Published in final edited form as:

Dev Psychol. 2011 January ; 47(1): 170–181. doi:10.1037/a0021305.

Effects of Maternal Negativity and of Early and Recent Recurrent Depressive Disorder on Children's False Belief Understanding

Lisa M. Rohrer¹, Dante Cicchetti^{1,2}, Fred A. Rogosch², Sheree L. Toth², and Angeline Maughan²

¹Institute of Child Development, University of Minnesota

²Mt. Hope Family Center, University of Rochester

Abstract

Research has shown that children of depressed mothers are at risk for problems in a variety of developmental domains; however, little is known about the effects of maternal depression on children's emerging understanding of false beliefs. In this study, three false belief tasks were administered to five-year-old children whose mothers had either met criteria for major depressive disorder within the first 20 months of the child's life ($n = 91$) or had never been depressed ($n = 50$). Significant difficulties in performance were found among the children of depressed mothers, especially those whose mothers had experienced early and recent recurrent depressive disorder. Regardless of diagnostic status, children whose mothers exhibited negativity during problem-solving tasks administered at an earlier developmental period also were less likely to demonstrate false belief understanding. These effects remained even after child verbal ability was controlled.

Keywords

maternal depressive disorder; timing of disorder; false belief understanding; parent behavior

Theory of mind has been conceptualized as the ability to mentally represent the thoughts, beliefs, desires, and intentions of self and others and to understand that others have beliefs, desires, thoughts, and intentions that differ from one's own, regardless of whether or not the circumstances involved are real (Leslie et al, 1991; Premack & Woodruff, 1978). Having a theory of mind enables an individual to comprehend that mental states can be the cause of, and thus be used to explain and predict, others' behavior (Premack & Woodruff, 1978). False belief understanding is one of the major milestones in comprehending a critical aspect of the mind – namely, its subjectivity and its susceptibility to being manipulated by information. The ability to recognize that others can have beliefs about the world that are incorrect requires an understanding: of how knowledge is formed; that one's beliefs are based on his/her knowledge; that mental states can be different from reality; and that the behavior of others can be predicted by their mental states (Wimmer & Perner, 1983). This awareness typically emerges during the preschool years, and is preceded by improvements in communication and representational thought (Flavell, 1999).

Circumstances that interfere with the attainment of false belief understanding may place children at risk for later developmental problems (Jenkins & Astington, 2000; Lalonde & Chandler, 1995). The current investigation assessed false belief understanding in children of depressed mothers because these children are known to exhibit impairments in related social cognitive skills, such as joint attention, language, mental state talk in the home, and symbolic play (Brennan et al., 2000; Carlson, Mandell, & Williams, 2004; Goldsmith & Rogoff, 1997; Tingley, 1994). The presence of depressive disorders in mothers and the recurrence of those disorders over time were expected to contribute to lower rates of false belief understanding among five-year-old children, and potential mediating processes were explored to identify influences on false belief understanding.

Maternal Depression and Child Development

Major Depressive disorder (MDD) is associated with significant social costs, particularly when it affects the mothers of young children (Murray & Lopez, 1996). Research coheres to indicate that children of depressed mothers are at risk for cognitive problems (Kurstjens & Wolke, 2001; Murray, Hipwell, Hooper, Stein, & Cooper, 1996), insecure attachment (Martins & Gaffan, 2000; Teti, Gelfand, Messinger, & Isabella, 1995), and psychopathology (Pillowsky et al., 2006; Weissman, et al., 2006a, b). The severity of these effects varies depending on the course of the mother's symptoms (Campbell & Cohn, 1997; Essex, Klein, Miech, & Smider, 2001; Hammen & Brennan, 2003), and appears to be greatest when depressive episodes occur early in the child's life and follow a severe and recurrent course thereafter (Brennan, Hammen, Andersen, Bor, Najman, & Williams, 2000; Cicchetti & Toth, 1995; Essex et al., 2001; Maughan, Cicchetti, Toth, & Rogosch, 2007; Toth, Rogosch, Sturge-Apple, & Cicchetti, 2009).

Children also incur risks if they are in the care of a depressed mother at any point in their development; however, these risks are particularly salient during the infant and toddler periods (Cicchetti & Aber, 1986; Cicchetti & Toth, 1995; Feng et al., 2008). Infants and toddlers who are in the care of a depressed mother may have difficulty in developing critical representational and regulatory skills (Dawson & Panagiotides, 2008; Reck et al., 2004). The causes of these developmental problems in children of depressed mothers have not been fully determined; however, it is likely that depression interferes with the ability of mothers to engage in positive social interactions (Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field, 1984, 1995; Maughan, Cicchetti, Toth, & Rogosch, 2007). These circumstances could interfere with the development of false belief understanding and predispose children to problems in later social cognitive development.

False Belief Understanding in Typically Developing Children

Accurately predicting the thoughts and behaviors of others involves processes that are a component of the broader domain of social cognition. Although newborns show a clear interest in the behavior of people around them, they do not comprehend that mental states guide this behavior until approximately 2 years of age (Meltzoff, Gopnik, & Repacholi, 1999), with appreciation of the representational nature of mental states emerging around 3 or 4 years of age (Perner, 1991). This understanding contributes to a change from significantly

below chance to above chance levels of performance on tasks that require children to predict the behavioral consequences of a false belief (Wellman, Cross, & Watson, 2001). This shift is accompanied by significant improvements in representational thought and behavioral control (Perner & Lang, 1999), and is sometimes claimed to signify the acquisition of a theory of mind.

Children differ in the rate at which they acquire social cognitive skills, but almost all will eventually conceptualize mental states as distinct from their referents in reality and pass false belief tasks (Avis & Harris, 1991; Wellman et al., 2001). This consistency has sometimes been attributed to innate developmental processes (Scholl & Leslie, 1999), although research is coalescing to suggest that children construct a concept of mind that reflects their social experiences (Gopnik & Wellman, 1992; Harris, 1992). In support of this view, performance on standard false belief tasks is correlated with a variety of socially relevant skills, including connected conversation (Slomkowski & Dunn, 1996), shared pretense (Hughes & Dunn, 1997; Youngblade & Dunn, 1995), and teacher ratings of social competence (Lalonde & Chandler, 1995). Social interactions promote the acquisition of these skills, and are also critically important for the development of false belief understanding (Hughes & Leekam, 2004).

The quality of social interactions has been shown to predict individual differences in children's emerging understanding of false beliefs. Infants and toddlers rely on caregivers to structure their interactions, and a secure relationship is related to success on false belief tasks during the preschool period (Fonagy, Redfern & Charman, 1997; Meins, Fernyhough, Russell & Clark-Carter, 1998; Symons & Clark, 2000). Moreover, mothers' frequent and appropriate mental state language predicts secure attachment in infancy (Meins, Fernyhough, Fradley, & Tuckey, 2001), as well as false belief understanding in the preschool period (Peterson & Slaughter, 2003; Ruffman, Slade, & Crowe, 2002).

False Belief Understanding in Children at Social or Developmental Risk

Several lines of research indicate that children at social or developmental risk are susceptible to difficulties in social cognitive development. Late or incomplete false belief understanding is typical of children with autism, and is frequently cited as a defining feature of the disorder (Baron-Cohen, 2001). Children with severe sensory impairments also show substantial delays in false belief understanding (de Villiers, 2005; Green, Pring, & Swettenham, 2004; Minter, Hobson, & Bishop, 1998), but only if they lack regular social interactions and conversational input (Schick, de Villiers, de Villiers, & Hoffmeister, 2007). The development of false belief understanding may also be compromised as a result of social risk. For example, Pears and Fisher (2005) have reported that maltreated preschoolers living in foster care score lower on false belief tasks than do nonmaltreated children from low-income homes. A study by Cicchetti, Rogosch, Maughan, Toth, and Bruce (2003) also revealed a negative effect of maltreatment on false belief understanding, even when children remained in the care of their biological parents. These results are cause for concern, since impaired false belief understanding may contribute to behavioral problems (Happé & Frith, 1996) or social rejection (Slaughter, Dennis, & Pritchard, 2002), exerting a cumulative negative impact on children's social development.

Role of Maternal Depression in False Belief Understanding

Previous research has shown that infants of depressed mothers are less socially responsive, although this may be true primarily in cases where mothers are not able to engage in sensitive social interactions (Field, Hernandez-Reif, & Diego, 2006). Later in development, the restricted behavioral repertoires of depressed mothers have the potential to interfere with participation in coordinated social exchanges (Jameson, Gelfand, Kulcsar, & Teti, 1997) and compromise the development of social cognitive skills (Cicchetti, Rogosch, Toth, & Spagnola, 1997; Goodman, Brogan, Lynch, & Fielding, 1993; Maughan et al., 2007; Toth et al., 2009). The effects of maternal depression on children's cognitive skills and social competence have been shown to be more deleterious when maternal depression is chronic or increases during the early years (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007).

Existing research indicates that symptoms of depression can interfere with the ability of mothers to initiate a joint attentional focus with their children, or to demonstrate continued responsiveness when competing attentional demands are present (Goldsmith & Rogoff, 1997; Henderson & Jennings, 2003). In addition, depressed mothers are less likely to involve their children in symbolic play, and their children show a reduced capacity for both social and independent play (Tingley, 1994). Collectively, these results highlight difficulties in the acquisition of skills that support later false belief understanding.

Preschool children of depressed mothers may be susceptible to impairments in false belief understanding because they lack prerequisite social cognitive skills, and because depressive symptoms prevent their mothers from communicating and interacting in ways that promote insight into the representational nature of beliefs. At present, we are not able to evaluate these possibilities because research on the development of false belief understanding in children of depressed mothers is extremely limited. The results of two existing investigations show that children of depressed mothers score lower on a measure of emotional understanding, but not on a measure of false belief understanding (Grieg & Howe, 2001) or on a measure of deceit (Murray, Woolgar, Briers, & Hipwell, 1999). Because the assessment of false belief understanding was not the primary purpose of either investigation, results were based on one or two tasks, with limited follow-up analysis. The current study incorporated three measures of false belief understanding, as well as an analysis of potential mediator variables to address these limitations.

The present investigation was designed to measure false belief understanding in five-year-old children of depressed mothers, and to identify risk and protective influences that may contribute to variation in performance. Based on findings from previous research, we hypothesized that maternal major depressive disorder occurring early in a child's life would impair children's false belief understanding at age 5. These effects were expected to be strongest in children whose mothers also experienced recent recurrent depressive disorder. In addition to this primary hypothesis, a secondary hypothesis was posited: differences in maternal behavior during interaction with her child were expected to mediate relations between maternal depressive disorder and false belief understanding.

Methods

Participants

Participants were 141 children (68 boys, 73 girls) who completed longitudinal assessments with their mothers. The families resided in a medium-sized metropolitan area in the northeast of United States. The initial assessment took place when children were approximately 1 ½ years of age ($M = 20.81$ months, $SD = 2.60$), with subsequent assessments at age 3 ($M = 38.84$ months, $SD = 2.99$), age 4 ($M = 50.40$ months, $SD = 1.45$), and age 5 ($M = 63.47$, $SD = 2.69$). At the time of the initial assessment, 91 mothers had met *Diagnostic and Statistical Manual of Mental Disorders, III-R* (DSM-III-R; American Psychiatric Association, 1987) criteria for MDD since the birth of their child, and the remaining 50 mothers had never met criteria for MDD or any other mental disorder.

The *Diagnostic Interview Schedule III-R* (DIS-III-R; Robins, Helzer, Cottler, & Goldring, 1989) was administered as part of all four assessments so that changes in MDD status could be documented. The DIS-III-R also provided information about the course of depressive disorder that was included in later analyses. Specifically, a designation of *early depression/recent recurrent* (EDRR) was assigned to depressed mothers ($n = 24$) who met MDD diagnostic criteria during the initial assessments, and again during the year preceding the age 5 assessments. A designation of *early depression/not recent recurrent* (EDNRR) was assigned to depressed mothers ($n = 67$) who met MDD criteria during the initial assessments, but not during the year preceding the age 5 assessments.

Recruitment strategy—A community sample of mothers with a history of MDD was recruited through referrals from local mental health professionals, and advertisements in local newspapers, newsletters, medical offices, and community bulletin boards. Mothers were included in the depressed group if they had a child who was approximately 20 months old, and if they had met criteria for MDD at some point since the birth of that child. In order to minimize co-occurring risk factors that may accompany depression (Campbell, Cohn, Flanagan, & Popper, 1992; Downey & Coyne, 1990), mothers were required to have at least a high school education, and families could not be reliant on public assistance. Among all mothers initially recruited for the depressed group, 35.6% were excluded from the sample because they did not meet diagnostic criteria for MDD.

A comparison sample was recruited by contacting mothers of children listed in county birth records. Comparison mothers came from similar neighborhoods and socioeconomic backgrounds as the depressed mothers; however, participation in the comparison group was restricted to mothers who had never met DIS-III-R criteria for any psychiatric disorder. Current or past psychiatric disorders were reported by 24.7% of mothers initially targeted for participation in the comparison group, and these mothers were excluded from the sample.

Demographic characteristics—Mothers and children in the depressed and comparison groups were similar on a range of demographic variables, as indicated by a series of statistical comparisons that were nonsignificant. Child age was equivalent for depressed and comparison participants at all time periods, including at the initial ($M_D = 20.58$, $SD = 2.43$;

$M_C = 21.21$, $SD = 2.85$); age 3 ($M_D = 38.89$, $SD = 3.39$; $M_C = 38.76$, $SD = 2.13$); age 4, $M_C = 50.37$, $SD = 1.40$; $M_C = 50.46$, $SD = 1.55$; and age 5 assessments ($M_D = 63.50$, $SD = 2.92$; $M_C = 63.41$, $SD = 2.26$), as was child gender, 50.5% female vs. 54.0%. Families also were comparable in terms of socioeconomic status, as based on the Hollingshead (1975) four-factor scale of social status, $M_D = 46.926$, $SD = 11.47$; $M_C = 43.38$, $SD = 10.12$; these scores range within the fourth of five Hollingshead socioeconomic levels (middle to high). Maternal years of education, $M_D = 15.12$, $SD = 1.62$; $M_C = 14.84$, $SD = 1.61$, and maternal race/ethnicity, 93.4% Caucasian in the depressed group vs. 100% in the comparison group, also did not differ. All families were English-speaking. Although a majority of mothers were married, the percentage of mothers who were not married (i.e., never married, separated, widowed, or divorced) was higher in the depressed group (18.7%) than in the comparison group (2.0%), $\chi^2(1) = 8.06$, $p < .01$. There were no significant correlations between marital status and any outcome variables, so this difference was not considered further. Finally, two comparison mothers were excluded from analyses because they developed MDD before the age 5 assessments were conducted.

Procedures

This investigation was conducted within the context of a longitudinal study of development and social relations among children of depressed mothers. Additional measures were administered at each assessment, and only those that are relevant to this investigation are described here. At the initial assessment, mothers completed DIS-III-R and a demographic interview in their homes with a trained research assistant who was not aware of recruitment status or study hypotheses. Mothers and children who met research criteria were retained in the sample. The DIS-III-R and a follow-up demographic interview were administered again the age 3, age 4, and age 5 assessments. Additionally, mothers completed a series of six problem-solving tasks with their children during the age 3 assessments. The quality of mothers' interactions and communication with their children during these tasks was examined to yield ratings of support and non-support. At the age 5 assessments, children also completed three false belief tasks and the Vocabulary subtest of the Wechsler Preschool and Primary Scales of Intelligence-Revised (WPPSI-R; Wechsler, 1989).

Measures

Diagnostic Interview Schedule III-Revised (DIS-III-R)—The DIS-III-R (Robins et al., 1989) is a structured interview that assesses the presence of Axis I psychiatric disorders according to diagnostic criteria specified in the DSM-III-R (American Psychiatric Association, 1987). The interview was conducted by bachelor's level research assistants who had been trained to criterion reliability on DIS-III-R administration. Approximately 260 yes/no questions were presented in a standard sequence, and a computer program generated diagnoses on the basis of responses to these questions. The DIS-III-R requires minimal clinical judgment on the part of interviewers, and allows for the assignment of 49 different DSM-III-R adult psychiatric diagnoses. The interview has undergone development and reliability and validity studies for use in psychiatric epidemiological field studies (Robins, Helzer, Croughan, & Ratcliff, 1981; Robins, Helzer, Ratcliff, & Seyfried, 1982)¹. The length of time to complete the DIS varied in accord with the extent of the mother's

symptomatology and differences between mothers with and without MDD; the interviews generally lasted between 45 and 90 minutes.

Maternal positivity and negativity during problem-solving tasks—Mothers and children completed six problem-solving tasks so that mothers' positivity and negativity toward the child during the tasks could be assessed. The tasks were administered in an invariant sequence during the age 3 assessments, and mothers and children worked on each task for five minutes. The task sequence consisted of a shape sorter game, a spool stringing task, a bean bag clown toss, a ring toss, an Etch-A-Sketch maze task, and a circus puzzle. The tasks varied in difficulty, and were designed to tax children's problem-solving skills and elicit a response from mothers. Based on pilot data, the first three tasks were deemed "easy" and the last three tasks were considered "difficult". Mothers were instructed to allow their children to solve the tasks on their own, and to give them help as they saw fit. The six tasks were completed in a single laboratory session, and were videotaped through a one-way mirror for subsequent coding.

The frequency and type of mothers' verbal, affective, and behavioral expressions toward their children were examined to obtain ratings of maternal positivity and negativity, based on the coding system utilized by Maughan et al. (2007) as adapted by Alessandri & Lewis (1996) from Burgess and Conger (1978).. The *positivity* rating captured behaviors (e.g., smiles, verbal praise, clapping) that expressed encouragement or acceptance, and the *negativity* rating captured behaviors (e.g., frowns, verbal criticism, shaking head) that expressed disappointment or rejection. Trained coders viewed videotapes of all six tasks (30 minutes total) and recorded behaviors indicative of positivity and negativity. An event versus interval coding strategy (Bakeman & Gottman, 1997) was utilized to record the frequency of positivity and negativity across the six problem solving tasks. Each incident or "momentary event" of positivity or negativity was recorded, and simultaneous behaviors (i.e., mother said "Good job!" while smiling and patting child's shoulder) were recorded as a single event. Preliminary analyses revealed that ratings of positivity and negativity did not differ for easy versus difficult tasks; therefore, frequency scores were summed across the six problem-solving tasks. These summed scores were used in subsequent analyses.

Coders were two trained graduate level research assistants who were not aware of study hypotheses or mothers' depression status. A reliability analysis was conducted on 20% of the sample (i.e., 28 tapes), and adequate reliability was attained. The intraclass correlations for the total scores for positivity and negativity were .91 and .87, respectively.

False belief tasks—At the age 5 assessments, children were individually administered a series of three false belief tasks. Age 5 was chosen for administration because little is known about false belief understanding in children of depressed mothers. Assessment of false belief understanding at an age where children should demonstrate competence in this ability was expected to allow for more ready identification of children who evinced developmental delays. A bachelor-level examiner presented the tasks while an assistant examiner recorded

¹Although a revised version of the DIS consistent with the DSM-IV now exists, the current investigation began before the most recent revision of this measure was completed.

the child's responses. The examiners had not been involved in conducting the DIS-III-R interviews, and were not aware of study hypotheses or mothers' diagnostic status. The examiners administered the three false belief tasks in an invariant sequence, starting with the Sally-Anne task (Wimmer & Perner, 1983), followed by the Band-Aid task (based on Perner, Leekam, & Wimmer, 1987), and the False Belief Book task (Gopnik & Astington, 1988). Children received a pass/fail score on each task, and these scores were combined according to a conservative *all-pass* criterion. This criterion specifies a pass rate of 100% (pass on 3 out of 3 tasks) as the threshold for adequate false belief understanding. This approach was introduced by Happé (1995) as an alternative to the practice of summing scores across tasks. A meta-analysis (Wellman et al., 2001) of 178 separate investigations found evidence for a developmental shift that occurs between the ages of 3 years-6 months and 4 years-0 months, whereby children's false belief understanding changes from significantly below chance to significantly above chance levels. Considering that the mean age of the children in the present investigation was 63.47 months (approximately 5 years-3 months) when the false belief tasks were administered, it was expected that child participants had the cognitive skills necessary, based on the normative literature, to understand and distinguish between real-world and mental-state content. Thus, we adopted a stringent criterion to identify children with clear attainment of false belief understanding.

Sally-Anne task—The Sally-Anne task was administered according to procedures described by Wimmer and Perner (1983). Children were seated at a table and introduced to a pair of dolls named Sally and Anne (or Sam and Alan if the child was a boy). After the child had correctly named the dolls, the examiner simultaneously told and acted out the following story:

Sally has this ball and Sally is going to put her ball in the basket. Then Sally is going out to play. So Sally leaves. While Sally is away, Anne comes along and takes Sally's ball out of the basket and puts it in the box. And then Anne goes out to play. Then Sally comes back.

To pass the task, children were required to correctly answer three questions following the story presentation. The first question ("Where will Sally look for the ball?") assessed false belief understanding. The second and third questions ("Where is the ball really?" and "Where was the ball in the beginning?") were control questions that assessed children's recall for story events. Children who had come to appreciate that the story character held a belief (i.e., the ball is in the basket) that did not correspond to the true state of affairs (i.e., the ball is in the box) were expected to answer all three questions correctly. Accordingly, children failed the task if they answered one or more questions incorrectly.

Band-Aid task—The Band-Aid task was based on a procedure developed by Perner et al. (1987) that requires children to report on their own beliefs about a box with deceptive contents (see Jenkins & Astington, 1996). Children were asked "What's in this box?" as an experimenter held up a box with pictures of Band-Aids on its exterior. As predicted, every child in the sample reported that the box contained Band-Aids. The examiner then opened the box, revealing crayons as the true contents and stating, "It's not Band-Aids in the box after all. There are *crayons* in the box." After the box had been closed to restore its

deceptive appearance, the examiner asked “So, what’s *really* in the box?” This control question was repeated until children answered that the box contained crayons. Children then answered test questions assessing their knowledge of representational change (“When I first asked you, what did you say was in the box?”) and false belief (“If your friend were here, and he/she had not seen this box before, what would he/she say was in the box?”). Children passed the task if their initial answers to the control and test questions were correct, and failed the task if they responded incorrectly to any of the questions.

False Belief Book task—The False Belief Book task was introduced by Gopnik and Astington (1988) as a variation on the deceptive contents task. Children were shown a picture book and told, “This book is special because some pages have holes in them so that you can only see part of the next page.” The examiner then opened the book to a partially covered picture that showed the right ear of a dog. Children were invited to answer the question “What’s this?” before the experimenter turned the page to reveal the full picture of the dog. The examiner repeated this procedure with a partially covered picture that showed the right ear of a rabbit. Again, children were invited to guess the identity of the picture before the examiner turned the page to reveal the full picture of the rabbit.

The third and final picture presentation served as the test condition. Children were asked to guess the identity of another partially covered picture that appeared to show the ear of an animal. The picture was identified as some type of animal (e.g., pig or cat) by every child in the study; however, when the examiner turned the page, the picture turned out to be the petal of a flower. The examiner asked a control question (“What is it really?”) to confirm that children recognized that the deceptive picture was part of a flower, rather than an animal. The covering was then put back into place, and examiner asked the child a false belief question (“If your friend were here and he/she had not seen the book yet, what would he/she say *before* he/she turned this page?”). To pass the task, children had to answer both the control and test questions correctly. Children failed the task if they could not identify the picture as a flower, or if they claimed that their friend would know the true identity of the picture.

Vocabulary subtest of the Wechsler Preschool and Primary Test of

Intelligence-Revised (WPPSI-R, Wechsler, 1989)—Child vocabulary was tested with the WPPSI-R, a widely used, individually administered test of intelligence for children aged 3 to 7. Verbal abilities were assessed in order to ensure that false belief performance was not a function of verbal skill limitations. The Vocabulary subtest of the WPPSI-R measures children’s verbal expressive abilities, verbal concept formulation skills, and accumulated verbal learning abilities. The subtest has been demonstrated to be a psychometrically sound measure of children’s language development (split-half reliability = .85; test-retest reliability = .75; concurrent validity with Stanford-Binet Form L-M = .82). For 5-year-old children, the correlation of the Vocabulary subtest with the WPPSI-R Verbal and Full Scale scores is .80 and .66, respectively (Groth-Marnat, 1997; Sattler & Atkinson, 1993; Wechsler, 1989). Verbal mental age (VMA) equivalent scores were derived from Vocabulary subtest raw scores for use in subsequent analyses.

Results

Performance on individual false belief tasks

Preliminary analyses were conducted to ascertain the number of children who passed each of the three false belief tasks. In the total sample, 49.6% of the children passed the Sally-Anne task, 68.1% passed the Band-Aid task, and 75.2% passed the False Belief Book task. The mean number of tasks answered correctly was 1.92 ($SD = .96$). Across tasks, 30.5% ($n = 43$) of children achieved perfect performance, 43.3% ($n = 61$) passed two tasks, 14.9% ($n = 21$) passed one task, and 11.3% ($n = 16$) passed no tasks. The percent agreement between the two unexpected content tasks (Band-Aid and False Belief Book tasks) was 77%, and the agreement between the change-in-location task (Sally-Anne task) and the two unexpected content tasks (Band-Aid and False Belief Book tasks) were 49% and 58%, respectively. In terms of the control questions, the percentage of children who answered these questions correctly was 98.1% for the Sally-Anne task, 95.7% for the Band-Aid task, and 99.3% for the False Belief Book task. These percentages show that nearly all children were able to recall factual information relevant to the false belief tasks.

Effects of maternal depression on false belief understanding

First, a t test was conducted to compare the average level performance of children whose mothers had early depressive disorder (as measured in the initial assessment) to those whose mothers did not. The two groups did not differ significantly, $t(139) = 1.46, p > .05, M = 1.84 (SD = .95)$ and $M = 2.08 (SD = .97)$, for the depressed and comparison groups, respectively. Second, the distribution of the number of tasks passed was examined as shown in Table 1. A marginally significant difference was observed for the depressed and comparison groups, $\chi^2(3, N = 141) = 6.44, p < .10$. Finally, to evaluate whether the groups differed based on attaining the more stringent “all-pass” criterion-level performance, the groups were again compared, $\chi^2(1) = 4.84, p < .05$. As predicted, children of early depressed mothers were less likely than children of comparison mothers to demonstrate criterion-level, consistent false belief understanding, $\chi^2(1) = 4.84, p < .05$. Specifically, as shown in Table 1, the all-pass criterion was met by just 24.2% of children whose mothers had experienced early depression, relative to 42% of comparison children.

Analyses also were conducted to examine the relationship between the course of depressive disorder and false belief understanding in children of depressed mothers. Among early depressed mothers, DIS-III-R criteria were met by 27.8% at the age 3 assessments, 15.9% at the age 4 assessments, and 26.4% at the age 5 assessments. Because recency of depressive disorder was of particular interest, early depressed mothers were classified according to whether or not they had met criteria for MDD during the year preceding the age 5 assessments. This resulted in 24 mothers with early depression and recent recurrent depression (EDRR) and 67 mothers with early depression but not recent recurrent depression (EDNRR). The EDRR and EDNRR groups did not differ significantly on any demographic variables. In addition to having met criteria for MDD at the initial and age 5 assessments, mothers in the EDRR group were also more likely to have met criteria at intervening assessments. At the age 3 assessments, MDD criteria in the prior year were met by 58.3% of EDRR mothers and 16.7% of EDNRR mothers, $\chi^2(1) = 15.24, p < .0001$. At the

age 4 assessments, MDD criteria in the prior year were met by 45.5% of EDRR mothers and 6.1% of EDNRR, $\chi^2(1) = 19.14, p < .0001$. Thus, mothers in the EDRR group were more likely than mothers in the EDNRR to exhibit recurrent episodes of depression across the child's early years.

We expected that recent recurrent depression would contribute to a decrease in false belief understanding among children of early depressed mothers. To evaluate this hypothesis, the three groups were contrasted on total false belief scores, $F(2, 138) = 1.35, p > .05$; these nonsignificant results indicated that the comparison ($M = 2.08, SD = .96$), EDNRR ($M = 1.88, SD = .99$), and EDRR ($M = 1.71, SD = .81$) groups did not differ in false belief total scores. In contrast, when the groups were compared based on the all-pass criterion for false belief understanding, a significant difference was obtained, $\chi^2(2) = 8.70, p < .05$, with 42% of the comparison children, 29.9% of the EDNRR, and 8.3% of the EDRR group passing all tasks. Follow-up contrasts revealed that the comparison and EDNRR groups did not differ in the rate of all-pass performance, $\chi^2(1) = 1.86, p > .10$, whereas the EDRR had significantly poorer performance than the comparison, $\chi^2(1) = 8.58, p < .01$ and the EDNRR groups, $\chi^2(1) = 4.46, p < .05$.

Effects of depression on maternal positivity, negativity, and child verbal mental age and relations with false belief understanding

Next, depression group differences in maternal positivity and negativity in when children were engaged in a problem-solving task at age 3, and WPPSI-R VMA at age 5 were examined. ANOVAs were conducted. As shown in Table 2, the comparison, EDNRR, and EDRR groups did not differ on any of these constructs.

Inter-relations among indices of maternal depression, maternal positivity and negativity, VMA, and false belief understanding were examined. Correlations among these variables are presented in Table 3. The presence of early maternal depressive disorder and recent recurrent depression were not significantly correlated with false belief total scores; however, both maternal depression variables were negatively associated with the all-pass criterion for false belief understanding. Maternal positivity was not associated with depression indices, VMA, or false belief scores. In contrast, maternal negativity was related to lower VMA, as well as lower false belief total scores, and lower passing rates for the all-pass criterion. Finally, VMA and false belief total scores were correlated, whereas VMA and the all-pass criterion were only marginally correlated. Of note, the lack of relations between the maternal depression variables and maternal negativity, positivity, and VMA precluded these latter constructs as serving as mediators between maternal depression and false belief understanding (cf. Baron & Kenny, 1986)

Collective effects of early and recent recurrent depression, maternal negativity, and VMA on false belief understanding

Two hierarchical regression analyses were conducted to examine the collective contribution of predictor variables in explaining false belief understanding, both for the total false belief score and for the all-pass criterion. Early and recent recurrent depression were each coded as dichotomous variables, and dummy variables were created for overall early depression

status (children of depressed mothers were coded as 1 and comparison mothers were coded as 0), and for recent recurrent maternal depression (children of mothers with early and recent depression were coded as 1 and all other children were coded as 0). In both analyses, variables were entered hierarchically into the regression equation in the same sequence. In step 1, early maternal depression was entered, followed by recent recurrent maternal depression in step 2, maternal negativity and VMA in Step 3.

Findings for the regression analysis for total false belief scores are summarized in Table 4. The effects of early depression in step1 and recent recurrent depression in step 2 were both nonsignificant. In Step 3, maternal negativity made a negative contribution to prediction, $\beta = -.24, p < .01$, whereas the effect of VMA approached significance, $\beta = .15, p < .10$. When the regression was conducted entering VMA alone in step 3, the effect was significant, $\beta = .21, p < .05$; however, it did not retain significance when entered along with maternal negativity. Interactions of early depression and maternal negativity, as well as recent recurrent depression and negativity, also were tested in an additional step 4. These interaction effects were not significant. Thus, maternal negativity alone appeared to contribute to poorer false belief performance, based on total false belief scores, even when VMA was accounted for. Early depression and recent recurrent depression did not make a contribution.

To evaluate the collective effects of these constructs on the all-pass criterion for false belief understanding, an analogous logistic regression was conducted, as shown in Table 5. In step 1, the presence of early maternal depression made a significant contribution, $B = .82, p < .05$. In step 2, recent recurrent depression was entered. Given the strong association between early depression and recent recurrent depression, the effect of recent recurrent depression attained significance, $B = 1.54, p < .05$, whereas the effect of early depression was no longer independently significant, $B = .53, p > .05$. In step 3, with the entry of maternal negativity and VMA, the effect of maternal negativity made an independent contribution, $B = -.06, p < .01$, whereas VMA did not add to prediction, $B = .02, p > .05$. In this final step, recent recurrent depression maintained an independent effect, $B = 1.67, p < .05$. As before, the interaction of early depression and maternal negativity and of recent recurrent depression and negativity were evaluated in a fourth step, but neither interaction effect was significant. Thus, the findings of this analysis indicate that recent recurrent depression and maternal negativity each made independent additive contributions to predicting lower criterion-level false belief understanding.

To illustrate these additive effects in greater detail, a median split was performed on negativity ratings to create low and high maternal negativity categories. Comparison, EDRR, and EDNRR children were then divided by maternal negativity category (low or high) to produce a total of six groups. Next, a chi-square analysis was performed to determine whether rates of criterion-level false belief understanding differed across the six diagnostic/negativity groups, and the result of this test was significant, $\chi^2(5) = 13.64, p < .05$. The percentage of children in each diagnostic/negativity group who achieved criterion-level performance is shown in Figure 1. An additive effect of high negativity and recent recurrent depression is readily apparent. For example, the rate of criterion-level performance among EDRR children decreased from 15.4% to 0% in the context of high maternal

negativity. Among comparison children, the rate of criterion-level performance also decreased from 53.6% to 24.7% when maternal negativity was high. Moreover, when maternal negativity was low, performance was greater among comparison children (53.6%), as compared to children of mothers with recent recurrent depression (15.4%).

Discussion

This investigation was designed to examine false belief understanding in children whose mothers had MDD at some point when their children were in the infancy to early toddler period. Results indicated that children of depressed mothers were less likely than comparison children to attain criterion-level false belief understanding. This was particularly true among children whose mothers met criteria for both early and recent recurrent MDD. These results are consistent with previous research indicating that children of depressed mothers are at risk for problems in social cognitive development (cf. Cicchetti & Toth, 1995, 1998; Goodman & Gotlib, 1999).

Relative to comparison children, children of depressed mothers were substantially less likely to demonstrate criterion-level false belief understanding when maternal depression was also recent recurrent. Moreover, over 90% of children whose mothers had early and recent recurrent depression responded incorrectly to at least one false belief item, and therefore fell below the all-pass criterion for this important social cognitive skill. Because previous research indicates that false belief performance is typically above chance levels by 3 ½–4 years of age (Wellman et al., 2001), the very low rate of criterion-level false belief understanding among children whose mothers had early and recent recurrent depression is noteworthy. This was particularly true among children with mothers who had exhibited high negativity in a problem-solving context two years previously; not one of these children demonstrated criterion level false belief understanding. Although it is possible that the performance of these children was temporarily compromised as a result of mothers' recent recurrent depressive disorder, the results point to a cumulative negative impact of depression on social cognitive development (cf. Toth et al., 2009). The performance of children whose mothers had early but not recent recurrent depression was intermediate between children whose mothers had both early and recent recurrent depression and comparison children. Therefore, although mothers' early depression was sufficient to interfere with the attainment of criterion-level false belief understanding, continuing or recent recurrent depression constituted increasing risk for children.

The results of this study also point to specific characteristics of mothers and children that might affect false belief understanding. In particular, mothers' frequent negativity during problem-solving was associated with a lower rate of criterion-level performance, as well as total false belief scores. In contrast, frequent maternal positivity was not associated with later variation in false belief understanding. Moreover, depressed and comparison mothers did not differ in their tendency to provide either positivity or negativity. It is possible that depressed and comparison mothers appeared similar on these measures because MDD diagnoses were absent in approximately 70% of previously depressed mothers by the time children were 3 years of age. Previous research indicates that a reduction in depressive symptoms can precipitate improvements in mothers' behavior toward their children

(Campbell et al., 2007); however, research also shows that children of depressed mothers do not differ from comparison children as long as their mothers remain capable of sustaining positive interactions (Cicchetti & Toth, 1995; Field, Diego, Hernandez-Reif, Schanberg, & Kuhn, 2003; Goodman & Gotlib, 1999). It is possible that differences in the behavior of depressed mothers existed at an earlier or later point (i.e., age 4 or 5) in time, and were not adequately captured in the problem-solving tasks.

In order to simultaneously examine multiple influences on task performance, early depression, recent recurrent depression, maternal negativity, and VMA were entered into a regression analysis. Negativity and recent recurrent depression emerged as significant predictors of false belief understanding. Negativity ratings did not differ for depressed and comparison mothers, thereby precluding the potential of maternal negativity to mediate relations between depression and false belief understanding. However, the additive effect of these predictors was associated with a substantial reduction in the percentage of children achieving criterion-level false belief understanding. Indeed, none of the children who experienced a combination of early/recent recurrent maternal depression and high negativity achieved criterion-level false belief understanding. Although the long-term effects of late or incomplete false belief understanding on these children are unknown, previous research has identified social cognitive difficulties as a potential marker of current or incipient adjustment problems (Hughes & Ensor, 2007).

The results of this study corroborate previous research showing that social cognitive development is experientially influenced. Results demonstrated that frequent maternal negativity, defined as instances of disappointment, criticism, or rejection, was associated with a reduced likelihood of criterion-level performance, as well as total false belief scores, among five-year-old children of both depressed and comparison mothers. Although previous investigations have yielded similar results (Hughes & Ensor, 2006; Pears & Moses, 2003), evidence regarding the relative role of positivity and negativity has remained inconclusive. Positive maternal behavior has sometimes been linked to above average false belief understanding (Meins, Fernyhough, Wainwright, Das Gupta, Fradley & Tuckey, 2002; Ruffman, Slade & Crowe, 2002; Symons & Clark, 2000), although that was not the case in this sample. It may be that the experience of being parented by a mother with a history of MDD, including maternal high negative affect, anhedonia, and hopelessness, coupled with rejection and criticism of and disappointment in the child, is particularly detrimental to children's attainment of false belief understanding.

Nevertheless, it also is noteworthy that maternal negativity at age three influenced children's later false belief understanding, based on the total scores as well as the all-pass criterion, irrespective of maternal depression. These findings further highlight the influence of social experience on social cognitive development more broadly. The unique contribution of maternal depression, particularly when recent and recurrent, to prediction of the all-pass criterion suggests that attention to perfect performance allowed for a more complete understanding of the effects of maternal depression on children's false belief abilities.

Continued research on the development of children of depressed mothers will help to address the limitations of this study and clarify the relation between social cognitive skills

and childhood adjustment problems. Because false belief tasks do not capture all potentially important social cognitive skills, it will be important to conduct research examining additional skills that emerge at different points in development. Such research may elucidate whether maternal depression affects the rate of social cognitive development, the absolute level of social cognitive skills, or the type of skills acquired.

It also will be important to ascertain why children are particularly susceptible to the effects of their mothers' depression at certain points in development. The results of this study revealed independent effects of early (during the first 20 months) and recent recurrent (age 4–5 years) depression; however, it was not possible to determine whether recent depression alone was sufficient to interfere with the development of false belief understanding, as this was precluded by the study design. Research examining the effects of later-onset depression on social cognitive skills would provide additional information about developmental variations in the way children respond to a depressed mother, as well as clarify the effects of differences in the course and severity of depressive disorder. Conversely, research examining the effects of depression in the prenatal period also will be important, because prenatal depression is known to affect neurological development in ways that could interfere with later social cognitive development (Field, Diego, & Hernandez-Reif, 2006; Sarkar, Bergman, O'Connor, & Glover, 2008).

Ideally, future research should differentiate course and severity. Addressing problems in the preschool period is a crucial component of prevention, because a substantial proportion of children of depressed mothers express symptoms of psychopathology before they reach adolescence (Wickramarante & Weissman, 1998), and symptom onset at a younger age is associated with a poorer prognosis (Kessler, et al., 2007; Zisook et al., 2007). Additional research is needed to ascertain the extent to which developing social cognitive skills are responsive to intervention, and to assess whether remediation of social cognitive difficulties during the preschool period is effective in preventing subsequent psychopathology. Although some research indicates that rates of child and adolescent psychopathology decrease when depressed mothers receive effective treatment (Weissman, Pilowsky et al., 2006), interventions targeted exclusively at maternal depression have not been consistently found to provide complete protection against the development of problems in children (Forman, et al., 2007; Toth, Rogosch, Manly, & Cicchetti, 2006). The results of this study point to compromised false belief understanding as a potentially important area for interventions aimed at preventing or reducing the likelihood of the onset of psychopathology in children of depressed mothers.

In conclusion, this study demonstrates that the development of false belief understanding is adversely affected when children are in the care of a depressed mother. These effects are clearest when relapsing or recent recurrent depression is combined with high levels of maternal negativity during the child's transition from the toddler to the preschool period. Protective effects were not identified for mothers' positivity, indicating that maternal depression constitutes a significant risk to the social cognitive development of children. Although the long-term effects of impaired false belief understanding are not currently known, they may include increased susceptibility to future psychopathology. Therefore, social cognitive difficulties in children of depressed mothers may ultimately exert a

substantial toll on society and, as such, warrant further scientific investigation. The current findings also underscore the criticality of intervening preventively to assist mothers with MDD in reducing negative interactions with their young children.

Acknowledgments

This research was supported by funding from the National Institute of Mental Health (MH45027) and the Spunk Fund, Inc. We are grateful to the participating families and research staff who contributed to this research. We also appreciate the valuable input from Stephanie M. Carlson.

References

- Alessandri SM, Lewis M. Differences in pride and shame in maltreated and nonmaltreated preschoolers. *Child Development*. 1996; 67:1857–1869. [PubMed: 8890512]
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 3rd ed.. Washington, DC: Author; 1987. revised).
- Avis J, Harris PL. Belief-desire reasoning among Baka children: Evidence for a universal conception of mind. *Child Development*. 1991; 62:460–467.
- Bakeman, R.; Gottman, JM. Observing interaction: An introduction to sequential analysis. 2nd ed.. New York: Cambridge University Press; 1997.
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986;1173–1182. [PubMed: 3806354]
- Baron-Cohen S. Theory of mind and autism: A review. *International Review of Research on Mental Retardation*. 2001; 23:169–184.
- Brennan PA, Hammen C, Andersen MJ, Bor W, Najman JM, Williams GM. Chronicity, severity, and timing of maternal depressive symptoms: Relationships with child outcomes at age 5. *Developmental Psychology*. 2000; 36:759–766. [PubMed: 11081699]
- Burcusa SL, Iacono WG. Risk for recurrence in depression. *Clinical Psychology Review*. 2007; 27:959–985. [PubMed: 17448579]
- Burgess RL, Conger RD. Family interaction in abusive, neglectful, and normal families. *Child Development*. 1978; 49:1163–1173. [PubMed: 738151]
- Campbell, SB.; Cohn, JF. The timing and chronicity of postpartum depression: Implications for infant development. In: Murray, L.; Cooper, PJ., editors. Postpartum depression and child development. New York: Guilford Press; 1997. p. 165-198.
- Campbell SB, Cohn JF, Flanagan C, Popper S. Course and correlates of postpartum depression during the transition to parenthood. *Development and Psychopathology*. 1992; 4:29–47.
- Campbell SB, Matestic P, von Stauffenberg C, Mohan R, Kirchner T. Trajectories of maternal depressive symptoms, maternal sensitivity, and children's functioning at school entry. *Developmental Psychology*. 2007; 43:1202–1215. [PubMed: 17723045]
- Cicchetti, D.; Aber, JL. Early precursors to later depression: An organizational perspective. In: Lippelsitt, L.; Rovee-Collier, C., editors. *Advances in infancy*. Vol. 4. Norwood, NJ: Ablex; 1986. p. 87-137.
- Cicchetti D, Rogosch FA, Maughan A, Toth SL, Bruce J. False belief understanding in maltreated children. *Development and Psychopathology*. 2003; 15:1067–1091. [PubMed: 14984138]
- Cicchetti, D.; Toth, SL. Developmental psychopathology and disorders of affect. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology: Risk, disorder, and adaptation*. Vol. 2. New York: Wiley; 1995. p. 369-420.
- Cicchetti D, Toth SL. The development of depression in children and adolescents. *American Psychologist*. 1998; 53:221–241. [PubMed: 9491749]
17. Cicchetti D, Toth SL, Rogosch FA, Spagnola. Affect, cognition, and the emergence of self-knowledge in the toddler offspring of depressed mothers. *Journal of Experimental Child Psychology*. 1997; 67:338–362. [PubMed: 9440297]

18. Cohn JF, Matias R, Tronick EZ, Connell D, Lyons-Ruth K. Face-to-face interactions of depressed mothers and their infants. *New Directions for Child and Adolescent Development*. 1986; 34:31–45.
- de Villiers, PA. The role of language in theory of mind development: What deaf children tell us. In: Astington, JW.; Baird, JW., editors. *Why language matters for theory of mind*. New York: Oxford University Press; 2005. p. 266–297.
- Downey G, Coyne JC. Children of depressed parents: An integrative review. *Psychological Bulletin*. 1990; 108:50–76. [PubMed: 2200073]
- Essex MJ, Klein MH, Miech R, Smider NA. Timing of initial exposure to maternal major depression and children's mental health symptoms in kindergarten. *The British Journal of Psychiatry*. 2001; 179:151–156. [PubMed: 11483477]
- Feng X, Shaw DS, Kovacs M, Lane T, O'Rourke FE, Alarcon JH. Emotion regulation in preschoolers: The roles of behavioral inhibition, maternal affective disorder, and maternal depression. *Journal of Child Psychology and Psychiatry*. 2008; 49:132–141. [PubMed: 18211275]
- Field TM. Early interactions between infants and their postpartum depressed mothers. *Infant Behavior and Development*. 1984; 7:512–522.
- Field, TM. Psychologically depressed parents. In: Bornstein, MH., editor. *Handbook of parenting*, Vol. 4: Applied and practical parenting. Hillsdale, NJ: Lawrence Erlbaum; 1995. p. 85–91.
- Field T, Diego M, Hernandez-Reif M. Prenatal depression effects on the fetus and newborn: A review. *Infant Behavior & Development*. 2006; 29:445–455. [PubMed: 17138297]
- Field T, Diego M, Hernandez-Reif M, Schanberg S, Kuhn C. Depressed mothers who are “good interaction” partners versus those who are withdrawn or intrusive. *Infant Behavior and Development*. 2003; 26:238–252.
- Field T, Hernandez-Reif M, Diego M. Intrusive and withdrawn depressed mothers and their infants. *Developmental Review*. 2006; 26:15–30.
- Forman DR, O'Hara MW, Stuart S, Gorman LL, Larsen KE, Coy KC. Effective treatment for postpartum depression is not sufficient to improve the developing mother-child relationship. *Development and Psychopathology*. 2007; 19:585–602. [PubMed: 17459185]
- Flavell JH. Cognitive development: Children's knowledge about the mind. *Annual Review of Psychology*. 1999; 50:21–45.
- Goodman SH, Brogan D, Lynch ME, Fielding B. Social and emotional competence in children of depressed mothers. *Child Development*. 1993; 64:516–531. [PubMed: 8477632]
- Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychological Review*. 1999; 106:458–490. [PubMed: 10467895]
32. Gopnik A, Astington JW. Children's understanding of representational change and it's relation to the understanding of false belief and the appearance-reality distinction. *Child Development*. 1988; 59:26–37. [PubMed: 3342716]
33. Gopnik A, Wellman HM. Why the child's theory of mind really *is* a theory. *Mind and Language*. 1992; 7:145–171.
- Green S, Pring L, Swettenham J. An investigation of first-order false belief understanding of children with congenital profound visual impairment. *British Journal of Developmental Psychology*. 2004; 22:1–17.
- Greig A, Howe D. Social understanding, attachment security of preschool children and maternal mental health. *British Journal of Developmental Psychology*. 2001; 19:381–393.
- Gross HE, Shaw DS, Moilanen KL. Reciprocal associations between boys' externalizing problems and mothers' depressive symptoms. *Journal of Abnormal Child Psychology*. 2008; 36:693–709. [PubMed: 18288602]
- Groth-Marnat, G., editor. *Handbook of psychological assessment*. 3rd ed.. New York: John Wiley & Sons; 1997.
- Hammen C, Brennan PA. Severity, chronicity, and timing of maternal depression and risk for adolescent offspring diagnoses in a community sample. *Archives of General Psychiatry*. 2003; 60:253–258. [PubMed: 12622658]

- Happé F. The role of age and verbal ability in the theory of mind task performance of subjects with autism. *Child Development*. 1995; 66:843–855. [PubMed: 7789204]
- Happé F, Frith U. The neuropsychology of autism. *Brain*. 1996; 119:1377–1400. [PubMed: 8813299]
- Harris PL. From simulation to folk psychology: The case for development. *Mind and Language*. 1992; 7:120–144.
- Henderson EN, Jennings KD. Maternal depression and the ability to facilitate joint attention with 18-month-olds. *Infancy*. 2003; 4:27–46.
- Hughes C, Dunn J. “Pretend you didn’t know”: Preschooler’s talk about mental states in pretend play. *Cognitive Development*. 1997; 12:477–497.
- Hughes C, Ensor R. Behavioural problems in 2-year-olds: Links with individual differences in theory of mind, executive functioning, and harsh parenting. *Journal of Child Psychology & Psychiatry*. 2006; 47:488–497. [PubMed: 16671932]
- Hughes C, Ensor R. Positive and protective: Effects of early theory of mind on problem behaviors in at-risk preschoolers. *Journal of Child Psychology and Psychiatry*. 2007; 48:1025–1032. [PubMed: 17915003]
- Hughes C, Leekam S. What are the links between theory of mind and social relations? Review, reflections, and new directions for studies of typical and atypical development. *Social Development*. 2004; 13:590–619.
- Jameson PB, Gelfand DM, Kulcsar E, Teti D. Mother-toddler interaction patterns associated with maternal depression. *Development and Psychopathology*. 1997; 9:537–550. [PubMed: 9327238]
- Jenkins JM, Astington JW. Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology*. 1996; 32:70–78.
- Jenkins JM, Astington JW. Theory of mind and social behavior: Causal models tested in a longitudinal study. *Merrill Palmer Quarterly*. 2000; 46:203–220.
- Kessler RC, Amminger GP, Aguilar-Gaxiola S, Alonso J, Lee S, Üstün TB. Age of onset of mental disorders: A review of the recent literature. *Current Opinion in Psychiatry*. 2007; 20:359–364. [PubMed: 17551351]
- Kurstjens S, Wolke D. Effects of maternal depression on cognitive development of children over the first 7 years of life. *Journal of Child Psychology and Psychiatry*. 2001; 42:623–636. [PubMed: 11464967]
- Lalonde CE, Chandler MJ. False belief goes to school: On the social-emotional consequences of coming early or late to a first theory of mind. *Cognition and Emotion*. 1995; 9:167–185.
- Leckman-Westin E, Cohen PR, Stueve A. Maternal depression and mother-child interaction patterns: Association of toddler problems and continuity of effects to late childhood. *Journal of Child Psychology and Psychiatry*. 2009; 50:1176–1184. [PubMed: 19486223]
- Leslie, AM. The theory of mind impairment in autism: Evidence for a modular mechanism of development?. In: Whiten, A., editor. *Natural theories of mind: Evolution, development and simulation of everyday misreading*. Cambridge, MA: Basil Blackwell; 1991. p. 63-78.
- Lyons-Ruth K, Connell DB, Grunebaum HU, Botein S. Infants at social risk: Maternal depression and family support services as mediators of infant development and security of attachment. *Child Development*. 1990; 61:85–98. [PubMed: 2307048]
- Martins C, Gaffan EA. Effects of early maternal depression on patterns of infant-mother attachment: A meta-analytic investigation. *Journal of Child Psychology and Psychiatry*. 2000:737–746. [PubMed: 11039686]
- Maughan A, Cicchetti D, Toth SL, Rogosch FA. Early-occurring maternal depression and maternal negativity in predicting young children’s emotion regulation and socioemotional difficulties. *Journal of Abnormal Psychology*. 2007; 35:685–703.
- Meins E, Fernyhough C, Fradley E, Tuckey M. Rethinking maternal sensitivity: Mothers’ comments on infants’ mental processes predict security of attachment at 12 months. *Journal of Child Psychology and Psychiatry*. 2001; 42:637–648. [PubMed: 11464968]
- Meins E, Fernyhough C, Russell J, Clark-Carter D. Security of attachment as a predictor of symbolic and mentalising abilities: A longitudinal study. *Social Development*. 1998; 7:1–24.

- Meins E, Fernyhough C, Wainwright R, Das Gupta M, Fradley E, Tuckey M. Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development*. 2002; 73:1715–1726. [PubMed: 12487489]
- Meltzoff, AN.; Gopnik, A.; Repacholi, BM. Toddlers' understanding of intentions, desires, and emotions: Explorations of the dark ages. In: Zelazo, PD.; Astington, JW.; Olson, DR., editors. *Developing theories of intention: Social understanding and self-control*. Mahwah, NJ: Erlbaum; 1999. p. 17-41.
- Minter M, Hobson RP, Bishop M. Congenital visual impairment and 'theory of mind'. *British Journal of Developmental Psychology*. 1998; 16:183–196.
- Murray, C.J.L.; Lopez, AD., editors. *The global burden of disease*. Vol. 1. Cambridge, MA: Harvard University Press; 1996.
- Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development*. 1996; 67:2512–2526. [PubMed: 9022253]
- Murray L, Hipwell A, Hooper R, Stein A, Cooper P. The cognitive development of 5-year-old children of depressed mothers. *Journal of Child Psychology and Psychiatry*. 1996; 8:927–935. [PubMed: 9119940]
- Murray L, Woolgar M, Briers S, Hipwell A. Children's social representations in dolls' house play and theory of mind tasks, and their relation to family adversity and child disturbance. *Social Development*. 1999; 8:179–200.
- Pears KC, Fisher PA. Developmental, cognitive, and neuropsychological functioning in preschool-aged foster children: Associations with prior maltreatment and placement history. *Journal of Developmental and Behavioral Pediatrics*. 2005; 26:112–122. [PubMed: 15827462]
- Pears KC, Moses LJ. Demographics, parenting, and theory of mind in preschool children. *Social Development*. 2003; 12:1–20.
- Perner, J. *Understanding the representational mind*. Cambridge, MA: MIT Press; 1991.
- Perner J, Lang B. Development of theory of mind and executive control. *Trends in cognitive sciences*. 1999; 3:337–344. [PubMed: 10461196]
- Perner J, Leekam SR, Wimmer H. Three-year-olds' difficulty with false belief: The case for a conceptual deficit. *British Journal of Developmental Psychology*. 1987; 5:125–137.
- Peterson C, Slaughter V. Opening windows into the mind: Mothers' preference for mental state explanations and children's theory of mind. *Cognitive Development*. 2003; 18:399–429.
- Pilowsky DJ, Wickramaratne PJ, Rush AJ, Hughes CW, Garber J, Malloy E, et al. Children of currently depressed mothers. *The Journal of Clinical Psychology*. 2006; 67:126–136.
- Premack D, Woodruff G. Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences*. 1978; 4:515–526.
- Robins, L.; Helzer, J.; Cottler, L.; Goldring, E. *NIMH Diagnostic Interview Schedule Version III Revised*. St. Louis, MO: Washington University, Department of Psychiatry; 1989.
- Robins L, Helzer JE, Croughan J, Ratcliff KS. National Institute of Mental Health Diagnostic Interview Schedule. Its history, characteristics, and validity. *Archives of General Psychiatry*. 1981; 38:381–389. [PubMed: 6260053]
- Robins LN, Helzer JE, Ratcliff KS, Seyfried W. Validity of the diagnostic interview schedule, version II: DSM-III diagnoses. *Psychological Medicine*. 1982; 12:855–870. [PubMed: 7156256]
- Ruffman T, Slade L, Crowe E. The relation between children's and mother's mental state language and theory of mind understanding. *Child Development*. 2002; 73:734–751. [PubMed: 12038548]
- Sarkar P, Bergman K, O'Connor TG, Glover V. Maternal antenatal anxiety amniotic fluid cortisol and testosterone: Possible implications for foetal programming. *Journal of Neuroendocrinology*. 2008; 20:489–496. [PubMed: 18266948]
- Sattler JM, Atkinson L. Item equivalence across scales: The WPPSI-R and WISC-III. *Psychological Assessment*. 1993; 5:203–206.
- Schick B, de Villiers P, de Villiers J, Hoffmeister R. Language and theory of mind: A study of deaf children. *Child Development*. 2007; 78:376–396. [PubMed: 17381779]

- Scholl BJ, Leslie AM. Modularity, development and 'theory of mind'. *Mind and Language*. 1999; 14:131–153.
- Slaughter V, Dennis MJ, Pritchard M. Theory of mind and peer acceptance in preschool children. *British Journal of Developmental Psychology*. 2002; 20:545–564.
- Slomkowski C, Dunn J. Young children's understanding of other people's beliefs and feelings and their connected communication with friends. *Developmental Psychology*. 1996; 32:442–447.
- Symons DK, Clark SE. A longitudinal study of mother-child relationships and theory of mind in the preschool period. *Social Development*. 2000; 9:3–23.
- Teti DM, Gelfand DM, Messinger DS, Isabella R. Maternal depression and the quality of early attachment: An examination of infants, preschoolers, and their mothers. *Developmental Psychology*. 1995; 31:364–376.
- Tingley, EC. Symbolic play in the interactions of young children and mothers with a history of affective illness: A longitudinal study. In: Slade, A.; Wolf, DP., editors. *Children at play: Clinical and developmental approaches to meaning and representation*. New York: Oxford University Press; 1994. p. 286-306.
- Toth SL, Rogosch FA, Manly JT, Cicchetti D. The efficacy of toddler-parent a psychotherapy to reorganize attachment in the young offspring of mothers with major depressive disorder: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*. 2006; 74:1006–1016. [PubMed: 17154731]
- Toth SL, Rogosch FA, Sturge-Apple M, Cicchetti D. Maternal depression, children's attachment security, and representational development: An organizational perspective. *Child Development*. 2009; 80:192–208. [PubMed: 19236401]
- Wechsler, D. Wechsler preschool and primary scales of intelligence manual--revised. San Antonio, TX: Psychological Corporation; 1989.
- Weissman MM, Pilowsky DJ, Wickramaratne PJ, Talati A, Wisniewski SR, et al. Remissions in maternal depression and child psychopathology: A STAR*D Report. *Journal of the American Medical Association*. 2006a; 295:1389–1398. [PubMed: 16551710]
- Weissman MM, Wickramaratne PJ, Nomura Y, Warner V, Pilowsky D, et al. Offspring of depressed parents: 20 years later. *American Journal of Psychiatry*. 2006b; 163:1001–1008. [PubMed: 16741200]
- Wellman HM, Cross D, Watson J. Meta-analysis of theory-of-mind development: The truth about false beliefs. *Child Development*. 2001; 72:655–684. [PubMed: 11405571]
- Wickramaratne PJ, Weissman MM. Onset of psychopathology in offspring by developmental phase and parental depression. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1998; 37:933–942. [PubMed: 9841243]
- Wimmer H, Perner J. Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*. 1983; 13:103–128. [PubMed: 6681741]
- Youngblade LM, Dunn J. Individual differences in young children's pretend play with mother and sibling: links to relationships and understanding of other people's feelings and beliefs. *Child Development*. 1995; 66:1472–1492. [PubMed: 7555225]
- Zisook S, Lesser I, Stewart JW, Wisniewski SR, Balasubramini, et al. Effect of age of onset on the course of major depressive disorder. *American Journal of Psychiatry*. 2007; 164:1539–1546. [PubMed: 17898345]

Figure 1.

Percentage of children meeting the false belief understanding all-pass criterion depending on mothers' diagnostic status and level of maternal negativity during problem-solving.

Table 1

Distribution of false belief tasks passed for comparison and early maternal depressive disorder groups.

False Belief Tasks Passed	Group	
	Early Depressed <i>N</i> (%)	Comparison <i>N</i> (%)
0	4 (8.05%)	12 (13.2%)
1	9 (18.0%)	13 (14.3%)
2	16 (32.0%)	44 (48.4%)
3 (All-Pass)	22 (24.2%)	21 (42.0%)

Table 2

Mean scores for maternal positivity, negativity, and verbal mental age.

	Comparison <i>M (SD)</i>	Early Depressed Not Recent/Recurrent <i>M (SD)</i>	Early Depressed Recent/Recurrent <i>M (SD)</i>	<i>F(2,138)</i>
Maternal Positivity	125.24 (50.79)	118.79 (41.94)	125.71 (52.58)	.34 ns
Maternal Negativity	10.88 (8.59)	12.80 (10.54)	11.42 (9.89)	.58 ns
Verbal Mental Age (Months)	71.52 (13.13)	70.25 (11.96)	67.38 (13.12)	.88 ns

Table 3

Correlations among depressive disorder, maternal positivity and negativity, verbal mental age, and false belief understanding.

	1	2	3	4	5	6
1. Early Depression						
2. Recent Recurrent Depression	.34**					
3. Maternal Positivity	-.05	.03				
4. Maternal Negativity	.08	-.02	-.23**			
5. Verbal Mental Age	.03	-.02	-.07	-.07		
6. False Belief Understanding: Total	-.12	-.10	.03	-.29**	.01	
7. False Belief Understanding: All-Pass	-.19*	-.22**	.02	-.25**	.00	.75**

* $p < .05$;

** $p < .01$

Table 4

Collective effects of early and recent recurrent depressive disorder, maternal negativity, and verbal mental age on false belief understanding total scores.

False Belief Total Score				
	β	$p <$	R^2	$p <$
Step 1			.015	.15
Early Depression	-.12	.15		
Step 2			.019	.004
Early Depression	-.10	.27		
Recent Recurrent Depression	-.07	.45		
Step 3			.091	.098
Early Depression	-.07	.42		
Recent Recurrent Depression	-.07	.43		
Maternal Negativity	-.24	.01		
Verbal Mental Age	.15	.10		

Collective effects of early and recent recurrent depressive disorder, maternal negativity, and verbal mental age on false belief understanding all-pass criterion performance.

Table 5

False Belief All-Pass Criterion						
	Naglekerke	Wald's				
	$\chi^2(df)$	R^2	B	F	$p < Exp(B)$	95% CI
Step1	4.74 (1) *	.047				
Early Depression			.82	4.34	.05	2.27 1.09 to 4.75
Step 2	9.95 (2) **	.096				
Early Depression			.53	1.84	.18	1.70 .79 to 3.67
Recent Recurrent Depression			1.54	3.86	.05	4.68 1.00 to 21.82
Step 3	20.67 (4) ***	.193				
Early Depression			.46	1.26	.26	1.58 .71 to 3.52
Recent Recurrent Depression			1.67	4.32	.05	5.29 1.10 to 25.41
Maternal Negativity			-.06	6.85	.01	.94 .89 to .98
Verbal Mental Age			.02	.99	.32	1.02 .98 to 1.05

* $p < .05$;

** $p < .01$;

*** $p < .001$