, and potential practical costs for parents, seems likely to have an even stronger effect. Steinberg (1990) has noted that even normative levels of conflict in adolescence are often highly distressing for parents. Angry, acting-out adolescents may direct their hostility particularly toward their mothers—the authority figure with whom they typically have the most daily contact and proximity. The direct challenge of such externalizing behavior may create acute stress for mothers, and the sense that a primary task of adulthood (i.e., raising socially competent offspring) is going poorly may also create a chronic source of distress. Some mothers may be more vulnerable to this stress than others of course; in particular, mothers with higher initial levels of depressive symptoms might find teen externalizing behavior especially difficult—particularly as they confront their own limited emotional resources to rise to the occasion to confront such behavior.

A significant literature now documents the ways in which interpersonal stressors can lead to depressive symptoms (Constance Hammen, 2000; Rudolph et al., 2000), and some evidence suggests that parent-offspring conflict during childhood is associated with maternal depressive symptoms, at least cross-sectionally (Webster-Stratton & Hammond, 1988). Somewhat surprisingly, though, this notion of child-effects has never been applied to understanding the maternal depressive symptom-adolescent externalizing behavior link. If an effect of teen externalizing behavior in predicting maternal depressive symptoms exists, it could at least partly explain the connection between maternal depressive symptoms and maternal report of teen externalizing behavior. It would also provide evidence of the tightly-linked nature of family dynamics in families with mothers experiencing depressive symptoms and adolescents engaged in externalizing behavior and could identify an important, previously unstudied risk factor in understanding maternal mental health and depressive symptoms during the parenting years.

## Hypotheses

A major limitation in our knowledge to date has been that the bulk of the research addressing the association between maternal depressive symptoms and offspring externalizing behavior has focused on childhood, even though both family dynamics and the nature of externalizing behaviors change significantly from childhood to adolescence. Of the research that has been conducted in adolescence, most has either been cross-sectional or used only a single reporter, thus making examination of predictions from causal hypotheses difficult. The current study was designed to go beyond these limitations using a two-wave, cross-lagged, and multi-reporter design with a socio-economically and ethnically diverse community sample of adolescents and their parents and peers followed from early- to mid-adolescence. This study examined three overarching hypotheses from a perspective that considers not only potential maternal reporting biases, but also important predictive relationships between maternal affect, maternal reports, and adolescent behavior.

First, we hypothesized that mothers experiencing depressive symptoms would indeed be sensitive to aspects of teen behavior seen by others but not reported by the teen (the heightened maternal awareness hypothesis), but that these mothers would also report levels of externalizing behavior not reported by any other observer (the bias or distortion hypothesis). We also assessed whether mothers experiencing depressive symptoms would be less reliable overall in their reporting by considering whether depressive symptoms would moderate the strength of the correspondence between maternal and other reports.

Second, we examined the hypothesis that maternal depressive symptoms would predict relative *increases* in adolescent externalizing behavior over time, even when this behavior was assessed by reporters other than mothers, and we considered whether the interaction of higher baseline levels of teen externalizing behavior and maternal depressive symptoms would lead to particularly large increases in teen externalizing behavior.

Finally, we examined the child-effects hypothesis that adolescent externalizing behavior would predict relative increases in levels of maternal depressive symptoms over a three-year period, and that these increases would be most strongly predicted in families where mothers began at higher levels of depressive symptoms and were thus least able to cope with teen behavioral challenges.

## Methods

### Participants

This report is drawn from a larger longitudinal investigation of adolescent social development in familial and peer contexts. The full larger study included 184 seventh- and eighth-graders assessed repeatedly over a four-year period. From this larger sample, a subset of 180 adolescents for whom mothers and peers were also available to participate as reporters was the primary focus of the study. This subsample was comprised of 83 males and 97 females. Adolescents were age 13.34 years ( $SD = .63$ ) at the first data collection point (henceforth referred to as the Age 13 assessment) and 16.35 years ( $SD = .88$ ) at the second data collection point (henceforth referred to as the Age 16 assessment). Adolescents' mothers were age 42.6 ( $SD = 6.7$ ) at the Age 13 assessment and 45.5 ( $SD = 6.6$ ) at the Age 16 assessment.

The sample was racially/ethnically and socioeconomically diverse: 104 adolescents identified themselves as Caucasian (58%), 52 as African American (29%), and 24 as being from other and/or mixed ethnic groups (13%). Parents reported a median family income in the \$40,000 – \$59,999 range ( $M = 43,900$ ,  $SD = \$22,500$ ). At each assessment point, reports were also obtained from the peer that our participating adolescents felt knew them best and one additional peer from within their closest circle of friends. These peers reported that they had known the adolescents for an average of 4.1 years ( $SD = 2.8$ ) at the age 13 assessment, and an average of 5.9 years ( $SD = 3.6$ ) at the age 16 assessment.

Adolescents were recruited from the 7<sup>th</sup> and 8<sup>th</sup> grades of a public middle school drawing from suburban and urban populations in the Southeastern United States. Students were recruited via an initial mailing to all parents of students in the school along with follow-up contact efforts at school lunches. Families of adolescents who indicated they were interested in the study were contacted by telephone. Of all students eligible for participation, 63% agreed to participate when asked (either in a primary role as target participants or as peers providing collateral information). All adolescent participants, including collateral peers, provided informed assent before each interview session, and parents provided informed consent for their adolescents and themselves. Interviews took place in private offices within a university academic building.

## Procedure

In the initial introduction and throughout all sessions, confidentiality was assured to study participants and adolescents were told that their parents would not be informed of any of the answers they provided. Participants' data were protected by a Confidentiality Certificate issued by the U.S. Department of Health and Human Services, which protected information from subpoena by federal, state, and local courts. In both waves, adolescents came in twice for interviews, first with their parents, and then with their named closest peer. Information from the additional peer was obtained in a separate interview session with that peer. Adolescents, their parents, and their peers were all paid for participation. Payment amounts increased over the course of the study but ranged from \$20 to \$40 per person for a two-hour visit. Transportation and childcare were provided if necessary.

For 108 adolescents, father reports were also available. Analyses indicated that adolescents who had (vs. those who did not have) data provided by fathers were higher in total family income, self-reported externalizing behavior, and maternal depressive symptoms at Age 13. No other differences were found in Age 13 variables. No effects of father presence vs. absence in the study appeared for any follow-up measures obtained at Age 16. At the age 16 follow-up, 171 adolescents had data available (a 95% retention rate). Analyses of adolescents who did vs. did not have Age 16 data available revealed no significant differences among these groups on any measures in the study.

To best address any potential biases due to attrition and missing data in longitudinal analyses, Full Information Maximum Likelihood methods were used, with analyses including all variables that were linked to future missing data (i.e., where data were not missing completely at random). Because these procedures have been found to yield less biased estimates than approaches (e.g., simple regression) that use listwise deletion of cases with missing data, the entire original sample of 184 for the larger study was utilized for these analyses. This analytic technique does not impute or create any new data nor does it artificially inflate significance levels. Rather it simply takes into account distributional characteristics of data in the full sample so as to provide the least biased estimates of parameters obtained when some data are missing. Alternative longitudinal analyses using just those adolescents without missing data (i.e., listwise deletion) yielded results that were substantially identical to those reported below.

## Measures

**Maternal Depressive Symptoms**—Mothers reported the degree of their depressive symptoms using the 21-item Beck Depression Inventory (Beck & Steer, 1987; Beck, Steer, & Garbin, 1988). This extensively-validated measure obtains reports about a variety of depressive symptoms on a 0 – 3 scale for each symptom. For example, the first item presents choices ranging from “I do not feel sad,” to “I am so sad or unhappy that I can't stand it.” This continuum/severity approach to assessing depressive symptoms recognizes that levels of depressive symptoms below diagnostic thresholds may nevertheless be important indicators of dysfunction (Lewinsohn, Solomon, Seeley, & Zeiss, 2000). Internal consistency for this scale was high (Cronbach's  $\alpha = .87$  for both assessment waves).

**Adolescent Externalizing Behavior (Self-reports)**—Adolescent self-reports of externalizing behavior were obtained using a shortened form of the Youth Self Report (Achenbach & Edelbrock, 1987) designed to tap items most sensitive in capturing externalizing behavior (Lizotte, Chard-Wierschem, Loeber, & Stern, 1992). This form employs 45 items that capture aspects of aggressive, delinquent, hostile, hyperactive, and immature behavior (as does the longer version). On this measure, adolescents indicated the extent to which each item reflected their own behavior during the previous six months on a

scale of 0 = *not true*, 1 = *somewhat or sometimes true*, and 2 = *very or often true*. These items were summed together to yield a score for total level of externalizing behavior. Internal consistency was good for this scale; Cronbach's  $\alpha = .78$  and  $.73$  for the first and second assessments respectively.

**Adolescent Externalizing Behavior (Other-reports)**—Reports about target adolescents by mothers, fathers, and close peers were obtained using a parallel shortened form of the Child Behavior Checklist (Achenbach & Edelbrock, 1991; Lizotte et al., 1992). This form, originally designed for teacher or parent report, and useable for peers without modification, also had good internal consistency. Cronbach's  $\alpha$  for both mothers' and fathers' reports ranged from  $.88$  to  $.89$  across the two assessment waves. Scores from the two peers were averaged together to yield the best overall measure of externalizing behavior as viewed from the peer vantage point. For peers internal consistency was also high, with Cronbach's  $\alpha$  ranging from  $.81$  to  $.85$ .

## Results

### Preliminary Analyses

Means and standard deviations for all substantive variables are presented in Table 1. The decreases in teens' externalizing behavior from Age 13 to Age 16 as reported by teens, their mothers, fathers, and peers were all significant ( $p$ 's  $\leq .001$ ,  $.01$ ,  $.05$ , and  $.01$ , respectively). Mother's displayed a trend toward decreasing levels of depressive symptoms from Wave 1 to Wave 2. Twenty-two percent of mothers displayed elevated levels of depressive symptomatology at baseline (i.e., above a cutoff score of 10 on the BDI) (Kendall, Hollon, Beck, Hammen, & Ingram, 1987). Seventeen percent of youths displayed at least borderline levels of externalizing problems according to the CBCL criteria, and 14% were clearly in the clinical range of externalizing behavior problems (Achenbach & Rescorla, 2003).

**Correlational Analyses**—For descriptive purposes, Table 1 also presents the results of simple univariate or point-biserial correlations among the key variables of interest in the study. Notably, lower family income and female teen gender were both linked to higher initial levels of maternal depressive symptoms. Lower family income was also linked to higher levels of several indices of teen externalizing behavior. As a result both measures were considered as covariates in all succeeding analyses. We also examined possible moderating effects (by multiplying centered versions of variables of interest to create interaction terms) of gender and family income on each of the relationships assessed in the primary analyses below. No such moderating effects were found.

### Primary Analyses

**Are Maternal Depressive Symptoms Linked to Maternal Reports of Teen Externalizing Behavior After Accounting for Other Observers' Reports of this Behavior?**—Analyses first examined the relation of maternal reports of teen externalizing behavior to teens' own reports, maternal depressive symptoms, and reports of others. Regression analyses proceeded hierarchically and are presented in Table 2. The goal of these analyses was to first regress teen reports of externalizing behavior onto maternal reports. This allows not only an assessment of links between these two reports, but also then allows further steps to examine predictions of the *residual variance* in maternal reports that could not be accounted for by teen reports. Given that other prior approaches have utilized raw difference scores to assess these questions (De Los Reyes & Kazdin, 2005; Richters, 1992), we also repeated all of the analyses below using a difference-scores approach. Substantially identical results were obtained and thus only the residual variance results are depicted, as

this approach allowed for consistency in addressing both maternal error in reporting, along with questions about reciprocal influence/prediction over time.

Primary analyses revealed, first, that maternal reports of adolescent externalizing behavior were significantly though moderately related to teens' own reports of their externalizing behavior ( $\beta = .32^{***}$ ). Teen demographic characteristics did not add anything beyond this in accounting for maternal reports. Next, analyses assessed maternal depressive symptoms as a predictor of maternal reports of teen externalizing behavior *after* accounting for adolescent reports. This test indicates the extent to which maternal depressive symptoms account for aspects of maternal reports of teen externalizing behavior that cannot be explained by teens' own ratings. Maternal depressive symptoms were found to account for significant variance in maternal reports of teen externalizing behavior even after accounting for teens' self-reports of this behavior. These findings, taken in isolation, would seem to suggest that perhaps maternal reporting may be biased by levels of depressive symptoms, as others have reported.

To assess whether this apparent effect was perhaps due to mothers' detecting behavior that teens did not self-report but that *others* might see, paternal and peer reports were entered next into the equation. In keeping with the heightened maternal awareness hypothesis, these other observer reports accounted for substantial additional residual variance in maternal reports of teen externalizing behavior. This indicates that some of the discrepancy between maternal and teen reports of teen externalizing behavior actually reflected objectively observable externalizing behavior.

Our final step was to then examine the  $\beta$  weight of maternal depressive symptoms in the final simultaneous model (i.e., after accounting for these additional reporters). In this case the  $\beta$  weight for maternal depressive symptoms decreased slightly in the final model (relative to the  $\beta$  weight in the initial model) but remained significant. Thus *some* of the apparent 'error' in maternal reports that might be assumed if simply comparing them to teen reports appears to actually represent behaviors that other reporters aside from the teen also detect. Nonetheless, maternal depressive symptoms still clearly accounted for additional significant variance in maternal reports of teen externalizing behavior that could not be explained even by the combination of multiple observers' reports.

### **Are Maternal Depressive Symptoms Linked to Lower Levels of Correspondence Between Maternal and Teen Reports of Teen Externalizing Behavior?**

—We next considered the possibility that maternal depressive symptoms might operate in a different fashion, by decreasing mothers' reliability in reporting teen externalizing behaviors, thus decreasing the correlation between maternal reports and other reports of such behavior (i.e., reducing mothers' accuracy overall, rather than biasing them toward higher levels of symptom reporting). To test this possibility, analyses next considered whether maternal depressive symptoms might moderate the relation between maternal and others' reports of teen externalizing behavior. These analyses were conducted by assessing the interaction term of maternal depressive symptoms and other reports of teen externalizing behavior for each of the other reports described above and presented in Table 2. These analyses (not depicted) revealed no evidence of such interactions (all  $p$ 's  $> .50$ ). Results thus suggest that while maternal depressive symptoms are associated with *higher* maternal reporting of teen externalizing behavior relative to teen reports, they are not associated with a decreased degree of correspondence between maternal and other reports (i.e., with more erratic maternal reporting).

### **Do Maternal Depressive Symptoms Predict Relative Increases in Teen Externalizing Behavior Over Time?**

—Analyses next assessed the hypothesis that

maternal depressive symptoms might be linked to reports of teen externalizing behavior because maternal depressive symptoms predict relative increases in teen externalizing behavior over time. To assess this hypothesis, maternal depressive symptoms were assessed as a predictor of relative change in teen levels of externalizing behavior over a 3-year period.

As expected, moderately high stability in teen externalizing behavior was observed over the three years of the study, as shown in Table 3. Predictions from maternal depressive symptoms to relative change in teen externalizing behavior were then assessed by predicting externalizing behavior at age 16 after first accounting for the effects of this behavior at age 13. This approach of predicting the future level of a variable while accounting for predictions from initial levels (e.g., stability), yields one marker of change in that variable: increases or decreases in its final state relative to predictions based upon initial levels (Cohen & Cohen, 1983). Primary analyses examining this question utilized paternal reports of teen externalizing behavior so as to avoid methods confounds in using maternal reports of both depressive symptoms and teen behavior. However, these results did not differ appreciably from results utilizing maternal reports of teen externalizing behavior. Results from both sets of analyses, shown in Table 3, reveal a consistent pattern in which maternal depressive symptoms when their adolescents were age 13 were in fact predictive of teen externalizing behavior at age 16 even after accounting for baseline levels of externalizing behavior at age 13.

Given the strong prediction of relative increases in externalizing behavior from maternal depressive symptoms at age 13, an additional step was then considered in which the level of maternal depressive symptoms when their adolescents were age 16 was entered as a final step into the predictive equation, so as to determine the extent to which predictions from prior maternal depressive symptoms might be mediated by current (i.e., ongoing) levels of depressive symptoms. Strong evidence of such mediation was observed in that concurrent maternal depressive symptoms were indeed predictive of teen externalizing behavior, and when entered into the predictive equation, the effect of prior maternal depressive symptoms fell to non-significance.

**Does Teen Externalizing Behavior Predict Relative Increases in Maternal Depressive Symptoms Over Time?**—Our final set of analyses examined predictions from teen externalizing behavior to relative increases in maternal depressive symptoms using the same analytic approach outlined above. Given the likelihood that mothers would be most likely to be affected by teen behaviors that the mothers themselves actually observed, primary analyses for this question used maternal reports of teen externalizing behaviors (although, as above, parallel analyses using paternal reports were also examined). These analyses, presented in Table 4, indicated that even after accounting for the very substantial stability in maternal depressive symptoms over time, teens' externalizing behavior at age 13 (particularly as perceived by their mothers) accounted for a significant relative increase in maternal depressive symptoms over time. Notably, however, there was a substantial moderating effect of baseline levels of maternal depressive symptoms in this prediction. Teen externalizing behavior had a far greater effect in predicting relative increases in maternal depressive symptoms when it occurred in families in which mothers began the study with relatively elevated levels of such symptoms. Conversely, mothers who began with relatively low levels of depressive symptoms did not change appreciably in the levels of those symptoms based upon the presence or absence of their teens' externalizing behaviors. Figure 1 presents the results of this moderating effect using maternal reports of teen externalizing behavior. A nearly identical graph, not depicted, is also obtained using paternal reports.

We also examined whether predictions from baseline levels of teen externalizing behaviors might be mediated via concurrent levels of those behaviors; however, no such effects were observed.

## Discussion

This study examined several processes that potentially explain the oft-observed link between mothers' depressive symptoms and their heightened reporting of their adolescents' externalizing behavior. Findings suggested that heightened maternal reports of teen externalizing behaviors could only be partially accounted for by considering evidence obtained from additional observers with strong vantage points for observing teen misbehavior (i.e., fathers and peers) but who had not been previously assessed in this line of research. In addition, findings suggested tight links between maternal affect and teen behavior in ways that could partly account for the observed depressive symptom-externalizing behavior link: maternal depressive symptoms were found to predict relative increases in teen externalizing behavior over time, and teen externalizing behavior in turn predicted relative increases in maternal depressive symptoms over time. We consider each of these findings, their limitations, and their implications for understanding patterns of psychological functioning within families with mothers experiencing depressive symptoms and teens engaged in externalizing behavior below.

We began by assessing whether apparent maternal overreporting of teen externalizing behavior might simply be an artifact of research based on incomplete information about that behavior. Perhaps mothers experiencing depressive symptoms simply report actual teen behavior that no other *single* observer is able to detect, thus creating an apparent bias in studies that compare maternal reports to only a single other observer's reports. To address this possibility, we considered not only maternal reports and youth self-reports, but also paternal reports, and reports of two close peers. Although inclusion of both paternal and peer report data helped explain significant additional variance in mothers' reports of teen externalizing behavior (i.e., mothers were partly seeing behavior that other single reporters simply did not detect), the effect of maternal depressive symptoms in explaining maternal reports remained significant even after the inclusion of these additional reports in analyses.

Several conclusions can be drawn from these findings. First, they provide evidence that the link between maternal depressive symptoms and heightened maternal reports of teen externalizing behavior that has been previously observed is not simply an artifact of comparing maternal reports only to reports of teens who may be minimizing their externalizing behavior. It should also be noted, however, that even the use of multi-reporter data does not rule out the possibility that mothers experiencing depressive symptoms are in fact perceiving teen behaviors that do exist and that others do not see (e.g., behavior that may be directed particularly toward those mothers).

A second conclusion that can be drawn from these findings is that in spite of potential biases, maternal reports of teen externalizing behavior appear remarkably sensitive. Notably, youth self-reports, paternal reports, and close peer reports each displayed *unique* relations to maternal reports of externalizing behavior. This indicates that maternal reports were sensitive to aspects of externalizing behavior that were uniquely observed by each of these parties (i.e., only by one party but not by the others). Maternal depressive symptoms accounted for at most 14% of the variance in mothers' reports of teen externalizing behavior and much of the remaining variance is shared with reports from other observers. Examination of potential moderating effects of depressive symptoms on the link between maternal and other reports indicated no evidence that increased levels of depressive symptoms were associated with any increase in erratic or unreliable maternal reporting of

teen behavior. Together, these findings suggest that even given any potential biases, even mothers experiencing significant depressive symptoms nonetheless appear to occupy a remarkably solid vantage point from which to observe and report on their teens' externalizing behavior.

Next, this study examined the possibility that maternal depressive symptoms might be linked to teen externalizing behavior in part because these depressive symptoms serve as a risk factor for relative increases in teen externalizing behavior over time, which mothers then observe. Findings supported this explanation in that mothers reporting more depressive symptoms when their teens were 13 had teens who displayed relatively higher levels of externalizing behavior (by both paternal and maternal report) at age 16, even after accounting for baseline levels of externalizing behavior. Although numerous studies have found links suggesting that maternal depressive symptoms may be a risk factor for externalizing behavior in younger children (Elgar et al., 2003; Luoma et al., 2001), this study provides one of the few pieces of evidence, based on a cross-lagged design, suggesting that similar processes occur in adolescence as well. Given that the overall levels of externalizing behavior across the entire sample were declining, these changes reflected increases relative to the sample norm; in absolute terms, it would be most accurate to say that teens' with mothers experiencing depressive symptoms were failing to decrease in externalizing behavior, unlike the decreases seen in the rest of the sample.

This finding at least leaves open the possibility that some of the observed connection between maternal depressive symptoms and teen externalizing behavior may reflect not so much maternal bias as a potential maternal effect in producing teen externalizing behavior. The finding that predictions from earlier maternal depressive symptoms to future teen externalizing behavior were largely mediated via a mother's concurrent depressive symptoms is also consistent with the hypothesis of an ongoing effect of exposure to maternal depressive symptoms on teens' behavior. To the extent that maternal depressive symptoms actually caused future teen externalizing behavior (possibly by increasing levels of teen frustration and anger) it is certainly plausible that such behavior would be most likely to be displayed toward those mothers. Such a process would then account for heightened reports of such behavior by mothers experiencing depressive symptoms. Several studies have linked maternal depressive symptoms to hostile or critical parenting behavior and such behavior has in turn been linked to adolescent externalizing behavior (Bolton et al., 2003; Frye & Garber, 2005; Nelson, Hammen, Brennan, & Ullman, 2003), thus suggesting the plausibility of this link. Further research of an experimental nature will ultimately be needed to determine the viability of each of these potential causal explanations of these findings.

Finally, this study examined a possibility that has not to our knowledge been considered in prior research: that adolescent externalizing behavior may serve as a *risk factor* for future increases in maternal depressive symptoms. This hypothesis was also supported. Adolescent externalizing behavior at age 13 predicted relative increases in mothers' depressive symptoms over the following three years, after accounting for baseline levels of such symptoms. Further, there was an interaction with baseline levels of depressive symptoms, such that the greatest relative increase in future maternal depressive symptoms occurred for mothers who began with relatively higher levels of depressive symptoms *and* who had teens who were displaying more externalizing behavior at age 13. This interaction in some ways parallels Hammen's (2004) findings that adolescents with mothers experiencing some depressive symptoms were most likely to become increasingly depressed in the presence of significant family discord—thus suggesting a multiplicative interaction between family discord and vulnerability to depressive symptoms that appears similar across both studies.

The observed link between teen externalizing behavior and future levels of maternal depressive symptoms is potentially important for several reasons. First, it suggests an additional possible explanation for the correlation between maternal depressive symptoms and teen externalizing behavior: Mothers may be experiencing more depressive symptoms *in response* to their teens' externalizing behaviors, perhaps even to behaviors that they are uniquely positioned to observe. Given longstanding findings that high levels of chronic interpersonal conflict, particularly within close relationships, are a risk factor for future depressive symptoms (Constance Hammen, Brennan et al., 2004; Constance Hammen, Shih, Altman, & Brennan, 2003), it seems quite likely that the defiant and rule-breaking behavior that characterize externalizing teens may serve as a significant stressor to their mothers. In addition, mothers' awareness that their teen is engaged in deviant and maladaptive behavior may also create significant distress. Notably, teens' externalizing behavior would be likely to have all of these effects primarily to the extent that it was *perceived* by their mothers. Thus it is quite possible that the observed link between maternal depressive symptoms and their perceptions of teen externalizing behaviors is driven in part by an effect of those perceptions in increasing depressive symptoms.

These findings also suggest a relatively unexplored risk factor for depressive symptoms in mid-adulthood: the behavior of one's offspring. Although the possibility that other significant family stressors, such as marital conflict or family illness, could increase the risk for parental depression has previously been noted (Rudolph et al., 2000; Wallander & Varni, 1998), consideration of child effects on parental depressive symptoms has been relatively absent in the literature to date. Given the widespread prevalence of externalizing behavior in adolescence (Moffitt, 1993), further exploration of this behavior as a factor marking increased risk for parental depressive symptoms appears warranted.

Several limitations should be noted regarding these findings. First, even longitudinal, cross-lagged analyses, although sufficient to disconfirm causal hypotheses, cannot be used to establish the presence of causal pathways. In particular predictions from maternal depressive symptoms to future increases in teen externalizing behavior and the converse could both have been driven by unmeasured third variables (e.g., other sources of conflict or stress within the family system). Further, only two time points were examined; consideration of more time points in future research will allow for more complete and thorough assessment of possible transactional processes that play out over the course of adolescence. For example, a multi-wave study would make it possible to examine whether the effects observed in this study potentially build on one another creating a feedback loop leading to increased depressive symptoms and externalizing behavior in vulnerable families.

In addition, it should be noted that this study examined depressive symptoms not formal diagnoses of major depression (relying on self-reports and not on clinical interviews), and did so within a community sample. Although the use of a community sample maximizes the broad generalizability of these findings and significant evidence now indicates that even depressive symptoms at a sub-clinical level may cause significant distress and dysfunction (Lewinsohn et al., 2000). One might conjecture that the predictive relationships observed in this study would be even stronger in samples of families experiencing clinical levels of depressive symptoms or of externalizing behaviors, however, the design of this study is not sufficient to demonstrate such effects, and its results cannot necessarily be generalized to samples of mothers with diagnosable major depression or teens with clinical levels of externalizing behavior.

Taken together, these findings suggest that the mother-adolescent dyad is a remarkably tightly linked system with respect to psychopathological functioning. We see evidence that a mother's depressive affect may distort her perception of her teen's externalizing behavior,

but also evidence using multi-reporter data that mothers are also exquisitely sensitive to real aspects of this externalizing behavior. When combined with evidence of a bi-directional predictive relationship between maternal depressive symptoms and teens' externalizing behavior over time, we have evidence suggesting a remarkably strong degree of interconnection between maternal affect and teen behavior during adolescence. These findings provide further support to systems approaches to understanding both the display of psychological symptoms within the family during adolescence, as well as family members' perceptions of those symptoms (Allen, Moore, Kuperminc, & Bell, 1998; Cowan & Cowan, 2002; Minuchin, 1985).

## Acknowledgments

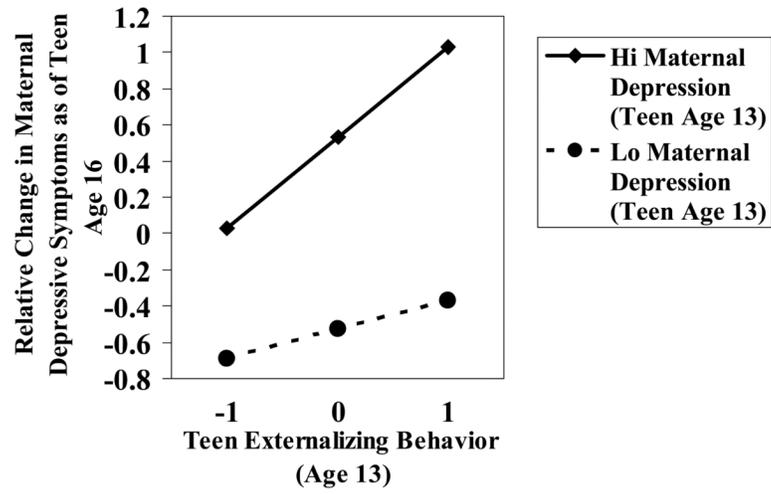
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**Figure 1.** Interaction of Baseline Maternal Depressive Symptoms and Teen Externalizing Behavior Predicting Relative Change in Maternal Depressive Symptoms Over 3 Years

**Table 1**

Univariate Statistics and Intercorrelations Among Primary Constructs

	<u>Mean</u>	<u>s.d.</u>	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Maternal Depressive Sx. (Teen Age 13)	6.16	5.85	66***	43***	38***	17*	20*	12	30**	27***	03	-38***	20**
2. Maternal Depressive Sx. (Teen Age 16)	5.21	5.81	--	40***	43***	21*	20*	19	39***	19*	-02	-16	10
3. Externalizing (13) (Mother Report)	5.89	5.20	--	67***	32***	22	62***	44***	38***	-02	-18*	03	03
4. Externalizing (16) (Mother Report)	4.80	4.67	--	--	18*	35***	47***	74***	27***	15	-25*	-06	-06
5. Externalizing (13) (Teen Report)	6.88	4.36	--	--	37***	19*	19	28***	-01	-18*	03	03	03
6. Externalizing (16) (Teen Report)	5.59	3.86	--	--	--	11	24*	16*	09	-01	-11	-11	-11
7. Externalizing (13) (Father Report)	5.77	5.30	--	--	--	--	52***	24*	02	-14	-08	-08	-08
8. Externalizing (16) (Father Report)	4.18	4.37	--	--	--	--	--	15	22*	-12	-13	-13	-13
9. Externalizing (13) (Peer Report)	3.94	3.53	--	--	--	--	--	--	27***	-17*	-09	-09	-09
10. Externalizing (16) (Peer Report)	5.18	5.59	--	--	--	--	--	--	--	-08	01	01	01
11. Family Income	\$43,900	\$22,500	--	--	--	--	--	--	--	--	--	--	-11
12. Gender (1=Male, 2=Female)	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Target adolescent age at time of assessment is in parentheses.

\*\*\* p < .001.

\*\* p < .01.

\* p < .05.

**Table 2**

Predicting Maternal Report of Teen Externalizing Behavior from Teen Report of Externalizing Behavior, Maternal Depressive Symptoms, and Others' Reports of Teen Externalizing Behavior

	Maternal Report of Teen Externalizing Behavior (13)			
	$\beta$ entry	$\beta$ final	$\Delta R^2$	Total $R^2$
Step I.				
Teen Report of Externalizing Behavior (13)	.32***	.13*	.100***	.100***
Step II.				
Gender (1=M; 2=F)	.01	.06		
Total Family Income	.12	.09		
<i>Statistics for Step</i>			.013	.113***
Step III.				
Maternal Depressive Symptoms (13)	.40***	.36***	.136***	.249***
Step III.				
Paternal Report of Teen Externalizing Behavior (13)	.59***	.57***	.321***	.570***
Step IV.				
Peer Report of Teen Externalizing Behavior (13)	.16**	.16**	.023**	.593***

Note. Target adolescent age at assessment is in parentheses.

\*\*\*  
p < .001.

\*\*  
p < .01.

\*  
p < .05.

**Table 3**  
 Predicting Paternal Report of Teen Externalizing Behavior at Age 16 from Maternal Depressive Symptoms (After Accounting for Baseline Teen Externalizing Behavior)

	Paternal Report of Teen Externalizing Behavior (16)			Maternal Report of Teen Externalizing Behavior (16)			
	$\beta$ entry	$\beta$ final	$\Delta R^2$	$\beta$ entry	$\beta$ final	$\Delta R^2$	Total $R^2$
<u>Step I.</u>							
Teen Externalizing Behavior (13)	.53***	.47***	.286***	.68***	.57***	.465***	.465***
<u>Step II.</u>							
Gender (1=M; 2=F)	-.06	-.06		-.05	-.07		
Total Family Income	-.21	-.17		-.15*	-.12+		
<i>Statistics for Step</i>		.062	.348***		.023+	.486***	
<u>Step III.</u>							
Maternal Depressive Symptoms (13)	.41***	.12	.160***	.16*	.05	.160***	.513***
<u>Step IV.</u>							
Maternal Depressive Symptoms (16)	.34**	.34**	.063**	.17*	.17*	.014**	.527***

Note. Target adolescent age at assessment is in parentheses.

\*\*\*  
 $p < .001$ .

\*\*  
 $p < .01$ .

\*  
 $p < .05$ .

Left hand columns use paternal reports of teen externalizing behavior in Step I.; right hand columns use maternal reports.

**Table 4**  
 Predicting Maternal Depressive Symptoms at Teen Age 16 from Prior Teen Externalizing Behavior (After Accounting for Baseline Maternal Depressive Symptoms)

Predicting Maternal Depression (16)							
From Maternal Reports of Teen Externalizing Behavior				From Paternal Reports of Teen Externalizing Behavior (16)			
	$\beta$ entry	$\beta$ final	$\Delta R^2$	Total $R^2$	$\beta$ entry	$\beta$ final	Total $R^2$
Step I.							
Maternal Depressive Symptoms (13)	.71***	.53***	.286***	.508***	.71***	.71***	.286***
Step II.							
Gender (1=M; 2=F)	-.05	-.03			-.05	-.07	
Total Family Income	.04	.07			.04	.10	
Statistics for Step			.003	.511***			.003
Step III.							
Teen Externalizing Behavior (13)	.16*	.17**	.025*	.536***	.16+	.29***	.021+
Step IV.							
Teen Externalizing (13) × Maternal Depression (13)	.33***	.33***	.109***	.645***	.30***	.30***	.069***
							.601***

Note. Target adolescent age at assessment is in parentheses.

\*\*\*  $p < .001$ .

\*\*  $p < .01$ .

\*  $p < .05$ .

+  $p < .10$ .

Left hand columns use maternal reports of teen externalizing behavior in Steps III. & IV.; right hand columns use paternal reports.