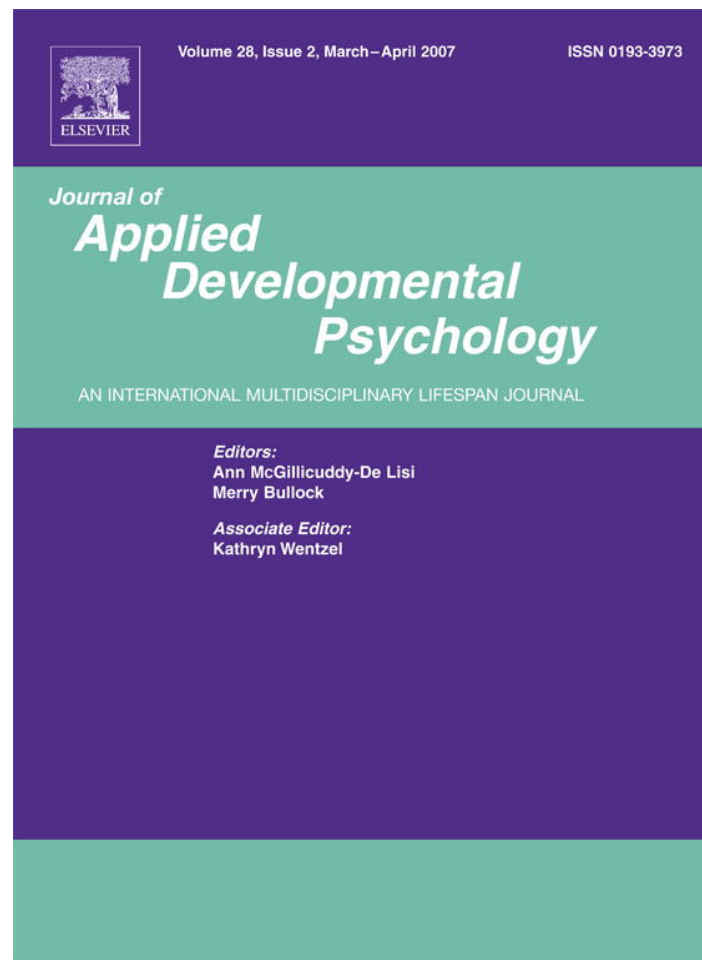


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Physical environmental adversity and the protective role of maternal monitoring in relation to early child conduct problems

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Abstract

Research on the development of externalizing behaviors during early childhood has focused on child and parenting factors. Fewer studies have investigated effects of aversive features of the micro-level physical environment, such as overcrowding and chaos in the home, and the macro-level environment, such as neighborhood quality. This study extends research on physical environmental factors by examining their association with children's early externalizing behaviors, and exploring how maternal monitoring may serve as a protective factor in such contexts. 120 male toddlers at high risk for developing early externalizing behaviors were followed from ages 2 to 5 years. Direct longitudinal associations were found for micro-level environmental factors beginning at age 2 and for neighborhood risk beginning at age 3. Maternal monitoring served as a protective factor for child externalizing behaviors in the context of neighborhood risk. Implications for prevention research and the development of early externalizing behaviors are discussed.

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1. Introduction

Recent research indicates that early-starting trajectories of child externalizing behaviors can be identified beginning in early childhood (Aguilar, Sroufe, Egeland, & Carlson, 2000; Campbell, Shaw, & Gilliom, 2000; Moffitt, 1990; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Both epidemiological and developmental studies have found externalizing behavior to be highly stable beginning as early as age 2, particularly among males (Cummings, Iannotti, & Zahn-Waxler, 1989; Olweus, 1979; Shaw, Gilliom, & Giovannelli, 2000). Similar to older children, behavior problems beginning in early childhood are associated with child characteristics (Calkins, Gill, & Williford, 1999; Caspi, Moffit, Newman, & Silva, 1997; Raine, Reynolds, Venables, Mednick, & Farrington, 1998), parental psychopathology (Leadbeter & Bishop, 1994; Osofsky & Thompson, 2000; Pannaccione & Wahler, 1986; Rose, Rose, & Feldman, 1989; Shaw & Vondra, 1995), parenting (Gardner, Sonuga-Barke, & Sayal, 1999; Shaw et al., 2003; Shaw, Winslow, Owens, & Hood, 1998), and distal, sociodemographic risk factors, such as parent education, marital status, childbearing age, and neighborhood violence (Chase-Lansdale, Gordon, Brooks-Gunn, & Klebanov, 1997; McLanahan, 1997; Nagin, Pagani, Temblay, & Vitaro, 2003; Wikstrom & Loeber, 1999). That is, both micro (home and family) and macro (community) physical environmental factors are associated with child externalizing behaviors.

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For the purposes of the current paper, the physical environment was defined as the material setting in which social transactions occur, including both the home environment (e.g., Matheny & Phillips, 2001; Wachs, 1989; Wohlwill & Heft, 1987) and the community (e.g., Evans & English, 2002; Evans, Lercher, Meis, Ising, & Kofler, 2001). Thus, the social environment both occurs in and is influenced by the context of the physical environment (Wohlwill, 1983). Characteristics of the physical environment, including small enclosed physical spaces, have been shown to alter individuals' social behavior. For example, elevators have been found to increase individuals' tendency to withdraw from social interaction and overcrowded prisons have been associated with increases in aggression towards others (Burgess & Fordyce, 1989; Lawrence & Andrews, 2004; Regoeczi, 2003).

As multiple disciplines (e.g., business, sociology, community, ecology, epidemiology; Blalock, 1984; Bronfenbrenner, 1989; Kellam, Koretz, & Moscicki, 1999; Shinn & Rapkin, 2000; Spence, 1999) have studied these contexts, it should not be surprising that there is variability in how micro- and macro-environments have been defined. For the purposes of the current paper, we define the micro-level environment as the immediate or intimate settings such as the classroom, family, peer group, or work place (Bronfenbrenner, 1989; Kellam et al., 1999) where children have daily contact with other children and/or adults. The macro-level environment encompasses a child's broader context, including the neighborhood and surrounding community that forms a culture or subculture in which the child lives (Bronfenbrenner, 1989; Kellam et al., 1999).

Though studies have examined many of these factors independently, few have examined how both micro-level family factors and macro-level community factors may be related to the development of early externalizing behaviors (Ackerman, Brown, & Izard, 2004; Ackerman, Kogos, Youngstrom, Schoff, & Izard, 1999; Keller, Spieker, & Gilchrist, 2005; Shaw et al., 1998). In addition, there have been few studies examining potential protective factors that might buffer the negative effects of family and community environmental risk on the development of children's early externalizing behaviors. The current study tested both direct effects and protective factors within the micro- and macro-level environment as they relate to the development of child's behavior problems (see Fig. 1 for the theoretical model).

1.1. Environmental adversity: chaotic, low structure environments

Research has found that lack of structure in both micro- (e.g., Dumas et al., 2005; Shaw, Criss, Schonberg, & Beck, 2004; Shaw, Dishion, Supplee, Gardner, & Arnds, 2006) and macro-level environments (e.g., Brody et al., 2001; Kohen, Brooks-Gunn, Leventhal, & Hertzman, 2002; Leventhal & Brooks-Gunn, 2000; Sampson, Raudenbush, & Earls, 1997)

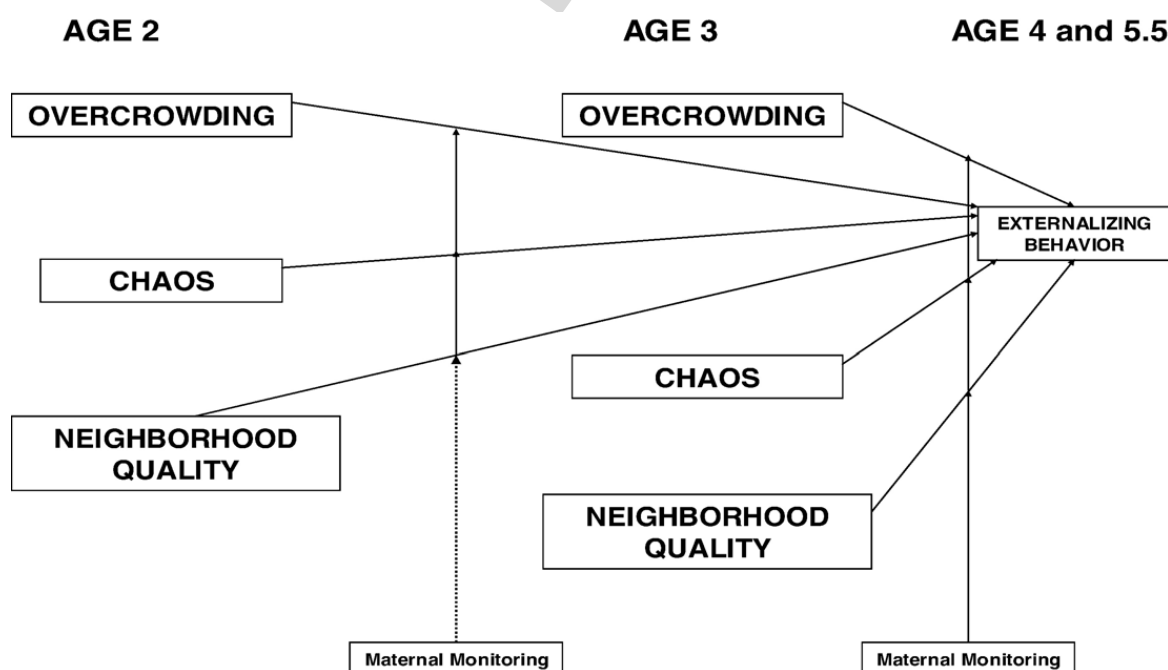


Fig. 1. Theoretical model of micro-physical environmental variables and macro-physical environmental variables at ages 2 and 3 on maternal and teacher reported child externalizing behaviors at ages 4 and 5.5 years.

is related to the development of behavior problems. Wilson and Neckerman (1987) argue that the lack of routines and structure in the micro-environment (e.g., chaotic home) may simply mirror similar breakdowns in the macro-environment (e.g., low collective efficacy in the neighborhood). Homes characterized by high chaos and/or overcrowded conditions have elevated rates of conflict, competition for resources, and few routines and organization (Dumas et al., 2005; Evans, Lepore, Shejwal, & Palsane, 1998; NICHD ECCRN, 2004; Regoeczi, 2003), each of which has been found to contribute to the development of children's externalizing behaviors (e.g., Cox, Paulus, & McCain, 1984; Low & Stocker, 2005; Regoeczi, 2003; Shaw et al., 2006; Webster-Stratton & Hammond, 1999).

Similarly, neighborhoods that are low in social structure (e.g., collective efficacy) have been found to have residents who demonstrate elevated rates of externalizing behaviors (Brody et al., 2001; Kohen et al., 2002; Leventhal & Brooks-Gunn, 2000; Sampson et al., 1997). Children living in neighborhoods low on social structure are expected to more often witness peers or adults engaging in deviant behavior and, similar to the home environment, experience externalizing behavior being condoned by omission.

1.2. Physical environmental contributions to child externalizing behaviors

Growing up in a low-socioeconomic (SES) environment has been identified as a risk factor for the development of child behavior problems (Chase-Lansdale & Gordon, 1996; Dodge, Pettit, & Bates, 1994; Duncan, Brooks-Gunn, & Klebanov, 1994; Leventhal & Brooks-Gunn, 2000) and the same low SES environments have been found to have a high number of physical environmental risk factors (e.g., overcrowding, poor neighborhood quality, chaos; Evans, 2004; Federman et al., 1996; Myers, Baer, & Choi, 1996). In turn, these risk factors place children at greater risk for the development of behavior problems.

1.3. Micro-level environmental factors

1.3.1. Overcrowding

Overcrowding in the home has consistently been found to be related to negative outcomes for humans and animals in multiple contexts (e.g., Cox et al., 1984; Maxwell, 2003; Ouagazzal, Moreau, Pauly-Evers, & Jenck, 2003; Regoeczi, 2003; Xigeng et al., 2004). Overcrowding has been defined in terms of density of living space, with more persons than rooms useable for living (i.e., bedrooms, living rooms; Rutter et al., 1975; United States Census Bureau [USCB], 2000). Families living in poverty tend to experience overcrowding in the home because of their inability to afford larger accommodations, often necessitating the sharing of a residence by extended family members, such as grandparents (Baydar & Brooks-Gunn, 1998; Caputo, 1999). When examined simultaneously, overcrowding in the home has proved to be a more reliable predictor of child externalizing behavior than family size (Fagan & Najman, 2003; Kalff et al., 2001).

Overcrowded conditions in the home have been associated with behavior problems in children (Shaw et al., 1998), adolescents (West & Farrington, 1977), and adults (Lawrence & Andrews, 2004; Kposowa, Breault, & Harrison, 1995; O'Brien, Shichor, & Decker, 1982–1983). Such associations have been attributed in part to higher rates of conflict among residents in more crowded conditions (Evans et al., 1998; Regoeczi, 2003) and competition for resources, such as individual attention and emotional support (NICHD ECCRN, 2004). Because of the relatively large percentage of time toddlers spend in the home environment relative to the neighborhood and broader community, we expected associations between overcrowding and externalizing behaviors to be evident earlier than for macro-level factors such as neighborhood quality.

1.3.2. Chaos in the home

Chaotic homes are characterized by frequent foot traffic (e.g., neighbors, family, children), phone calls, and noise (e.g., children, electronics, etc.), as well as disorganization (e.g., difficult to find items; Dumas et al., 2005). Chaotic homes may have frequent transitions of adults and children in the environment and are a centralized socialization location for the extended family and neighborhood members. The measurement of chaos provides a qualitatively rich assessment of the organizational structure of the home, and although chaos may occur more often in overcrowded homes, previous research suggests that chaos and the number of people in a home are only modestly related (Dumas et al., 2005).

Chaos in the home, a micro-level factor in the current study, has been negatively associated with cognitive (Petrill, Pike, Price, & Plomin, 2004) and social (Wachs, Gurkas, & Kontos, 2004) development in preschool-age children and with child behavior outcomes in school-age children (Dumas et al., 2005). In addition, chaos in the home has been associated with parenting factors that contribute to the development of externalizing behavior (e.g., level of maternal responsivity; Corapci & Wachs, 2002), and factors shown to compromise caregiving skills (e.g., parenting stress; Dumas et al., 2005; Evans et al., 1998). With the exception of the literature cited, little research has been conducted on associations between chaos in the home and child externalizing behaviors, particularly in early childhood. Similar to overcrowding, it was hypothesized that chaos would be directly related to children's behavioral outcomes at earlier ages than macro-level environmental factors due to the higher amount of time young children spend in the home versus their neighborhood (Research Connections, 2005).

1.4. Macro-level environmental factors

1.4.1. Neighborhood quality

The majority of research investigating associations between physical environmental factors and child outcomes has focused on neighborhood quality (e.g., Greenberg et al., 1999; Kohen et al., 2002; Leventhal & Brooks-Gunn, 2004; Sampson, 1983; Sampson et al., 1997). Typically, low SES neighborhoods include risk factors such as poverty (Leventhal & Brooks-Gunn, 2003), high unemployment (McLoyd, 1990), and dangerousness (Wikstrom & Loeber, 1999), each of which has been associated with child externalizing behaviors (Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Chase-Lansdale & Gordon, 1996; Deater-Deckard, Dodge, Bates, & Pettit, 1998). Although there are multiple theories of mechanisms by which neighborhoods influence the development of externalizing behavior, most models focus on lack of access to individuals with education and employment (e.g., Wilson, 1996), lack of collective efficacy (e.g., Sampson et al., 1997), normalization of violence, and exposure to deviant peers (e.g., Guerra, Huesmann, & Spindler, 2003; Schwab-Stone et al., 1995).

Previous research has focused most heavily on neighborhood effects for adolescents (Ingoldsby & Shaw, 2005) because of their greater self-reliance and time spent outside of the home and in the neighborhood relative to younger children. This potentially makes them more susceptible to the influence of deviant neighborhood peers and adults in communities where collective efficacy is low (Dishion, Capaldi, Spracklen, & Li, 1995). However, in the most impoverished North American neighborhoods, research suggests that children as young as age 3 can be directly affected by their neighborhood quality after accounting for more proximal risk factors (Brooks-Gunn et al., 1993; Kohen et al., 2002). Specifically, the presence of few managerial and professional workers in the neighborhood has been associated with later externalizing problems among 3–5 year old children, with similar results found for other neighborhood factors and later externalizing problems (Brooks-Gunn et al., 1993; Kohen et al., 2002; Matheny & Phillips, 2001; Winslow & Shaw, in press). However, to our knowledge, previous research has not examined the influence of neighborhood quality on externalizing behavior in children younger than 3 years old. In contrast to micro-level physical environment factors, for which we anticipated associations with externalizing behaviors would be evident earlier, we did not expect to see significant associations between neighborhood factors and child externalizing behaviors emerge until at least age 3 years when children begin to spend more time outside of the home through their growing independence and new relationships with peer groups outside of the family (Chase-Lansdale et al., 1997; Duncan et al., 1994).

1.5. Parental monitoring in the context of overcrowding in the home, chaos and poor neighborhood quality and child behavior outcomes

At a broad level, parental monitoring of children's activities and well-being has been widely studied in relation to child externalizing behavior, but primarily with school-age and adolescent populations (Dishion & McMahon, 1998; Leventhal & Brooks-Gunn, 2000; Loeber & Dishion, 1983; Pettit, Laird, Dodge, Bates, & Criss, 2001). Parental monitoring has been defined as a set of correlated parenting behaviors involving attention to and tracking of children's whereabouts and activities (Dishion & McMahon, 1998). Though much of the parental monitoring research has utilized measurements that focus on parents' knowledge of their children's peers and activities that occur outside of the home, Dishion and McMahon's definition indicates an even broader array of parenting behaviors and suggests that these behaviors may change over time as the child matures.

Although much of the research on parental monitoring has focused on school-age children and adolescents (e.g., Brown, Mounts, Lamborn, & Steinberg, 1993; Fletcher, Darling, & Stenberg, 1995; Kolko & Kazdin, 1986, 1990), the importance of parental monitoring in children's activities can be traced back to early childhood, particularly toddlerhood. During these years, young children gain a newfound independence (e.g., walking and talking) that often requires active monitoring on the part of their caregivers to ensure the safety of the child, valuable property, pets, and other family members (Shaw, Bell, & Gilliom, 2000). For example, low parental monitoring has been related to increased accidental poisonings in children 3 to 7 years of age (Brayden, MacLean, Bonfiglio, & Altemeir, 1993), exposure to household safety hazards in children between the ages of 6 months to 4.5 years (Glik, Greaves, Kronenfeld, & Jackson, 1993), and handling of hazardous substances in grocery stores in preschool-age children (Harrell & Reid, 1990). In the context of schools, higher rates of student victimization have been found in overcrowded classrooms (Khoury-Kassabri, Benbenishty, Astor, & Zeira, 2004), which has been attributed to teacher's inability to monitor and actively engage students.

It is reasonable to expect similar dynamics in overcrowded or chaotic homes, where parents are less able to monitor child behavior. In addition, in an overcrowded or chaotic home where there are multiple adults and children within enclosed areas with frequent distractions, interruptions and competition for attention makes it challenging for mothers to spend focused time with one particular child. In fact, preschool-age children who spend more time wandering aimlessly and are not interacting with/being monitored by their mother have been found to have an increased risk of externalizing behavior over time (Gardner, Ward, Burton, & Wilson, 2003).

However, a parent who addresses the challenges posed by a chaotic or overcrowded home or dangerous neighborhood by more rigorously structuring the child's home environment and monitoring the child's activities in the neighborhood may decrease the risk of child externalizing behavior. For example, parents high on monitoring would be expected to more regularly know where the child is and what the child is doing, as well as setting aside time to connect personally with the child (e.g., playing, talking with them during housework). In fact, research indicates that parents of early adolescents who effectively monitor their children's exposure to neighborhood influences, both when they are young and concurrently, have children with low levels of externalizing behavior (Brody et al., 2001; Pettit, Bates, Dodge, & Meece, 1999).

Therefore, a second goal of the current study was to examine the potential protective effects of maternal monitoring in relation to different types of physical environment risk. Though parental monitoring has been shown to be associated with reduced risk of delinquent activity for adolescents (Patterson & Stouthamer-Loeber, 1984), few studies have examined if monitoring serves as a protective factor in relation to externalizing behavior within the context of physical environment risk in early childhood (Shaw et al., 2006).

1.6. Study hypotheses

The current study tested two hypotheses. First, based on previous research, we expected to find direct associations between overcrowding and chaos in the home, neighborhood quality, and later child externalizing outcomes both at home at age 4 and in school at age 5.5. We expected such relations to be found beginning at age 2 for overcrowding and chaos, but not until age 3 for neighborhood quality. Second, we hypothesized that maternal monitoring at age 2 and 3 would serve as a protective factor to moderate the effects of chaos and overcrowding in the home, and neighborhood dangerousness on children's later externalizing behaviors.

2. Method

2.1. Participants

Participants included 120 mother–son dyads recruited from the Women, Infant and Children (WIC) Nutritional Supplement Program in the Pittsburgh, PA metropolitan area. The sample was restricted to male children due to the greater prevalence of serious behavioral issues in male versus female children. Families were approached at WIC sites and invited to participate if they had a son between 17 and 27 months old, following a screen to ensure that they met the study criteria by having socioeconomic, family, and/or child risk factors for future behavior problems. Two or more of the three risk factors were required for inclusion in the sample. Of 271 families who participated in the screening, 124 families met the eligibility requirements and 120 (97%) of these families agreed to participate in the study. The children in the sample had a mean age of 24.1 months ($SD = 2.8$). At the time of assessment, the mean age of mothers was

27.2 years ($SD = 6.1$), with a range between 18 and 45 years of age. The average family income was \$15,374 per year ($SD = 8754$), with per capita income \$3594 ($SD = 2076$) per family member. The mean level of education attainment for mothers was 12.23 years ($SD = 1.41$), with approximately 66.6% of the sample having a high school education or less. In terms of ethnicity, 48.3% were African American, 40.0% were European American, and 11.7% identified themselves as other ethnicities (e.g., bi-racial, Asian, Hispanic, Native-American). At the time of the initial assessment, 45% were married or living together, 50% were single and never married, and 5% were separated, divorced, or widowed.

Mothers and their sons were approached at eight WIC sites in the Pittsburgh metropolitan area and asked if they would be willing to complete a series of questionnaires about the “Terrible Two’s.” The questionnaires were focused on the child’s disruptive behavior and emotionality, parenting hassles, and maternal depressive symptoms and took approximately 20–25 min to complete. Participants who completed this screen received compensation for their assistance. Families who met criterion for study inclusion based on socioeconomic status (i.e., maternal education and family income) and either or both family and/or child risk (e.g., maternal depressive symptoms or substance abuse; child externalizing symptoms), were contacted about participating in a more intensive study, of which 50% would have the opportunity to take part in a home-based, family intervention. If risk criterion were attained for only socioeconomic and family risk, mothers were also required to rate children above the normative mean on either the Intensity or Problem factors of the Eyberg Behavior Inventory.

Mothers and sons 1.75 to 2.5 years of age who met eligibility requirements and who agreed to participate in the study were then scheduled for a 2.5 hour home visit. The home visit included two videotaped structured tasks (e.g., a clean up task, delay of gratification, cooperative play) for the mothers and sons to participate in as well as time for the mothers to complete questionnaires. Families were compensated for participating in this home visit. Immediately following the first assessment, families were randomly assigned to a treatment or no-treatment condition. Those families assigned to the treatment condition were presented with the opportunity to meet with a parent consultant for two or more sessions. The sessions included a time for the parent consultant to get to know the family (session one) and a time for the parent to receive feedback on the child’s behavior, which employed motivational interviewing techniques (session two). If desired, the families could participate in follow-up sessions with the parent consultant to address parenting issues. For additional details on the intervention, see [Shaw and colleagues \(2006\)](#). Although the intervention was strictly voluntary, 92% of the families participated in the feedback and a smaller percentage (41%) engaged in one or more additional sessions with the parent consultant. For the purposes of the current study, the family’s treatment status was used as a covariate in the analyses.

When the children were approximately three ($N = 112$, 93% retention) and four ($N = 109$, 91% retention) years of age, families participated in follow-up home visits. These follow-up home visits occurred annually, 1 and 2 years after the original assessment when children were 1.75 to 2.5 years of age. Therefore, at the age 3 home visits the children ranged from 2.75 years to 3.5 years of age and at the age 4 home visit children ranged from 3.75 years to 4.5 years of age. The final home visit was conducted 1.5 years after the age 4 visit (children were 5.5–6 years of age) to ensure that the child would be attending school. The structure and measures were similar to those used for the initial home visit, with a few alterations in the observation procedures to match the child’s developmental status. Families were reimbursed for their time at each of the follow-up assessments. There were no differences in the participants who were not retained based on socioeconomic status at age three, $F(1, 119) = .16$, *ns*, or age four, $F(1, 119) = 2.34$, *ns*. In addition, when the children were 5.5–6 years of age, their classroom teachers were contacted to complete a number of questionnaires on child behavior. Of the children who completed the age 4 assessment, 72 (72%) teachers completed and returned these measures and received compensation for their time. There were no significant differences at age 2 between those children who did and did not have teacher reports at age 5.5–6 on socioeconomic status, $F(1, 119) = 2.02$, *ns*, maternal monitoring, $F(1, 119) = 1.71$, *ns*, externalizing behavior, $F(1, 119) = .29$, *ns*, or neighborhood quality, $F(1, 119) = .15$, *ns*.

2.2. Measures

2.2.1. Demographics

At both assessments the mothers reported on demographic characteristics of their household, including family income, education levels, number of children and adults in the home, child ethnicity, and size of the family home. A composite score of the family’s socioeconomic status was created by standardizing each variable and then creating a composite for income and education.

2.2.2. Maternal monitoring

Maternal monitoring was measured using the three observable items from the maternal involvement subscale on the infant–toddler version of the *Home Observation for Measurement of the Environment* (HOME; Bradley & Caldwell, 1984). The HOME is a measure of the quality of the home environment that was completed in the current study by a trained examiner at the end of the first home visit. The three items used to represent maternal monitoring included: 1) parent keeps child in visual range and looks often (defined in the current study as “Mother looks frequently enough to ensure safety of the child and to keep some kind of interpersonal contact with him — the sort of thing lovers do when in the same room but out of reach of one another”); 2) parent talks to child while doing housework (“Talking” to the child in this item means that the mother, in the course of her own work activities, finds a way of including the child in what she is doing. She may talk directly to the child, e.g., “Well, Mommy’s going to wash these dishes now”; or she may simply talk as though to the child as she goes about her work, “I don’t see how one family can get a house so dirty”); and 3) parent structures child’s play (defined as “Mother recognizes the short attention span of the young child and his need to have occasional suggestions as to things he might wish to do. Structuring need not involve any request that the child play”). The internal consistency of these three maternal monitoring items was acceptable, $\alpha = .53$ at age 2 and $= .56$ at age 3. The trained examiners rated these three items as being absent (0) or present (1) based on their impressions of each item while completing the 2.5 hour long home visit. In the current study, the items were considered observer impressions and therefore no inter-rater reliability was calculated, which may contribute to the factor’s low internal consistency. Previous research has found negative associations between HOME maternal monitoring scores and child problem behavior (Shaw et al., 2006).

2.2.3. Confusion, Hubbub and Order Scale (CHAOS; Matheny, Wachs, Ludwig, & Phillips, 1995)

The CHAOS is a 15-item measure of environmental confusion. Items are derived from a list of factors typically found in chaotic homes. Previous research has found the measure to have good internal consistency ($\alpha = .79$; $\alpha = .84$ in the current sample) and test–retest reliability ($r = .74$), and to be correlated with observations of environmental confusion (e.g., noise measurement, number of siblings, $r_s = .30$ – $.55$). Recent research has also found the measure to be significantly correlated with the externalizing subscale of Achenbach’s Child Behavior Checklist and Teacher Report Form, as well as with the anger-aggression subscale of the Social Competence and Behavior Evaluation, Short Form (parent version) (Dumas et al., 2005). As the CHAOS measure was a late addition to the age 2 assessment battery, 13 of the families in the initial sample were not administered the questionnaire. However, all participants did complete the questionnaire at the age 3 assessments.

2.2.4. Overcrowding in the home

The overcrowding variable was obtained from information gathered during a demographic interview, and derived by taking the ratio of the number of people reported to be living in the home to the number of rooms (not counting bathrooms or hallways) in the home. This variable was found to have a skewed distribution (skewness = 1.40) and therefore a log transformation was used to normalize scores.

2.2.5. Neighborhood quality

The measure of neighborhood quality was based on data gathered from official records of 1) overcrowding in the neighborhood (number of housing units within the family’s census tract from the 2000 Census, Regoeczi, 2003); 2) rates of crime based on FBI reporting of serious crime (murder, manslaughter, rape, United States Department of Justice, 2005); and 3) the percentage of people in the census-tract living below the poverty line according to U.S. Census data (2000). Each of these items has been found to be associated with high levels of neighborhood deviance and low levels of collective efficacy (Sampson, 1983; Sampson et al., 1997). The final score of neighborhood quality was created using the regression coefficient generated by a factor analysis, with higher scores indicating higher quality neighborhood (eigenvalue = 1.73; percentage of variance explained = 57%).

2.2.6. Child behavior problems: mother report

The Child Behavior Checklist 4–18 (Achenbach, 1991a) was used to obtain a maternal report of child externalizing behavior (including delinquent and aggressive behavior) at the age 4 assessments. The CBCL is one of the most widely used behavior checklists of childhood behavior problems and has been found to be significantly correlated with similar measures of child behavior problems. In addition to correlations with other self-report measures of behavior problems

(e.g., Strengths and Difficulties Questionnaire, $r = .84$), the CBCL has been shown to be a good predictor of clinical referral for behavioral issues (Achenbach, 1991a). The externalizing factor demonstrated satisfactory internal consistency in the current sample ($\alpha = .87$).

2.2.7. Child behavior problems: teacher report

Classroom teachers completed the Teacher Report Form (TRF) (Achenbach, 1991b) when the children were between 5.5 and 6 years of age. The TRF assesses teacher perceptions of the frequency (0 = “not true”; 2 = “very true”) of 113 problem behaviors that a child may display in school, for which both broad-band (e.g., externalizing) and narrow-band (e.g., aggression, delinquency) factors of conduct problems can be derived. The TRF is widely used, is considered to be a reliable measure of child behavior problems, and has been found to be significantly correlated with other teacher report measures of child behavior problems in a high risk sample ($r = .77$ with oppositional defiance and conduct disorder scales of the Child Symptom Inventory-4T) and with clinical referrals for mental health and special education services (Achenbach, 1991b). The externalizing behavior factor had high internal consistency in the current sample ($\alpha = .97$).

3. Results

3.1. Analysis plan

The statistical analysis for the current study was chosen to examine both direct and indirect associations between predictor and outcome variables. First bivariate correlations were used to examine direct effects between predictor and outcome variables. Second, hierarchical linear regressions were used to examine the direct relationships after accounting for potential covariates of SES, ethnicity and treatment status. Finally, to test whether maternal monitoring acted as a moderator for the impact of micro- and macro-level physical environmental variables, the interactions between maternal monitoring and environmental variables were included in the regression followed by the test of simple slopes for significant interactions.

3.2. Descriptive statistics for predictor and outcome variables

Descriptive statistics for all study variables are provided in Table 1. To interpret the current findings, an understanding of the risk status of the sample is necessary. At both age 2 and 3, 15.8% of the boys lived in an overcrowded home. The family's age 2 and 3 chaos scores ($M_2 = 5.92$, $SD_2 = 3.82$; $M_3 = 5.82$, $SD_3 = 3.87$) were somewhat higher than those reported by Dumas and colleagues' (2005) original study using both a normative sample of kindergarten families ($M = 3.99$, $SD = 3.42$) and a low-income sample of third-grade children ($M = 2.90$, $SD = 3.03$). Finally, t -scores on the CBCL and TRF Externalizing factors support the behavioral risk status of the current sample. Approximately 46% of the boys were above the 84th percentile on mothers' responses to the CBCL and 23.6% of the children were above the 84th percentile for the TRF in kindergarten.

3.3. Relationships between environmental factors at ages 2 and 3 on mother- and teacher-reported child behavior problems

The first goal was to examine the relationships between physical environmental variables and child problem behavior. As shown in Table 2, bivariate correlations indicated that chaos in the home at both ages 2 and 3 was significantly related to mother's (but not teacher's) reports of child behavior problems at ages 5.5–6 years. In addition, maternal monitoring at age 3 was negatively related to both maternal and teacher report of child behavior problems at school entry. There were no significant relationships between neighborhood quality and either mother- or teacher-reported externalizing behavior. To investigate the relationship between child ethnicity and predictor variables, a MANOVA was conducted. The overall MANOVA was significant, $F(8, 73) = 2.05$, $p < .01$. Significant differences between European-Americans and African-Americans were observed specifically with neighborhood quality at age 3 (European Americans, $M = .45$, $SD = .90$, $p < .05$, African Americans, $M = -.19$, $SD = 1.08$, $p < .05$) and maternal monitoring at age 2 (European Americans, $M = .30$, $SD = .88$, $p < .05$, African Americans, $M = 1.51$, $SD = 1.07$, $p < .05$).

Table 1
Descriptive statistics for predictor and outcome variables

	Mean	SD	Range in sample	Possible range
<i>Predictor variables</i>				
Overcrowding in the home (age 2)	.88	.34	.36–2.00	–
Neighborhood quality (age 2)	.00	1.00	–3.39–3.38	–
Chaos (age 2)	5.92	3.82	.00–15.00	0–15
Overcrowding in the home (age 3)	.86	.29	.36–2.00	–
Neighborhood quality (age 3)	.00	1.00	–2.00–3.22	–
Chaos (age 3)	5.82	3.87	.00–14.00	0–15
Maternal monitoring (age 2)	1.85	1.05	.00–3.00	0–3
Maternal monitoring (age 3)	1.92	1.03	.00–3.00	0–3
<i>Outcome variables</i>				
Maternal reported externalizing (age 4)	14.36	8.33	.00–40.00	0–48
Teacher reported externalizing (age 5)	14.53	13.32	.00–59.00	0–84

Note. The neighborhood quality scores are standard scores.

Because significant relationships were observed for socioeconomic status and child ethnicity in relation to physical environment and maternal behavior scores and/or child problem behavior scores, these demographic variables were included as control variables in subsequent analyses. In this manner the relationships between physical environment measures, maternal behavior, and child problem behavior could be explored over and above any relationship due to covariation with socioeconomic measures and/or ethnicity. However, because no associations were found between the family's treatment group assignment and either predictor or child problem behavior variables, treatment status was not included in subsequent analyses. This reduced the number of parameters and increased power to detect effects.

3.4. Examination of maternal monitoring behaviors at child ages 2 and 3 as moderating the relationship between physical environmental factors and later child externalizing behaviors

Our second goal was to assess whether early maternal monitoring behaviors attenuated associations between physical environmental variables and subsequent child externalizing problems. To ensure that there were a similar number of mothers who were high and low on monitoring in all different levels of the physical environments, the maternal monitoring and the environmental variables were dichotomized into high and low levels. Chi-square analyses indicated that a similar number of mothers high on monitoring were in both high and low chaos homes at age 2, $\chi^2(1, N = 107) = .91, ns$, and age 3, $\chi^2(1, N = 106) = .76, ns$; in both high and low overcrowded homes at age 2, $\chi^2(1, N = 120) = .45, ns$ and at age 3, $\chi^2(1, N = 107) = .02, ns$; and in high and low quality neighborhoods at age

Table 2
Bivariate correlations examining SES, physical and social environmental variables assessed at ages 2 and 3 and child externalizing behaviors assessed at ages 4 and 5

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Socioeconomic status	–										
2. Treatment	–.00	–									
3. Overcrowding in the home (age 2)	–.24**	–.07	–								
4. Neighborhood quality (age 2)	.19*	.04	–.02	–							
5. Chaos (age 2)	–.16	.02	.17	–.05	–						
6. Overcrowding in the home (age 3)	–.22*	.13	.66**	–.07	.09	–					
7. Neighborhood quality (age 3)	.18	.05	.02	.83**	–.05	–.01	–				
8. Chaos (age 3)	–.07	.14	.13	–.01	.70**	.09	–.02	–			
9. Maternal monitoring (age 2)	.26**	.01	.02	.27**	–.01	.02	.31**	.01	–		
10. Maternal monitoring (age 3)	.16	–.14	.03	.17	–.06	.00	.14	–.08	.18	–	
11. Maternal reported externalizing (age 4)	–.05	.01	–.04	–.09	.29*	–.02	–.12	.42**	.04	–.21*	–
12. Teacher reported externalizing (age 5)	.06	–.02	–.20	–.13	–.02	–.21	–.15	.22	–.06	–.36**	.19

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

3, $\chi^2(1, N = 107) = .96, ns$. There was a significant relationship between maternal monitoring and neighborhood quality at age 2, $\chi^2(1, N = 120) = 4.56, p < .05$, with more mothers high in monitoring behaviors occurring in low quality versus high quality neighborhoods.

Hierarchical linear regression analyses were used to investigate maternal monitoring as a potential moderator of the relationship between physical environment and child externalizing behaviors. The demographic variables of child ethnicity and socioeconomic status were entered first in each equation to control for their relationship with child externalizing behavior, followed by the physical environmental variables and then the individual two-way interaction terms representing levels of maternal monitoring and the physical environment. When an interaction term was significant, a test of simple slopes (Aiken & West, 1991) was used to investigate the pattern of slopes at low, average, and high levels of the moderator of maternal monitoring.

The overall equation examining the relationship between age 2 environmental variables on the child's age 4 externalizing behaviors reported at home by mothers or reported at school by teachers at age 5 were not significant (see Table 3).

However, the regression analysis that examined physical environmental variables and maternal monitoring assessed when the child was 3 years old as predictors of child externalizing behaviors reported at home by mothers when the child was 4 years old was significant, $F(8, 88) = 3.62, p < .001, R^2 = .18$. As can be seen in the left panel of Table 4, neighborhood quality, chaos, and a significant interaction between monitoring and neighborhood quality were significant predictors of the problem behaviors reported by mothers. The test of simple slopes to explore the nature of the interaction effect is presented in Fig. 2. This graph reveals that poor neighborhood quality was associated with higher levels of externalizing behavior at age four for children with mothers who evidenced low levels of maternal monitoring when the child was 3 years old (slopes = $-.11$, and -1.87 for low levels and mean levels of monitoring, respectively, $ps < .01$). However, when mothers showed high levels of maternal monitoring when the child was 3 years old, the relationship between poor neighborhood quality and children's subsequent problem behavior was not significant (slope = $.36, ns$, see Fig. 2).

Table 3

Summary of linear regression analyses of demographic, physical environmental, and maternal behavior variables (assessed at child's age 2) predicting child externalizing behaviors reported by mothers (at child's age 4) and by teachers (at child's age 5)

Variable	Maternal reported externalizing (age 4)			Teacher reported externalizing (age 5)		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Step 1						
Socioeconomic status	-.72	1.06	-.07	1.58	2.10	.10
Child ethnicity	-2.12	1.24	-.18	4.10	2.56	.20
Step 2						
Socioeconomic status	.02	1.13	.00	2.00	2.34	.12
Child ethnicity	-1.60	1.33	-.13	4.32	2.81	.22
Maternal monitoring	-.24	.92	-.03	-.172	2.06	-.01
Neighborhood quality	-1.499	.821	-.19	-1.69	1.74	-.13
Overcrowding in home	-3.35	5.76	-.06	-16.78	11.80	-.19
Chaos in home	.54	.23	.25*	.54	.55	.14
Step 3						
Socioeconomic status	-.27	1.16	-.03	1.92	2.36	.12
Child ethnicity	-1.40	1.36	-.12	4.36	2.80	.22
Maternal monitoring	-.72	1.80	-.09	2.46	4.91	.17
Neighborhood quality	-1.32	2.20	-.17	-7.85	5.09	-.59
Overcrowding in home	8.03	12.12	.15	2.38	28.39	.03
Chaos in home	.64	.49	.30	1.78	1.25	.46
Maternal monitoring \times Neighborhood quality	-.10	.93	.03	2.60	2.05	.47
Maternal monitoring \times Chaos	-.02	.23	-.03	-.61	.58	-.39
Maternal monitoring \times Overcrowding in the home	-6.94	6.38	-.27	-8.80	15.03	-.21

Note. Maternal reported externalizing behavior: $F(9, 94) = 1.60, p < .13, R^2 = .05, ns$. Teacher reported externalizing behavior: $F(9, 63) = 1.12, p < .37, R^2 = .02, ns$.

Table 4

Summary of linear regression analyses of demographic, physical environmental, and maternal behavior variables (assessed at child's age 3) predicting child externalizing behaviors reported by mothers (at child's age 4) and by teachers (at child's age 5)

Variable	Maternal reported externalizing (age 4)			Teacher reported externalizing (age 5)		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Step 1						
Socioeconomic status	-.41	1.10	-.04	2.12	1.96	.14
Child ethnicity	-2.13	1.35	-.16	4.33	2.31	.24
Step 2						
Socioeconomic status	.21	1.07	.02	2.26	1.90	.15
Child ethnicity	-1.64	1.26	-.13	3.67	2.18	.20
Maternal monitoring	-1.52	.79	-.19	-3.41	1.40	-.28*
Neighborhood quality	-.74	.80	-.09	-1.28	1.38	-.11
Overcrowding in home	-2.57	5.87	-.04	-18.25	10.22	-.21
Chaos in home	.82	.21	.37**	.98	.38	.29**
Step 3						
Socioeconomic status	.33	1.09	.03	2.17	1.86	.14
Child ethnicity	-1.36	1.26	-.11	4.41	2.21	.24*
Maternal monitoring	-2.71	1.49	-.34	-3.35	3.25	-.27
Neighborhood quality	-3.99	1.79	-.49*	-6.97	2.83	-.58*
Overcrowding in home	-14.91	10.69	-.25	-46.29	18.62	-.54*
Chaos in home	.89	.30	.40**	1.27	.55	.38*
Maternal monitoring \times Neighborhood quality	1.47	.76	.42*	2.945	1.35	.54*
Maternal monitoring \times Chaos	-.05	.13	-.06	-.22	.23	-.17
Maternal monitoring \times Overcrowding in the home	6.38	5.23	.23	13.82	8.77	.35

Note. Maternal reported externalizing behavior: $F(9, 88) = 3.23, p < .002, R^2 = .19$; Teacher reported externalizing behavior: $F(9, 58) = 3.56, p < .002, R^2 = .28$.

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

Similar findings emerged using the same model to predict teacher reports of children's externalizing behavior at school at age 5.5. The overall equation examining the effect of the age 2 physical environmental variables was not significant (see right panel of Table 3), but the equation using age 3 physical environmental variables as predictors of children's problem behaviors at age 5 was significant (see right panel of Table 4), $F(8, 56) = 4.02, p < .001, R^2 = .27$. There were significant direct effects for neighborhood quality, overcrowding in the home, chaos in the home, and the interaction between neighborhood quality and maternal monitoring. To examine the nature of the interaction, a test of

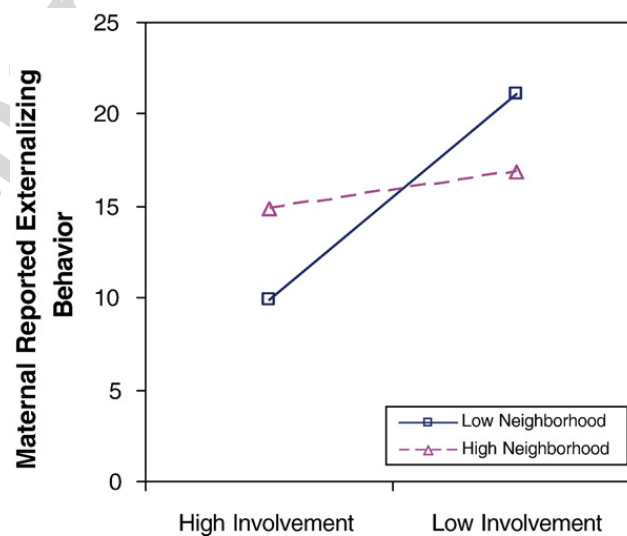


Fig. 2. Interaction between maternal monitoring and neighborhood quality on mothers' report of child externalizing behavior at age 4 years.

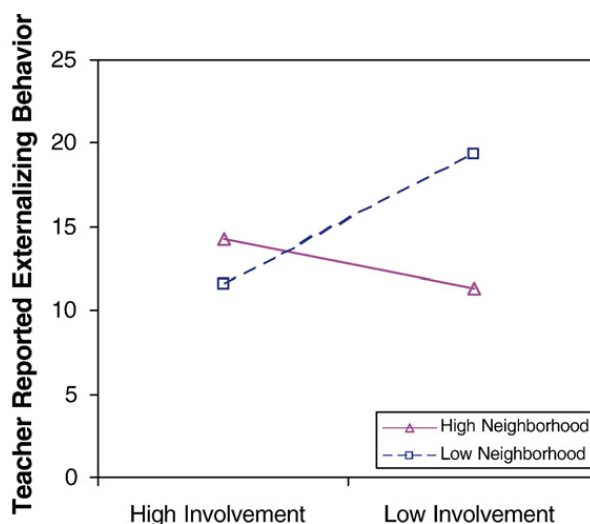


Fig. 3. Interaction between maternal monitoring and neighborhood quality on teachers' report of child externalizing behavior at age 5.5.

simple slopes was computed. These slopes, depicted in Fig. 3, revealed that poor neighborhood quality was associated with higher levels of externalizing behavior at low levels of maternal monitoring (slopes = -8.26 and -13.67 , $ps < .01$), but was not significant at high levels of maternal monitoring (slope = -2.85).

4. Discussion

This study examined associations between risk factors in children's physical environment and the development of early externalizing behavior. In addition, we investigated the potential protective role of maternal monitoring in relation to risk factors in the physical environment. Consistent with expectations, both micro- and macro-physical environmental risk factors were related to later child externalizing behaviors. However, overcrowding and neighborhood quality were predictive of children's externalizing problems only after accounting for sociodemographic variables and were not evident until the child was 3 years old. Additionally, maternal monitoring was found to attenuate the negative association of poor neighborhood quality and children's later externalizing behavior.

4.1. Direct associations of physical environmental factors and subsequent measures of externalizing behavior

Consistent with our hypotheses, there were direct associations between physical environmental variables and children's later externalizing behavior. Corroborating recent research (Dumas et al., 2005), maternal reports of chaos in the home were directly related to children's later externalizing behavior at age 4. In addition, after controlling for child SES and ethnicity, chaos was also positively associated with teacher reports of externalizing problems at school when the children were 5.5 years old. Interestingly, Dumas and colleagues (2005) found similar relationships between chaos and maternal-reported behavior problems with third-grade children. However, the Dumas et al. associations with teacher-reported problems were no longer evident after controlling for sociodemographic variables. The current findings suggest that at least for low-income boys at elevated risk for externalizing behaviors, chaos in the home may be associated with problematic child behavior in the early grades at school. Children living in chaotic homes may not develop the necessary regulatory skills to behave in a structured context, making the transition to the classroom more challenging than for other children in less chaotic home environments.

One possible reason to explain the different pattern of findings found in the current study and the Dumas et al. study (2005) is sample selection. In the Dumas study children were not selected based on risk factors associated with early-starting externalizing problems, a gating procedure that was used to recruit the sample in the current study. Socioeconomic risk factors accounted for associations between chaos and school-based externalizing problems in Dumas et al.'s sample of non-selected children. Perhaps because children in the current study were required to have risk factors present beyond socioeconomic factors, controlling for socioeconomic risk did not attenuate associations between chaos and externalizing behaviors at school. In fact, SES appeared to serve as a suppressor variable in the

present study, amplifying the association between chaos and externalizing when included as an independent variable in the regression equation.

Overcrowding in the home also was expected to be directly associated with child externalizing behavior in the home and at school. However, this association was evident for older children's school-based externalizing, apparent only when the children were 5.5 years old and only after controlling for sociodemographic variables. It may be that in overcrowded homes it is difficult for the mother to observe and therefore accurately report children's deviant behavior, or that because of the lack of space a higher threshold of child disruptive behavior is tolerated by parents, or that this relationship emerges at later ages (i.e., age 5.5 versus 4). Another possibility is that because of less space, overcrowded homes may elicit more hostile interactions among family members. Although condoned in the context of an overcrowded home, the child may demonstrate similar acrimonious ways of interacting with peers and teachers in the school context, which would more likely be viewed as problematic by teachers than those also living in the crowded home atmosphere.

Regarding neighborhood risk and children's emerging externalizing behavior, the findings were largely consistent with a small number of studies conducted in early childhood (Brooks-Gunn et al., 1993; Kohen et al., 2002; Winslow & Shaw, in press). First, as expected, neighborhood effects were found on later child externalizing behaviors, but were not evident until age three. This finding supports previous research findings (Brooks-Gunn et al., 1993), that is, neighborhood effects tend to grow as children age and become more independent, providing greater opportunity for direct exposure to neighborhood influences. Second, direct neighborhood effects on later externalizing problems were not evident in correlational analyses, but emerged only in multivariate analyses that incorporated the influences of family income and maternal education. Macro-level factors such as neighborhood quality may only become salient after taking into consideration the more proximal influences of income and parental education, particularly for young children. In the current study, family income and parental education might have served as proxies for other factors that affect risk for externalizing problems, such as access to high-quality child care and material resources. For young children, the effects of neighborhood quality on later externalizing problems may only be evident when family resources are also low. Though some research has found concurrent interactions between home and neighborhood environments (e.g., Kohen et al., 2002), future research should explore how home and neighborhood factors interact to exacerbate risk on externalizing behaviors over time (e.g., lack of emotional support in the home during infancy and toddlerhood in combination with poor neighborhood during the preschool years).

Although the early school years have been described as the period in which children begin to have more regular direct contact with neighborhood influences (Farver & Garcia, 1997; Guerra et al., 2003), this study corroborates previous research suggesting that children as young as preschool age can be influenced by neighborhood factors (Osofsky, 1995). Although our measure of neighborhood did not assess how much time children actually spend in the neighborhood and their specific exposure to aspects of the neighborhood and must be therefore interpreted with caution, the findings are consistent with the notion that exposure to neighborhood influences may be important beginning in early childhood. Some evidence suggests that negative effects of this exposure can be mitigated by parental monitoring (Brooks-Gunn et al., 1993).

4.2. Maternal monitoring as a buffer against negative physical environmental risk

Maternal monitoring was not found to act as a buffer of micro-level physical environmental factors in the home (i.e., chaos, overcrowding), but was found to serve as a protective factor in relation to neighborhood risk. The finding suggests that in the most disadvantaged neighborhoods, maternal monitoring in the preschool years may serve a similar function as parental monitoring of adolescents. Research with adolescents has demonstrated that parental monitoring can buffer the effects of living in a poor quality neighborhood (Dishion & McMahon, 1998; Dishion, Andrews, Kavanagh, & Soberman, 1996; Loeber & Dishion, 1983; Pettit et al., 2001; Waizenhofer, Buchanan, & Jackson-Newsom, 2004), particularly in relation to the development of drug use and delinquency. As previously stated, in much of the previous research parental monitoring has been defined as a set of correlated parenting behaviors involving attention to and tracking of children's whereabouts and activities (Dishion & McMahon, 1998). Although this definition has been associated most often with adolescents, some research has tracked the importance of parental monitoring to early childhood, specifically toddlerhood. During these years, parental attention and tracking of a child's activities is required to ensure the safety of the child inside and outside of the house (Shaw et al., 2000; Brayden et al., 1993; Glik et al., 1993). Parents' use of effective monitoring techniques in the preschool period may protect children

from beginning associations with deviant peers or older children and implicitly let children know that externalizing behavior outside of the home will not be condoned (Pettit et al., 2001).

The current results also suggest that interventions promoting the development of monitoring and proactive parenting should be given consideration beginning in early childhood, particularly for those children living in high-risk neighborhoods. The toddler period appears to be a critical developmental point in establishing early-starting trajectories of conduct problems for at-risk children (Shaw et al., 2003). Thus, targeting malleable risk factors that are associated with early-starting externalizing and conduct problem behavior patterns, such as maternal monitoring, should be a priority for prevention scientists.

It is interesting that maternal monitoring did not buffer the effects of chaos or overcrowding on externalizing behavior for these children. Theoretically if the mother shapes the home environment through her behavior, it may be that those mothers in high chaos homes do not have the organizational skills to effectively monitor and structure their child's environment. However, there were similar numbers of mothers in the current sample who scored high for monitoring in each context, indicating that there may be alternate explanations.

One possible explanation for this finding is that neighborhood quality is a macro-level context and therefore more amenable to the influences of maternal monitoring. This is in contrast to the home environment, for which contact with the child occurs on a daily basis. Parents living in poor quality neighborhoods have noted one protective factor they can use — keeping their children in the home (Blakely, 1994; Jarrett, 1997; Spilsbury, 2005). However, if the home is overcrowded, it is difficult to know how effectively a mother could monitor children within this challenging environment. A second possible explanation for the finding that high maternal monitoring did not lessen the effect of micro-level factors is that micro-level family factors such as chaos and overcrowding are strong predictors of child adjustment and exposure to high levels of these risk factors is challenging to overcome. Therefore, maternal monitoring, even at the highest level, would have only modest influence on these risk factors.

4.3. Limitations

There are several limitations that need to be considered in interpreting the current findings. First the sample included only low-income, high-risk, urban male toddlers from primarily two ethnic groups. Additional research with children from more diverse socioeconomic strata and region, as well as inclusion of girls, is necessary to better understand the implications of the findings. Second, the current study would have benefited from direct measurement and observation of physical environmental variables (e.g., using multiple methods including scientific measurement of noise and organization in addition to mother and home visitor ratings of chaos) to better capture the quality of the home and immediate neighborhood environment. More research is needed to replicate the current findings using observational methods. Finally, the definition and measures of maternal monitoring used in the current study may tap into similar monitoring behaviors as defined with adolescent monitoring as we are attempting to tap into an overall set of monitoring behaviors. However, little research has looked at monitoring specifically during the preschool years thus, the definition and measures used in the current study examining maternal monitoring would have benefited greatly from additional research examining maternal monitoring as it relates to children during the preschool years.

4.4. Summary and conclusions

The results of this paper provide support for the importance of physical environmental contributions in relation to early developing child externalizing problems. In addition, the findings highlight the protective role of maternal monitoring in relation to neighborhood risk beginning in early childhood. Future prevention studies targeting family process issues may want to consider the potential buffering role of maternal monitoring for children living in high-risk neighborhoods.

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