8-30-2013

Childhood externalizing behavior problems, maternal depression, and father involvement in low-income African American families

Sara Johns

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Childhood Externalizing Behavior Problems, Maternal Depression, and Father Involvement in Low-Income African American Families

by

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Thesis

Submitted to the Department of Psychology
Eastern Michigan University
In partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE
in
Clinical Psychology

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August 30, 2013
Ypsilanti, Michigan
Abstract

Data indicate that up to 25% of preschoolers are exhibiting clinical levels of externalizing behaviors. Among children in at-risk populations, such as those attending Head Start preschools, estimates of clinical levels of externalizing behavior problems are as high as 30%. Studies of early childhood externalizing behavior problems indicate the potential for stability of elevated externalizing behaviors over time and the association of these behaviors with a variety of negative outcomes. Maternal depression and father involvement may be important predictors of externalizing behavior. The current study investigated the nature of the relationship between maternal depression, father involvement, and child externalizing behaviors among low-income African-American families with preschool-aged children. Path analysis implemented through Mplus computer software was used to test the hypothesized moderation and mediation models. Father involvement was not found to moderate the relationship between maternal depression and child externalizing behavior problems as hypothesized. However, father involvement was found to have an indirect relationship to child externalizing behaviors with maternal depression fully mediating the relationship between father involvement and parent-rated child externalizing behavior problems. Father involvement was also found to have a significant direct relationship with maternal depression such that as involvement increased, depression decreased. Maternal depression was also found to have a direct relationship with parent-rated child externalizing behavior problems, such that as depression decreased externalizing behaviors did as well.

Keywords: child, externalizing, behaviors, mothers, depression, fathers
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Childhood Externalizing Behavior Problems, Maternal Depression, and Father Involvement in Low-Income African American Families

**Introduction**

It is not atypical for parents of preschool children to complain that their child is showing aggression towards other children, is noncompliant, highly active, or has difficulty regulating their impulses (Campbell, Shaw, & Gilliom, 2000). Such behaviors are known as externalizing behaviors (Achenbach & Rescorla, 2000), and at lower levels are considered to be typical behaviors of the toddler and preschool period of development (Campbell, 2002). In many instances children will outgrow such externalizing symptoms. However, for some children (typically those exhibiting clinical levels of externalizing behaviors), they will continue to show problems into school age, adolescence, and even adulthood (Capaldi & Stoolmiller, 1999; Fanti & Henrich, 2010; Gilliom & Shaw, 2004). Data indicate that up to 25% of preschoolers are exhibiting clinical levels of externalizing behaviors (e.g., Oppositional Defiant Disorder and Conduct Disorder; Stephan & Miclea, 2010). Among children in at-risk populations, such as those attending Head Start preschools, estimates of clinical levels of externalizing behavior problems are as high as 30% (Qi & Kaise, 2003). In addition to the potential stability of elevated externalizing behaviors over time, these behaviors have also been associated with a variety of negative outcomes such as later substance use, peer rejection, poor academic achievement, delinquency, and violence (Capaldi & Stoolmiller, 1999; Fanti & Henrich, 2010; McLeod & Kaiser, 2004). Given these two factors of stability and associated negative outcomes, it is important to investigate the underpinnings of such behaviors as they begin to emerge in early childhood. With a better understanding of how and under what circumstances preschool children are likely to begin exhibiting externalizing problems, we will have a greater likelihood of
developing successful interventions and preventing the development of such behaviors in future generations.

In general, the home environment (e.g., parents) is thought to have a greater impact on child development during the preschool years than later periods of development (Schonberg & Shaw, 2007). Parents act as the most proximal variable in a young child’s environment and parental factors, such as maternal depression, have been linked to child externalizing behavior problems (e.g., Ashman, Dawson, & Panagiotides, 2008; Goodman et al., 2011). Depression is a highly prevalent disorder among women (Kessler, 2006). It is particularly prevalent among low-income mothers with young children where rates of depression have been reported to be as high as 40% (Knitzer, 2007). Empirical findings suggest that mothers who suffer from depression have homes that tend to be characterized by irritability, sadness, hopelessness, and guilt, and that they are more likely to engage in problematic parenting practices that have been linked to increased levels of child externalizing behaviors (Bayer, Sanson, & Hemphill, 2006; Blatt-Eisengart, Drabick, Monahan, & Steinberg, 2009; Goodman & Tully, 2006).

Although the literature has consistently shown a relationship between maternal depression and child behavior problems, an ecological perspective proposes that environmental factors do not work in isolation, but rather they interact to influence a child’s development (Bronfenbrenner, 1986). This theoretical perspective suggests that there are complex factors that interact with maternal depression to affect the child’s behavioral outcome. Despite these theoretical implications, empirical investigations are somewhat limited in this regard, particularly among low-income minority populations. The majority of studies examine predictors of child behavior problems without taking moderation or mediation into account (e.g., Goodman et al., 2011; Weissman et al., 2006).
Another notable omission in the literature is the lack of attention paid to the role that fathers may play in protecting children from, or exacerbating, the effects of maternal depression on externalizing behaviors. A variety of research indicates that children who lack a father’s meaningful involvement are more likely to exhibit externalizing behavior problems (Lamb, 2010). Among African American children now living in the United States, data indicate that 50% of young children are living with their mothers only (U.S. Census Bureau Data, 2011). Non-resident fathers, when compared to resident fathers, have been shown to be less involved in their children’s lives (Cabrera, Ryan, Mitchell, Shannon, & Tamis-LeMonda, 2008). Given the link between father involvement and child externalizing behavior problems, it is essential to include this factor in the investigation of these behavior problems among African American families where there are particularly high rates of non-residential fathers. Furthermore, there is a lack of understanding regarding the role that a father’s involvement may play in the relationship between maternal depression and child externalizing behaviors. Evidence suggests that father involvement could potentially moderate this relationship, such that father involvement buffers the effects of maternal depression on children. Literature also indicates that father involvement could potentially indirectly predict child externalizing behaviors through the mediator of maternal depression. Further research is needed to understand both of these potential processes.

Most literature on factors included in this study (i.e., maternal depression, father involvement, and child externalizing behaviors) report findings pertaining to samples of middle to high-income Caucasian families. However, data indicate that among low-income minority populations, when compared to higher income non-minority populations, there are increased rates of clinically significant child externalizing behaviors, maternal depression, and less father involvement (Conger et al., 2002; Hofferth, 2003; Lyons-Ruth, Wolfe, Lyubchik, & Steingard,
2002). Thus, this study aimed to investigate the nature of the relationship between maternal depression, father involvement and child externalizing behaviors among low-income African-American families with preschool-aged children.

As a note to readers, robust findings exist relating both maternal clinical depression and sub-clinical maternal depressive symptomology to child externalizing problems (Goodman & Tully, 2006); thus, the term ‘maternal depression’ will be used throughout the paper to describe both types of depression. In the following sections, the background literature on child externalizing behaviors, maternal depression and father involvement will be reviewed. To begin, the specifics regarding such problematic behaviors in preschool children are discussed.

**Literature Review**

**Externalizing Behaviors in Preschool Children**

Externalizing behavior patterns are those characterized by impulsive, overactive, noncompliant, aggressive, and antisocial actions (Achenbach & Rescorla, 2000). These behaviors may be exhibited in multiple settings, including the home and school. As children enter into preschool, the school setting becomes an important context to assess for externalizing behaviors (Achenbach, 2011). With the introduction to preschool, children are placed in a setting that is often different from that of the home or day-care (e.g., increased structure and number of interactions with same aged peers). A variety of developmental skills such as the child’s verbal abilities, emotional and behavioral regulation skills, and cognitive skills are tapped and often challenged in the preschool setting (Kail & Cavanaugh, 2004). Such variations in context (i.e., home versus school) may result in setting-specific presentations of child behavior problems (Achenbach, 2011). Evidence for this discrepancy is said to be reflected in the low agreement between parent and teacher reports of child behavior, and thus, it is recommended that
measures of child behavior be obtained from multiple informants (Achenbach, 2011; Achenbach, McConaughy, & Howell, 1987).

Up until around the last decade, research aimed at identifying the developmental antecedents of externalizing behavior problems was focused primarily on school aged children. Overall, people thought of externalizing behaviors in preschool children as being normative and it was generally believed that children would outgrow such behaviors (Campbell et al., 2000). While this may be true for some children, others continue to exhibit problems that can persist into adolescence (Fanti & Henrich, 2010; Gilliom & Shaw, 2004; Webster-Stratton & Taylor, 2001) and even into young adulthood (Capaldi & Stoolmiller, 1999). Disturbances found to be associated with children who exhibit stable externalizing behaviors beginning in early childhood include an increased likelihood to engage in risky behaviors, associations with deviant peers, rejection by peers, and asocial behaviors with peers by early adolescence (Fanti & Henrich, 2010; Gilliom & Shaw, 2004). Additionally, early presentations of externalizing behavior problems have been found to be associated with a range of adjustment problems in young adulthood, including substance use, poor self-esteem, non-completion of education, unemployment, driver’s license suspensions, and unplanned pregnancies (Capaldi & Stoolmiller, 1999). With regards to academic achievement specifically, externalizing problems evident in young children at age 6 have been shown to strongly diminish the probability of receiving a high school degree (McLeod & Kaiser, 2004). Such links between early externalizing behavior problems and later associated negative outcomes reflects the lasting effects of these problems. Therefore, it is important to further address how prevalent such behaviors are in young children in addition to their degree of stability.
The Prevalence and Stability of Externalizing Behaviors

The reported prevalence rates of clinically significant levels of externalizing behaviors among the general population of preschool children (ages 3-5) vary greatly. Much of this variability has been cited as being due to an inconsistency in the assessment and definition of significant externalizing behaviors (Qi & Kaise, 2003). The prevalence of externalizing behavior problems among the general child population has been estimated at between 3% and 6% (Qi & Kaiser, 2003). Prevalence of clinically significant levels of such behaviors among preschool-aged children has been reported to be as high as 25% (Stephan & Miclea, 2010). Increased incidence of such behaviors have been reported among low-income populations (e.g., Head Start preschoolers) with clinical levels of externalizing behaviors as high as 30% (Qi & Kaise, 2003).

Children reared in poverty are faced with multiple challenges, and there is a great deal of research that indicates an association between socioeconomic disadvantage and externalizing behavior problems in children (Conger et al., 2002; Linver, Brooks-Gunn, & Kohen, 2002; Martin et al., 2010; Mistry, Vandewater, Hustin, & McLoyd, 2002). Data indicate that African American children are more likely to experience poverty than non-minority children. According to the United States Census Bureau, more than one-third of African American children belong to families who are below the national poverty line (U.S. Census Bureau, 2012). This is more than double the rate of poverty among Caucasian children in the United States. Additionally, low-income African American children have been shown to exhibit higher rates of externalizing behaviors when compared to their more affluent, non-minority peers (Randolph, Koblinsky, Beemer, Roberts, & Letiecq, 2000), which may be due, in part, to growing up poor.

Previous literature suggests that for some children, early childhood behavior problems can endure over time (Campbell, 2002). Mild displays of externalizing behaviors typically
diminish with development. However, more serious externalizing behavior problems beginning in early childhood can be indicative of longer term disturbances, particularly if other risk factors are also present (e.g., socioeconomic disadvantage; Campbell, 2002).

Longitudinal data collected by Campbell and colleagues from two cohorts of parent-and/or teacher-identified “hard to manage” preschool children provide insight into the trajectories of early childhood behavior problems (Campbell, 2002; Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Pierce, Ewing, & Campbell, 1999). Hard to manage preschool children were identified by their parents in the first cohort ($n = 46$) as having concerns about their child’s level of activity, defiance, poor impulse control, and difficulty playing alone (Campbell, 2002). This cohort was followed and assessed at five different time points (ages 3, 4, 6, 9, and 13 years). Externalizing behaviors were identified through a variety of methods: laboratory observations of child during free play, structured tasks and parent interactions, natural observations of child’s interactions with peers and teachers, structured parent interview, and parent questionnaires. The second cohort of hard to manage preschool children focused only on boys who were assessed at three time points: ages 4, 6, and 9 years (Campbell, 2002; Campbell et al., 1996). The hard to manage boys ($n = 69$) were identified by parent and teacher reports of externalizing behaviors on the Behar Preschool Behavior Questionnaire (i.e., elevated scores on the Hyperactivity and Aggression scales), and teacher ratings of Diagnostic and Statistical Manual of Mental Disorders (3rd ed.; DSM III) criteria for Attention Deficit Disorder (ADD). Each boy was then matched with another boy in his classroom with the closest birth date who did not meet cutoff criteria in any of the behavioral domains (comparison group, $n = 42$). Campbell (2002) reports that data from these two cohorts (analyzed in aggregate) provided converging findings on the developmental trajectories of preschool externalizing behavior problems. More
specifically, findings revealed that across cohorts, children with persistent externalizing problems had higher levels of symptoms and more varied symptoms at ages 3 and 4. Additionally, those children who were initially rated as having severe behavior problems with problems persisting into the first grade, were more likely to exhibit externalizing problems at a diagnosable level (e.g., ADD, Oppositional Defiant Disorder, or Conduct Disorder) by age 9. If externalizing problems persisted through age 9, they were also more likely to exhibit a continuation of problems into early adolescence (age 13). For both cohorts, the severity and persistence of externalizing behavior problems was also found to be related to family adversity (e.g., lower SES, maternal depression, stressful life events, single parent status; Campbell, 2002).

Another longitudinal study examining the stability of externalizing behavior problems followed an at-risk sample of young males (N = 203) from the sixth grade (ages 11-12) to age 21 (Capaldi & Patterson, 1989; Capaldi & Stoolmiller, 1999). Externalizing behavior problems were measured with the Child Behavior Checklist (CBCL; Externalizing Index), self-reported delinquent behaviors, and total number of arrests from court records. The authors found that externalizing behaviors present in the sixth grade had significant stability across developmental periods, persisting into young adulthood (age 21; Capaldi & Patterson, 1989; Capaldi & Stoolmiller, 1999). Given such evidence of the persistent nature of early externalizing behavioral problems, it is imperative for researchers to further examine such behaviors among low-income African American preschoolers.

**The Family System and Child Development**

Research indicates that the family is a key system for human development and that disturbances in this system (especially in early childhood) can have particularly negative effects on developmental outcomes (Masten & Schaffer, 2006). Included in the family system are
parent factors (e.g., maternal depression and father involvement) that are within the proximal ecology of the child. When compared to more distal factors such as poverty, parent factors have been shown to have a greater impact on child development (Campbell, 2002), and therefore, it is important to examine their role on the development of the child.

**Parental factors.** Evidence from risk and resiliency literature clearly indicates that there are several ways in which parents affect the development of their child. Parents can function as direct and indirect influences on their child’s behavior in both positive and negative ways (Masten & Schaffer, 2006). With regards to child externalizing behaviors, research has identified several parental factors that are associated with this outcome in preschool children. Thus, when investigating the underpinnings of such behaviors among low-income African American families, it is important to take into account the parental risk factors that are highly prevalent in such populations. Findings indicate that among low-income African American families, compared to non-minority middle to high-income families, there are higher rates of non-resident fathers (which is associated with lower levels of father involvement when compared to resident fathers) and higher rates of maternal depressive symptomology (Knitzer, 2007; U.S. Census Bureau Data, 2011) as noted earlier. Both of these parental factors have been linked to child externalizing problems and yet their relationships have been understudied. Furthermore, examination of such relationships has been particularly overlooked among low-income African American populations where higher prevalence indicates greater risk.

**Maternal depression.** Depression is a highly prevalent mental health disorder among parents. According to the National Research Council and Institute of Medicine (2009), an estimated 7.5 million U.S. adults with depression have a child living with them under the age of 18. Furthermore, given that the rate of depression in women has been reported as being 1 ½ to 3
times higher than the rate of depression in men, it can be assumed that the majority of those 7.5 million depressed parents are mothers (Kessler, 2006). A point of additional concern is that depression is likely to be a chronic disorder, with more than 80% of individuals experiencing depression reporting the occurrence of more than one major depressive episode (MDE), and approximately 50% of those MDEs reoccurring within 2 years of a previous episode (Goodman, 2007).

Researchers define clinically significant depression by using either a categorical or dimensional approach (Wilhelm, 2006). The categorical approach relies on the current diagnostic systems of either the Diagnostic and Statistical Manual of Mental Disorders (DSM), originating in the United States, or the International Classification of Diseases (ICD), originating in Europe. Both are systems that have diagnostic criteria (i.e., symptoms, signs, and characteristics of the disorder), with a specified number of criteria necessary for inclusion in the diagnostic category (Wilhelm, 2006). The dimensional approach relies on identifying depressive symptomology by a minimum score on a dimensional scale (e.g., Center for Epidemiological Studies-Depression Scale [CES-D; Wilhelm, 2006]. Dimensional measures of depression are typically used for screening purposes and are not appropriate for the use of diagnosing depressive disorders (Goodman & Tully, 2006). Both those women who have met diagnostic criteria for depression and those who have scored high on depressive rating scales have been found to have impaired parenting skills (Goodman & Tully, 2006).

Maternal depression as a predictor of child externalizing problems. According to Bayer et al. (2006), depressed mothers may transmit disadvantage to their children through the following pathways. First, maternal depression can directly affect children by exposing them to the parent’s emotional distress, which can be dysregulating to a child. Also, when a parent is
depressed, his or her home environment tends to be characterized by irritability, sadness, guilt, and hopelessness and the child is more likely to model his or her parent’s styles of attribution and negative self-cognitions. Second, a parent’s depression can also indirectly affect children through the impact that depression may have on their parenting behaviors (Bayer et al., 2006). As a result, maternal depression can have a negative effect on child outcomes, like externalizing behavior problems.

The association between maternal depression and childhood behavioral and emotional problems has been well established in the literature (e.g., Ashman et al., 2008; Garnstein & Fagot, 2003; Goodman, 2007; Goodman et al., 2011; National Research Council and Institute of Medicine [NRCIM], 2009; Weissman et al., 2006). Goodman and colleagues (2011) conducted a meta-analysis of 193 studies to examine the strength of the association between maternal depression and child externalizing behavior problems. Their analysis revealed that maternal depression was significantly related to higher levels of child externalizing behaviors. Additionally, the authors found that studies sampling low-income families yielded significantly higher effect sizes when compared to studies that sampled middle, higher, or mixed income populations (Goodman et al., 2011). Such findings have also been demonstrated specifically among low-income African American populations. For example, Malik and colleagues (2007) examined the direct and indirect relationships between maternal depression and child externalizing problems in a sample of 270 low-income African American children and families attending Early Head Start programs. Both maternal depression and child externalizing behavior problems were measured through mother self-report measures (The Center for Epidemiologic Studies of Depression [CES-D] and Child Behavior Checklist [CBCL; Externalizing Behaviors Index]. The authors found that poor maternal mental health (maternal depression and parenting
distress), as well as negative family interactions (spankings, family conflict, and relationship satisfaction) accounted for 36.4% of the variance in child externalizing behaviors (Malik et al., 2007).

Empirical findings also indicate that successful treatment of maternal depression is associated with decreases in child externalizing problem behaviors (Wickramaratne et al., 2011). Wickramaratne and colleagues looked at a subsample of mother-child pairs \( n = 151 \) from the large multi-site Sequenced Treatment Alternatives to Relieve Depression (STAR*D) study. They examined the relationship between a mother’s remission from Major Depressive Disorder (MDD) and child outcomes during the first year following her remission. Children ranged in age from 7 to 17 years and came from racially and economically diverse backgrounds. Child externalizing behavior problems were measured through maternal reports on the CBCL. Results indicated that 1-year after their mothers’ remission, externalizing behavior problems in children significantly decreased. Such findings aid in further establishing the link between maternal depression and child externalizing behaviors. Additionally, findings advocate for the treatment of depression in mothers.

Studies examining the underlying mechanisms of the relationship between maternal depression and child externalizing behavioral outcomes suggest that mothers who suffer from depression are more likely than non-depressed mothers to engage in problematic parenting practices that have been linked to increased child behavior problems (Bayer et al., 2006; Goodman & Tully, 2006; Ewell-Foster, Garber, & Durlak, 2008). For example, in a study comparing depressed mothers to non-depressed mothers, those who were depressed tended to show less positive affect, and more irritable and sad affect when interacting with their child (Goodman & Tully, 2006). Also, depressed mothers tended to discipline their children
inconsistently by alternating between overly harsh and punitive punishment, and coercive and permissive parenting. Employment of such problematic parenting practices has been shown to mediate the association between maternal depression and increased levels of child externalizing behaviors (Blatt-Eisengart et al., 2009; Caughy, Huang, & Lima, 2009; Garnstein & Fagot, 2003).

Investigations of this mediating relationship show that mothers suffering from depression are more likely to be preoccupied with negative life events, to have low energy, and low stress tolerance (Bayer et al., 2006). Furthermore, such depressive symptoms (i.e., lack of energy and/or patience) have been associated with mothers monitoring their children less and engaging in less parental cognitive guidance (Bayer et al., 2006; Garnstein & Fagot, 2003). Deficits in monitoring and parental cognitive guidance (e.g., scaffolding/guided instruction) have been linked with decreased self-regulation skills and socio-emotional competence in children and subsequent increased child externalizing behavior problems (Gartstein & Fagot, 2003; Leckman-Westin, Cohen, & Stueve, 2009).

Additionally, attachment literature suggests a strong relationship between maternal depression and insecure mother-child attachment styles (Campbell et al., 2004; Goodman & Gotlib, 2002; Green, Stanley, & Peters, 2007). Empirical findings indicate that mother-child attachment insecurity, particularly disorganized attachment, is predictive of child externalizing behavior problems (Bohlin, Eninger, Brocki, & Thorell, 2012; Green et al., 2007). Attachment theory proposes that the child’s early experiences with caregivers (e.g., caregivers’ availability and responsiveness) are internalized and develop into internal working models or mental representations of the self and others (Bowlby, 1982). These internal working models act to provide expectations and interpretations for the individual in subsequent interpersonal socio-
emotional interactions (Green et al., 2007). Thus, according to attachment theory, the foundation for a child’s socio-emotional development is based in early experiences and interactions between the child and caregiver (Bowlby, 1982).

In addition to the ample support for the association between maternal depression and child externalizing behaviors, empirical evidence indicates that this association has significant stability over time and across developmental periods. For example, a study conducted by Blatt-Eisengart and colleagues (2009) examined the longitudinal relations between parental behaviors, maternal depressive symptoms, and children’s externalizing behaviors in a diverse sample of 1,364 families. Structural equation modeling revealed that maternal depression and negative parental behaviors (e.g., intrusive, low-warmth, harsh, and unsupportive) were associated with concurrent child externalizing behaviors at two different time periods in development (24 months and 6 years of age).

Additionally, data suggest that the effects of maternal depression on their offspring may extend into later periods of development. Keenan-Miller, Hannen, and Brennan (2010), for example, studied a diverse sample of 710 families and found that a history of maternal depression, present prior to youth age 15, predicted higher levels of aggression in their children during the transition into adulthood (20 years of age). Given these results, it is critical to examine potential protective factors against childhood externalizing behaviors in early childhood.

*Risks for maternal depression.* Research examining risks for maternal depression indicates that mothers who are living in poverty are more likely to experience psychological problems than those mothers who are living above the poverty line (Lyons-Ruth et al., 2002). A meta-analysis conducted by Lorant et al. (2003) examined 60 studies looking at socioeconomic
status (SES) and depression. The authors found that those individuals in the lowest SES group were twice as likely to have a depressive episode as those in the highest SES group (Lorant et al., 2003). Rates of depression in low-income mothers with young children have been reported to be as high as 40% (Knitzer, 2007). Furthermore, factors present in settings characterized by poverty, may amplify the effects that depression in low-income mothers has on their children (Petterson & Friel, 2001). Given the increased risk for depression among low-income mothers, further attention to the mechanisms of association between maternal depression and child externalizing behaviors among low-income families is warranted.

As previously highlighted, the association between maternal depression and child externalizing behavior problems has been well documented, but not all children of depressed mothers exhibit problem behaviors. These individual differences suggest the presence of protective factors. Despite the apparent existence of protective factors, little is known about those factors associated with better childhood outcomes for the offspring of depressed mothers (Phares, Duhig, & Watkins, 2002). The role of the father may be one important protective factor, which has been understudied in the literature, particularly for low-income families. Hence, the proposed study aims to investigate the function of father involvement in two different roles. That is, the role that the father may play in potentially protecting his child against the negative effects associated with having a depressed mother (moderation), and the role that the father may play in potentially explaining the role of maternal symptoms of depression (mediation) in a high-risk sample of low-income African American mothers.

**Fathers and child development.** As previously stated, the father’s role in child development has largely been overlooked in research, a void most likely influenced by women historically being thought of as the child’s primary caretaker (Forste, 2002). However, in the
1940s and 1950s there was an increase in attention to the effects that a father’s absence may have on a child (particularly boys; Lamb & Tamis-Lemonda, 2003). This interest was fueled by the changes in the traditional American family structure following World War II, as well as the emerging idea that pathology could be a result of excess mothering (Lamb & Tamis-Lemonda, 2003). Despite this growing interest in fathers, the role of the father as a child caretaker continued to be perceived as minimal.

**Co-parenting.** With the feminist movement in the 1970s came the idea that the father should take on equal child rearing responsibilities, thus, the concept of co-parenting was formed (Pleck, 2004). Inherent in this idea was the acknowledgement that fathers are as capable as mothers in parenting children, a belief that continues to be held by many today.

The idea of what it means to be a father in American society has evolved over time. Fathers have been seen as moral teachers/disciplinarians, gender-role models, family providers and protectors, and currently include the ideal image of the father as being a nurturing co-parent (Pleck & Pleck, 1997; Sarkadi, Kristiansson, Oberklaid & Brenberg, 2008). Fatherhood research (albeit extremely limited) has paralleled these societal definitions of fatherhood. This body of research indicates that fathers influence their children’s development in multiple and unique ways. For example, they can directly influence them by interacting and being involved in their lives and indirectly influence them by affecting maternal behaviors (Lewis & Lamb, 2003).

**Father involvement.** A father’s level of involvement in his child’s life is typically measured through frequency of father-child contact, as well as engagement in father-child shared activities (Carlson & McLanahan, 2002). Such components to father involvement have been linked to a father’s residential status. Evidence suggests that when compared to resident fathers, non-resident fathers are involved less in their children’s lives (Cabrera et al., 2008). In the
United States, data indicate that close to 1/2 of children will live apart from their biological father at some point in their childhood (King, Harris, & Heard, 2004). Among African American children, the 2011 U.S. Census Bureau data indicate that 39% of African American children are currently living with both their mother and father, and that 50% are living with only their mothers.

Socio economic status (SES) has also been a factor shown to contribute to differences in levels of father involvement. For example, fathers of low SES status have been shown to be involved less in their child’s life when compared to those in higher SES groups (Hofferth, 2003). With regards to educational attainment (a specific component of SES), literature indicates that those fathers with greater amounts of formal education are involved more with their children than those fathers with less education (Roggman, Boyce, Cook, & Cook, 2002; Sorensen & Zibman, 2011). National public high school graduation rates (2003) reveal the existence of wide racial disparities, with 48% of African American male students graduating compared to 73% Caucasian male students (Miller & Bennett, 2011). With level of father involvement being linked to factors such as residential status and SES, father involvement (or lack of) is a poignant issue among low-income African American families.

As previously mentioned, there are a limited number of studies pertaining to fathering especially when compared to the vast amount pertaining to mothering. The significant challenges that researchers face when embarking on a study in the field of fatherhood most likely play a role in explaining this literature gap. Such challenges include, defining fathers, identifying fathers for contact, and locating and gaining cooperation of fathers (Mitchell et al., 2007). These challenges are particularly prominent among low-income, minority, and unmarried fathers (Coley, 2001). Mothers are the typical reporters on children and they are also the primary
source for researchers to gain identifying information regarding the child’s father (West, 2007). Obtaining such information pertaining to the child’s father may not be problematic in two-parent homes, however, in single-parent homes, mothers may be reluctant to identify the man for which the study aims to contact; also mothers may not have good contact information on this person (West, 2007). Additionally, once identification of the fathers occurs, the recruitment may bring difficulties as well and often requires several research assistants, a substantial budget, and ample participants (Mitchell et al., 2007). Because of these challenges, information pertaining to father involvement is often obtained from the child’s mother, which allows for greater numbers of low-income families, and therefore, may decrease nonresponse bias (Kalil, Zio, Guest, & Coley, 2005).

**Father involvement and child externalizing problems.** A variety of research suggests that children who lack the experience of a father’s meaningful involvement may be at an increased risk for externalizing challenges including substance abuse, aggression, and delinquency (Lamb, 2010). High levels of father involvement, measured as time spent with child in shared activities, during early childhood (i.e., preschool-age) have been linked with fewer externalizing behavior problems later in life (i.e., school-age; Aldous & Mulligan, 2002). Furthermore, father involvement has been shown to have a unique impact on child development. Amato and Rivera (1999) found that after controlling for level of mother involvement, father involvement (reported by fathers) was negatively related to mother reports of child externalizing behavior problems. Also, this finding was consistently found among the Latino, African-American, and Caucasian participants in the study.

Research in this realm is limited with regards to high-risk samples. However, among the few studies that have investigated this relationship with higher-risk samples, findings have
generally been consistent with those reported above (i.e., higher levels of father involvement have been associated with lower levels of child externalizing behaviors). For example, Choi and Jackson (2011) analyzed data from a sub-sample of 915 low-income African American families with non-resident fathers from the Fragile Families and Child Wellbeing study. Results showed that more frequent contact between fathers and their children was found to be associated with fewer child behavioral problems, as well as a higher quality of mothers’ parenting (thus highlighting the indirect influences of father involvement).

In another study using a high-risk sample of low-income adolescent mothers, authors investigated the nature and impact of the biological father’s involvement over the first 10 years of his child’s life (Howard, Lefever, Borkowski, & Whitman, 2006). Findings revealed that, after controlling for maternal risk factors (e.g., symptoms of psychological dysfunction), children with low amounts of father contact exhibited significantly more externalizing problems than children with higher amounts of father contact. Similarly, in a sample of low-income Head Start families, researchers investigated children who were with their fathers more than half of the time compared to children who were with their fathers less than half of the time (Harden et al., 2000). Findings revealed that children who spent less than half the time with their fathers were more likely to exhibit externalizing behavioral problems.

Among these few fatherhood studies with at-risk samples, findings are limited by the lack of multiple informants used for assessment of the child outcome variable. Specifically, child externalizing behaviors are measured either with parent or teacher reports only. Additionally, these studies do not take maternal depression directly into account and only sometimes control for it as part of a larger “maternal risk” variable (e.g., Howard et al., 2006).
**Father involvement as a potential moderator.** As previously detailed, the association between maternal depression and child externalizing behavior problems has been well documented. However, not all children of depressed mothers exhibit problem behaviors, suggesting the presence of protective factors. Despite the apparent existence of protective factors, little is known about the factors associated with better childhood outcomes for the offspring of depressed mothers (Phares et al., 2002). One potential protective factor is the involvement of the child’s father. Previous literature is limited in this regard, but those examining such an interacting relationship suggest that father involvement may act as a protective factor against the negative effects associated with having a depressed mother (Chang, Halpern, & Kaufman, 2007; Howard et al., 2006).

For example, in a large U.S. national sample, researchers found that over a 10-year period (i.e., birth through 10 years of age), higher levels of father involvement were associated with lower levels of child externalizing behaviors over time, and the effects of maternal depression on child externalizing behaviors varied by the level of the father’s involvement (Chang et al., 2007). The study concluded that the father’s involvement might have compensated for depressed mother’s parenting deficits, and in turn, reduced the risk for child externalizing behavior problems. The potential for father involvement to moderate the relationship between maternal depression and child externalizing behaviors has yet to be adequately studied in general. Furthermore, no other known studies besides the current study have investigated father involvement as a moderator of maternal depression and externalizing behaviors among a high-risk sample of low-income African American families with preschool-aged children. In addition to the need to examine father involvement as a moderator of the maternal depression-child
externalizing behaviors relationship, father involvement also needed to be examined as a predictor of maternal depression.

**Maternal depression as a potential mediator.** As previously discussed, greater father involvement has been shown to predict lower levels of externalizing behaviors in their offspring. However, it is not well understood if the primary factor accounting for the child’s behavioral outcomes is that of father involvement, or if there is another mediating factor that is potentially accounting for a significant portion of the outcome. For example, research indicates that a mother is less likely to experience depression when her child’s father is more involved in her child’s life (Rafferty, Griffin, & Robokos, 2010; Smith, Howard, & Centers for the Prevention of Child Neglect, 2008). Specifically, evidence suggests that with more father child contact, there is less maternal depression. Rafferty, Griffin, and Robokos (2010) conducted a longitudinal study examining the effects of family environmental risk factors (inadequate resources, insufficient care-giving support from child’s father, and high family conflict) on maternal depression. Researchers sampled a group of low-income mothers with children enrolled in Early Head Start programs. They found that a higher level of father child care-giving was associated with higher levels of maternal psychological well-being (i.e., less depression). Similar findings were revealed among a sample of racially and ethnically diverse families from various SES backgrounds (Smith et al., 2008). Findings from the Smith et al. study revealed that high levels of father involvement, when the child was 4 months of age, was associated with fewer depressive symptoms in the mother when the child was 6, 12, and 24 months.

Thus, previous literature indicates that mothers are less likely to be depressed when their child’s father is more involved than compared to when they are less involved. Given the well-established link between maternal depression and child externalizing behaviors, it is possible that
when fathers are more involved in their child’s lives, their children’s mother is less likely to be depressed as a result, which in turn, makes the child less likely to exhibit externalizing behavior problems. Once again, such a potential mediating relationship needs to be investigated among low-income African American families with preschool-aged children. Research is needed to determine whether or not father involvement functions as a predictor of maternal depression (with maternal depression as the mediator of the father involvement-child externalizing behaviors relationship), or as a moderator of the relation between maternal depression and child externalizing behaviors (or both). The current study adds value in that regard.

**Theoretical Framework for the Current Study**

When studying childhood psychopathology, it is beneficial to use theoretical perspectives from the field of developmental psychology. Ecological systems theory (Bronfenbrenner, 1979) conceptualizes human development as complex and multi-determined, influenced by the interaction between the individual characteristics of the child and the environment in which they develop. For young children, the primary and proximal environment is typically the family, and therefore, it is not surprising that data suggest parent variables play a large role in child developmental outcomes for they include both genetic and contextual influences (McCartney, 2006). According to ecological systems theory, the relations between a child and his/her parents are encompassed in the microsystem (i.e., the inner most level of Bronfenbrenner’s model). The mesosystem is the next layer for which the child’s microsystem is embedded, and it encompasses the links between microsystems (e.g., relationship between mother and father), which also act to influence the child.

A developmental-ecological systems model provides a useful conceptual framework for understanding the relations and interactions between parental variables and the exhibition of
child externalizing behavior problems. Thus, the current study employed such a perspective in understanding the hypothesized relationships between the variables. Specifically, previous research has suggested the presence of a causal relationship between fathers’ provision of support through child involvement and maternal depression (Howard et al., 2006; Malik et al., 2007). The benefits of a father being involved in his child’s life may act to decrease the mother’s level of stress, thus improving upon her well-being and making her less likely to experience symptoms of depression or to decrease any current symptoms. Therefore, this study is primarily focusing on the mesosystem and how each relationship (i.e., mother-child and father-child) affects the other. In order to better understand the development of such childhood outcomes as behavior problems, it is necessary to examining more than just microsystem level influences.

**Goals of the Present Study**

The purpose of the current study was to examine the relationship between maternal depression, father involvement, and externalizing behavior problems in 3 to 5 year old children across various social settings (home and preschool) in low-income African American families. Whereas both maternal depression and father involvement have been associated with child externalizing behaviors, few studies have investigated their potential interacting effects and/or underlying mechanisms of association. In addition to the aforementioned limits in the literature, an even greater gap exists with regards to the investigation of these three variables among low-income African American families. Thus, the current study contributes to the body of literature by addressing the empirical gaps regarding low-income African American populations.

The overall goal of this study was to investigate the relations between these three variables by comparing a moderation model to a mediation model. Additionally, the study
examined both models with two potentially different outcomes of child externalizing behaviors; that is, those externalizing behaviors reported by the child’s mother (parent report) and those externalizing behaviors reported by the child’s teacher. In the first set of models, father involvement was tested as a moderating variable to see if it altered the strength of the relationship between maternal depression (the predictor) and child externalizing behavior problems (the outcome). In the second set of models, maternal depression was tested as a mediating variable to see if it was a mechanism through which father involvement (the predictor) influenced the outcome of child externalizing behavior problems. These two models were then compared to one another to determine which provided the best fit to the data.

In addition to addressing the literature gap with regards to a low-income African American population, results from the following investigation also have potential importance in providing valuable information that could be used in the development of interventions specifically designed to address the needs of low-income families.

**Hypotheses**

Given the literature indicating the presence of moderators, or protective factors, associated with better childhood outcomes for the offspring of depressed mothers, it was hypothesized that father involvement would moderate the relationship between maternal depression and child externalizing behavior problems. In this first model, maternal depression was hypothesized to predict child externalizing behavior problems, and this relationship was predicted to vary based on level of father involvement. In other words, maternal depression was expected to adversely affect child behavior more strongly under conditions of low father involvement compared to conditions of high father involvement. Figure 1 and 2 depict the hypothesized moderation models and reflect the following predictions that were made:
H1: Maternal depression will be positively related to parent and teacher rated child externalizing behavior problems.

H2: Father involvement will be negatively related to parent and teacher rated child externalizing behavior problems.

H3: Father involvement will moderate the effects of maternal depression on parent and teacher rated child externalizing behavior problems; specifically, it is predicted that the relation between maternal depression and externalizing problems will be stronger for children with less involved fathers.

The second hypothesized set of models was driven by findings indicating that greater father involvement is associated with lower levels of child externalizing behaviors, and that mothers are less likely to be depressed when their child’s father is more involved than when they are less involved. Given these two findings, in addition to the well-established link between maternal depression and child externalizing behaviors, it was hypothesized that father involvement would have an indirect and direct effect on child externalizing behaviors. For the indirect path, it was expected that greater levels of father involvement would predict lower levels of maternal depression and in turn, less parent and teacher rated child externalizing behavior problems. It was also hypothesized that higher levels of father involvement would directly predict lower levels of parent and teacher rated child externalizing behavior problems. Figure 3 and 4 depict the hypothesized mediation models and reflect the following predictions:

H4: Father involvement will be negatively related to maternal depression.

H5: Father involvement will be negatively related to parent and teacher rated child externalizing behavior problems.
H6: Maternal depression will partially mediate the relationship between father involvement and parent and teacher rated child externalizing behavior problems.

**Methods**

**Participants**

The sample was drawn from an existing larger data set of mothers and children enrolled in Head Start. The sample consisted of 337 women who were the parent or primary caregiver of at least one child attending a Head Start program in Detroit, Michigan. Mothers ranged in age from 18 to 52 years (mean age = 29.1 years, $SD = 6.5$) and were predominantly African American (98% African American). Children ranged in age from 3 to 5 years (mean age = 45.4 months, $SD = 6.7$ months). The majority of the mothers were single (73%), while 19% reported being married, 5% reported living with their partner, and 3% reported being divorced or widowed. In terms of educational attainment, 60% of mothers completed high school or less, and 39% reported some college or more. The number of children mothers reported having ranged from 1 to 8 (mean = 2.6, $SD = 1.5$). With regards to household income, the majority (68%) reported annual incomes below $15,000 per year. Further demographic characteristics of the sample can be found in Table 1.
Table 1

Demographic Characteristics of Participants

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s Age</td>
<td>$M = 29.1$ years, $SD = 6.5$, Range = 18-52 years</td>
</tr>
<tr>
<td>Target Child’s Age</td>
<td>$M = 45.4$ months, $SD = 6.7$ months, Range = 3-5 years</td>
</tr>
<tr>
<td>Number of Children in home</td>
<td>$M = 2.60$, $SD = 1.50$, Range = 1-8</td>
</tr>
<tr>
<td>Child’s Gender</td>
<td>50.9% Boys, 49.1% Girls</td>
</tr>
<tr>
<td>Race</td>
<td>98% African American, .3% Hispanic or Latino, 1.7% Multiracial</td>
</tr>
<tr>
<td>Education</td>
<td>.3% Elementary or Less, .7% Middle School, 60% High School, 39% Some College or More</td>
</tr>
<tr>
<td>Marital Status</td>
<td>73% Single, 19% Married, 5% Living with Partner, 3% Divorced or Widowed</td>
</tr>
<tr>
<td>Annual Income</td>
<td>34% &lt; $5,000, 20% $5,000 - $9,999, 14% $10,000 - $14,999, 13% $15,000 - $19,999, 14% $20,000 - $29,999, 4% $30,000 - $49,999, 1% $50,000 or more</td>
</tr>
</tbody>
</table>

Procedure

The current study utilized secondary data gathered from a larger study designed to examine the role of environmental tobacco exposure on the cognitive development of preschool
This study took part in two phases. In phase 1, mothers completed surveys composed of multiple self-report questionnaires. Questionnaires provided information pertaining to demographics, family characteristics, current levels of depressive symptoms, father involvement, and child behavioral functioning. Mothers were recruited by researchers for voluntary participation in the study at monthly Head Start parent meetings, while either dropping off or picking up their child from school, and with flyers posted at Head Start locations (see Appendix A). The surveys took approximately 45 minutes to complete and the participating mothers were paid $10.00 in cash for their time. Phase 1 of the study took place in October through December of the 2008 school year (see Appendix B for research informed consent).

In phase 2 of the study, 204 mother-child pairs were randomly selected from the original 337 participants to complete additional measures (including a measure of teacher reported child behavioral functioning). If randomly selected, mothers from phase 1 were first sent a letter via post mail and then directly contacted via telephone to request participation in the second phase of the study. Phase 2 took place from January through April of the same school year as phase 1 (i.e., 2009). Because phase 2 included multiple observational measures and was more time intensive than phase 1, mothers were paid $40.00 in cash for their participation. See Appendix C for the recruitment letter, recruitment telephone script, teacher instructions, and research consent.

Measures from the described data set that were relevant to the current study goals were utilized. The specific measures used in the current study are described below.

**Measures**

**Demographics.** Participants completed a brief demographic characteristics questionnaire. Question items pertained to the participant’s age, race, educational status, marital status, annual income, number of children, and child’s age.
**Maternal depression.** The presence and severity of maternal depressive symptoms was measured using The Center for Epidemiologic Studies Depression 10 Scale (CESD-10; Andresen, Malmgren, Carter, & Patrick, 1994; Randlof, 1977; see Appendix D). The CESD-10 is a screening measure for adults and adolescents developed to identify current depressive symptomatology related to clinical depression (e.g., Major Depressive Disorder) or subsyndromal depression (i.e., when symptoms of depression do not meet diagnostic criteria for a major depressive episode; Randloff, 1977).

The 10 item self-report version of the scale was used, which asks the mother about the frequency of experiencing depressive symptoms during the past week such as: depressed mood, feelings of guilt, worthlessness and helplessness, psychomotor retardation, loss of appetite, and sleep difficulties. The measure uses a 4-point ordinal scale: (rarely or none of the time) less than 1 day = 1, (some or a little of the time) 1-2 days = 2, (occasionally or a moderate amount of the time) 3-4 days = 3, (most or all of the time) 5-7 days = 4. A summary score is calculated and scores range from 0-30, with higher scores indicating increased maternal depression. This scale correlates highly with other depression scales such as the Sung scale ($r = .90$) and the Beck Depression Inventory ($r = .81$; Myers & Weissman, 1980). Reliability for the CES-D has been reported to be good in both community and patient samples, alpha = .89 and .90, respectively (Randloff, 1977). Internal consistency ($\alpha$) for the CESD-10 of the current sample was estimated to be .79.

**Father involvement.** Father involvement was assessed based on maternal report, and therefore, this measurement represents maternal perceptions of father involvement. Maternal perceptions of father involvement was measured using a single item that asked the mothers to report on their child’s father’s level of overall involvement in the child’s life using a 5-point
scale. The item read, “Since the child’s birth their father has been involved in their life:” (not involved any of the time) coded as 0, (very little) coded as 1, (off and on) coded as 2, (most of the time) coded as 3, and (always) coded as 4. Empirical findings suggest that mother reports of father involvement can be used for reliable father involvement measurement (Hernandez & Coley, 2007). Hernandez and Coley (2007) assessed the internal reliability of fathers’ versus mothers’ reports of father involvement among low-income African American families. These authors found similar reliable composites across father versus mother reports of father involvement and across resident versus nonresident fathers.

**Child externalizing behavior problems.** Due to the associations between depression and negative biased perceptions, depressed mothers’ reports of their child’s functioning have been found to be negatively biased when compared to other informants (Connell & Goodman, 2002; Goodman et al., 2011). Additionally, evidence suggests that children may exhibit setting specific levels of behavior problems (e.g., home versus school; Achenbach, 2011). Therefore, this study utilized multiple data sources (i.e., mother and teacher) for the child outcome variable, parent-rated externalizing behavior problems (home), and teacher rated externalizing behavior problems (school).

Mothers completed the Child Behavior Checklist (CBCL) for children ages 1.5 to 5 years and teachers completed the Caregiver Teacher Report Form (C-TRF) for children ages 1.5 to 5 years (Achenbach & Rescorla, 2000; see Appendix E). Both the CBCL and the C-TRF have been standardized on large samples of children, and have been widely used with ethnically and racially diverse groups to measure child behavioral and adjustment problems. Mothers and teachers rated the extent to which each behavior described the child using a 3-point likert scale: (not true) coded as 0, (somewhat or sometimes true) coded as 1, or (very or often true) coded as
2. Six subscales are derived from these ratings: aggressive behaviors, destructive behaviors, anxious/depressed, withdrawn, sleep problems, and somatic problems. Age normed $T$-scores for an externalizing behaviors index score were calculated from the aggressive and destructive behaviors subscales. Scores on this index range from 30 to 100, with higher scores indicating increased behavioral problems. Achenbach (1991) reported acceptable criterion validity and excellent test-retest reliability for both the CBCL and the C-TRF with alpha coefficients above .90 for each scale. For the current sample, the internal consistency ($\alpha$) for the CBCL and the C-TRF was estimated to be .96 and .94 respectively.

**Data Analysis**

Statistical analyses were conducted using SPSS 20 (SPSS Inc., 2011) and Mplus (Muthén & Muthén, 2009) computer software. Path analysis (PA) implemented through Mplus, was used to test the proposed moderation and mediation models (Figures 1, 2, 3, and 4). PA is a structural equation modeling (SEM) technique used to analyze structural models with observed variables. The PA model specifies theory driven hypothesized causal relations among observed variables (i.e., endogenous and exogenous variables; Anderson & Gerbing, 1988). It provides model fit information on the consistency of the hypothesized model to the data. As with all SEM techniques, the basic statistic of PA is covariance. Thus the analysis aims to explain correlation patterns among variables and to explain the variance within the specified model. PA offers advantages for mediation and moderation analysis over the more traditional methods, including the ability to use multiple outcome variables, while also fixing certain paths at zero.

**Assumptions of path analysis.** When using PA as a confirmatory technique, the full model must be specified a priori to analysis. Additionally, the number of parameters needed to be estimated must be known. Sample size is also important in PA because it relates to the
stability of the parameter estimates. According to Schreiber and colleagues (2006), there is no exact rule for sample size, but general consensus conveys that 10 participants per estimated parameter is needed (Schreiber, Stage, King, Nora, & Barlow, 2006). For the current study, up to 7 parameters were estimated. Thus, a sample of at least 70 participants was needed, a minimum that is much smaller than the present study’s sample size.

To determine the appropriate estimation technique to be used in SEM, data needed to be examined prior to analysis for multivariate normality. That is, many of the default estimation techniques used in Mplus (e.g., maximum likelihood, generalized least squares) require multivariate normality. If such assumptions of data normality are not met, robust statistical estimators can be used to produce valid fit indices despite data non-normality.

**Preliminary analyses.** Preliminary analyses were conducted using SPSS computer software. Variables were first screened and tested for assumptions of normality and linearity using SPSS Frequencies and Explore. Participants with missing data were also identified and compared to participants without missing data. Multivariate outliers were screened for using Mahalanobis Distance. Bivariate correlations were run to examine the patterns of relations between the demographic characteristics, independent, and dependent variables. Relevant demographic characteristics were also examined as possible covariates.

**Path analysis.** The expected relations of the hypothesized moderation and mediation models were specified with PA in Mplus. Demographic characteristics found to be related to model variables at $p < .20$ were entered into the model and controlled for. The model parameters were estimated using Maximum Likelihood Robust (MLR). Missing data were handled using Full Information Maximum Likelihood (FIML). To estimate goodness of fit, the following measures were used: The chi-squared test of model fit ($X^2$), the comparative fit index (CFI), root
mean squared error of approximation (RMSEA), and the standardized root mean squared residual (SRMR). If the $X^2$ test statistic is large and statistically significant, then the indication is that the model poorly fits the data. For the CFI, the suggested value for acceptable fit is .90 or higher (Bentler, 1990), and for the RMSEA and the SRMR the suggested value is less than or equal to .08 (MacCallum, Browne, & Sugawara, 1996).

After examination of fit indexes and parameter estimates, the modification indices (MIs) were reviewed for indications of possible re-specifications to improve model fit. Non-significant parameter estimates of demographic variables were also deleted in the interest of scientific parsimony.

Finally, when the data fit more than one model, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) predictive fit indexes were used to compare the models. Predictive fit indexes such as the AIC and the BIC are used in SEM to compare non-nested models estimated with the same data. The model with the smallest AIC and BIC indicate a better fit to the data (Burnham & Anderson, 2004).

**Results**

**Preliminary Analyses**

Univariate outliers were identified on two of the model variables. Maternal depression (CESD-10) had four outliers and parent-rated child externalizing behavior problems (CBCL) had one outlier. Six multivariate outliers were detected using Mahalanobis $D^2$. All outliers were Winsorized. Results from the frequency analysis of model variables, post Winsorizing of outliers, can be seen in Tables 2 – 5.
Table 2

*Frequencies of Maternal Depression*

<table>
<thead>
<tr>
<th>CESD-10 Total Score</th>
<th>n</th>
<th>Percent</th>
<th>Descriptive Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total score = &lt; 10</td>
<td>253</td>
<td>75.4%</td>
<td>Normal Range</td>
</tr>
<tr>
<td>Total score = ≥ 10</td>
<td>84</td>
<td>24.6%</td>
<td>Clinically Significant Depressive Symptoms</td>
</tr>
</tbody>
</table>

Table 3

*Frequencies of Father Involvement*

<table>
<thead>
<tr>
<th>Measure Item</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s father is involved:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not involved any of the time</td>
<td>34</td>
<td>10.2%</td>
</tr>
<tr>
<td>Involved very little</td>
<td>28</td>
<td>8.4%</td>
</tr>
<tr>
<td>Involved off and on</td>
<td>46</td>
<td>13.9%</td>
</tr>
<tr>
<td>Involved most of the time</td>
<td>52</td>
<td>15.7%</td>
</tr>
<tr>
<td>Always involved</td>
<td>172</td>
<td>51.8%</td>
</tr>
</tbody>
</table>

Table 4

*Frequencies of Parent-rated Child Externalizing Behavior Problems*

<table>
<thead>
<tr>
<th>CBCL Externalizing Behaviors Index Score</th>
<th>n</th>
<th>Percent</th>
<th>Descriptive Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-score = &lt; 60</td>
<td>298</td>
<td>88.7%</td>
<td>Normal Range</td>
</tr>
<tr>
<td>T-score = 60 - 63</td>
<td>16</td>
<td>4.8%</td>
<td>Borderline Clinical Range</td>
</tr>
<tr>
<td>T-score = ≥ 64</td>
<td>22</td>
<td>6.5%</td>
<td>Clinically Significant Range</td>
</tr>
</tbody>
</table>

Table 5

*Frequencies of Teacher Rated Child Externalizing Behavior Problems*

<table>
<thead>
<tr>
<th>C-TRF Externalizing Behaviors Index Score</th>
<th>n</th>
<th>Percent</th>
<th>Descriptive Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-score = &lt; 60</td>
<td>162</td>
<td>94.2%</td>
<td>Normal Range</td>
</tr>
<tr>
<td>T-score = 60 - 63</td>
<td>8</td>
<td>4.7%</td>
<td>Borderline Clinical Range</td>
</tr>
<tr>
<td>T-score = ≥ 64</td>
<td>2</td>
<td>1.2%</td>
<td>Clinically Significant Range</td>
</tr>
</tbody>
</table>
The relatively low frequencies of both clinically significant child externalizing behavior problems and maternal depressive symptoms is worth noting. As previously discussed, the study’s sample was taken from a high risk population of low-income minority families where, given previous literature (Qi & Kaise, 2003), such frequencies would be expected to be much higher.

Significant skewness was also indicated on all of the model variables: (skewness/standard error of skewness) father involvement (-.96/.13), maternal depression (1.11/.133), parent-rated externalizing behavior problems (.617/.133), and teacher rated externalizing behavior problems (.82/.19). Significant kurtosis was detected on two of the model variables (i.e., father involvement and parent-rated externalizing behavior problems). Such patterns of data non-normality violate the assumptions of multivariate normality required for many of the estimation techniques used in SEM. Therefore, a robust statistic was used in Mplus as an estimation technique that would still produce valid goodness-of-fit indices despite data non-normality (i.e., Maximum Likelihood Robust; MLR).

Preliminary analyses also revealed that there were missing data on three of the model variables and three of the demographic variables in the data set. Of the 337 participants, 29 had missing data. Father involvement was missing for five participants, maternal depression was missing for one participant, parent-rated externalizing behavior problems was missing for one participant, education was missing for six participants, marital status was missing for two participants, and income was missing for 18 participants. Traditional methods for handling missing data (e.g., listwise deletion) can be problematic in structural equation modeling (e.g., biased parameter estimates) and literature suggests the use of full information maximum-likelihood estimation (FIML; Enders & Bandalos, 2001; Schafer & Graham, 2002). FIML
estimates each parameter directly by using all available data and does not impute missing values (Enders & Bandalos, 2001). As previously mentioned, the robust statistical estimator of MLR was used to account for the non-normality of the data. Missing data are handled in MLR by default with FIML.

Bivariate correlations were also run to examine the patterns of relations between the demographic characteristics, independent, and dependent variables. Relevant demographic characteristics such as mother's age, education, income, marital status, child's age, and gender were examined as possible covariates. Table 6 displays zero order correlations, means, and standard deviations for the demographic, independent, and dependent variables. The following demographic characteristics were found to be significantly related to the model variable of father involvement at $p < .20$: mother’s education, income, and marital status. In addition to these variables significance in the data, previous literature also provided support for the decision to include them in the models. Consequently, the variables of education, income, and marital status were added to the models and controlled for.

More specifically, mother’s level of education was significantly positively related to father involvement. As mother’s education increased, so did father’s level of involvement. Previous research links educational attainment to father involvement in the aforementioned direction (e.g., Roggman et al., 2002; Miller & Bennett, 2011; Sorensen & Zibman, 2011), and therefore, a path was added from education to father involvement in the hypothesized models.

Income was also significantly positively related to father’s level of involvement. As income increased, so did father involvement. Research indicates that family income may be a factor in determining the quantity of father involvement, particularly among low-income African American families (Carlson & McLanahan, 2002). Additionally, evidence supports the
directionality of the relationship found in the data between these variables, and therefore, a path was added to the hypothesized models from income to father involvement (Carlson & McLanahan, 2002).

Finally, marital status was significantly related to father involvement. When compared to those mothers who reported being either married or living with their partner, those mothers who reported being single, widowed, or divorced were more likely to also report lower levels of father involvement. Evidence suggests that marital/residential status plays a role in African American father’s level of involvement with their children, with non-resident fathers being less involved when compared to resident fathers (Cabrera et al., 2008). Consequently a new path was added to the hypothesized models from marital status to father involvement.

Zero order correlations also showed significant relations between most model variables. That is, significant relations were found between all model variables except the variable of teacher rated child externalizing behavior problems. However, teacher rated child externalizing behavior problems were significantly positively related to parent-rated child externalizing behavior problems. Significant negative relations were found between father’s level of involvement and maternal depression, and parent-rated child externalizing behavior problems. Mothers who reported higher levels of father involvement were more likely to report lower levels of maternal depression and fewer child externalizing behavior problems. Maternal depression was significantly positively related to parent-rated child externalizing behaviors problems. Mothers who reported more depressive symptoms were more likely to report more child externalizing behavior problems.
Table 6
Zero Order Correlations, Means, and Standard Deviations Among Demographic and Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mother’s Age</td>
<td>29.11</td>
<td>6.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Child’s Age</td>
<td>3.44</td>
<td>.54</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3. Gender(^a)</td>
<td>1.49</td>
<td>.50</td>
<td>.02</td>
<td>.15**</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. Education</td>
<td>3.38</td>
<td>.52</td>
<td>-.07</td>
<td>.08</td>
<td>-.06</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5. Marital Status(^b)</td>
<td>1.24</td>
<td>.43</td>
<td>-.002</td>
<td>.01</td>
<td>.12*</td>
<td>.16**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6. Income</td>
<td>2.73</td>
<td>1.68</td>
<td>-.03</td>
<td>.07</td>
<td>.03</td>
<td>28**</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Father</td>
<td>3.90</td>
<td>1.38</td>
<td>-.02</td>
<td>.03</td>
<td>-.03</td>
<td>.14*</td>
<td>.25**</td>
<td>.26**</td>
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</tbody>
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Involvement

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>7</th>
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</thead>
<tbody>
<tr>
<td>8. Mat. Depression</td>
<td>7.14</td>
<td>4.93</td>
<td>-.10</td>
<td>.04</td>
<td>.06</td>
<td>-.02</td>
<td>-.06</td>
<td>-.09†</td>
<td>-.25**</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9. P. Ext. Behaviors</td>
<td>44.89</td>
<td>11.3</td>
<td>.10</td>
<td>.03</td>
<td>-.01</td>
<td>-.01</td>
<td>-.09</td>
<td>-.04</td>
<td>-.13*</td>
<td>.36**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. T. Ext.</td>
<td>44.42</td>
<td>7.96</td>
<td>.01</td>
<td>.003</td>
<td>-.12</td>
<td>-.10</td>
<td>-.03</td>
<td>-.02</td>
<td>-.07</td>
<td>.03</td>
<td>.16*</td>
<td></td>
</tr>
</tbody>
</table>

Behaviors

\(^a\) 1 = male 2 = female; \(^b\) 1 = single, widowed, or divorced 2 = married or living with partner; Mat. Depression = Maternal Depression, P. Ext. Behaviors = Parent-rated Child Externalizing Behavior Problems, T. Ext. Behaviors = Teacher Rated Child Externalizing Behavior Problems.

\(\dagger p < .10\) \(\ast p < .05\) \(\ast\ast p < .01\) \(\ast\ast\ast p < .001\)
Path Analysis

The hypothesized models. Using path analysis in Mplus, two hypothesized moderation models and two hypothesized mediation models were examined. The models included theoretically relevant demographic variables and the model variables of father involvement, maternal depression, and child externalizing behavior problems. The hypothesized models are depicted in Figures 1, 2, 3, and 4.

Figure 1 illustrates the hypotheses that father involvement would moderate the relationship between maternal depression and parent-rated child externalizing behavior problems. Figure 2 illustrates the hypotheses that father involvement would moderate the relationship between maternal depression and both parent and teacher rated child externalizing behavior problems. The two outcomes of parent-rated child externalizing behavior problems and teacher rated child externalizing behavior problems were also hypothesized to covary with one another. In both of the hypotheses reflected in Figure 1 and 2, maternal depression was expected to predict child behavior problems, and this relationship was predicted to vary based on level of father involvement.

Figure 2 illustrates the hypotheses that father involvement would have a direct relationship to parent-rated child externalizing behavior problems and an indirect relationship through maternal depression. Thus, it was predicted that maternal depression would partially mediate the relationship between father involvement and parent-rated child externalizing behavior problems. For the indirect path, it was expected that greater levels of father involvement would predict lower levels of maternal depression and in turn, less parent-rated child externalizing behaviors. It was also hypothesized that higher levels of father involvement would directly predict lower levels of parent-rated child externalizing behaviors. Figure 4
illustrates the hypotheses that father involvement would have a direct relationship to both parent
and teacher rated child externalizing behavior problems and an indirect relationship through
maternal depression. Thus, it was predicted that maternal depression would partially mediate the
relationship between father involvement and both parent and teacher rated child externalizing
behavior problems. For the indirect path, it was expected that greater levels of father
involvement would predict lower levels of maternal depression and in turn, less parent and
teacher rated child externalizing behaviors. It was also hypothesized that higher levels of father
involvement would directly predict lower levels of parent and teacher rated child externalizing
behaviors. The two outcomes of parent-rated child externalizing behavior problems and teacher
rated child externalizing problems were also predicted to covary with one another.

The moderation models. The first moderation model tested (Figure 5) had one outcome,
parent-rated child externalizing behaviors problems. This model poorly fit the data \(X^2(5) =
225.13, p = .00; \text{CFI} = .34; \text{RMSEA} = .36; \text{SRMR} = .07; \text{AIC} = 10399.64; \text{BIC} = 10437.84\].
Significant direct paths at \(p < .001\) were found from the demographic variables of income and
marital status to father involvement. All of the other estimated paths in the model were found to
be non-significant. That is, paths from maternal depression, father involvement, and the
interaction term of maternal depression and father involvement to parent-rated child
externalizing behavior problems were found to be non-significant. Also, the path from the
demographic variable of education to father involvement was found to be non-significant.
Modification indices (MIs) were examined for indications of possible adjustments to improve
model fit. There were no indications of model adjustments to be made. See Figure 5 for
standardized path coefficients of this tested moderation model. The model was run again
without the interaction term to test the two direct paths from maternal depression and father
involvement to parent-rated child externalizing behavior problems (H1 and H2). Without the interaction term, the model poorly fit the data \( X^2(4) = 20.82, p = .00; CFI = .82; RMSEA = .11; SRMR = .05; AIC = 7775.65; BIC = 7810.03 \). However, the path from maternal depression to parent-rated child externalizing behavior problems was significant \( p < .001 (\beta = .35) \). The path from father involvement to parent-rated child externalizing behavior problems was non-significant \( p = .43 (\beta = -.05) \).

The second moderation model tested (Figure 6) included the two outcomes of parent and teacher rated child externalizing behavior problems. This model also poorly fit the data \( X^2(8) = 265.79, p = .00; CFI = .30; RMSEA = .31; SRMR = .06; AIC = 11607.29; BIC = 11617.66 \). Significant paths at \( p < .001 \) were found from the demographic variables of income and marital status to father involvement. Also, the two outcomes of parent-rated child externalizing behavior problems and teacher rated child externalizing behavior problems significantly covaried with one another at \( p < .05 \). All of the other estimated paths in the model were found to be non-significant. That is, paths from maternal depression, father involvement, and the interaction term of maternal depression and father involvement to both parent and teacher rated child externalizing behavior problems were found to be non-significant. Also, the path from the demographic variable of education to father involvement was found to be non-significant.

Examination of the MIs indicated no possible adjustments to improve model fit. See Figure 3a for standardized path coefficients of this tested moderation model. The model was run again without the interaction term to test the two direct paths from maternal depression and father involvement to parent and teacher rated child externalizing behavior problems (H1 and H2). Without the interaction term, the model poorly fit the data \( X^2(7) = 23.07, p = .00; CFI = .82; RMSEA = .08; SRMR = .05; AIC = 8981.46; BIC = 9034.94 \). However, the path from maternal
depression to parent-rated child externalizing behavior problems was significant at $p < .001$ ($\beta = .35$). Conversely, the path from maternal depression to teacher rated child externalizing behavior problems was non-significant at $p = .84$ ($\beta = .02$). The paths from father involvement to parent and teacher rated child externalizing behavior problems were non-significant at $p = .43$ ($\beta = -.05$) and $p = .55$ ($\beta = -.06$), respectively.

The mediation models. The first mediation model tested (Figure 7) had one outcome, parent-rated child externalizing behavior problems. This model adequately fit the data [$X^2(6) = 1.77$, $p = .94$; CFI = 1.00; RMSEA = .00; SRMR = .01; AIC = 7747.89; BIC = 7793.74]. Significant direct paths at $p < .001$ were found from father involvement to maternal depression, maternal depression to parent-rated child externalizing behavior problems, income to father involvement, and marital status to father involvement. The indirect path from father involvement to parent-rated child externalizing behavior problems through maternal depression was also found to be significant at $p < .001$. Non-significant paths included the direct paths from father involvement to parent-rated child externalizing behavior problems ($p = .36$) and the path from education to father involvement ($p = .32$). Given that the original correlation between father involvement and parent-rated child externalizing behaviors was significant [$r(331) = -.13$, $p < .05$], this model provides support for full mediation. See Figure 7 for standardized path coefficients.

Examination of MI’s indicated no possible model adjustments to be made. In the interest of scientific parsimony, the non-significant path from the demographic variable of education to father involvement was removed and the model was re-tested (see Figure 8). The adjusted model provided a better fit to the data with smaller AIC and BIC indexes [$X^2(4) = 1.85$, $p = .76$; CFI = 1.00; RMSEA = .00; SRMR = .01; AIC = 7273.97; BIC = 7315.99]. As previously mentioned,
predictive fit indexes such as the AIC and the BIC can be used in SEM to compare non-nested models estimated with the same data. The model with the smallest AIC and BIC indicate a better fit to the data.

The second mediation model tested (Figure 9) included two outcomes, parent and teacher rated child externalizing behavior problems. This model adequately fit the data \[X^2(9) = 4.88, p = .84; \text{CFI} = 1.00; \text{RMSEA} = .02; \text{SRMR} = .02; \text{AIC} = 8953.74; \text{BIC} = 9018.69\]. Significant direct paths at \(p < .001\) were found from father involvement to maternal depression, maternal depression to parent-rated child externalizing behavior problems, income to father involvement, and marital status to father involvement. The indirect path from father involvement to parent-rated child externalizing behavior problems through maternal depression was also found to be significant at \(p < .001\). Finally, parent-rated child externalizing behavior problems was found to significantly covary with teacher rated child externalizing behavior problems at \(p < .05\). Non-significant paths included the direct paths from father involvement to both parent and teacher rated child externalizing behavior problems, from maternal depression to teacher rated child externalizing behavior problems, and from education to father involvement. The indirect path from father involvement to teacher rated child externalizing behavior problems through maternal depression was also found to be non-significant. See Figure 9 for standardized path coefficients.

Examination of MIs indicated no possible model adjustments to be made. In the interest of scientific parsimony, the non-significant path from the demographic variable of education to father involvement was removed and the model was re-tested (see Figure 10). The adjusted model provided a better fit to the data with smaller AIC and BIC indexes \[X^2(6) = 2.37, p = .88; \text{CFI} = 1.00; \text{RMSEA} = .00; \text{SRMR} = .01; \text{AIC} = 8479.82; \text{BIC} = 8540.94\].
Discussion

The purpose of the current study was to examine the relationship between maternal depression, father involvement, and externalizing behavior problems in 3 to 5 year old children across various social settings (home and preschool) in low-income African American families. Whereas both maternal depression and father involvement have been associated with child externalizing behaviors, few studies have investigated their potential interacting effects and/or underlying mechanisms of association. In addition to the aforementioned limits in the literature, an even greater gap exists with regards to the investigation of these three variables among low-income African American families. Thus, the current study contributes to the body of literature by addressing the empirical gaps regarding low-income African American populations.

In the first set of models tested, it was hypothesized that father involvement would moderate the relationship between maternal depression and child externalizing behavior problems. In the second set of models tested, it was hypothesized that maternal depression would partially mediate the relationship between father involvement and child externalizing behavior problems. The overall goal of this study was to investigate the relations between father involvement, maternal depression, and child behavior problems by comparing a moderation model to a mediation model. Results from the current study offer greater support for a mediational process. The results from each of these approaches are discussed below.

The Moderation Models

The hypothesis that father involvement would moderate the relationship between maternal depression and child externalizing behavior problems was rejected. Results from the testing of both hypothesized moderation models produced poor model fit results (i.e., significant $X^2$, CFI < .90, and RMSEA and SRMR > .08). Findings failed to produce a significant
interaction between father involvement and maternal depression. Thus, the third hypothesis that father involvement would moderate the effects of maternal depression on parent and teacher rated child externalizing behavior problems was rejected. Since the interaction term was not significant, the models were run again without the interaction term to specifically test the direct paths between maternal depression, father involvement, and child externalizing behavior problems. A significant path was found from maternal depression to parent-rated child externalizing behavior problems, thus providing support for the first hypothesis. The direct path from father involvement to behavior problems was not significant.

Although previous research has suggested that father involvement may serve as a protective factor for children against the negative effects associated with having a depressed mother (Chang et al., 2007; Howard et al., 2006; Mezulis, Hyde, & Clark, 2004), these data do not support this claim. This unexpected result could be a reflection of the current study’s measures of mostly maternal self-report. That is, previous studies with findings of a significant interaction between father involvement and maternal depression included father self-report or child self-report measures of father involvement (e.g., Mezulis et al., 2004, Chang et al., 2007). Another possible reason for this study’s findings could be that the measure of father involvement employed did not adequately capture the essence or quality of father involvement that has been found to moderate the effects of maternal depression on child behavioral outcomes (Chang et al., 2007). Finally, it could also be that in this particular sample, father involvement better fits into a mediation model as a predictor of maternal depression, which is further discussed next.

The Mediation Models

Results from the path analysis conducted with the mediation models, produced significant findings that partially supported study hypotheses. The model that provided the best fit to the
data (i.e., non-significant $\chi^2$, CFI $\geq .90$, RMSEA and SRMR $\leq .08$, and the smallest AIC and BIC predictive fit indexes of all the tested models) included the hypothesized relationships along with the inclusion of marital status and income level as predictors of father involvement.

Therefore, with regards to the study’s hypotheses, analyses produced results that support a mediation hypothesis. Although the originally hypothesized partial mediation hypothesis was not supported, the data do support a full mediation model. More specifically, the data suggested that maternal depression fully mediates the relationship between father involvement and parent-rated child externalizing behavior problems. Mothers who reported fathers as more involved reported fewer depressive symptoms, which in turn predicted fewer maternal reported child externalizing behavior problems. Bivariate correlations show that the relationship between father involvement and externalizing behavior problems was significant. However, in the mediation path analysis, this relationship was no longer significant, while the indirect effect was significant. This full mediation only took place with the outcome of parent-rated child externalizing behavior problems and not with the teacher rated outcome.

The significant indirect relationship between father involvement and parent-rated child externalizing behavior problems through maternal depression was one of the most important conclusions of this study. This finding offers some insight into the underlying mechanism of association (full mediation through maternal depression) between these two variables and is therefore of great value. As previously discussed, research suggests that children who lack a father’s involvement in their life are at an increased risk for externalizing behavioral problems (Amato & Rivera, 1999; Choi & Jackson, 2011; Lamb, 2010). However, this relationship is not well understood. Specifically, it has been unclear in previous literature if the primary factor accounting for the child’s behavioral outcomes is that of father involvement, or other mediating
factors accounting for a significant portion of the outcome. Findings from the current study suggest that maternal depression is one mechanism that can explain the negative association between father involvement and child externalizing behavior problems among low-income African American families.

That being said, none of the predicted paths to the outcome of teacher rated child externalizing behavior problems were found to be significant in any of the models tested. One possible explanation for this result is that the preschool children in the sample whose teachers rated their behavior, exhibited more problematic behaviors while at home or in their mother’s care, than when they were at school with their teacher. This inference is supported by evidence that suggests that preschool-aged children may exhibit setting-specific levels of behavior problems (e.g., home versus school; Achenbach, 2011). However, it is also possible that some mothers may have biased reports on the measure of their child’s behavioral difficulties (i.e., CBCL). For example, previous studies have found that when compared to other informants, depressed mothers’ reports of their child’s functioning can be negatively biased and partially account for the relationship between the two variables (Connell & Goodman, 2002; Goodman et al., 2011). Thus, it is possible that the parent reports of externalizing behavior problems in this study have questionable reliability. Although the correlation between a mother’s and teacher’s reports were significant and offer some evidence of reliability, the relationship is relatively weak \( r(170) = .16, p < .05 \). Also, it is noteworthy that the frequency analyses indicated a pattern of generally low endorsement of mother’s depressive symptoms and child behavior problems. Such findings were unexpected given the nature of the study’s high-risk sample. Future research is needed for a better understanding of this phenomenon.
When interpreting the valuable findings reported in this study, one possible explanation can be seen through the two significant direct relationships found in the mediation models (i.e., father involvement to maternal depression and maternal depression to parent-rated child externalizing behavior problems). More specifically, there was consistent support for the hypothesis that father involvement would be directly negatively related to maternal depression, as this relationship was found to be statistically significant in all mediation models tested. Thus, as mothers reported experiencing more symptoms of depression they also reported less father involvement. This finding builds upon existing literature indicating that mothers tend to suffer from fewer psychological problems when their child’s father is more involved (Rafferty et al., 2010; Smith et al., 2008). One possible explanation for this is that when mothers perceive more support (e.g., an involved father), they are less likely to experience depressive symptoms (McManus & Poehlmann, 2012).

Furthermore, results from the current study revealed a statistically significant direct positive relationship from maternal depression to parent-rated child externalizing behavior problems in all mediation models tested. This finding is consistent with the robust amounts of previous literature identifying the link between maternal depression and child externalizing behavior problems (e.g., Ashman et al., 2008; Garnstein & Fagot, 2003; Goodman, 2007; Goodman et al., 2011; National Research Council and Institute of Medicine [NRCIM], 2009; Weissman et al., 2006). One possible explanation for this link is that when mothers are less depressed, they may tend to exhibit fewer problematic parenting behaviors (e.g., low monitoring, inconsistent disciplining, low warmth) that have been associated with increased child behavioral difficulties (Bayer et al., 2006; Blatt-Eisengart et al., 2009; Goodman & Tully, 2006; Leckman-Westin et al., 2009). Thus, the full mediation finding in this study could be interpreted as
mothers who perceive more support via the child’s father being more involved in the child’s life, are less likely to be depressed, and therefore, less likely to exhibit poor parenting practices (e.g., low monitoring, inconsistent discipline) that could lead to an increase in their child’s externalizing behavioral difficulties. Additionally, this interpretation reflects the ecological theoretical framework of the current study. Specifically, the parent variables are not working in isolation but rather have relationships with one another that act to influence the child outcome.

Although not a focus of this study, significant relations were also found between two sample demographic characteristics and father involvement. That is, income and marital status were found to each have a significant direct positive relationship to father involvement. With respect to income, mothers’ reports of lower income were associated with lower levels of father involvement. These results are in line with other findings that identify financial resources as a determining factor in quantity of father involvement, particularly among low-income African American families (Carlson & McLanahan, 2002).

Marital status was also a significant predictor of father involvement with those mothers who reported being either single, widowed, or divorced being more likely to also report lower levels of father involvement when compared to those mothers who reported being either married or living with their partner. This is also consistent with other research that has found that marital/residential status plays a role in African American father’s level of involvement with their children, with non-resident fathers being less involved when compared to resident fathers (Cabrera et al., 2008).

The overall findings from this investigation build upon previous research and address gaps in our understanding of how father involvement and maternal depression influence child behavioral outcomes among low-income African American populations.
Limitations and Strengths

A number of limitations of this study should be acknowledged. First, the data rely mostly on mothers’ self-report. That is, all of the significant relationships that were found in the study were found between variables that had been measured with maternal self-reports only (paths to teacher reports of child externalizing behaviors were found to be non-significant). A particular weakness in this regard, is that the variable of father involvement was based on maternal reports of a single questionnaire item. Although empirical findings suggest that mother reports of father involvement can be used for reliable father involvement measurement (e.g., Hernandez & Coley, 2007), the addition of father self-reports of involvement would have strengthened the measurement of this variable. Furthermore, the inclusion of more questionnaire items that adequately encompassed the multiple dimensions of the father’s role [(e.g., father engagement (direct father-child contact and interaction), father accessibility (degree of father availability to the child), and father responsibility (father’s economic provision for the child)], would have likely improved upon the construct validity of the measure (Lamb, 2010).

Additionally, the sample was predominately African American, low-income, and generally quite homogenous. Even though the sample demographics are considered a strength of the current study, findings do have limited generalizability. That is, results may not be applicable to those other than low-income African American families with Head Start preschool children in urban areas.

The study is also limited by its cross-sectional design, and thus, findings should be considered correlational. Although speculations can be made about the direction or causality between the study variables, supporting such speculations regarding causality or directionality cannot be done without longitudinal data. For example, depressive symptoms could influence
how mothers report both level of father involvement and child behaviors. It is possible that negative thought patterns associated with depressive symptoms could have caused mothers to both underestimate the level of father involvement taking place in their child’s life, and to overestimate the degree of externalizing behavior problems their child was exhibiting (Connell & Goodman, 2002; Goodman et al., 2011). Thus, longitudinal data could have helped to more fully disentangle these relationships.

Despite these limitations the present study has numerous strengths. First, the study employed multivariate statistical methods to examine the potential pathways predicting child externalizing behaviors through hypothesized moderation and mediation models. Such methods of data analyses are considered to be a strength of the present study because the majority of the literature examining the predictors of child behavior problems do so without taking moderation or mediation into account (e.g., Goodman et al., 2011; Weissman et al., 2006). Additionally, the study’s models were tested using path analysis, which offers advantages over the more traditional methods, including the ability to use multiple outcome variables, while also fixing certain paths at zero.

Another strength of the current study is that the relationship between maternal depression and childhood outcomes was uniquely examined in terms of the understudied variable of father involvement. As previously mentioned, there are a limited number of studies pertaining to fathering especially when compared to the vast amount pertaining to mothering. Although fatherhood research is generally on the rise, a continued need remains to investigate the father’s role in child development.

The study’s sample of low-income minority families is another strength of the present study. Most literature that looks at the variables included in this investigation (i.e., maternal
depression, father involvement, and child externalizing behaviors) report findings pertaining to samples of middle to high-income Caucasian families, particularly with regards to investigations that take fathers into account. Thus, it is an asset of the present study that it attends to the historically under served and understudied populations of low-income African Americans.

**Implications of the Current Study**

The current study has clear clinical implications. Results provide evidence that mothers’ perceptions of father involvement are associated with mothers’ level of depressive symptoms, and in turn, how problematic they report their children’s behaviors to be. Clinicians may need to be more attentive to the potential effects that perceived father involvement may have on both mother and child well-being. Additionally, findings suggest that clinicians working with depressed mothers should include an assessment of child behavior for identification of any significant child behavior problems. Clinicians working with children to reduce behavior problems should also channel efforts into educating and encouraging fathers to become more involved in their children’s lives by stressing the potential positive impact of their efforts. Furthermore, developers of child intervention programs may want to broaden their focus to include maternal depression as a target of change and parenting.

Additionally, policy, program, and clinical interventions that attempt to increase fathers’ level of involvement with their child should also consider the potential barriers men may face in becoming more involved in their child’s life. That is, evidence suggests that many low-income African American men face multiple barriers when trying to fulfill their roles as a father (Hammond, Caldwell, Brooks, & Bell, 2009). Common barriers of involvement for low-income minority fathers cited in the literature include: lack of financial stability, difficulty in attaining stable formal employment, lack of education, and relational difficulties with the child’s mother.
and/or her family (Cannon, Schoppe-Sullivan, Mangelsdorf, Brown, & Sokolowski, 2008; Hammond et al., 2011; Roy, 2004; Sorensen & Zibman, 2001). Thus, given the findings from the current study, which build upon previous literature highlighting the impact of level of father involvement on both child and maternal outcomes, it is imperative for clinicians and policy makers to also consider the experiences of such men and the barriers that they may face in becoming actively involved fathers.

Finally, because low-income minority mothers have been found to be at an increased risk for experiencing depression, brief screenings for such psychological difficulties (e.g., CESD-10) at the time of entry into programs such as Head Start could be beneficial in prevention and treatment efforts. For example, those parents who score above the cutoff score on brief depression screeners could be given referral information for affordable psychological services in addition to psychoeducational materials on depression. Additionally, programs such as Head Start could offer psychoeducational workshops to parents that teach coping strategies that may aid in reducing psychological difficulties. Similarly, parent training workshops could be regularly available that teach and facilitate parenting behaviors to aid in decreasing child externalizing difficulties. Given the continued replication of findings associating maternal depression and child externalizing behavior problems, persistent efforts towards the prevention and treatment of depression among mothers (particularly those at high-risk) are warranted.

Suggestions for Future Research

The results of this study also prompt suggestions for future research. For example, it would be valuable to investigate the role of father-like figures such as step-fathers, mother’s boyfriends, uncles, or other male relatives in directly or indirectly predicting maternal depressive symptoms and child externalizing behavior problems. That is, adding paths for these father-like
figures to the current study’s conceptual mediation model in order to take their potential effects into account would be helpful.

Additionally, researchers should attempt to construct more comprehensive measures that capture the different components of father involvement (i.e., father engagement, father accessibility, and father responsibility; Lamb, 2010). Similarly, further research is needed to examine the potential critical components of the father involvement construct in the significant relationships found in this study.

Finally, future research about father involvement in low-income African American families should be longitudinal. Findings suggest that fathers in impoverished settings often exhibit cycles of father involvement and un-involvement (Roy, 2004). Thus, allowing investigations that consider the effects of changes in involvement over time is warranted. Similarly, longitudinal data are needed to help clarify the causal relationships that have been implied in the current study’s findings.

**Conclusions**

In closing, the present study represents an advance in our understanding of the potential impacts that fathers have on their children’s development. Although a number of researchers have already documented the impact that maternal depression can have on child behavioral outcomes, this study aids in filling important gaps that considers the father’s role in this relationship, as well as the father’s role among low-income African American families. Even with the methodological shortcomings of this study, the present research provides important information on the identification of maternal depression as one of the mediating mechanisms that can explain the negative association between father involvement and child externalizing behavior problems.
References


doi:10.1023/A:1011510923900


Figures

Figure 1. Hypothesized moderation model with parent rated outcome of child externalizing behavior problems.
Figure 2. Hypothesized moderation model with parent and teacher rated outcomes of child externalizing behavior problems.
Figure 3. Hypothesized mediation model with parent rated outcome of child externalizing behavior problems. Dashed line represents indirect relationships.
Figure 4. Hypothesized mediation model with parent and teacher rated outcomes of child externalizing behavior problems. Dashed lines represent indirect relationships.
Figure 5. Tested moderation model with parent rated outcome of child externalizing behavior problems with standardized coefficients. $X^2 = \chi^2$ test of model fit value; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean squared residual. $^p < .10$, $^{**}p < .001$. 

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>Standardized Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Depression (predictor)</td>
<td>.20***</td>
<td>.36</td>
</tr>
<tr>
<td>Father Involvement (interaction term)</td>
<td>.18***</td>
<td>.24†</td>
</tr>
<tr>
<td>Parent Rated Child Externalizing Behavior Problems (outcome/home)</td>
<td>.12</td>
<td>.20***</td>
</tr>
<tr>
<td>Education</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>.20***</td>
<td>.36</td>
</tr>
<tr>
<td>Marital Status</td>
<td>.18***</td>
<td>.36</td>
</tr>
</tbody>
</table>

$X^2 = 225.13, \ p = .00$
$CFI = -.34$
$RMSEA = .36$
$SRMR = .07$
$AIC = 10399.64$
$BIC = 10437.84$
Figure 6. Tested moderation model with parent and teacher rated outcomes of child externalizing behavior problems with standardized coefficients. $X^2$ = chi-square test of model fit value; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean squared residual. $^*p < .10$, $^*^*p < .05$, $^*^*^*p < .001$. 
Figure 7. Tested mediation model with parent rated outcome of child externalizing behavior problems with standardized coefficients. Dashed line represents indirect relationships. $X^2 = 1.77, p = .94$
CFI = 1.00
RMSEA = .00
SRMR = .01
AIC=7747.89
BIC=7793.74

$\chi^2 = 1.77, p = .94$
CFI = 1.00
RMSEA = .00
SRMR = .01
AIC=7747.89
BIC=7793.74

$***p < .001.$
Figure 8. Tested modified mediation model with parent rated outcome of child externalizing behavior problems with standardized coefficients. Dashed line represents indirect relationship. \( \chi^2 = 1.85, p = .76 \)
CFI = 1.00
RMSEA = .00
SRMR = .01
AIC = 7273.97
BIC = 7315.99

\[ X^2 = 1.85, p = .001 \]
CFI = 1.00
RMSEA = .00
SRMR = .01
AIC = 7273.97
BIC = 7315.99
**Figure 9.** Tested mediation model with parent and teacher rated outcomes of child externalizing behavior problems with standardized coefficients. Dashed lines represent indirect relationships. $X^2 = 4.88, p = .84$  
CFI = 1.00  
RMSEA = .00  
SRMR = .02  
AIC = 8953.74  
BIC = 9018.69

*p < .05, ***p < .001.
Figure 10. Tested modified mediation model with parent and teacher rated child externalizing behavior problems with standardized coefficients. Dashed lines represent indirect relationships. $X^2 = 2.37, p = .88$  
CFI = 1.00  
RMSEA = .00  
SRMR = .01  
AIC = 8479.82  
BIC = 8540.94  

$p<.05, ***p < .001$.
Appendix A

Would you like to earn a quick $10?

Head Start Mothers, complete a brief research survey on secondhand smoke and child health and you will be paid $10!

Please come to St. Bart’s Head Start on:
Thursday, October 4th at 11:30-12:00pm
Your participation is very important to us!

Only biological mothers from Head Start can participate.

If you are selected for the second part of this research study, you will be paid an additional $40!

Conducted by

Children’s Hospital of Michigan

Detroit Medical Center / Wayne State University
Would you like to earn $10?
Would you like to win $100?

Head Start Mothers, complete a brief research survey on secondhand smoke and child health and you will be paid $10!

IF YOU’VE DONE THE SURVEY BEFORE, DON’T DO IT AGAIN.
Everyone who has completed a survey will have a chance to win $100!

The $100 lottery draw will take place on November 19th at 12:30 p.m.
Turn your survey in by this time to be entered!

Only biological mothers from Head Start can participate.
If you are selected for the second part of this research study, you will be paid an additional $40!

Conducted by

DMC
Children’s Hospital of Michigan
DETROIT MEDICAL CENTER / WAYNE STATE UNIVERSITY
Appendix B

Research Informed Consent

Study Title: CYP2A6 Gene, Tobacco Exposure, and Cognitive Development of Urban Preschoolers

Principal Investigator (PI): Xiaoming Li, Ph.D.

Department of Pediatrics, Children’s Hospital of Michigan

(313) 745-8663

Funding Source: Wayne State University and The Henry Ford Health System

Study Purpose

Dear Parent:

You and your child are being asked to take part in a research study that looks at the relationship of genes and tobacco smoke exposure on children’s abilities and school readiness because you are enrolled in Head Start. This study is being conducted at Wayne State University. The estimated number of study participants to be enrolled at Wayne State University is about 800. Please read this form and ask any questions you may have before agreeing to be in this study.

The purpose of the study is to investigate if exposure to tobacco and variations in a gene named CYP2A6 are related to the learning of a child. Tobacco is known to be harmful to one’s health and the CYP2A6 gene is responsible for getting rid of toxic tobacco chemicals in our body. We want to know if changes in this gene increase the harmful effect of tobacco on children’s learning. Findings from this study will help develop better ways to protect both children and mothers.

Study Procedures

This study consists of two major phases that are described in detail below.

In Phase 1, about 800 mothers with a child in Head Start will be asked to participate. If you agree, you will be asked to do the following:

- You (the mother) will fill in a confidential survey to obtain some information about yourself, your family, and a few questions about substance use in the past. You will also
be asked about smoking, secondhand smoking (especially during the time when you were pregnant with this child), secondhand smoke of your child, attitudes about parenting, and behaviors of your child.

- The survey takes about 30 minutes to complete.

In **Phase 2**, we will randomly select, like pulling names out of a hat, 200 mother-child pairs by classroom from the 800 that participated in Phase 1 to participate in this phase. If you are selected, you and your child will be asked to complete the following additional measures:

  - You (the mother) will be asked to complete an additional survey that includes questions about tobacco use and exposure and a measure of cognitive skills.
  - Your child will be asked to participate in a routine assessment of learning and a school readiness survey.
  - We will collect a cheek cell sample from both you and your child that will be used assess changes in the CYP2A6 gene. A swab procedure will be used to collect this sample. The procedure entails swirling a tooth brush inside your cheek and between lips and gum for about 30 seconds.
  - A sample of hair (about 20 shafts from the back of the head) will be collected from both mother and child as a measure of recent tobacco exposure.
  - A breath test will be conducted for both mother and child as a measure of recent tobacco smoke exposure. The breath test entails blowing into a hand held device.
  - Your (the mother’s) medical records from the time when you were pregnant with the child participating in this study will be obtained. Because remembering behaviors from the past can be difficult, these records will be looked at as another source of information about your smoking, drinking, and other substance use while pregnant.
  - Your child’s teacher will be asked to complete a child behavior checklist about your child’s classroom behavior.
  - Phase 2 of the study will take approximately 45 minutes of your (the mother’s) time and 40 minutes of the child’s time.

**Benefits**

- There may be no direct benefits for you and your child for taking part in this study; however, information from this study may be used for smoking prevention programs and benefit you and other people in the future.

- The possible indirect benefit to you and your child for taking part in this study includes the awareness of whether your child is exposed to secondhand smoke, which may encourage you to take measures to protect your child and others from exposure.

**Risks**

By taking part in this study, you may experience the following risks: You may feel uncomfortable when you are asked to answer some questions about smoking during pregnancy or when you fill in the questionnaire on past substance use. You may feel mild discomfort during the collection of the cheek cell sample.

There may also be risks involved from taking part in this study that are not known to researchers at this time.
Alternatives
You do not have to participate in this study

Study Costs
Participation in this study will be of no cost to you.

Compensation:
For taking part in this research study, you will be paid for your time and effort. You will receive $10 for completing Phase 1. If you are selected to participate in Phase 2 of the study, you will be paid an additional $40 upon the completion of all the procedures described above.

Research Related Injuries
In the unlikely event that this research related activity results in an injury; no reimbursement, compensation or free medical care is offered by Children’s Hospital of Michigan, Henry Ford Health System, or Wayne State University. If you think that you have suffered a research related injury, let the investigators know right away.

Confidentiality:
All data collected about you and your child during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a unique number. Only this number will appear on your data or the samples you provide in this study. No researcher will tell anyone how you answered the questions. Your data and samples will be stored in secured databases and laboratories. No personal identifiers will be contained in the final database. In addition to the researchers, the study sponsor, the Human Investigation Committee (HIC) at Wayne State University or federal agencies with appropriate regulatory oversight may review the data.

Voluntary Participation /Withdrawal:
Taking part in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to refuse to answer any questions or withdraw at any time. Your decision about participation will have no effect on the services you receive from Head Start or any other service agency. Your decision will not change any present or future relationships with Wayne State University or its affiliates or other services you are entitled to receive.

Contact Information:
You will be asked to provide the study with ways to contact you by telephone, either at home or through trusted friends and relatives who know where you are and how to reach you. This contact information will only be used to contact you for Phase 2 of this study, if selected.

Questions:
If you have any questions now or in the future, you may contact Dr. Xiaoming Li or one of his research team members at the following phone number: 313-745-8663. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628.
Consent to Participate in a Research Study:
To voluntarily agree for you and your child to take part in this study, you must sign on the line below. If you choose to take part in this study, you and your child may withdraw at any time. You are not giving up any legal rights of you and your child by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered. You will be given a copy of this consent form.

________________________________________
Signature of Participant/ Legally Authorized Representative

________________________________________
Date

________________________________________
Printed Name of Participant/ Authorized Representative

________________________________________
Time

**Signature of Witness (When applicable)________________________________________

________________________________________
Date

________________________________________
Printed Name of Witness

________________________________________
Time

Permission to ask your child’s Head Start teacher to complete a checklist about your child’s behavior in the classroom.
By signing below, you are giving the researchers permission to request classroom behavior information from your child’s teacher.

Signature: ___________________________ Date: ___________________________

Permission to obtain secondary data collected by the United Children Family Head Start Program from your child
By signing below you are giving the researchers permission to access the results of the routine assessments given to your child while attending Head Start (including the Chicago Early Assessment).

Signature: ________________________________  Date: _____________________________

Permission to use the buccal cell samples collected from you and your child for future research.
By signing below you are giving the researchers permission to use your cell samples for other gene related research in the future. Your personal information will remain confidential.

Signature: ________________________________  Date: _____________________________
Dear ______________________,

You are receiving this letter because you participated in a survey at your child’s Head Start school in the fall. As you may remember, the survey asked questions about your smoking behavior and exposure, and the exposure to second hand smoke your child enrolled in Head Start may have encountered. This project is being conducted by Wayne State University/Children’s Hospital of Michigan.

**You have been chosen to participate in part two of this survey and we will pay you $40 for your time.** We will meet with you and your child once, in your home or in our office, and will take about an hour of your time. Upon completion, we will pay you $40 in cash. Your time and input is very important to us.

If you are interested in participating, please call **Amy Fry at (313)745-8657** so we can schedule an appointment with you and your child. Or call if you’d just like to get more information about this survey.

Thank you,

Amy Fry

Wayne State University/Children’s Hospital of Michigan
313-745-8657
Hello, my name is _________

I am calling from Children’s Hospital of Michigan. Back in (insert month) you completed a survey at Head Start on second hand smoke. Do you recall doing that? At that time, we let you know that we would be conducting a second part to that research study and we were hoping you might be willing to continue helping us out. We are paying $40 to those mothers who participate. Right now I’d just like to remind you what we will be asking you to do this time around and find out if you are still interested.

For this part of the study, we would like to collect some additional information about you and your child in Head Start (give the child’s name). We would like to conduct two routine learning assessments with (child’s name), similar to things they already do in the classroom. We’d also like to collect a few other things to look at tobacco exposure, including a breath test which just entails blowing into a hand held device, a very small hair sample, and cheek cell samples, which is simply done by swirling a small toothbrush in the mouth.

For you, the mom, we will ask you to complete another survey, to do the same breath test, hair sample, and cheek cell sample as your child, and a brief cognitive skill test.

Again, we will pay you $40 when all of these things are complete and all of the information about you and your child will be kept confidential.

If you are okay with participating, we’d like to start some of the data collection with your child during class time this Monday.
Hello Head Start Teachers,

As you know, the Second Hand Smoke Study has been going on in the United Children and Family Head Start Centers this school year. **We appreciate all of your help so far!**

We would like to ask all teachers who have a child in their classroom who participated in our study to fill out a brief behavior checklist for that child. The child’s mother has already given us permission to ask you for this information. You will be paid $2 for each form you fill out.

**First.** Please read the enclosed Research Informed Consent Form. This form explains what you are being asked to do and how you will be compensated. Please call us if you have any questions.

**Second,** Fill out one form for each child. The forms are also enclosed. We have put the child’s name at the top of the form. As long as you have known the child for a sufficient amount of time, we would like you to complete a form for that child.

**Third,** Once you have completed ALL of the forms, return them to us and we will pay you for your time and effort.

- **If you complete the forms before school ends,** you can call Amy Fry at 313-745-8657 and she will arrange for someone to come to your school to pick up the forms and pay you in cash.
- **If you complete the forms after school ends,** or if you simply prefer, you can return the forms in the enclosed postage paid envelope and we will send you a money order for your payment in the mail.

We really appreciate your help.
Research Informed Consent

Study Title: CYP2A6 Gene, Tobacco Exposure, and Cognitive Development of Urban Preschoolers

Principal Investigator (PI): Xiaoming Li, Ph.D.

Department of Pediatrics, Children’s Hospital of Michigan
4201 St. Antoine, UHC-6D
Detroit, MI 48201

(313) 745-8663

Funding Source: Wayne State University and The Henry Ford Health System

Study Purpose
You are being asked to take part in a research study that looks at the relationship of genes and tobacco smoke exposure on children’s abilities and school readiness because you are the teacher of a child currently participating in this study. This study is being conducted at Wayne State University. The estimated number of teachers to be enrolled in this study is about 15. **Please read this form and ask any questions you may have before agreeing to participate.**

The purpose of the study is to investigate if exposure to tobacco and changes in a gene named CYP2A6 are related to the learning of a child. Tobacco is known to be harmful to one’s health and the CYP2A6 gene is responsible for getting rid of toxic tobacco chemicals in our body. We want to know if changes in this gene increase the harmful effect of tobacco on children’s learning. We are currently collecting information from mothers and children in Head Start and want to include teachers as another source of information on the children. Findings from this study will help develop better ways to protect both children and mothers.

Study Procedures:
If you take part in the study, you will be asked to complete a Teacher Report Form for the students in your classroom who are participating in the study. There are a total of _____ students for which we would like behavior ratings. This report form is to reflect your view of the child’s classroom behavior. Each form will take approximately 5 minutes to complete.

Benefits
As a participant in this research study, there may be no direct benefit for you; however, information from this study may benefit other people now or in the future.
Risks
There are no known risks to participation in this study.

Costs
There will be no costs to you for participation in this research study.

Compensation
For taking part in this research study, you will be compensated for your time and inconvenience. You will be paid $2 per child/form upon the completion of all forms for participating children in your class.

Confidentiality:
You will be identified in the research records by a code number.

Voluntary Participation /Withdrawal:
Taking part in this study is voluntary. You are free to not complete a checklist for any child at any time. Your decision will not change any present or future relationships with Wayne State University or its affiliates.

Questions:
If you have any questions about the study now or in the future, you may contact Dr. Xiaoming Li or one of his research team members at the following phone number: 313-745-8663. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Participation:
By completing the Teacher Report Form you are agreeing to participate in this study.
Appendix D

**CESD-10**

**INSTRUCTIONS:** Please answer the following questions by placing a "✓" in the appropriate box.

1. For each of the following statements, please check the box that best describes how often you felt or behaved this way during the past week.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rarely or None of the Time (Less than 1 day)</th>
<th>Some or a Little of the Time (1-2 days)</th>
<th>Occasionally or a Moderate Amount of the Time (3-4 days)</th>
<th>Most or All of the Time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I was bothered by things that usually don't bother me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b. I had trouble keeping my mind on what I was doing.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c. I felt depressed.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d. I felt that everything I did was an effort.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e. I felt hopeful about the future.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>f. I felt fearful.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g. My sleep was restless.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h. I was happy.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>i. I felt lonely.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>j. I could not get &quot;going&quot;.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
**Appendix E**

**CHILD BEHAVIOR CHECKLIST FOR AGES 1½-5**

<table>
<thead>
<tr>
<th>Item</th>
<th>Not True</th>
<th>Somewhat or Sometimes True</th>
<th>Very True or Often True</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2</td>
<td>1. Aches or pains (without medical cause; do not include stomach or headaches)</td>
<td>30. Easily jealous</td>
<td>47. Nervous, highstrung, or tense</td>
</tr>
<tr>
<td>0 1 2</td>
<td>2. Acts too young for age</td>
<td>31. Eats or drinks things that are not food—don’t include sweets (describe:</td>
<td>48. Nightmares</td>
</tr>
<tr>
<td>0 1 2</td>
<td>3. Afraid to try new things</td>
<td></td>
<td>49. Overeating</td>
</tr>
<tr>
<td>0 1 2</td>
<td>4. Avoids looking others in the eye</td>
<td></td>
<td>50. Overindulged</td>
</tr>
<tr>
<td>0 1 2</td>
<td>5. Can’t concentrate, can’t stay focused for long</td>
<td></td>
<td>51. Shows panic for no good reason</td>
</tr>
<tr>
<td>0 1 2</td>
<td>6. Can’t sit still, restless, or hyperactive</td>
<td>32. Fears certain animals, situations, or places (describe:</td>
<td>52. Painful bowel movements (without medical cause)</td>
</tr>
<tr>
<td>0 1 2</td>
<td>7. Can’t stand having things out of place</td>
<td></td>
<td>53. Physically attacks people</td>
</tr>
<tr>
<td>0 1 2</td>
<td>8. Can’t stand waiting; wants everything now</td>
<td></td>
<td>54. Picks nose, skin, or other parts of body (describe:</td>
</tr>
</tbody>
</table>
### Externalizing Behavior Problems

**Please print your answers. Be sure to answer all items.**

<table>
<thead>
<tr>
<th>Item</th>
<th>0 = Not True (as far as you know)</th>
<th>1 = Somewhat or Sometimes True</th>
<th>2 = Very True or Often True</th>
</tr>
</thead>
<tbody>
<tr>
<td>55.</td>
<td>Plays with own sex parts too much</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.</td>
<td>Poorly coordinated or clumsy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>Problems with eyes (without medical cause) (describe):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58.</td>
<td>Punishment doesn’t change his/her behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59.</td>
<td>Quickly shifts from one activity to another</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>Rash or other skin problems (without medical cause)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.</td>
<td>Refuses to eat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.</td>
<td>Refuses to play active games</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63.</td>
<td>Repeatedly rocks head or body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64.</td>
<td>Resists going to bed at night</td>
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<tr>
<td>65.</td>
<td>Resists toilet training (describe):</td>
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<tr>
<td>66.</td>
<td>Screams a lot</td>
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<td>67.</td>
<td>Seems unresponsive to affection</td>
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<td>68.</td>
<td>Self-conscious or easily embarrassed</td>
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<td>69.</td>
<td>Selfish or won’t share</td>
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<td>70.</td>
<td>Shows little affection toward people</td>
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<tr>
<td>71.</td>
<td>Shows little interest in things around him/her</td>
<td></td>
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<tr>
<td>72.</td>
<td>Shows too little fear of getting hurt</td>
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<tr>
<td>73.</td>
<td>Too shy or timid</td>
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<tr>
<td>74.</td>
<td>Sleeps less than most kids during day and/or night (describe):</td>
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<tr>
<td>75.</td>
<td>Sways or plays with bowel movements</td>
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<td>76.</td>
<td>Speech problem (describe):</td>
<td></td>
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<td>77.</td>
<td>Stares into space or seems preoccupied</td>
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<tr>
<td>78.</td>
<td>Stomachaches or cramps (without medical cause)</td>
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<td>79.</td>
<td>Rapid shifts between sadness and excitement</td>
<td></td>
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<tr>
<td>80.</td>
<td>Strange behavior (describe):</td>
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<td>81.</td>
<td>Stubborn, sullen, or irritable</td>
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<td>82.</td>
<td>Sudden changes in mood or feelings</td>
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<td>83.</td>
<td>Sulks a lot</td>
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<td>84.</td>
<td>Talks or cries out in sleep</td>
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<td>85.</td>
<td>Temper tantrums or hot temper</td>
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<td>86.</td>
<td>Too concerned with neatness or cleanliness</td>
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<td>87.</td>
<td>Too fearful or anxious</td>
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<td>88.</td>
<td>Uncooperative</td>
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<td>89.</td>
<td>Underactive, slow moving, or lacks energy</td>
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<td>90.</td>
<td>Unhappy, sad, or depressed</td>
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<td>91.</td>
<td>Unusually loud</td>
<td></td>
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<tr>
<td>92.</td>
<td>Upset by new people or situations (describe):</td>
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<td>93.</td>
<td>Vomiting, throwing up (without medical cause)</td>
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<tr>
<td>94.</td>
<td>Wakes up often at night</td>
<td></td>
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<td>95.</td>
<td>Wanders away</td>
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<tr>
<td>96.</td>
<td>Wants a lot of attention</td>
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<td></td>
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<tr>
<td>97.</td>
<td>Whining</td>
<td></td>
<td></td>
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<tr>
<td>98.</td>
<td>Withdrawn, doesn’t get involved with others</td>
<td></td>
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<tr>
<td>99.</td>
<td>Worries</td>
<td></td>
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</tr>
<tr>
<td>100.</td>
<td>Please write in any problems the child has that were not listed above.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Does the child have any illness or disability (either physical or mental)?**

- [ ] No
- [ ] Yes—Please describe:

**What concerns you most about the child?**

**Please describe the best things about the child:**
EXTERNALIZING BEHAVIOR PROBLEMS

CAREGIVER-TEACHER REPORT FORM FOR AGES 1½-5

CHILD'S FULL NAME

CHILD'S GENDER

☐ Boy ☐ Girl

CHILD'S AGE

CHILD'S ETHNIC GROUP OR RACE

TODAY'S DATE

Mo Day Year

CHILD'S BIRTHDATE

Mo Day Year

PARENTS' USUAL TYPE OF WORK, even if not working now. Please be specific—e.g., auto mechanic, high school teacher, homemaker, laborer, path operator, shoe salesman, army sergeant.

FATHERS' TYPE OF WORK

MOTHER'S TYPE OF WORK

THIS FORM FILLED OUT BY: (print your full name)

Your role at the school or care facility:

☐ primarily educational (teacher) ☐ primarily care (caregiver)

Your training for this position:

Your experience in child care or early education: _______ years.

Name & address of school or care facility:

I. What kind of a facility is it? (Please be specific, e.g., home day care, day care center, nursery school, preschool, school readiness class, Early Childhood Special Education, Headstart, Kindergarten, etc.)

II. What is the average number of children in the child's group or class? _______ children in the child's group or class.

III. How many hours per week does this child spend at the facility? _______ hours per week.

IV. For how many months have you known this child? _______ months.


VI. Has he/she ever been referred for a special education program or special services?

☐ Don't know ☐ No ☐ Yes - what kind and when?

Below is a list of items that describe children. For each item that describes the child now or within the past 2 months, please circle the number that best describes how true it is. Circle the 0 if the item is somewhat or sometimes true of the child. If the item is not true of the child, circle the 0. Please answer all items as well as you can, even if some do not seem to apply to the child.

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

1. Aches or pains (without medical cause; do not include stomach or headaches)

2. Acts too young for age

3. Afraid to try new things

4. Avoids looking others in the eye

5. Can't concentrate, can't pay attention for long

6. Can't sit still, restless, or hyperactive

7. Can't stand having things out of place

8. Can't stand waiting; wants everything now

9. Chews things that aren't edible

10. Clings to adults or too dependent

11. Constantly seeks help

12. Apathetic or unmotivated

13. Cries a lot

14. Cruel to animals

15. Defiant

16. Demands must be met immediately

17. Destroys his/her own things

18. Destroys property belonging to others

19. Daydreams or gets lost in his/her thoughts

20. Disobedient

21. Disturbed by any change in routine

22. Cruelty, bullying, or meanness to others

23. Doesn't answer when people talk to him/her

24. Difficulty following directions

25. Doesn't get along with other children

26. Doesn't know how to have fun; acts like a little adult

27. Doesn't seem to feel guilty after misbehaving

28. Disturbs other children

29. Easily frustrated

30. Easily jealous

31. Eats or drinks things that are not food—do not include sweets (describe):

32. Fears certain animals, situations, or places other than day care or school (describe):

33. Feelings are easily hurt

34. Gets hurt a lot, accident-prone

35. Gets in many fights

36. Gets into everything

37. Gets too upset when separated from parents

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Be sure you answered all items. Then see other side.
Please print your answers. Be sure to answer all items.

<table>
<thead>
<tr>
<th>Item</th>
<th>0 = Not True (as far as you know)</th>
<th>1 = Somewhat or Sometimes True</th>
<th>2 = Very True or Often True</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>12</td>
<td>38. Explosive and unpredictable behavior</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>39. Headaches (without medical cause)</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>40. Hits others</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>41. Holds his/her breath</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>42. Hurts animals or people without meaning to</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>43. Looks unhappy without good reason</td>
<td>01</td>
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<tr>
<td>01</td>
<td>2</td>
<td>44. Angry moods</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>45. Nausea, feels sick (without medical cause)</td>
<td>01</td>
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<tr>
<td>01</td>
<td>2</td>
<td>46. Nervous movements or twitching (describe):</td>
<td>01</td>
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<tr>
<td>01</td>
<td>2</td>
<td>47. Nervous, highstrung, or tense</td>
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<td>01</td>
<td>12</td>
<td>48. Fails to carry out assigned tasks</td>
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<tr>
<td>01</td>
<td>12</td>
<td>49. Fears daycare or school</td>
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<td>01</td>
<td>12</td>
<td>50. Overtired</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>51. Fidgets</td>
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<tr>
<td>01</td>
<td>2</td>
<td>52. Gets teased by other children</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>53. Physically attacks people</td>
<td>01</td>
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<tr>
<td>01</td>
<td>12</td>
<td>54. Picks nose, skin, or other parts of body (describe):</td>
<td>01</td>
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<td>01</td>
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<td>55. Plays with own sex parts too much</td>
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<tr>
<td>01</td>
<td>12</td>
<td>56. Poorly cooricated or clumsy</td>
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<td>01</td>
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<td>57. Problems with eyes without medical cause (describe):</td>
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<td>01</td>
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<td>58. Punishment doesn’t change his/her behavior</td>
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<td>01</td>
<td>2</td>
<td>59. Quickly shifts from one activity to another</td>
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<td>01</td>
<td>2</td>
<td>60. Rashes or other skin problems (without medical cause)</td>
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<td>01</td>
<td>2</td>
<td>61. Refuses to eat</td>
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<td>01</td>
<td>2</td>
<td>62. Refuses to play active games</td>
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<td>01</td>
<td>2</td>
<td>63. Repeatedly rocks head or body</td>
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<td>01</td>
<td>2</td>
<td>64. Inattentive, easily distracted</td>
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<td>01</td>
<td>2</td>
<td>65. Lying or cheating</td>
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<tr>
<td>01</td>
<td>2</td>
<td>66. Screams a lot</td>
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