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The mitigating effects of maternal social support and paternal involvement on the intergenerational transmission of violence

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Abstract

Childhood maltreatment is a strong risk factor for subsequent violence, including violent behaviors in young adulthood and offspring maltreatment after becoming a parent. Little is known about the specific circumstances under which supportive relationships may help disrupt this cycle of violence throughout the life course. We conducted two complementary analyses to assess whether maternal social support in early childhood, and also paternal involvement in middle childhood, could prevent the intergenerational transmission of violence, using data from the Avon Longitudinal Study of Parents and Children (n = 11,384). We found that higher levels of maternal social support in the postpartum period reduced the odds of offspring maltreatment at ages 0–8 years (OR = 0.95, 95% CI 0.93–0.96). When classifying mothers according to their abuse history, this protective association of social support was observed among mothers with no history of childhood maltreatment and among those with only childhood maltreatment (and not postpartum intimate partner violence [IPV]), but not among mothers who reported IPV since the child's birth. We then extended our analysis of these offspring forward in time and found that paternal involvement at ages 9–10 years was associated with a reduced risk of offspring self-reported violent perpetration at ages 18–20 years (OR = 0.85, 95% CI = 0.77–0.94). This protective association was generally apparent among all subgroups of children, including those with a history of childhood maltreatment. Together these results highlight the protective influence of supportive relationships against the intergenerational transmission of violence, depending on abuse history, context, and timing, with important implications for the prevention of childhood maltreatment and mitigation of its negative effects.

Keywords

ALSPAC; Maltreatment; Violence; Intergenerational transmission; Social support; Paternal involvement

1. Introduction

Childhood maltreatment is a strong risk factor for subsequent violence, including violent behaviors in adolescence and young adulthood and offspring maltreatment after becoming a

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parent (Duke, Pettingell, McMorris, & Borowsky, 2010; Schofield, Lee, & Merrick, 2013; Widom, 1989). However, this “cycle of violence” is certainly not universal, with some studies failing to find continuity in violent behaviors across generations (Ertem, Leventhal, & Dobbs, 2000; Thornberry, Knight, & Lovegrove, 2012). Even among those studies where intergenerational transmission of violence is observed, the majority of individuals who experienced maltreatment in their childhood break free of violent behavior in their own adulthood (Dym Bartlett & Easterbrooks, 2015; Jaffee, Bowes, Ouellet-Morin, Fisher, Moffitt, Merrick, & Arseneault, 2013).

Supportive relationships may help to disrupt this cycle of violence and promote resilience among individuals with a history of abuse (Dym Bartlett & Easterbrooks, 2015; Herrenkohl, Klika, Brown, Herrenkohl, & Leeb, 2013; Pearce, Jones, Schwab-Stone, & Ruchkin, 2003; Wilson, Kimbrel, Meyer, Young, & Morissette, 2015). In particular, safe, stable, nurturing relationships (SSNRs) have been found to protect against the perpetuation of harsh discipline and maltreatment (Conger, Schofield, Neppl, & Merrick, 2013; Herrenkohl et al., 2013; Jaffee et al., 2013; Schofield et al., 2013; Thornberry, Henry, Smith, Ireland, Greenman, & Lee, 2013). SSNRs may include relationships with parents, other caregivers, siblings, peers, and other adults, including romantic partners (Merrick, Leeb, & Lee, 2013), as well as particular dimensions of those relationships, including warmth, communication, attachment, satisfaction, and emotional support (Schofield et al., 2013). Although direct protective effects of various SSNRs on childhood maltreatment have been found, the particular contexts in which SSNRs may buffer maltreated individuals against further violence need to be investigated further (Conger et al., 2013; Herrenkohl et al., 2013; Thornberry et al., 2013). In particular, different types and aspects of social relationships may be important at different stages of the life course (Umberson, Crosnoe, & Reczek, 2010). The specific context of prior abuse experiences, including the timing of maltreatment and continued involvement in abusive relationships (Jaffee et al., 2013; Schofield et al., 2013 Schofield et al., 2013), may also lead to differential impacts of SSNRs on other outcomes. Finally, the role of SSNRs in disrupting the continuity of violent behaviors in general, not just maltreatment, has not been fully explored.

Social support among mothers reflects SSNRs in adulthood that may be important for the continuity of violence across generations. The perceived availability of emotional and instrumental support to mothers in the postpartum period may be an important determinant of offspring abuse and neglect (Price-Wolf, 2015; Sidebotham, Golding, & ALSPAC Study Team. Avon Longitudinal Study of Parents and Children, 2001). Mothers who can rely on partners, relatives, and friends for help may be better able to respond to a young child’s demands and difficulties with positive parenting and patience, and may be protected from other factors like financial hardship and poor mental health that also increase the risk of offspring maltreatment (Dym Bartlett & Easterbrooks, 2015; Jaffee et al., 2013; Oh et al., 2016). Through its stress buffering effects, social support may particularly protect mothers who have experienced childhood maltreatment against perpetuating the cycle of violence in their own households (Dym Bartlett & Easterbrooks, 2015); however, few studies have assessed the particular circumstances under which maternal social support protects against off-spring maltreatment.

Relationships during childhood may also be important for disrupting the cycle of violence. Parent involvement, ranging from supervision to frequency of communication to attachment and warmth, has been found in some studies to promote resilience among children exposed to violence, in terms of reducing their risks for delinquent behaviors, substance use, and other adverse outcomes (Pearce et al., 2003). Parent-child relationships may serve as buffers against the intergenerational transmission of violence specifically, as they promote attitudes and beliefs about responding to stress and conflict in non-violent ways and serve as a source of emotional and instrumental support during difficult times (Bandura, 1977; Herrenkohl et al., 2013; Pearce et al., 2003; Thornberry et al., 2013). Fathers (including non-resident biological fathers) and father figures (including mothers' partners) may exercise particular protective powers over children at risk for problem behaviors through a variety of mechanisms, including increasing trust and expectations among youth, providing additional supervision over youth activities, and providing financial and emotional support (Coley & Medeiros, 2007; Dunn, Cheng, O'Connor, & Bridges, 2004; Marshall, English, & Stewart, 2001). However, little is known about whether paternal involvement during childhood protects against later violent perpetration among children who have been maltreated and whether such effects may vary by offspring gender.

The objectives of this study were to examine the potential for supportive relationships, represented by maternal social support and father-child interactions, to protect against violence and to evaluate whether supportive relationships may have a differential impact depending on an individual's prior abuse experience. As illustrated in Fig. 1, we first examine the role of maternal social support in the perinatal period as potentially protective against subsequent offspring maltreatment through age 8 years (see Fig. 1). We also consider the differential impact of maternal abuse history (including maternal childhood maltreatment and postpartum intimate partner violence [IPV]) on this protective process. We then extend our analysis of these same offspring to investigate whether paternal involvement in middle childhood influences subsequent offspring physical violence perpetration in young adulthood and whether that influence depends on the offspring's own maltreatment experiences earlier in childhood, including the timing and type of maltreatment (Fig. 1), when also controlling for maternal characteristics including childhood maltreatment and postpartum social support and IPV. We hypothesized that higher levels of maternal social support and paternal involvement would reduce the risk of subsequent offspring violence, especially among mothers and offspring, respectively, with a prior history of violence themselves. Together, these analyses explore the contexts in which SSNRs mitigate the transmission of violence across the life course and across generations, increasing our understanding of these protective mechanisms and providing important information to clinicians, social workers, researchers, and policy makers.

2. Method

2.1. Study participants and procedures

The sample for this study consisted of participants in the Avon Longitudinal Study of Parents and Children (ALSPAC), an ongoing population-based prospective birth cohort study that enrolled 14,541 pregnant women residing in the former county of Avon in

southwestern England with expected delivery dates between April 1, 1991 and December 31, 1992 (Boyd et al., 2013; Fraser et al., 2013). Eligible women (residing in the targeted area and with an expected delivery date in the aforementioned range) were recruited at community locations, during health service utilization, and through media advertising (Boyd et al., 2013). Of the 14,062 live births resulting from these pregnancies, 13,988 children were alive at 1 year of age. Information on the health, development, behaviors, and social circumstances of the study children, their mothers, and their mothers' partners has been continuously collected through questionnaires and clinic assessments since the study's inception. In total, over 55 assessments about the mother and/or child were administered during a 20-year period; participation ranged from about 85% of those enrolled completing an assessment at 8 months postpartum to about 50% at 18 years (Boyd et al., 2013; Fraser et al., 2013). Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

2.2. Measures

The measures used in our analyses are described below. More detail on each measure, including item wording and response options, is included in Table S1 in the Supplemental files.

2.2.1. Maternal childhood maltreatment—At 32 weeks gestation, mothers enrolled in the study completed a questionnaire developed by the ALSPAC study team reporting whether a parent had been physically or emotionally cruel to them and whether they had been sexually abused during childhood (before age 17 years), with response options rating the impact of the experience (Table S1). Given the relatively low prevalence of childhood maltreatment, responses were dichotomized into an indicator for any maternal childhood emotional, physical or sexual maltreatment. In prior analyses of the ALSPAC study, strong correlations have been found between retrospective reports of maternal childhood emotional and physical maltreatment and reported childhood sexual abuse as well as with other measures of the mother's relationship with her parents and with other measures of maltreatment collected at other time points, indicating that the measure of childhood maltreatment used in this analysis validly and reliably identifies women who experienced maltreatment in childhood (Collishaw, Dunn, O'Connor, Golding, & Avon Longitudinal Study of Parents and Children Study Team, 2007; Roberts, O'Connor, Dunn, Golding, & ALSPAC Study Team, 2004).

2.2.2. Maternal social support—Perceived social support was assessed via a questionnaire developed by the ALSPAC study team and completed by the mother when the study child was around 8 weeks old (Table S1). The nine-item social support scale included items like "There are other mothers with whom I can share my experiences" and "I believe in moments of difficulty my neighbors would help me." Response options rated the mother's agreement with each statement (exactly feel, often feel, sometimes feel, and never feel). Responses were summed to create a social support score, with higher values indicating higher levels of perceived support from one's partner, family, friends, and neighbors. The internal consistency of the social support score was high (Cronbach's alpha = 0.76), with correlations between items ranging from 0.09 to 0.57. This measure has been used in

previous studies (Thomson et al., 2014) and showed high correlations with later assessments of social support as well as independent assessments of instrumental support and social networks, demonstrating reliability and validity.

2.2.3. Maternal intimate partner violence (IPV)—When the study child was approximately 8 months old, mothers reported whether their partner had been physically or emotionally cruel to them since the study child was born (Table S1). This measure has been used in prior work to examine the experience, risk factors, and consequences of domestic violence in the ALSPAC cohort (Bowen, 2015; Bowen, Heron, Waylen, Wolke, & ALSPAC Study Team, 2005; Kothari, Easter, Lewis, Howard, & Micali, 2015).

2.2.4. Offspring childhood maltreatment—Mothers completed several questionnaires developed by the ALSPAC team reporting on a series of life events that had occurred to themselves and/or to their children at multiple time points between the study child's birth and ninth birthday, including their assessment of the impact of the event on either themselves or the child (see Table S1). As part of these life events measures, mothers were asked to report whether they had been physically or emotionally cruel to their children in a specified time period (usually since the last interview) and the impact it had on themselves. Mothers were also asked to report emotional or physical maltreatment of the child by their partner (who is most often the child's biological father, but may have been the child's stepfather or the mother's boyfriend). In addition, mothers were asked if the study child had been sexually abused during the specified time period and how it impacted the child. Given the low prevalence of maltreatment at each time point and differences in the focus of impact ratings across types of maltreatment, we collapsed all responses indicating that maltreatment had occurred (regardless of the reported impact) into dichotomous indicators for each type of maltreatment at each time point. We then created a dichotomous measure indicating whether any maltreatment (emotional, physical, or sexual) had occurred at ages 0–8 years, as well as additional measures to capture the timing and type of maltreatment. The *timing* of offspring childhood maltreatment was categorized as: no maltreatment, maltreatment first reported at ages 0–2 years, at ages 2–5 years, or at ages 5–8 years, consistent with other studies that have examined the timing of maltreatment in relation to offspring developmental outcomes (Dunn, McLaughlin, Slopen, Rosand, & Smoller, 2013). The *type* of maltreatment was categorized as: no maltreatment, emotional only, physical only, or sexual and/or multiple types of maltreatment from ages 0–8 years; we were not able to consider sexual maltreatment alone because of its low prevalence in our sample. Although self-reports of maltreatment perpetration are certainly limited, they have been used in other studies, including studies of the intergenerational cycle of violence (Jaffee et al., 2013; Peltonen, Ellonen, Pösö, & Lucas, 2014).

2.2.5. Paternal involvement—We created an overall measure of paternal involvement for the purposes of this study by combining two measures indicating the nature of the child's relationship with his or her father or the mother's partner and the frequency with which the study child's biological father sees him or her (see Table S1). The child's mother was asked to report whether she currently had a partner when the study child was around 9 years old. If she did, she was asked to respond to a series of questions about her partner's relationship

with the study child, including items like “He seems to feel very close to the child” and “The child gets on his nerves.” Response options rated the mother’s agreement with each statement (always how I feel, sometimes how I feel, never feel this way). Responses were summed, with higher values indicating a more positive relationship between her partner and child. In the following questionnaire, when the study child was around 10 years old, mothers were asked to report if the child’s biological father currently lived with the child. If she responded in the negative, she was asked to report how often the biological father sees the child, with responses ranging from not at all to nearly every day (see Table S1). These two measures were added together and standardized within each of three groups (biological father lives with the study child; biological father does not live with the study child but the mother has a partner; biological father does not live with the study child and the mother has no partner), with higher scores indicating greater involvement of the biological father and/or mother’s partner in the child’s life. The internal consistency of this measure was high in this sample (Cronbach’s alpha of 0.72).

2.2.6. Offspring violence in young adulthood—Study children self-reported their perpetration of physical violence at several time points during adolescence and young adulthood by reporting the frequency in the last year that they had “hit, kicked, or punched someone else on purpose with the intention of really hurting them,” with responses dichotomized into any physical violence perpetration in the past year (see Table S1). Violent behaviors like physical fighting are highly prevalent among adolescents (Kosterman, Graham, Hawkins, Catalano, & Herrenkohl, 2001), but usually decrease by young adulthood (Loeber & Hay, 1997). Individuals who are still engaging in these behaviors at age 18 years and older are thus at highest risk for escalation to criminal offending and more serious forms of violence (Kosterman et al., 2001). Therefore, we identified study children who reported violent perpetration in the past year at ages 18 or 20.

2.2.7. Other covariates—Offspring, maternal, and parental characteristics that were considered as potential confounders of the relations of interest included offspring sex; mother’s marital status; mother’s age at delivery (range: 15–44 years); highest level of mother or father’s education (below O-level, O-level, A-level, or university degree); and highest occupational class of mother or father (coded per the UK Office of National Statistics classification system: I (professional), II (managerial and technical), III (skilled non-manual), IV (skilled manual), and V/VI (partly skilled/unskilled) (Khandaker, Pearson, Zammit, Lewis, & Jones, 2014)). These characteristics were reported by the mother during pregnancy or recorded at the time of the study child’s birth. Maternal alcohol consumption during the first trimester was reported by mothers around 18 weeks gestation and dichotomized as regular consumption (one or more glasses per week) vs. none or rare consumption (no drinking or less than one glass per week). Maternal mental health during pregnancy was assessed with the Crown Crisp Experiential Index (CCEI; Crown & Crisp, 1966) and the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), completed by the mother around 18 weeks gestation. As in previous ALSPAC analyses, mothers were identified as having probable anxiety or depression if their CCEI anxiety subscale score was > 10, their CCEI depression subscale score was > 9, or their EPDS score was > 12 (Slopen, Koenen, & Kubzansky, 2014). Please note that the study

website contains details of all the data that are available through a fully searchable data dictionary (http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/).

2.3. Statistical analysis

First, we calculated descriptive statistics for all measures of interest. In order to evaluate the intergenerational transmission of violence, we next examined bivariate associations between maternal childhood maltreatment and offspring maltreatment at ages 0–8 years, and between offspring maltreatment at ages 0–8 years and offspring violent perpetration at ages 18–20 years. As depicted in Fig. 1, we then conducted logistic regression analyses of the association between maternal social support and offspring maltreatment at ages 0–8 years. We evaluated potential moderation of this relation by including an interaction term in the final logistic regression model between maternal social support and a four-category variable reflecting the mother's history of abuse (neither childhood maltreatment nor postpartum IPV, maltreatment only, IPV only, and both maltreatment and IPV). We then extended this analysis to focus on the influence of paternal involvement in middle childhood on offspring violence in young adulthood, and whether that relation varied by offspring childhood maltreatment experiences. Specifically, we conducted logistic regression analyses of the association between paternal involvement at ages 9–10 years and offspring physical violence perpetration at ages 18–20 years. We evaluated potential moderation of this relation by offspring maltreatment at ages 0–8 years, including consideration of any maltreatment as well as the timing and type of maltreatment experienced. Furthermore, we stratified these analyses by offspring gender to examine whether the relation between paternal involvement and youth violence and/or the intergenerational transmission of violence varied by gender. Potential confounders were included in the logistic regression models if they were associated with either the exposure or outcome of interest at $p < 0.20$ in bivariate analyses and were supported by prior theoretical and empirical work (Farrington, 1989; Fergusson, Boden, & Horwood, 2006; Herrenkohl et al., 2001; Martin et al., 2011; Sampson, Morenoff, & Raudenbush, 2005; Sidebotham et al., 2001).

2.3.1. Multiple imputation of missing data—Given our interest in measures collected over a 20-year period, there was considerable missing data among our sample owing both to attrition and failure to participate in specific assessments. Fig. S1 in the Supplemental files includes a flow chart of inclusion in the ALSPAC study and our analytic samples, and characteristics of the sub-samples are compared in Table 1. Overall, mothers in the samples with complete information on all covariates of interest for our two analyses had higher education and higher occupational class than those who were excluded because of missing data on key measures; they were also older and more often married at the time of the study child's birth. Female offspring were over-represented in the analytic samples and mothers who experienced anxiety or depression during pregnancy were under-represented. Given these differences, restricting our analyses to those with complete information on covariates of interest would likely produce biased estimates of the relations of interest, as well as underestimates of maltreatment and violence. Therefore, we conducted multiple imputation of missing data using the sequential regression algorithm (a.k.a. fully conditional specification) implemented in IVEware (Raghunathan, Lepkowski, Hoewyk, & Solenberger, 2001). The imputed sample included those with data on maternal childhood maltreatment

and at least one assessment of offspring childhood maltreatment at ages 0–8 (n = 11,384; Fig. S1); this sample was similar to the larger baseline sample (Table 1). Multiple imputation assumes that data are missing at random (i.e., given the observed data included in the imputation model, the missingness does not depend on unobserved data (Little & Rubin, 2002)), which is a reasonable assumption given the large amount of data available on study participants in the imputed sample (Davies et al., 2016; Hammerton et al., 2015). Using logistic regression, multinomial logistic regression, and linear regression as appropriate, 40 imputed datasets were created, each with 10 iterations, producing a relative efficiency close to one for all effects (Berglund, 2015). The PROC MIANALYZE commands in SAS version 9.4 (SAS Institute Inc., Cary, NC, USA) were used to combine estimates across imputed datasets and calculate correct variance estimates according to Rubin's rules (Rubin, 1987). We focus on the results of the multiply imputed analyses in an effort to minimize bias; the results of the analyses run on the samples with complete data were quite similar and are included in the Supplemental files (see Tables S4–S5 and Figs. S4–S5).

3. Results

As shown in Table 1, of the 13,619 singleton births who were alive at 1 year of age, 51.6% were male, 79.5% were born to married mothers, and their mothers were 28 years old, on average, at the time of delivery (standard deviation [SD] 5 years). The imputed sample (n = 11,384) used for these analyses (see Fig. S1) was similar to the larger baseline sample on all characteristics of interest.

Overall, 1721 (15.1%) study children were reported to have experienced emotional, physical, or sexual maltreatment at ages 0–8 years. Maternal childhood emotional, physical, or sexual maltreatment before age 17 years was reported by 11.5% of mothers, whereas, around 8 months postpartum, 9.2% of mothers reported experiencing emotional cruelty or having been physically hurt by their partner since the study child was born. In total, 18.4% of mothers reported either childhood maltreatment or postpartum partner violence, with 2.2% reporting both, 9.2% reporting childhood maltreatment only, and 6.9% reporting postpartum IPV only. Maltreatment at 0–8 years was more common among offspring of mothers with a history of childhood maltreatment and/or postpartum IPV (25.4% among offspring of mothers who experienced childhood maltreatment only, 46.4% among offspring of mothers who reported postpartum IPV only, and 62.0% among offspring of mothers who reported both, compared to 10.0% among offspring of mothers with no reports of either childhood maltreatment or IPV at 8 months; see Fig. S2 in the Supplemental files).

Perceived social support at 8 weeks postpartum was generally high among mothers in the sample (mean = 27.7; SD = 6.9; range = 9–36) and was protective against offspring maltreatment at 0–8 years (OR = 0.90 for a one-unit increase in perceived social support, 95% CI = 0.89–0.92), with a slight attenuation when controlling for other covariates (OR = 0.95, 95% CI = 0.93–0.96) (Table 2). Maternal history of childhood maltreatment and IPV remained strongly associated with offspring maltreatment (OR = 2.59, 95% CI = 2.19–3.07 for those with childhood maltreatment only; OR = 5.89, 95% CI = 4.87–7.12 for those with postpartum IPV only, and OR = 9.56, 95% CI = 6.96–13.13 for those with both childhood maltreatment and postpartum IPV, all compared to those with neither) in the adjusted model.

Adding an interaction term for maternal social support and history of abuse suggested a differential effect of maternal social support on offspring maltreatment according to maternal history of childhood maltreatment and postpartum IPV, when also adjusting for maternal marital status, mental health, alcohol consumption, and age at delivery, and parental education and occupational class ($p = 0.13$ for the interaction). In particular, we observed a protective association of perceived support on risk for maltreatment among offspring of women with a history of childhood maltreatment but no postpartum IPV (OR = 0.96, 95% CI = 0.93–0.99) and no history of either childhood maltreatment or postpartum IPV (OR = 0.93, 95% CI = 0.92–0.95) (Fig. 2). However, this protective association was reduced among offspring of women who reported both childhood maltreatment and postpartum IPV (OR = 0.96, 95% CI = 0.92–1.01), with no association observed among offspring of women who reported IPV at 8 months postpartum (OR = 1.00, 95% CI = 0.96–1.03).

We next considered the consequences of offspring maltreatment for later offspring violence, and the potential mitigating role of paternal involvement. Of the 15.1% of study children who were reported to experience maltreatment at ages 0–8, about a third (30.3%) began experiencing maltreatment at ages 0–2 years old and about half (45.8%) began experiencing maltreatment when 2–5 years old (Table S2). Nearly two thirds (64.0%) were subjected to emotional maltreatment only, 8.2% experienced physical maltreatment only, and 27.8% experienced sexual maltreatment and/or some combination of emotional, physical, and sexual maltreatment. Physical violence perpetration at ages 18–20 years was reported by 1493 study children (13.1%). Offspring violent perpetration in young adulthood was more common among those with a history of childhood maltreatment (18.2% vs. 12.2% among those who were not maltreated), and was highest specifically among those who were maltreated beginning in early childhood (0–2 years: 19.8%) or middle childhood (5–8 years: 21.3%) and who experienced sexual and/or multiple types of maltreatment (22.5%) (Table S2).

About three-quarters of the study children (73.8%) were living with their biological father at ages 9–10 years, and the mothers of about two-thirds (63.9%) of those children who were not living with their biological father reported having a current partner. Table 3 includes the results of adjusted logistic regression models predicting offspring violent perpetration at ages 18–20 years. Paternal involvement was associated with a lower odds of offspring physical violence at ages 18–20 years (OR = 0.81 for a one-unit increase on the standardized involvement measure, 95% CI = 0.73–0.90) in an unadjusted logistic regression model, as well as when adjusted for other covariates (OR = 0.85, 95% CI = 0.77–0.94), including offspring maltreatment, maternal postpartum social support, maternal history of childhood maltreatment and postpartum IPV, offspring sex, parental education, parental occupational class, maternal marital status, and maternal age at delivery (Table 3). Offspring who experienced any childhood maltreatment exhibited greater odds of subsequent violent perpetration in the adjusted model (Adjusted model 1: OR = 1.45, 95% CI = 1.15–1.82), as did offspring whose maltreatment reportedly began when 0–2 years old or 5–8 years old (Adjusted model 2: OR for 0–2 years = 1.61, 95% CI = 1.08–2.41; OR for 5–8 years = 1.72, 95% CI = 1.12–2.66, both compared to those with no maltreatment at ages 0–8 years). Furthermore, sexual maltreatment or multiple types of maltreatment was associated with a

higher odds of offspring violent perpetration later in life (Adjusted model 3: OR = 1.85, 95% CI = 1.26–2.71, compared to those with no maltreatment from 0 to 8 years). Maternal history of childhood maltreatment and postpartum IPV and postpartum maternal social support were not associated with offspring violence in young adulthood, when controlling for offspring maltreatment and other covariates.

We tested for statistical interactions between paternal involvement and each of the three measures of offspring maltreatment in predicting offspring physical violent perpetration. We did not find evidence of differential effects of paternal involvement in childhood on the risk of later offspring violence according to history of childhood maltreatment (p-values for interactions with paternal involvement were 0.167 for any offspring maltreatment, 0.386 for timing of maltreatment, and 0.242 for type of maltreatment, respectively). As shown in Fig. 3, there was generally a protective association of higher levels of paternal involvement on offspring physical violence among all subgroups, when also adjusting for offspring sex and parental and maternal characteristics. We also stratified by gender and found similar estimated effects of paternal involvement and childhood maltreatment on violent perpetration in young adulthood among both males and females (Table S3 and Fig. S3).

4. Discussion

Using both retrospectively and prospectively collected data on childhood maltreatment and violence across three generations, we found evidence for protective effects of supportive relationships on subsequent violence, with some differences depending on abuse history and timing. Maternal social support in the postpartum period reduced the risk of maltreatment among offspring of mothers with no history of abuse and mothers who experienced childhood maltreatment but were not currently in an abusive relationship. However, maternal social support had a lesser protective effect against offspring maltreatment among mothers who reported emotional or physical violence by their partner after the child's birth. Similarly, paternal involvement in childhood, represented by more frequent and more positive father-child interactions, reduced the risk of offspring violent perpetration in young adulthood. However, study children who had been maltreated in childhood, especially those whose maltreatment began in early or middle childhood or who experienced multiple types of treatment, continued to be at increased risk of subsequent violent perpetration.

4.1. Protective effects of supportive relationships

4.1.1. Maternal social support and offspring maltreatment—In this study, higher perceived social support among mothers shortly after their child's birth reduced the risk of maltreatment of their offspring up to 8 years later. The postpartum period can be a particularly stressful time for mothers (Oh et al., 2016), and other studies have similarly showed positive effects of social support during this period on both maternal and offspring outcomes (Leadbeater & Bishop, 1994; C. Leahy-Warren, McCarthy, & Corcoran, 2012; Shaw, Levitt, Wong, Kaczorowski, & The McMaster University Postpartum Research Group, 2006). High levels of maternal social support during this period may promote mother-child attachment and set the tone for continued positive parent-child interactions. In addition, emotional and instrumental support may remain fairly stable among mothers, as in

this sample, providing consistent protection against offspring maltreatment throughout childhood.

4.1.2. Paternal involvement and offspring violence—We also observed a protective effect of paternal involvement at ages 9–10 years on the risk of violent perpetration among young adults, confirming previously recognized beneficial effects of supportive family relationships on externalizing behaviors and violence (Culyba et al., 2016; Pearce et al., 2003; Stoddard, McMorris, & Sieving, 2011). Fathers and father figures may serve as positive role models for youth, in terms of handling stressful situations without resorting to violence, as they age into adulthood (Coley & Medeiros, 2007). The presence of an involved father or father figure may also provide needed emotional support and confidence to youth who have been exposed to violence earlier in childhood (Pearce et al., 2003). Together, these findings are consistent with previous work on SSNRs (Schofield et al., 2013) and the CDC's promotion of SSNRs as an important strategy to prevent child maltreatment (Merrick et al., 2013).

4.1.3. The role of abuse history—However, we found that the protective effects of supportive relationships were somewhat dependent on prior abuse history. In particular, although maternal social support reduced the risk of maltreatment among offspring of mothers with no abuse history and those who reported maltreatment in their own childhood, this protective effect was diminished among mothers who reported being in a current relationship with an abusive partner. However, higher levels of paternal involvement in middle childhood were generally protective against subsequent perpetration of violence, even among youth who experienced maltreatment in childhood. The strong estimated effects of social support among mothers with no history of abuse and of paternal involvement among offspring with no history of maltreatment in this study stand in contrast to prior studies finding stronger influences of social support and supportive relationships on individuals *with* prior abuse (Dym Bartlett & Easterbrooks, 2015; Thornberry et al., 2013). Our hypothesis that supportive relationships would be especially protective against violence among those with a history of abuse was therefore not supported in this study. The additional consideration of postpartum IPV was an important aspect of this work that allowed us to distinguish between mothers whose abuse experiences were confined to childhood and those whose experiences of abuse were still ongoing in the form of IPV. This latter group exhibited the highest risks of reporting offspring maltreatment, echoing previous work demonstrating the particular role of domestic violence in maintaining the cycle of maltreatment (Jaffee et al., 2013). Our findings suggest that other sources of maternal support may be insufficient to counteract the presence of a mother's violent partner in terms of the risk of offspring maltreatment during childhood. However, paternal involvement in middle childhood may help to set youth on a non-violent trajectory, regardless of their earlier maltreatment experiences.

4.1.4. Implications for future research—Given mixed results regarding the buffering effects of SSNRs on the intergenerational transmission of violence in this and previous studies (Schofield et al., 2013), more work is needed to clarify the types of support that are most beneficial in reducing further harms among both youth and adults who experienced

childhood maltreatment and to examine whether supportive relationships at particular times in the life course are most influential. An important consideration in this work is the tendency for individuals who were maltreated in childhood to have fewer SSNRs later in life (Conger et al., 2013; Herrenkohl et al., 2013), making those with higher levels of support fundamentally different from those without such support on a variety of factors that may also influence subsequent risk of violence. In fact, it may be more fruitful to consider aspects of parent-child relationships as mediators, rather than moderators, of the association between offspring maltreatment and subsequent offspring violence (Sutton, Simons, Wickrama, & Futris, 2014). Considering the protective effects of social relationships is further complicated by the potential for relationships, including parent-child relationships and romantic relationships, to be the source of both support and hazards, and thus both positive and negative effects (Tracy, Braga, & Papachristos, 2016). Furthermore, the protection offered by supportive relationships to individuals who have been exposed to other types of adverse childhood experiences, including neglect and the direct witnessing of IPV (which were not directly assessed in this study), should be investigated.

4.2. Intergenerational transmission of violence

We found evidence for the intergenerational transmission of violence in this study, consistent with prior literature. Specifically, retrospective self-reports of maternal childhood maltreatment were strongly associated with prospective reports of offspring maltreatment in the ALSPAC cohort, even when adjusting for indicators of parental socioeconomic status and maternal mental health, substance use, and social support. The highest risk of maltreatment occurred among offspring of mothers who reported physical or emotional abuse by their partner after the child's birth; this confirms the frequent co-occurrence of child maltreatment and domestic violence found in other studies (Herrenkohl, Sousa, Tajima, Herrenkohl, & Moylan, 2008) as well as the particular hazards associated with maternal violence exposure in both childhood and adulthood (Dubowitz et al., 2001). Furthermore, maternal reports of offspring maltreatment at ages 0–8 years were associated with offspring self-reported violent perpetration at ages 18–20 years. This finding is in keeping with other studies that have found substantial continuity in maltreatment that was prospectively and independently reported or documented across generations (Ertem et al., 2000; Schofield et al., 2013), although our study differs from previous work by considering the relation between offspring maltreatment in childhood and subsequent physical violence perpetration in young adulthood rather than focusing solely on maltreatment or harsh discipline. A similar analysis from the Christchurch Health and Development Study found that exposure to violence in childhood was not associated with self-reported violent crime (including physical violence) at ages 21 and 25, but was associated with violence at age 18, when adjusting for confounding factors including parental care and socioeconomic status (Fergusson et al., 2006), although that study focused on exposure to interparental violence in childhood rather than childhood maltreatment. Others have suggested that stronger continuity may be present for specific types of violence, reflecting specific learning of violent behaviors (Besemer, 2012; Murrell, Merwin, Christoff, & Henning, 2005), and further work is needed in this area.

4.2.1. Timing and type of maltreatment—Initiation of offspring maltreatment at ages 0–2 years or 5–8 years was associated with an increased risk of offspring violent perpetration in young adulthood, even after adjusting for other parental characteristics. This finding highlights the potential importance of the timing of maltreatment, with maltreatment beginning in infancy causing disruption in the development of cognitive and emotional functioning, as well as potentially indicating greater chronicity and cumulative exposure to maltreatment, thereby leading to poorer long-term developmental outcomes (Cowell, Cicchetti, Rogosch, & Toth, 2015; Dunn et al., 2013; Narayan, Englund, & Egeland, 2013). The strong observed effects of maltreatment beginning at ages 5–8 years may indicate social learning of violent behaviors among school-age children, who are prone to imitation (Guerra, Huesmann, & Spindler, 2003). Replication of these findings, and separation of maltreatment timing and chronicity effects (Jaffee & Maikovich-Fong, 2011), is needed. The adverse effects of cumulative exposures to maltreatment were also illustrated through the high risks of youth violence among offspring exposed to multiple forms of maltreatment, in keeping with other studies of the adverse effects of cumulative abuse (Davies et al., 2015; Ford, Grasso, Hawke, & Chapman, 2013).

4.3. Other predictors of offspring maltreatment and violence

Maternal anxiety or depression and maternal alcohol consumption were associated with higher odds of offspring maltreatment, as expected (Martin et al., 2011; Sidebotham et al., 2001). However, offspring of mothers who were older at the time of their child's birth also exhibited an increased risk of maltreatment. This stands in contrast to many previous studies that have identified younger maternal age as a risk factor for maltreatment, including previous work in the ALSPAC cohort based on investigated and documented child abuse cases (Sidebotham et al., 2001). The observed relation between maternal age at delivery and subsequent offspring maltreatment may be confounded by omitted covariates (e.g., number of children in the household) or may reflect differential willingness to report instances of offspring maltreatment by maternal age and requires further investigation. With respect to offspring violence in young adulthood, males and offspring with unmarried mothers and parents with lower education and lower occupational class were generally at higher risk for perpetrating violence, consistent with prior studies (Farrington, 1989; Herrenkohl et al., 2001; Sampson et al., 2005). Previous work has suggested that the intergenerational effects of maltreatment may vary by gender (Stith et al., 2000; Widom, Czaja, & Dutton, 2014), increasing the risk of externalizing behaviors like physical aggression among males and internalizing behaviors and susceptibility to re-victimization among females. Although violent perpetration in young adulthood was more common among males, the relations between paternal involvement, offspring maltreatment, and offspring violence were similar for males and females in this study.

4.4. Study limitations

This study is not without limitations. Maternal childhood maltreatment was reported retrospectively during pregnancy, while mothers' prospective self-reports were used to identify study children who had experienced maltreatment during childhood. Other types of maltreatment, including emotional and physical neglect, and whether children witnessed intimate partner violence in the home were not directly assessed. Participants may have

interpreted the items assessing maltreatment differently and may have been fearful of reporting instances of offspring maltreatment, leading to misclassification of maltreatment experiences in this sample. Although our measure of paternal involvement included aspects of both the quantity and quality of father-child interactions (including interactions with the child's stepfather or the mother's current boyfriend), other aspects of the father-child relationship like time spent engaged in shared activities or communicating through means other than in-person contact were not assessed, nor were relations with "father figures" other than the child's biological father and the mother's partner (e.g., grandparents, uncles), though support from such figures may reduce risks of adverse outcomes (Marshall et al., 2001). We used multiple imputation to account for differential attrition by more disadvantaged participants; however, we did not have information on attrition due to a child's removal from his or her biological parents because of maltreatment or other placement in foster care. Finally, although the total sample used for these analyses was larger than in many previous studies, when categorizing by prior abuse some subgroups were quite small, leading to wide confidence intervals and uncertainty regarding the statistical significance of observed effects. Overall, we expect these limitations would lead to underestimates of the relations of interest.

4.5. Conclusions and implications

Despite these limitations, this study leveraged multiple, temporally distinct assessments of violence and SSNRs across three generations to demonstrate the influence of supportive relationships on the intergenerational transmission of violence, with some differences depending on prior abuse context and timing. In concordance with previous work, this study highlights the particular importance of domestic violence in perpetuating maltreatment and other forms of violence across generations (Jaffee et al., 2013; Tracy et al., 2016). These findings highlight the importance of efforts to promote the development of supportive relationships during childhood (e.g., warmth, secure attachment, and positive parenting in parent-child interactions) as well as in adulthood (e.g., with romantic partners, peers, and others, including during key times like the postpartum period). Evidence-based programs that provide training in parenting practices and promote parent-child attachment and improved partner relationships (MacMillan et al., 2009; Thornberry et al., 2013; Webster-Stratton & Taylor, 2001; Wilson et al., 2015) may be particularly valuable among parents who experienced maltreatment in their own childhood. Clinicians, including pediatricians, should consider screening all mothers for victimization, including both childhood maltreatment and current IPV, and providing appropriate referrals for therapy and services that may help women overcome their circumstances and break the cycle of violence (Dubowitz et al., 2001). This is particularly important given our finding that women who were currently in abusive relationships did not seem to benefit as much from social support as women who were not. Finally, further investigations of the particular mechanisms that connect childhood maltreatment experiences to violence later in life depending on the timing and type of maltreatment will help to identify multiple points of intervention throughout the life course, as we observed continued intergenerational transmission of violence despite the presence of supportive relationships.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.chiabu.2017.09.023.

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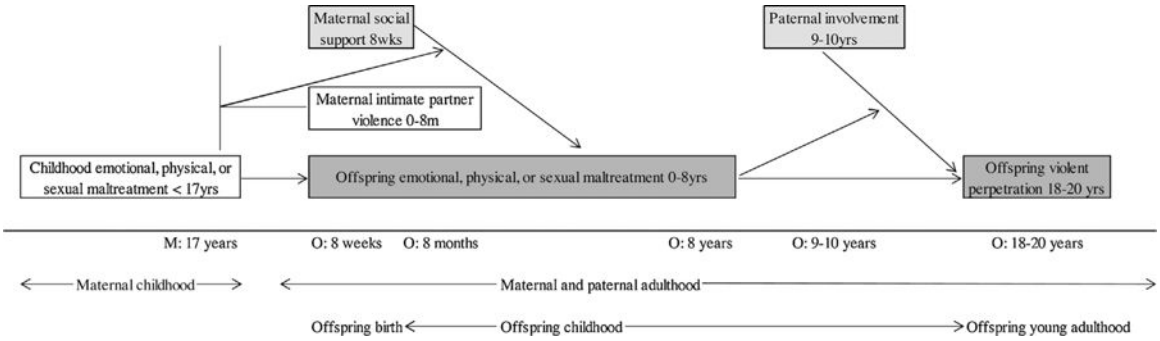

Fig. 1.

Visualization of the measures included in the study analyses. We first consider the effect of maternal social support (in light gray) on offspring maltreatment (in dark gray), with the combination of maternal childhood maltreatment and postpartum intimate partner violence (in white) as a potential moderator. We then consider the effect of paternal involvement in middle childhood (in light gray) on offspring physical violence perpetration in young adulthood (in dark gray), with offspring maltreatment (in dark gray) as a potential moderator and controlling for maternal childhood maltreatment, IPV, and social support.

Note: 'M' indicates maternal age, 'O' indicates offspring age.

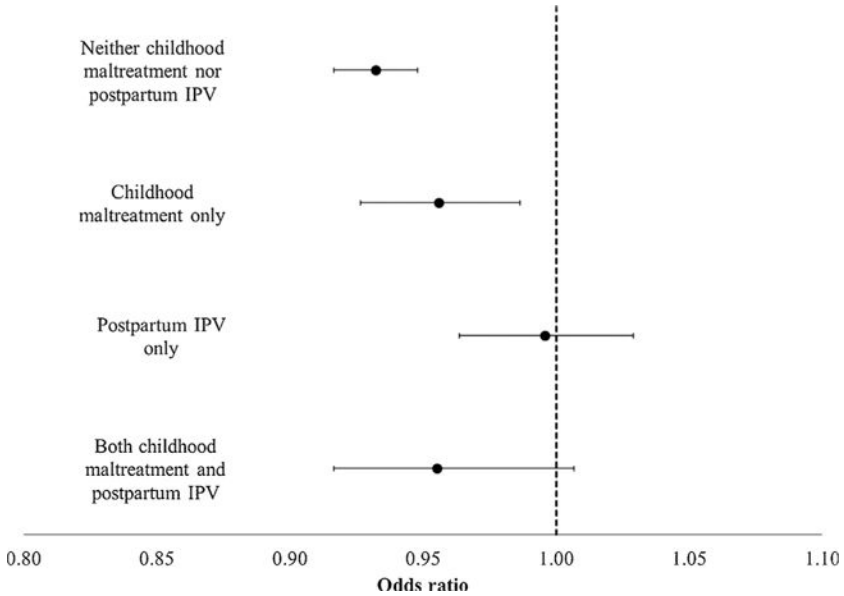

Fig. 2.

Adjusted odds ratios and 95% confidence intervals for the association between maternal social support and offspring maltreatment at ages 0–8 years, by mother's history of maltreatment and intimate partner violence (n = 11,384)[a].

[a]Adjusted for parental education, parental occupational class, maternal marital status, maternal anxiety or depression during pregnancy, maternal regular alcohol consumption during pregnancy, and maternal age at delivery.

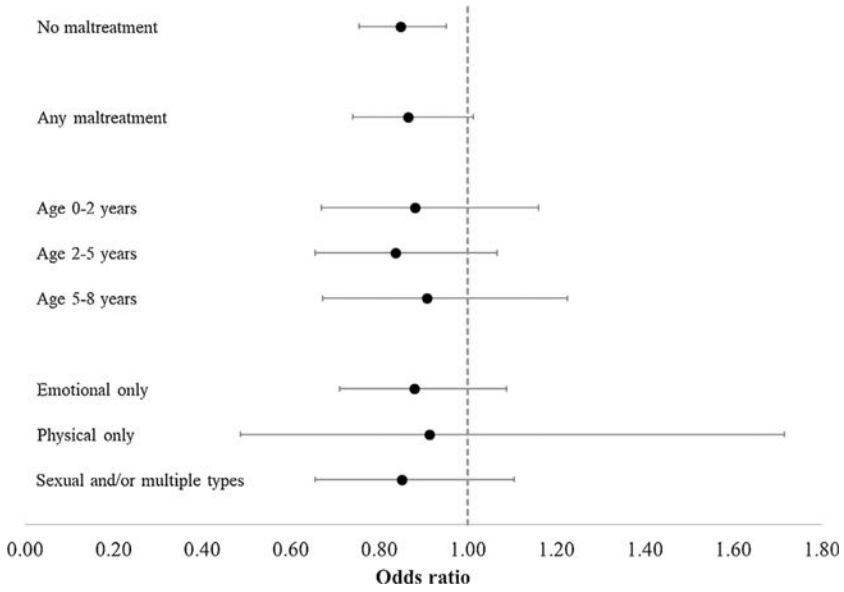

Fig. 3.

Adjusted odds ratios and 95% confidence intervals for the association between paternal involvement at ages 9–10 years and offspring physical violence perpetration at ages 18–20 years, by offspring maltreatment at ages 0–8 years, including maltreatment timing and type (n = 11,384)[a].

[a]Each model was adjusted for maternal postpartum social support, maternal history of childhood maltreatment and postpartum IPV, offspring sex, parental education, parental occupational class, maternal marital status, and maternal age at delivery.

Table 1

Socio-demographic and behavioral characteristics of parents and offspring, Avon Longitudinal Study of Parents and Children.

	Singleton births alive at 1 year (n = 11,384)		Imputed sample (n = 13,619)		Complete case sample for analysis #1 (n = 8931)		Complete case sample for analysis #2 (n = 3226)	
	n	%	n	%	n	%	n	%
Offspring characteristics								
Offspring sex								
Female	6592	48.4	5510	48.4	4347	48.7	1904	59.0
Male	7021	51.6	5874	51.6	4584	51.3	1322	41.0
Offspring race								
Non-white	591	5.0	557	4.9	318	3.6	101	3.2
White	11,174	95.0	10,827	95.1	8486	96.4	3096	96.8
Maternal characteristics								
Maternal education								
Below O-level	3635	30.1	3248	28.5	2154	24.2	480	14.9
O-level	4183	34.6	4004	35.2	3269	36.7	1073	33.3
A-level	2727	22.5	2624	23.1	2205	24.7	974	30.2
University degree	1553	12.8	1508	13.2	1290	14.5	696	21.6
Maternal occupational class								
I – Professional	578	5.9	624	5.5	504	6.3	281	9.5
II – Managerial or technical	3084	31.5	3393	29.8	2559	32.2	1112	37.7
III – Skilled non-manual	4192	42.8	4861	42.7	3444	43.3	1202	40.7
IV – Skilled manual	769	7.9	949	8.3	585	7.4	142	4.8
V/VI – Partly skilled or unskilled	1178	12.0	1557	13.7	861	10.8	215	7.3
Maternal marital status								
Married	8739	79.5	8994	79.0	7430	83.2	833	87.8
Divorced, widowed, or separated	618	5.6	650	5.7	437	4.9	122	3.8
Never married	1641	14.9	1740	15.3	1064	11.9	271	8.4
Anxiety or depression in pregnancy[a]								
No	9713	82.3	9441	82.9	7576	84.8	2799	86.8
Yes	2095	17.7	1943	17.1	1355	15.2	427	13.2

	Singleton births alive at 1 year (n = 11,384)		Imputed sample (n = 13,619)		Complete case sample for analysis #1 (n = 8931)		Complete case sample for analysis #2 (n = 3226)	
	n	%	n	%	n	%	n	%
Regular alcohol use in pregnancy[b]								
No	10666	84.2	9613	84.4	7559	84.6	2730	84.6
Yes	2009	15.9	1771	15.6	1372	15.4	496	15.4
Maternal age at birth (Mean, SD)	27.96 (4.98)		28.37 (4.82)		28.78 (4.59)		29.70 (4.35)	
Paternal characteristics								
Paternal education								
Below O-level	4021	34.6	3904	34.3	2509	29.0	637	20.1
O-level	2462	21.2	2435	21.4	1944	22.5	650	20.5
A-level	3032	26.1	2985	26.2	2463	28.5	977	30.8
University degree	2109	18.1	2060	18.1	1742	20.1	908	28.6
Paternal occupational class								
I – Professional	1175	11.0	1219	10.7	1014	11.8	512	16.4
II – Managerial/technical	3624	34.0	3777	33.2	3025	35.3	1220	39.0
III – Skilled non-manual	1165	10.9	1230	10.8	976	11.4	392	12.5
IV – Skilled manual	3347	31.4	3656	32.1	2578	30.0	750	24.0
V/VI – Partly skilled/unskilled	1351	12.7	1503	13.2	988	11.5	255	8.2
Parent characteristics								
Highest level of parental education								
Below O-level	2467	20.4	2075	18.2	1300	14.6	254	7.9
O-level	3235	26.7	3062	26.9	2424	27.1	690	21.4
A-level	3851	31.8	3746	32.9	3076	34.4	1188	36.8
University degree	2571	21.2	2501	22.0	2131	23.9	1094	33.9
Highest occupational class of parents								
I – Professional	1497	13.4	1565	13.7	1290	14.4	654	20.3
II – Managerial or technical	4675	41.7	4902	43.1	3849	43.1	1511	46.8
III – Skilled non-manual	2864	25.6	3184	28.0	2302	25.8	730	22.6
IV – Skilled manual	1504	13.4	1284	11.3	1055	11.8	247	7.7
V/VI – Partly skilled/unskilled	664	5.9	449	3.9	435	4.9	84	2.6

[a]Crown-Crisp Experiential Index (CCEI) anxiety subscale score > 10 or CCEI depression subscale score > 9 or Edinburgh Postnatal Depression Scale score > 12, reported at 18 weeks gestation.

[b] Drank 1 or more glasses of alcohol per week during first trimester of pregnancy, reported at 18 weeks gestation.

Table 2

Results of logistic regression models predicting offspring emotional, physical, or sexual maltreatment at ages 0–8 years (n = 11,384).

	Unadjusted model			Adjusted model		
	OR	**95% CI**	**Wald p-value**	**OR**	**95% CI**	**Wald p-value**
Maternal social support[a]	0.90	0.89–0.92	< 0.001	0.95	0.93–0.96	≤0.001
Maternal history of maltreatment and IPV						
Neither childhood maltreatment nor postpartum IPV				1.00	(ref)	≤0.001
Childhood maltreatment only				2.59	2.19–3.07	
Postpartum IPV only				5.89	4.87–7.12	
Both childhood maltreatment and postpartum IPV				9.56	6.96–13.13	
Highest level of parental education						
Below O-level				0.82	0.64–1.06	0.351
O-level				0.92	0.75–1.13	
A-level				0.89	0.74–1.08	
University degree				1.00	(ref)	
Highest occupational class of parents						
I – Professional				1.00	(ref)	0.246
II – Managerial/technical				1.05	0.85–1.29	
III – Skilled non-manual				0.93	0.72–1.19	
IV – Skilled manual				1.16	0.85–1.57	
V/VI – Partly skilled/unskilled				1.18	0.78–1.78	
Maternal marital status						
Married				1.00	(ref)	0.118
Divorced, widowed, separated				1.23	0.96–1.58	
Never married				1.02	0.85–1.24	
Maternal anxiety or depression during pregnancy						
No				1.00	(ref)	≤0.001
Yes				1.66	1.43–1.92	
Maternal regular alcohol consumption during pregnancy						
No				1.00	(ref)	0.328
Yes				1.04	0.87–1.24	

	Unadjusted model			Adjusted model		
	OR	95% CI	Wald p-value	OR	95% CI	Wald p-value
Maternal age at delivery				1.03	1.01–1.04	≤0.001

[a]Mother's perceived social support from her partner, family, friends, and neighbors, reported at 8 weeks postpartum. Higher scores indicate higher perceived support.

Table 3

Results of logistic regression models predicting offspring physical violence perpetration at ages 18–20 years (n = 11,384).

	Adjusted model 1			Adjusted model 2			Adjusted model 3		
	OR	**95% CI**	**Wald p-value**	**OR**	**95% CI**	**Wald p-value**	**OR**	**95% CI**	**Wald p-value**
Paternal involvement[a]	0.85	0.77–0.94	0.013	0.85	0.77–0.95	0.013	0.85	0.77–0.95	0.012
Offspring maltreatment									
No	1.00	(ref)	≤0.001	–	–	–	–	–	–
Yes	1.45	1.15–1.82		–	–		–	–	
Offspring maltreatment, by timing									
No maltreatment	–	–	–	1.00	(ref)	0.004	–	–	–
0–2 years	–	–		1.61	1.08–2.41		–	–	
2–5 years	–	–		1.21	0.89–1.64		–	–	
5–8 years	–	–		1.72	1.12–2.66		–	–	
Offspring maltreatment, by type									
No maltreatment	–	–	–	–	–	–	1.00	(ref)	≤0.001
Emotional only	–	–		–	–		1.28	1.00–1.64	
Physical only	–	–		–	–		1.52	0.80–2.88	
Sexual and/or multiple types	–	–		–	–		1.85	1.26–2.71	
Maternal social support	1.00	0.98–1.02	0.188	1.00	0.98–1.02	0.266	1.00	0.98–1.02	0.218
Maternal maltreatment and IPV									
Neither maltreatment nor IPV	1.00	(ref)	0.278	1.00	(ref)	0.269	1.00	(ref)	0.287
Childhood maltreatment only	1.09	0.80–1.50		1.10	0.80–1.50		1.08	0.79–1.49	
Postpartum IPV only	1.05	0.75–1.46		1.03	0.72–1.47		1.04	0.75–1.45	
Both maltreatment and IPV	1.11	0.68–1.83		1.09	0.65–1.83		1.08	0.65–1.78	
Offspring sex									
Female	1.00	(ref)	≤0.001	1.00	(ref)	≤0.001	1.00	(ref)	≤0.001
Male	1.94	1.59–2.36		1.94	1.59–2.36		1.94	1.59–2.36	
Highest level of parental education									
Below O-level	1.39	1.04–1.85	0.020	1.38	1.03–1.84	0.021	1.40	1.05–1.86	0.018
O-level	1.15	0.88–1.51		1.14	0.87–1.50		1.16	0.88–1.52	
A-level	1.08	0.81–1.44		1.07	0.80–1.43		1.08	0.81–1.44	

	Adjusted model 1			Adjusted model 2			Adjusted model 3		
	OR	**95% CI**	**Wald p-value**	**OR**	**95% CI**	**Wald p-value**	**OR**	**95% CI**	**Wald p-value**
University degree	1.00	(ref)		1.00	(ref)		1.00	(ref)	
Highest parental occupational class									
I – Professional	1.00	(ref)	0.020	1.00	(ref)	0.018	1.00	(ref)	0.019
II – Managerial or technical	1.29	0.95–1.74		1.29	0.96–1.75		1.29	0.95–1.74	
III – Skilled non-manual	1.42	1.02–1.98		1.43	1.03–2.00		1.42	1.02–1.98	
IV – Skilled manual	1.17	0.78–1.76		1.18	0.78–1.77		1.17	0.77–1.76	
V/VI – Partly skilled/Unskilled	1.27	0.62–2.63		1.27	0.62–2.64		1.28	0.62–2.64	
Maternal marital status									
Married	1.00	(ref)	0.046	1.00	(ref)	0.044	1.00	(ref)	0.048
Divorced, separated, widowed	1.35	0.91–1.99		1.34	0.91–1.99		1.35	0.91–2.00	
Never married	1.31	0.98–1.76		1.31	0.98–1.76		1.31	0.98–1.75	
Maternal age at delivery	0.99	0.96–1.01	0.118	0.99	0.96–1.01	0.149	0.99	0.96–1.01	0.117

[a]Positive father-child relationship and frequency of father-child contact at 9–10 years of age, as reported by the child's mother. Higher values indicate more paternal involvement.