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Family Functioning and Externalizing Behaviour among Low-income Children: Self-regulation as a Mediator

Cecily R. Hardaway[a,*], **Melvin N. Wilson**[a], **Daniel S. Shaw**[b], and **Thomas J. Dishion**[c,d]

[a] University of Virginia, Charlottesville, VA, USA

[b] University of Pittsburgh, Pittsburgh, PA, USA

[c] Arizona State University, Tempe, AZ, USA

[d] University of Oregon, Eugene, OR, USA

Abstract

The purpose of this study was to examine self-regulation as a mediator of the relation between family functioning and externalizing behaviour in 731 low-income children (M age = 41 months) across three time points. Specifically, this study focused on whether chaos in the home and positive behaviour support were indirectly related to externalizing problems through their influence on inhibitory control. The primary findings were as follows: (a) chaos in the home at age 3 years was indirectly related to externalizing behaviour at age 5.5 years through children's inhibitory control at age 4 years, and (b) positive behaviour support at age 3 years was indirectly related to externalizing behaviour at age 5.5 years through inhibitory control at age 4 years. Implications of these findings and directions for future research are discussed.

Keywords

household chaos; inhibitory control; self-regulation; externalizing problems; low-income children

The family is an important ecological microsystem that represents opportunities for economic and instrumental cooperation, informal communications and reciprocated social obligations (Wilson & Tolson, 1990). Because the family does not exist in a vacuum, aspects of the family context afford fundamental conditions that disrupt, enhance or otherwise qualify the role of the family as a functional system (Bronfenbrenner, 1989; Conger et al., 1992; McLoyd, 1990). Chaos at the microsystem level can provide conditions that disrupt the basic goals of the family system. Chaotic home environments lack structure and routines and feature high levels of noise, crowding and disorganization (Evans, Eckenrode, & Marcynyszyn, 2010; Wachs, 1989). In chaotic households, proximal processes occur in a microenvironment that lacks a sense of order, predictability and safety —features of the environment that have been shown to promote healthy child development (Boyce, Jensen, James, & Peacock, 1983; Evans & Wachs, 2010; Howe, 2002; Steinglass, Bennett, Wolin, & Reiss, 1987). In this study, we draw on Bronfenbrenner's Bioecological Model to examine the influence of chaos on children's inhibitory control and subsequent problem behaviour (Bronfenbrenner & Morris, 1998).

[*]Correspondence to: Department of Psychology, University of Virginia, 102 Gilmer Hall, PO BOX 400400, Charlottesville, VA 22904, USA. .
Current address: Department of Psychiatry, University of Pittsburgh School of Medicine, Psychiatric Epidemiology Training Program, 4415 Fifth Avenue, Suite 138, Pittsburgh, PA, 15213, USA. hardaway@pitt.edu

PARENTING, FAMILY SOCIOECONOMIC STATUS AND HOUSEHOLD CHAOS

The relation between household chaos and parenting has been the focus of several investigations. Such studies have documented that household chaos is correlated with but distinct from parenting (Coldwell, Pike, & Dunn, 2006; Deater-Deckard et al., 1983) and that household chaos is associated with negative parenting behaviours (i.e. low responsivity and harsh or inconsistent parenting; Coldwell et al., 2006; Corapci & Wachs, 2002; Dumas et al., 2005; Matheny, Wachs, Ludwig, & Phillips, 1995; Nelson, O'Brien, Blankson, Calkins, & Keane, 2009; Pike, Iervolino, Eley, Price, & Plomin, 2006; Valiente, Lemery-Chalfant and Reiser, 2007). In as much as most studies have utilized cross-sectional designs and/or have relied on parent reports for both household chaos and parenting, the strength of the conclusions that can be drawn from research on parenting and chaos are limited. Moreover, most research on household chaos and parenting has centered on the hypothesis that household chaos elicits negative parenting behaviours. Far fewer studies have examined bidirectional relations between chaos and parenting, how parenting may contribute to household chaos or whether certain caregiver characteristics act as third variables, influencing both parenting and level of chaos. Longitudinal, multi-informant studies that take caregiver characteristics into account are needed to clarify issues of directionality.

In addition to investigations that have focused on household chaos and parenting, the relation between household chaos and family socioeconomic status (SES) has also garnered attention. Income and household chaos are positively related, and factors such as cumulative stress, lack of resources, shifting work schedules and single parenthood likely account for the higher levels of chaos in low-income households compared with more economically advantaged households (Ackerman & Brown, 2010; Evans et al., 2010; Wachs & Evans, 2010). Low-income mothers are employed in low-wage jobs with unpredictable work schedules at high rates (Presser, 2003), and work demands can interfere with the establishment and maintenance of family routines (McLoyd, Toyokawa, & Kaplan, 2008; Yoshikawa, Magnuson, Bos, & Hsueh, 2003). Evidence suggests that household chaos partially mediates relations between poverty and adolescent socioemotional adjustment problems (i.e. learned helplessness, psychological distress, self-regulatory problems; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). Nevertheless, correlations between household chaos and family income or socioeconomic status tend to be relatively low (e.g. Dumas et al., 2005; Evans et al., 2005; Matheny et al.,1995; Nelson et al., 2009; Pike et al., 2006), and associations between house-hold chaos and child outcomes remain, even when income or SES is controlled (Wachs & Evans, 2010).

HOUSEHOLD CHAOS AND CHILDREN'S EXTERNALIZING PROBLEMS

Chaos in the home has been consistently linked to children's externalizing problems (Fiese & Winter, 2010), including subtypes of externalizing problems such as anger-aggression and limited attentional focusing (Dumas et al., 2005). Chaos in the home is associated with externalizing behaviours during early childhood (Deater-Deckard et al., 1983; Supplee, Unikel, & Shaw, 2007), middle childhood (Dumas et al., 2005) and adolescence (Evans et al., 2005). However, one of the limitations of the literature linking household chaos to child development is that studies have largely been cross-sectional (Evans et al., 2010). In addition to the lack of longitudinal analysis, studies that investigate processes through which household chaos affects children's socioemotional adjustment are scarce (Fiese & Winter, 2010).

The Role of Self-regulation

Self-regulation is one plausible mechanism linking household chaos to externalizing problems that has some support in the literature. Studies have shown that poverty and its cofactors pose direct and indirect threats to children's self-regulatory abilities (Evans et al., 2005; Lengua, 2009; Lengua, Honorado, & Bush, 2007; Raver, 2004). Positive correlations between SES and child self-regulation have been reported cross-nationally and within both child and adolescent samples (Eisenberg et al., 2005; Lengua, 2006; Zhou, Lengua, & Wang, 2009). For example, a cross-sectional study of 287 rural children ages 8 to 10 years reported that 32% of low-income children compared with 19% of middle-income children failed a delay of gratification task used to assess self-regulation (Evans & English, 2002). Although researchers have documented a positive relation between income and self-regulation, little is known about why low-income children have lower self-regulation (Lengua, 2009). Raver (2004) suggests that emotional self-regulation may act as a mediator between poverty-related risks and child socioemotional functioning. Lengua (2009) proposed a model in which family risk factors associated with economic disadvantage (e.g. negative life events and residential instability) lead to poor parenting practices which in turn are related to low self-regulation directly and through children's physiological stress responses.

Parenting—Previous research on environmental predictors of self-regulation has largely focused on parenting and parental socialization among middle-income families (Eisenberg, Spinrad and Eggum, 2010). Positive parenting and family functioning appear to be associated with greater levels of self-regulation. For example, maternal responsiveness (Kochanska, Murray, & Harlan, 2000), dyadic mutuality (characterized by high levels of positive affect and connectedness) and positive behaviour support (Moilanen, Shaw, Dishion, Gardner, & Wilson, 2009) have all been found to either predict later self-regulation or changes in self-regulation over time. Likewise, negative parenting behaviours and practices have been shown to be inversely correlated with self-regulation (Kochanska & Knaack, 2003; Lengua, 2006; Moilanen et al., 2009).

Studies have also shown that self-regulation acts as a mediator of the association between parenting and children's externalizing problems (Spinrad et al., 2007; Valiente et al., 2006; van Aken, Junger, Verhoeven, van Aken, & Deković, 2007). One such study reported that maternal supportive parenting was positively associated with effortful control, which in turn was negatively associated with externalizing problems amongtoddlers ages 16.8 to 20 months. The model held when constructs were examined con-currently at each wave but did not hold in a longitudinal model that controlled for autoregressive effects (Spinrad et al., 2007). Other longitudinal studies have found, however, that effortful control acts as a mediator of relations between parenting and externalizing problems (Eisenberg et al., 2005; Valiente et al., 2006).

Household chaos—Although chaos in the home has been found to be associated with poor self-regulation (Evans et al., 2005), to our knowledge only one cross-sectional study of children in middle childhood and early adolescence has directly examined self-regulation as a mediator of the relation between family chaos and externalizing problems. Specifically, Valiente et al. (2007) investigated a chain of multiple mediators linking household chaos to externalizing problems among children ages 7 to 12 years. Parents in chaotic homes had less positive reactions to their children's negative emotions which were related to children's externalizing problems through effort control. Findings from Valiente and colleagues suggest that chaotic home environments may undermine the development of children's behavioural regulation. Other noteworthy research has shown that family routines are important in promoting child self-regulation (Brody & Flor, 1997).

Household chaos likely disrupts important proximal processes that are critical for the development of self-regulation. Chaotic environments may overstimulate children, thereby leading to overarousal and interfering with the development of self-regulatory skills (Evans et al., 2005; Hoffman, 2000, Wachs & Evans, 2010). Regulating thoughts, emotions and behaviours is especially difficult in environments with erratic routines and shifting expectations (Evans et al., 2010). Limit setting and scaffolding have been shown to play a key role in shaping the development of self-regulatory skills (Lengua et al., 2007). Inconsistent, unpredictable environments obscure the connection between actions and outcomes, and without adequate understanding of action-outcome contingencies, it is more difficult for children to internalize the regulation of actions (Grolnick & Farkas, 2002; Skinner, Johnson, & Snyder, 2005).

THE CURRENT STUDY

Studies indicate that self-regulation begins to rapidly develop very early in childhood; thus, environmental influences may be particularly salient during the early childhood period (Lengua, 2009). In the present study, we focus on inhibitory control, a form of self-regulation that refers to a child's ability to refrain from inappropriate behaviour upon instruction (Eisenberg, Fabes, Guthrie, & Reiser, 2000; Eisenberg et al., 2010). Research has shown that inhibitory control increases linearly across early childhood (Moilanen et al., 2009), with discernable age differences becoming increasingly apparent over time (Dowsett & Livesey, 2000; Gerardi-Caulton, 2000). Our goals were to examine whether inhibitory control mediates relations between (a) chaos in the home and child externalizing problems and (b) positive behaviour support and child externalizing problems.

Figure 1 presents a graphic illustration of our hypothesized model. In testing inhibitory control as a mediator of the relation between positive behaviour support and externalizing problems, we expected to replicate past studies that have found that parenting has an indirect effect on externalizing problems through self-regulation. We were particularly interested in whether inhibitory control would mediate the relation between household chaos and externalizing problems after accounting for the path linking positive behaviour support to externalizing problems through children'sinhibitory control. Further, our model includes a path linking household chaos and positive behaviour support. We expected household chaos and parenting to be negatively correlated and independently related to inhibitory control.

The current study makes a unique contribution to the existing literature in several ways. We add to research demonstrating an association between chaos in the home and externalizing problems by augmenting previous cross-sectional findings with longitudinal data and extending the focus to young children. The longitudinal design of the current study allows for an examination of processes over time, controlling for prior levels of both the mediating variable and the outcome variable. The present study also contributes to the literature by examining whether household chaos is a predictor of self-regulation. Little is known about predictors of self-regulation other than parenting, particularly predictors that may be highly salient in the context of poverty. Although previous literature has shown that low-income children tend to have lower self-regulatory skills than other children (Evans et al., 2005; Raver, 2004), the reasons for the relation between income status and self-regulation skills remain unclear. Further, existing studies (e.g., Corapci & Wachs, 2002; Matheny et al., 1995) have focused primarily on parenting as a mediator of the association between household chaos and externalizing behaviour, and little is known about other processes that link household chaos to externalizing behaviour. The present study adds to the literature by examining self-regulation as a means through which household chaos is related to child behaviour problems.

METHOD

Participants

Participants included 731 primary caregiver–child dyads recruited between 2002 and 2003 from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Programs in the metropolitan areas of Pittsburgh, PA, and Eugene, OR, and within and outside the town of Charlottesville, VA (Dishion et al., 2008). Families were approached at WIC sites and invited to participate if they had a child between 2 years 0 months and 2 years 11 months of age. Risk criteria for recruitment were defined at or above one standard deviation above normative averages on several screening measures within the following three domains: (a) child behaviour (conduct problems, high-conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status) and (c) socio-demographic risk (no more than 2 years post high school education, and low family income). Two or more of the three risk factors were required for inclusion in the sample. Children who met criteria based on family problems and socio-demographic risk were also required to have above-normative levels of externalizing problems to ensure significant levels of problem behaviour.

Of the 1666 parents who were approached at WIC sites across the three study sites and had children in the appropriate age range, 879 families met the eligibility requirements, and 731 agreed to participate. No differences in family problems, socio-demographic risk or problem behaviour were found between those who agreed to participate and those who did not. Of the 731 families (49% female children), 272 (37%) were recruited in Pittsburgh, 271 (37%) in the Eugene site and 188 (26%) in Charlottesville. During the period of screening from 2002 to 2003, more than two-thirds of those families enrolled in the project had an annual income of less than $20 000, and the average number of family members per household was 4.5 (SD = 1.63). Forty-one per cent of the sample had a high school diploma or General Educational Development, and an additional 32% had 1 to 2 years of post-high school training. Across sites, the children were reported to belong to the following racial groups: 27.9% African American, 50.1% European American, 13.0% biracial and 8.9% other races (e.g. American Indian, Native Hawaiian). In terms of ethnicity, 13.4% of the sample reported being Hispanic American.

Of the 731 families who initially participated, 659 (90%) were available at the age-3 years follow-up (T2), 619 (85%) participated at the age-4 years follow-up (T3), and 621 (85%) participated at the age-5.5 years follow-up (T4). Selective attrition analyses revealed no significant differences at age 2 years between retained participants and those who would later drop out of the study at ages 3, 4, or 5.5 years with respect to project site, children's race, ethnicity or gender, levels of maternal depression, household chaos or children's externalizing behaviours. Furthermore, no differences were found in the number of participants who were not retained in the control versus the intervention groups at age 3 years (n = 40 and n = 32, respectively), age 4 years (n = 58 and n = 53, respectively), and age 5.5 years (n = 48 and n = 62, respectively). The current study focuses on the age 3, 4, and 5.5 follow-ups.

Design and Procedure

At child ages 3, 4, and 5.5 years, respondents included the target child and primary caregiver (PC). In families with more than one caregiver, alternate caregivers (AC; e.g. father, grandmother) also participated in the annual assessments, when possible. A research team met with families for a 3-h home visit in which children and caregivers completed written questionnaires and engaged in a series of observational interaction tasks. Assessments began by having an adult stranger (i.e. undergraduate videographer) approach the child, introduce

him/her to an assortment of age-appropriate toys and then allow him/her to play for 15 min while the primary caregiver completed questionnaires. After the free play(15 min), each primary caregiver and child participated in a cleanup task (5 min), followed by a wait task (5 min), four teaching tasks (3 min each, with the last task being completed by alternate caregiver and child), a second free play (4 min), a second cleanup task (4 min), the presentation of two inhibition-inducing toys (2 min each) and a meal preparation and lunch task (20 min). Similar procedures were used to assess child behaviour and parent–child interaction at each wave with minor modifications made to adjust for the developmental status of the child. Research teams were comprised of two to three staff members: a lead examiner, a videographer and a child-sitter if non-target children were present in the home during the visit. All home visit research team members underwent training to learn home visit protocols. Additionally, lead examiners all held bachelor's degrees and engaged in a formalized certification process.

Families who participated in the age 3, 4, and 5.5 assessments were reimbursed $120, $140 and $160, respectively. The randomization sequence was computer-generated by a staff member who was not involved with recruitment. Randomization was balanced on gender to assure an equal number of men and women in the control and intervention sub-sample. To ensure blindness, the examiner opened a sealed envelope, revealing to the family their group assignment only after the assessment was completed. Examiners carrying out follow-up assessments were not informed of the family's assigned condition. For a detailed description of the intervention, see Dishion et al. (2008). Because intervention group status was not a focus of the current study, it was used as a covariate in all analyses.

Measures

Chaotic home environment

The Confusion, Hubbub and Order Scale (CHAOS; Matheny et al., 1995) was used to assess household chaos at the age 3 visit. Primary caregivers answered true or false to statements such as 'it's a real zoo in your home' and 'your family almost always seems to be rushed.' Fifteen items were summed to compute the scale score. Higher scores indicate higher levels of household chaos ($\alpha = .82$).

Observed positive behaviour support

A team of undergraduates coded the videotaped family interaction tasks by using the Relationship Process Code (RPC; Jabson, Dishion, Gardner, & Burton, 2004). The average team RPC per cent agreement $\kappa = .86$. The RPC is a third-generation code derived from the Family Process Code (Dishion, Gardner, Patterson, Reid, & Thibodeaux, 1983) used extensively in previous research. After coding each family interaction, coders completed a coder impressions inventory regarding proactive and positive behaviour support practices, for the purpose of this research study. All family interaction tasks were evaluated in the scoring of positive behaviour support practices. In addition, the home visitors' ratings of parent involvement with the young child were used as another indicator of the positive behaviour support construct. Although coders were predominantly European American (90%), protocols developed by using examples of culturally diverse coding categories and by extensive training ensured that coding of family interactions was culturally sensitive. Our previous research revealed that cultural biases in coding of African American family interactions existed when coders were untrained in the coding system and that coder training resulted in eliminations of coding differences between European American and African American coders (Yasui & Dishion, 2007).

In detail, the following items were entered into the positive behaviour support scores:

1. Parent involvement. This measure is based on the home visitor's rating of the parents' involvement, which used the following items from the Home Observation for Measurement of the Environment inventory (Bradley, Corwyn, McAdoo, & Garcia-Coll, 2001): 'parent keeps child in visual range, looks at often'; 'parent talks to child while doing household work'; and 'parent structures child's play periods.'
2. Positive behaviour support. This measure is based on videotape coding (durations) of caregivers prompting and reinforcing young children's positive behaviour as captured in the following RPC codes: positive reinforcement (verbal and physical), prompts and suggestions of positive activities and positive structure (e.g. providing choices in a request for behaviour change).
3. Engaged parent–child interaction time. This measure reflects the average length of parent–child sequences that involve talking or physical interactions such as turn taking or playing a game. Thus, the average duration of episodes that included consecutive parent–child exchanges involving RPC codes such as Talk and Neutral Physical Contact were used to define these episodes.
4. Proactive parenting. Videotape coders rated each parent on his or her tendency to anticipate potential problems and to provide prompts or other structural changes to avoid young children becoming upset and/or involved in problem behaviour on the following six items: parent gives child choices for behaviour change whenever possible; parent communicates to the child in calm, simple and clear terms; parent gives understandable, age-appropriate reasons for behaviour change; parent adjusts/defines the situation to ensure the child's interest, success and comfort; parent re-directs the child to more appropriate behaviour if the child is off task or misbehaves; parent uses verbal structuring to make the task manageable (α = .84).

Inhibitory control

Inhibitory control was measured using the 13-item inhibitory control subscale of the Child Behavior Questionnaire (Rothbart, Ahadi, Hershey & Fisher, 2001). Primary caregivers and alternate caregivers rated how true 13 statements about their children's reactions to situations were on a seven-point scale (e.g. 'My child can lower his/her voice when asked to do so'; 1 = extremely untrue, 7 = extremely true). Correlations between primary and alternate caregiver ratings were .36 at age 3 years and .30 at age 4 years. Most of the respondents were primary care-givers; however, when data from alternate caregivers were available, the two scores were averaged to form the total score. The inhibitory control subscale had adequate reliability across reporters and visits: αs for primary caregivers were .69 and .74 at the age 3 and age 4 visits, respectively, and αs for alternate caregivers were .73 and .80 at the age 3 and age 4 visits, respectively.

Externalizing Problems

Externalizing problems were measured using a latent construct indicated by two observed variables: problem behaviour and aggression. Factor loadings for externalizing problems are shown in Figure 2.

Problem behaviour—The Eyberg Child Behavior Inventory Intensity scale (Robinson, Eyberg, & Ross, 1980) was used to assess child behaviour problems. Primary care-givers and alternate caregivers rated on a seven-point scale (1 = never, 7 = always) how often each of 36 problem behaviours occurred. Correlations between primary and alternate caregiver ratings were .44 at age 3 years and .45 at age 5 years. Most of the respondents were primary caregivers; however, when data from alternate caregivers were available, the two scores

were averaged to form the total score. Alpha reliability was .93 at age 3 years for each caregiver's report and was .94 at age 4 years for each caregiver's report.

Aggressive behaviour—The Child Behavior Checklist for Ages 1.5–5 (CBCL; Achenbach & Rescorla, 2000) is a 100-item questionnaire that assesses behavioural problems in young children. Primary caregivers and alternate caregivers respond on a three-point scale to a series of items focusing on how true particular problem behaviours are of their child (not true, somewhat or sometimes true, very true or often true). Correlations between primary and alternate caregiver ratings were .48 at age 3 years and .43 at age 5 years. The CBCL yields both broad-band and narrow-band factors of internalizing and externalizing problems, normalized within gender and age groups. The narrow-band factor aggression was used in the current study (αs = .87 and .89 at age 3 years for PCs and ACs, respectively; α = .89 at age 5.5 yearsfor both PCs and ACs). Most of the respondents were primary caregivers; however, when data from alternate caregivers were available, the two scores were averaged to form the total score.

DATA ANALYSIS

Structural equation modelling in MPLUS version 5.2 (Muthén & Muthén 3463 Stoner Avenue Los Angeles, CA 90066, USA) was used to test the hypothesized model (Muthén & Muthén, 1998–2007). MPLUS handles missing data using full information maximum likelihood estimation (FIML), which yields parameter estimates that tend to be less biased than those generated by ad hoc missing data techniques (e.g. listwise deletion; Schafer & Graham, 2002). Unlike imputation methods for handling missing data, which assign values for each missing data point, FIML uses an iterative procedure to generate the parameters of the population most likely to have produced the available sample data. The percentage of missing data for each study variable is reported in Table 1.

To test indirect effects, bias-corrected bootstrapped confidence intervals based on 5000 bootstrap resamples were estimated. Bias-corrected bootstrap methods provide empirical estimates of indirect effects that accommodate nonnormality of the sampling distribution of the indirect effect. A significant indirect effect is indicated when the confidence interval for the point estimate of the indirect effect does not include zero (Preacher & Hayes, 2008).

Covariates

Parent education, child gender (0 = female, 1 = male), number of children in the home and assignment to treatment condition (1 = treatment group, 0 = control group) were controlled. Attention problems at age 3 years (α = .82) was also controlled because of its association with inhibitory control and externalizing problems. To assess attention problems, examiners rated children's restlessness, impulsivity, distractibility and task persistence at age 3 years using an existing temperament scale (Caspi, Henry, McGee, Moffit, & Silva, 1995). Age 3 inhibitory control and a latent construct representing age 3 externalizing problems were also modelled as covariates; by doing so, we were able to assess the influence of the focal study constructs on externalizing problems above and beyond the influence of prior adjustment.

Direct paths from each control variable to age 4 inhibitory control and age 5.5 externalizing problems were included. Direct paths from treatment group to household chaos and positive behaviour support were also specified. Other covariates (parent education, child gender, attention problems, number of children in the home, age 3 inhibitory control, age 3 externalizing problems) were specified as correlated with household chaos in the home and with positive behaviour support. A correlational path between age 3 household chaos and positive behaviour support was included, as was a correlational path linking age 3 inhibitory control and age 3 externalizing problems. Gender was specified as correlated with age 3

inhibitory control, age 3 attention problems and age 3 externalizing problems. Attention problems were specified to be correlated with age 3 inhibitory control and age 3 externalizing problems.

RESULTS

Variable descriptives and bivariate correlations are presented in Tables 1 and 2. The overall pattern of correlations provided preliminary support for the hypothesized mediation model. As expected, household chaos was negatively correlated with inhibitory control and positively correlated with problem behaviour and aggression. Further, positive behaviour support was positively correlated with inhibitory control and negatively correlated with aggression. Positive behaviour support was not correlated with problem behaviour. Also, as predicted, inhibitory control was negatively associated with problem behaviour and aggression. Contrary to our prediction, household chaos and positive behaviour support were not correlated.

Fit indices suggested that the hypothesized mediation model provided good fit to the data, χ^2 (36, N = 731) = 143.13, $p < .05$; comparative fit index (CFI) = 0.95; Tucker-Lewis Index (TLI) = 0.91; root mean square error of approximation (RMSEA) = 0.06; standardized root mean square residual (SRMR) = 0.03. Predictors in the model explained 34% of the variance in age 4 inhibitory control and 56% of the variance in age 5.5 externalizing problems. Contrary to our prediction, age 3 household chaos did not significantly covary with positive behaviour support (β = −.03, ns). Direct effects were consistent with our hypotheses regarding mediation. Age 3 household chaos was negatively related to age 4 inhibitory control (β = −.11, $p < .01$), and age 3 positive behaviour support was positively related to age 4 inhibitory control (β = .14, $p < .01$). Further, age 4 inhibitory control was negatively related to age 5.5 externalizing problems (β = .21, $p < .01$). Both household chaos and positive behaviour support were not directly − related to age 5.5 externalizing problems (β = .08, ns and β = .00, ns, respectively). In support of our hypotheses regarding mediation, both household − chaos and positive behaviour support were indirectly related to externalizing problems through inhibitory control ($CI_{.95}$ = .01, .06; $CI_{.95}$ = −.37,–.09, respectively).

DISCUSSION

Studies to date have focused primarily on examining direct associations between chaotic home environments and children's externalizing problems—with the preponderance of evidence suggesting that chaos in the home is positively associated with externalizing problems (Evans & Wachs, 2010). The current study adds to a growing effort to understand the processes through which chaotic home environments affect children's behaviour. The findings from the current study suggest that self-regulation mediates the association of chaos in the home and parenting to children's externalizing problems. Specifically, positive behaviour support fostered the development self-regulatory skills, whereas household chaos acted as an impediment to the development of self-regulatory skills over time. Moreover, as predicted, poor self-regulatory skills were related to increases in externalizing problems over time.

Contrary to our expectation, we did not find an association between household chaos and positive behaviour support. Unlike some studies that have found an association between household chaos and parenting, our measure of parenting was derived from home observations. Thus, it is possible that correlations between household chaos and parenting, found in some previous studies (e.g. Dumas et al., 2005; Nelson et al., 2009; Pike et al., 2006; Valiente et al., 2007), may reflect inflation because of shared method variance.

Another reason for the discrepancy may stem from the fact that we assessed parenting using a composite measure. Some of the variables that comprised the composite measure of positive behaviour support could individually be correlated with household chaos. Other reasons for the lack of correlation may have to do with the measurement of household chaos. The CHAOS scale taps into what can be considered controllable (e.g. routines, structure, organization) and uncontrollable (e.g. noise and crowding) forms of household chaos. It may be that uncontrollable and controllable forms of house-hold chaos are related to parenting in opposing ways. If this is the case, relations between household chaos and parenting may be masked when both types of items are combined.

The results of this study corroborate past research that points to parenting as one of the key factors in the development of self-regulation (Kochanska et al., 2000; Moilanen et al., 2009). Indeed, there was a stronger association between positive behaviour support and inhibitory control than between household chaos and inhibitory control. The findings from this study are also consistent with past research suggesting that family routines modify the strength of the relation between various risk factors and child socioemotional problems and that family routines have both direct and indirect effects on children's socioemotional functioning (Brody & Flor, 1997; Loukas & Prelow, 2004; Prelow, Loukas, & Jordan-Green, 2007). Past work has shown that children coping with stress in the context of consistent and predictable family circumstances appraise threats as less dangerous and fare better than children in homes that are more disorganized (Kliewer, Sandler, Wolchik, Nestmann, & Hurrelmann, 1994). Our study suggests that maintaining family routines and minimizing disorganization likely promotes positive child development.

Implications, Future Directions and Limitations

Understanding factors that influence the development of self-regulation will have important implications for enhancing school readiness. Children's ability to self-regulate is related to more adaptive classroom behaviour (Rimm-Kaufman et al., 2002) and better academic skills (Graziano, Reavis, Keane, & Calkins, 2007; McClelland et al., 2007). Children who experience order, structure and routines at home may experience an easier transition to school where classroom environments call for the regular employment of self-regulatory skills (Blair, 2002). Theresults of our study also suggest that students with better self-regulatory skills are less likely to present behaviour problems. While longitudinal studies are necessary, it is possible that children from more structured home environments may ultimately be less likely to experience the fallout associated with being labelled a disciplinary problem at school, for example, expulsions, grade retention or even assignment to special education classes (Blair, 2002).

Future studies should investigate whether self-regulation acts as a protective factor, buffering children from the negative effects of household chaos. Past research has shown that effortful control helps protect children facing other types of contextual risk, acting as a buffer against adjustment problems (Lengua, 2009). For example, in a cross-sectional study of 155 low-income youth ages 8–17 years, youth categorized as resilient on the basis of multiple indices of adjustment were found to have higher levels of self-regulation (Buckner, Mezzacappa, & Beardslee, 2003). Indeed, socioeconomic risk has been shown to be most strongly related to externalizing problems among adolescents with low effortful control (Lengua, Bush, Long, Kovacs, & Trancik, 2008).

Additional work is needed to identify other environmental predictors of child self-regulation beyond parenting, particularly with respect to children growing up in low-income families (Lengua, 2009). A paucity of studies has investigated links between self-regulation and externalizing problems using low-income samples. Studies that are available, however, suggest that economically disadvantaged children tend to show lower self-regulatory skills

than their non-poor counterparts but provide little insight as to why (Evans & English, 2002).

Further research will also be needed to establish that the findings from the current study generalize to samples not selected on the basis of risk. Available research suggests that the same processes are likely to occur in lower-risk samples. Specifically, evidence supporting component paths in our model largely comes from studies with normative samples—not samples selected on the basis of income, child adjustment or other risk criteria. Still, studies that test similar models with different samples are needed.

A limitation of the current is that household chaos, inhibitory control and both outcomes were measured with questionnaires, leaving open the possibility that shared method variance may have inflated some of the coefficients. However, a strength of the study is the longitudinal design which allowed us to control for stability in both externalizing problems and self-regulation, thereby strengthening the methodological rigour of the study and the conclusions that can be drawn from the results (Cole & Maxwell, 2003). Despite the current study's strengths, future studies should incorporate behavioural observation measures to reduce the likelihood that findings are a result of shared method variance.

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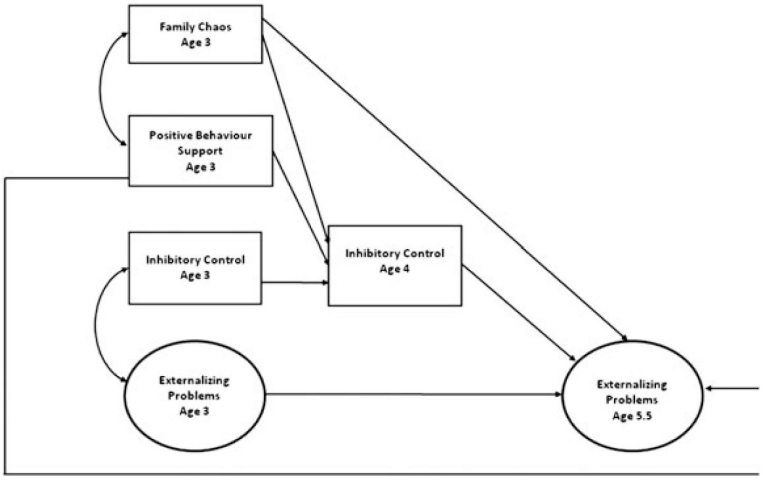

Figure 1.
Hypothesized model of direct and indirect effects of household chaos, positive behaviour support, and inhibitory control on children's externalizing problems.

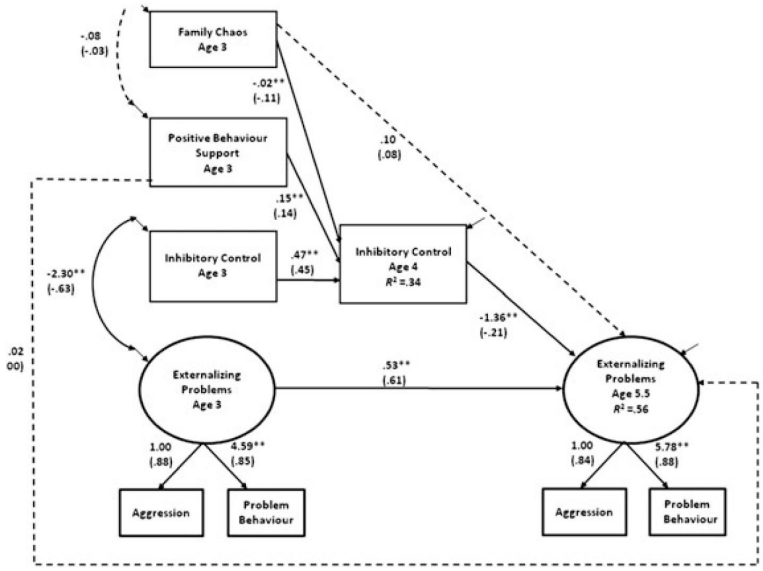

Figure 2.

Model of relations among household chaos, positive behaviour support, inhibitory control and externalizing problems *$p < .05$; **$p < .01$. Note: Unstandardized estimates are above the standardized estimates, which are in parentheses. Covariates (treatment group, parent education, child gender, attention problems and number of children in the home) and some correlational paths between predictors were included in the model but are not shown for simplicity. Residual variances are shown for age 3 predictors because age 3 predictors were regressed on treatment group.

Table 1

Descriptive statistics for study variables

	N	Mean	*SD*	% missing
PC education	731	5.19	1.14	0
Number of children	619	2.68	1.28	15.3
Attention (3)	635	0.44	0.52	13.1
Chaos (3)	657	5.29	3.65	10.1
Positive behaviour support (3)	643	0.00	0.68	12.0
Inhibitory control (3)	653	4.33	0.69	10.7
Problem behaviour (3)	646	123.19	28.47	11.6
Aggression (3)	657	13.10	6.02	10.1
Inhibitory control (4)	627	4.51	0.72	14.2
Problem behaviour (5.5)	616	115.13	31.03	15.7
Aggression (5.5)	614	7.84	5.60	16.0

Note: PC, primary caregiver; AC, alternate caregiver. Numbers in parentheses represent the age at which the variable was assessed.

Table 2

Intercorrelations between study variables

Study variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intervention group	–												
2. Gender (0 = f, 1 =m)	−.00	–											
3. PC education	.01	.03	–										
4. Number of children	.06	.03	−.05	–									
5. Attention problems (3)	−.09*	.17**	−.06	−.05	–								
6. Household chaos (3)	−.04	.06	.01	.13**	.02	–							
7. Pos. behaviour support (3)	.08	−.01	.25**	−.08	−.08 −.04	–							
8. Inhibitory control (3)	.03	−.16**	.11**	.04	−.27*	−.31**	.18**	−					
9. Problem behaviour (3)	−.05	.08*	.00	−.13**	.13**	.41**	−.04	−.53**	−				
10. Aggression (3)	−.02	.07	−.04	−.05	.19**	.40**	−.14**	−.56**	.75**	−			
11. Inhibitory control (4)	.06	−.14**	.04	.05	−.26**	−.25**	.23**	.54**	−.37**	−.40**	−		
12. Problem behaviour (5.5)	−.03	.05	.03	−.14*	.13**	.33**	−.07	−.39**	.60**	.54**	−.42**	−	
13. Aggression (5.5)	−.03	.08	−.04	−.02	.14**	.34**	−.15**	−.39**	.49**	.58**	−.42**	.74**	−

* p<.05.

** p<.01.

Note: PC, primary caregiver; AC, alternate caregiver. Numbers in parentheses represent the wave in which the variable was assessed.