Cognitive Development in the Context of Trauma: Longitudinal Implications of Intimate Partner Violence for Women and Children

by

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DEDICATION

This work is dedicated to my advisor, Dr. Sandra Graham-Bermann, and to my friends and family—especially Kevin Clark—without whose love and encouragement this undertaking would have been impossible.

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ABSTRACT

Nearly one in three women in the United States have experienced intimate partner violence (IPV), and children are often direct eyewitnesses to these events. IPV places women and children at risk for a range of health problems, and mounting literature indicates that IPV threatens cognitive development as well, particularly with regard to executive functioning (EF). EF refers to the ability to plan, think flexibly, inhibit responses, and redirect attention. Bioecological and developmental cascade models suggest that EF may influence the relation between IPV and a host of mental health concerns in women and children. One such concern involves disruptions in children's abilities to direct and sustain attention, as executive dysfunction is a core component of Attention-Deficit/Hyperactivity Disorder. Accordingly, this dissertation assessed EF and attention problems in women and children with histories of IPV.

The first study of this dissertation examined factors associated with mothers' EF following IPV. Using longitudinal data, this study revealed unique relationships between IPV and women's performance on tasks measuring distinct EF domains. Specifically, recent—but not remote—experiences of IPV were associated with impaired interference control, whereas women's cognitive flexibility was not significantly impacted by recent or remote IPV. Women's post-intervention depressive symptoms were predictive of impairments in cognitive flexibility eight years later, suggesting that treatment-resistant depression may increase risk for poor EF in women with histories of IPV. By assessing the differential effects of recent and remote IPV on distinct EF domains, this study

addressed a gap in the literature on the links between trauma, mental health, and EF. Examining these relationships in women with children is critically important, as deficits in mothers' EF following IPV may have lasting effects on their children's development.

The second dissertation study evaluated speeded control, an aspect of EF influenced by processing speed, in IPV-exposed children. Results indicated that children's IPV exposure during the preschool years had a significant, negative impact on their speeded control in late childhood, eight years later. This relation was mediated by the remote effects of IPV on their mothers; specifically, IPV was positively associated with maternal depression, which in turn contributed to greater use of negative parenting strategies when children were of preschool age. Children's IPV exposure during late childhood was not predictive of their concurrent speeded control performance, suggesting that the preschool years may be a sensitive period for EF development. This study was the first to assess how the detrimental effects of IPV on women affect their children's cognition in the long term, and provides compelling evidence for developmental cascade models that emphasize the role of parent-child relationships during early childhood.

The final dissertation study assessed the effectiveness of a ten-session intervention in reducing children's attention problems. Results indicated that IPV exposure interacted with experimental group assignment such that among children exposed to high levels of IPV, those in the Treatment group exhibited fewer attention problems one year post-intervention relative to Controls. There was no treatment effect for children exposed to low levels of IPV. These results inform the implementation of evidence-based interventions for IPV-exposed children and their mothers that address the effects of violence on cognitive development. In doing so, this dissertation has

implications for research on both cognitive development and family violence,

contributing to two fields of psychology that, until recently, were rarely integrated.

CHAPTER I

Introduction

Over the course of their lifetimes, one in three women are affected by physical, sexual, or psychological violence by a current or former intimate partner, more broadly conceptualized as intimate partner violence (IPV; Breiding et al., 2014). Although all genders experience IPV, women consistently report more IPV-related injuries than men, and women are significantly more likely than men to be killed by an intimate partner (Catalano, Smith, Snyder, & Rand, 2009; Tjaden & Thoennes, 2000). Beyond acute physical injury, IPV is known to have lasting effects on women's physical and mental health. These effects include an increased risk for chronic pain, respiratory problems, gastrointestinal problems, and cardiovascular disease (Dillon, Hussain, Loxton, & Rahman, 2013), in addition to mental health conditions such as anxiety, depression, and traumatic stress (Beydoun, Williams, Beydoun, Eid, & Zonderman, 2017; Ellsberg, Jansen, Heise, Watts, & Garcia-Moreno, 2008). Because IPV exposure increases the incidence of both acute and chronic physical and mental health conditions, nearly $600 billion in health care costs are attributed to IPV each year in the United States (Peterson et al., 2018). Consequently, IPV has been recognized as a growing public health concern, as it places a great burden not only on those who experience it, but also on their families and communities.

Women with children are significantly more likely to experience IPV than women without children (Ernst, Weiss, & Enright-Smith, 2006). As a result, an estimated one in 15 children in the United States live in a home where IPV has occurred, and between 80% and 90% of these children are direct eyewitnesses to the events (Graham-Bermann, Lynch, Banyard, DeVoe, & Halabu, 2007; Hamby, Finkelhor, Turner, & Ormrod, 2011). Children who witness IPV are significantly more likely than their non-exposed peers to develop chronic health conditions including allergies, asthma, and gastrointestinal complications (Graham-Bermann & Seng, 2005). Further, IPV exposure places children at unique risk for internalizing and externalizing problems and traumatic stress symptoms that, if untreated, can persist long after the violence has ended (Evans, Davies, & DiLillo, 2008; McDonald et al., 2016). These risks are greatest for children who are younger when first exposed to IPV, as its negative effects on children's development are compounded over time (Graham-Bermann & Perkins, 2010).

Bioecological Model

The impact of IPV on women and children can be understood within the framework of Bronfenbrenner and Morris' (1998) bioecological model. This model posits that human development is the product of transactions between nested biological and environmental influences. At the microsystems level, children are shaped by interactions with their most proximal settings (e.g., biological factors and immediate environments at home, daycare, and school) and the individuals in those settings (e.g., parents, siblings, teachers, caretakers). Exchanges between microsystems (e.g., interactions between parents, teachers, caretakers, and their respective environments) constitute the mesosystem. The exosystem encompasses environments in which the developing child

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does not participate but that have an effect on settings with which the child does interact (e.g., school district, extended family). Each of these systems is situated within the macrosystem, or the larger sociohistorical context.

In applying Bronfenbrenner and Morris' (1998) model to the case of IPV, McCoy (2013) suggested that children's self-regulatory development is directly influenced by disruptions in the family microsystem and indirectly influenced by the effects of IPV on their caretakers in the broader environment. Based on this theory, it follows that IPV would have a direct, negative impact on children's psychosocial development as well as indirect influences, including negative effects on mothers' functioning. The relative impact of these interacting factors would vary based on individual characteristics of the child (e.g., sex, age, temperament), their context, and the passage of time. Further, because children's outcomes are products of simultaneous interactions with multiple environments, and transactions between these environments, the risk conferred by exposure to trauma, such as IPV, can be compounded by the cascading effects of these interactions. Indeed, Masten and Cicchetti (2010) describe developmental cascades as, "the cumulative consequences for development of the many interactions and transactions occurring in developing systems that result in spreading effects across levels, among domains at the same level, and across different systems or generations" (p. 491). The authors highlight that cascading effects have most often been applied to the study of negative developmental outcomes for children, but that the transactional nature of each layer of influence on children's development can also explain the emergence of favorable outcomes, even in a high-risk context.

Executive Functioning

From the perspective of the bioecological model, the multifinality of outcomes associated with IPV exposure and the relationships between these outcomes can be explained by the transactions between multiple systems of influence over the course of children's development. Within this framework, then, it follows that IPV could disrupt not only women and children's physical and mental health, but also their cognitive development. An emerging body of literature supports this assumption, as studies have linked IPV exposure to poorer short-term memory, verbal ability, and academic performance in children (Graham-Bermann, Howell, Miller, Kwek, & Lilly, 2010; Jouriles et al., 2008; Kiesel, Piescher, & Edleson, 2016), as well as impaired autobiographical memory and abstract reasoning in adults (Billoux, Arbus, Telmon, & Voltzenlogel, 2016; Twamley et al., 2009). Because performance across these cognitive domains is supported by executive functioning (EF) abilities, there is also burgeoning interest in how experiences of IPV may impact EF development. EF, broadly defined, is a set of related abilities that facilitate future-oriented behavior. EF includes skills such as inhibition, cognitive flexibility, planning, and working memory (Royall et al., 2002), and these skills are predominantly regulated by activity in the frontal lobes (Duncan, Johnson, Swales, & Freer, 1997; Nigg et al., 2017).

Given the broad range of skills encompassed by EF, there is debate in the field as to whether EF abilities can be accounted for by one unifying mechanism or whether the components of EF are distinct, but correlated. As studies have found evidence for both unitary (e.g., Duncan et al., 1997; De Frias, Dixon, & Strauss, 2006) and non-unitary theories (e.g., Lerner & Lonigan, 2014; Salthouse, Atkinson, & Berish, 2003) of EF, a

widely-accepted understanding of EF is that its elements, while clearly separable, also share a certain fundamental commonality (Miyake et al., 2000). Miyake and colleagues (2000) proposed that inhibition, shifting, and updating comprise the core components of EF. Updating refers to working memory abilities that allow one to mentally work with information that is no longer perceptually present. Shifting involves cognitive flexibility, perspective-taking, and complex problem-solving. Inhibition is further separable into two domains: behavioral response inhibition (i.e., self-control) and interference control (i.e., selective attention). The three core components of EF support one another to facilitate success on any given EF task. For example, in order to inhibit a prepotent response, one must hold a goal in mind long enough to determine the appropriate behavior. Similarly, task-switching, or shifting, requires one to inhibit a prior response or mental set and "update" working memory to adapt to a new perspective (for a review of the core components of EF and their relation to one another, see Diamond, 2013). This premise, that the elements of EF are separable but related, is the conceptualization of EF assumed in the present dissertation studies.

Outcomes Associated with Executive Functioning

EF contributes to successful development across a wide variety of domains. Children with more advanced EF abilities are better able to adapt to the transition to school (Neuenschwander, Rothlisberger, Cimeli, & Roebers, 2012) and also demonstrate higher measured math and reading skills throughout their school-aged years (Duncan et al., 2007; Gathercole, Pickering, Knight, & Stegmann, 2004; for review, see McClelland & Cameron, 2019). Conversely, poor EF abilities in childhood are associated with behavior problems in school (Espy, Sheffield, Wiebe, Clark, & Moehr, 2010; Monette,

Bigras, & Guay, 2015) and disruptive behaviors in adolescence (Long, Hill, Luna, Verhulst, & Clark, 2015). With regard to physical health, EF has been associated with weight loss (Crescioni et al., 2011), and poor EF is related to a number of adverse health outcomes including asthma, high cholesterol, hypertension, cancer, and overeating in adults and children (Miller, Barnes, & Beaver, 2011; Riggs, Sprujit-Metz, Sakuma, Chou, & Pentz, 2010). Studies of EF in adults have demonstrated that those with better EF abilities have greater job satisfaction and higher quality of life (Brown & Landgraf, 2010; Diestel, Cosmar, & Schmidt, 2013), whereas poorer EF performance is associated with lower occupational attainment and greater likelihood of involvement with the criminal justice system (Biederman et al., 2006; Seruca & Silva, 2016).

EF is of clinical relevance due to the robust associations between EF abilities and a range of mental health problems. EF has been implicated in children's internalizing and externalizing problems (Eisenberg et al., 2009), depressive symptoms (Wang, Chassin, Eisenberg, & Spinrad, 2015), risk for bipolar disorder (Tseng et al., 2015), and substance abuse (Zucker, Heitzeg, & Nigg, 2011). EF also plays a key role in the development of symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD), discussed in detail below. Adults with EF deficits are at greater risk for obsessive-compulsive disorder (Penadés et al., 2007) and schizophrenia (Barch, 2005), and among the strongest links between EF abilities and psychopathology in adulthood is the association with depression. In a meta-analysis of 113 studies of the relation between EF and depression, Synder (2013) found that poor EF is consistently associated with depression, and there appears to be a dose-response relationship between depressive symptom severity and performance on measures of EF. Although a portion of reduced EF performance can be accounted for by

psychomotor speed impairments symptomatic of depression, processing speed alone does not explain deficits on untimed accuracy measures. Taylor-Tavares and colleagues (2007) found that EF performance differentiated between study participants with unipolar major depressive disorder (MDD) and bipolar disorder (BD), such that only participants with MDD demonstrated impaired EF. This effect persisted after controlling for depression symptom severity, suggesting a unique neurocognitive profile for MDD that is associated with EF deficits.

There has been some speculation in the field that the relation between EF and psychosocial outcomes can be explained by more systemic environmental covariates, particularly socioeconomic status (SES). Because studies have shown that the predictive effects of EF are reduced when taking SES into account (e.g., Watts, Duncan, & Quan, 2018), the value of investigating EF as a construct has been called into question. However, the role of EF in promoting adaptive development across a wide variety of domains is supported by studies that have demonstrated such relations while accounting for SES. Researchers have revealed that, controlling for SES, EF abilities explain unique variation in children's academic achievement and school readiness (Duncan et al., 2007; Willoughby, Magnus, Vernon-Feagans, & Blair, 2017), health behaviors and substance abuse (Stautz, Pechey, Couturier, Deary, & Marteau, 2016), and internalizing and externalizing problems (Ghassabian et al., 2014; Sulik et al., 2015). Relations between adults' EF and educational attainment, employment status, quality of life, and physical and mental health are also robust to statistical controls for SES (Altshuler et al., 2007; Davis, Marra, Najafzadeh, & Liu-Ambrose, 2010; Fergusson, Boden, & Horwood, 2013). Thus, although SES and other systemic environmental factors (e.g., race, historical context) are

sure to critically impact psychosocial adjustment, EF appears to play a distinct and important role in shaping human development.

Development of Executive Functions

Clearly, optimizing EF across the lifespan is crucial given the wide-reaching implications of executive dysfunction. Because EF abilities are organized and coordinated by the prefrontal cortex—one of the slowest maturing brain regions—there are vast developmental differences in children's abilities to perform EF tasks (Best & Miller, 2011). EF abilities develop hierarchically, such that more basic and foundational competencies are acquired first and allow for the development of increasingly complex EF skills (for review, see Garon, Bryson, & Smith, 2008). Children typically master basic EF tasks, including simple tests of working memory, selective attention, and response inhibition, within the first year of life (Hendry, Jones, & Charman, 2016). Building on these competencies, toddlers are able to perform a wide array of fundamental EF tasks across the domains of shifting, updating, and inhibition, prior to age three (Willoughby, Blair, Wirth, & Greenberg, 2010). The greatest growth in proficiency across these three domains of EF occurs between the ages of three and five (Anderson & Reidy, 2012; Best & Miller 2011; Carlson, 2005), suggesting that the preschool years are an especially critical time in terms of neurological development.

This argument is corroborated by evidence that a network of brain regions implicated in attentional control processes begins to develop between ages three and five, and continues to mature slowly thereafter into adulthood. This network, described by Rothbart and Posner (2001), comprises a set of coordinated regions that facilitate conflict resolution, including the dorsolateral prefrontal cortex, supplementary motor area, and

basal ganglia. Studies have supported the role of this attentional control network in the

mastery of EF tasks (Casey et al., 2007; Cole & Schneider, 2007; Weiss, Meltzoff, &

Marshall, 2018), and there is evidence to suggest that continued improvement in

performance on EF tasks over the course of development coincides with a strengthening of

these neural circuitries (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; for

review, see Tau & Peterson, 2010).

Beyond the preschool years, additional surges in the growth of the prefrontal

cortex – and concurrent EF abilities – occur between ages seven and nine, and again from

ages 16 to 19 (Anderson, Northam, Hendy, & Wrenall, 2001). During these spurts,

children and adolescents attain more complex inhibition skills (Brocki & Bohlin, 2004),

demonstrate improvements in processing speed (Anderson et al., 2001), and their ability to

plan and execute goal-oriented behaviors is enhanced (Romine & Reynolds, 2005).

Typically, the prefrontal cortex achieves full functional maturity around age 25, and the

regions associated with impulse control are among the last to develop (Giedd, 2004).

Individual and Environmental Correlates of Executive Functioning

The bioecological model posits that the development of executive functions is

shaped by nested biological and environmental influences whose interactions have

cascading effects over time. Accordingly, a vast research literature is dedicated to

understanding the risk and protective factors that shape EF development. Findings largely

support the assumptions of the bioecological and developmental cascade perspectives,

pointing to key biological and environmental influences that impact EF abilities over time.

The heritability of executive functions. Genetic research in the area of EF lends

credence to Miyake and colleagues' (2000) conceptualization of EF as a set of separable

abilities that share an underlying unitary component. In a study of 293 young adult twin

pairs, Friedman and colleagues (2008) found extremely high heritability (99%) for a

"Common EF" factor that was distinguishable from unique genetic influences on

individual EF domains that were also highly heritable (81—100%). Among the domains,

shifting was the only set of abilities that was also significantly influenced (13%) by

unshared environmental factors; however, these factors accounted for significant portions

of the variance in performance on all individual EF tasks, regardless of domain. In a

similar study of 505 third- through eighth-graders, Engelhardt, Briley, Mann, Harden, and

Tucker-Drob (2015) also found that a Common EF factor was extremely heritable (100%)

and unshared environmental influences significantly affected performance on all

individual EF tasks. In contrast, shifting was the only EF domain with unique genetic

variance separable from the Common EF factor, and unshared environmental influences

accounted for individual differences in working memory and updating domains (as

opposed to shifting in Friedman and colleagues' 2008 study). These findings suggest that

the heritability of the executive functions within individual domains may increase over

time and that environmental influences—and interventions—are likely to have the greatest

effects on EF domains at earlier developmental stages.

  Although research indicates that genetic factors greatly influence both individual

EF domains and a common unitary EF component, Friedman and colleagues (2008)

caution against concluding that EF is solely influenced by one's biological

predispositions, emphasizing that heritability is an estimation of the relative contribution

of genetic factors to variation around the population mean. Because genes influence

individual differences around a mean, environmental factors can play a role in shifting the

mean itself. This phenomenon has been demonstrated in countless studies of gene by environment (G x E) interactions, in which genetic risk is attenuated or exacerbated by environmental influences. Thus, the high heritability of executive functions does not obviate efforts to reduce environmental threats to EF development, nor does it preclude the effectiveness of interventions to bolster EF abilities.

Evidence for gene by environment interactions. The serotonin system has been a focus of genetic studies of EF development, given the density of serotonergic receptors in the prefrontal cortex (Enge, Fleischhauer, Lesch, Reif, & Strobel, 2011). The long (L) allele polymorphism in the serotonin transporter gene has generally been found to be associated with reduced performance on measures of EF in children and adults (Borg et al., 2009; Gizer, Ficks, & Waldman, 2009), though G x E research reveals the central role of environmental factors in moderating gene expression. Weikum and colleagues (2013), for example, discovered that genetic vulnerabilities interacted with maternal depression to predict performance on EF tasks among six-year-olds. Children with the L/L genotype in this study were especially sensitive to context, as those whose mothers endorsed high levels of depression demonstrated impaired performance on measures of EF relative to peers with at least one short allele, but among children whose maternal depression levels were low, L/L children performed significantly better than non-L/L peers. Similarly, G x E interactions were evident in a study of EF in adolescents; among youth who reported low levels of parental supervision, those with the L/L genotype performed significantly worse on measures of conceptual flexibility, but when parental supervision was high, L/L adolescents outperformed their non-L/L peers (Li et al., 2015). The body of literature on the transactional interplay between genes and environment in contributing to EF abilities

across the lifespan clearly suggests that although genetic factors may increase sensitivity to particular ecological threats, adaptive development is possible—and even likely—in children with genetic vulnerabilities when environmental risk is controlled.

Indeed, environmental influences make robust contributions to individual differences in domain-specific EF abilities. For example, a number of early environmental risk factors, including prenatal nicotine exposure (Daseking, Petermann, Tischler, & Waldmann, 2015), preterm birth (O'Meagher, Kemp, Norris, Anderson, & Skilbeck, 2017), and neonatal complications (McKinlay et al., 2017), engender vascular and structural changes in the brain regions responsible for basic executive functions, the effects of which are observable on EF tasks among children during the preschool years and as late as adolescence. Farooqi, Adamsson, Serenius, and Hägglöf (2016) found that extremely preterm adolescents performed over one standard deviation below peers who were carried to-term on measures of EF, an effect size up to three times larger than that observed in preschool-aged children (Aarnoudse-Moens, Weisglas-Kuperus, van Goudoever, & Oosterlaan, 2009). These results are indicative of the compounding effects of early exposure to environmental threats on emerging executive functions and accentuate the importance of timely interventions to promote the healthy development of these foundational abilities.

Research on more distal environmental influences that affect children's executive functions suggests that a number of factors can mitigate or exacerbate the consequences of early risk. In a landmark study of 320 twin pairs, Turkheimer, Haley, Waldron, D'Onofrio, and Gottesman (2003) found that the heritability of performance on measures of cognitive abilities was dependent on children's SES, such that among children from affluent

families, scores were over 80% heritable, whereas genetic factors had virtually no effect

on children from impoverished families, whose scores were instead more heavily

influenced (60%) by elements of their environments. Indeed, mounting evidence suggests

that beyond G x E interactions, the importance of transactions between social and

environmental influences themselves in shaping EF is unquestionable.

Compounding environmental risk. SES, educational attainment, and race are

among the most extensively studied correlates of EF development, with consistent links

between executive dysfunction and low SES, low educational attainment, and racial

minority status (Hackman & Farah, 2009; Jacobsen, de Mello, Kochhann, & Fonseca,

2017; Schwartz et al., 2004). Although there is undeniable intersectionality between these

factors, studies have begun to shed light on more malleable features of the environment

that can interact with demographic variables to promote EF among vulnerable groups. For

example, in a study of 60 school-aged children, those from families of higher SES

generally exhibited better performance on measures of inhibition, switching, and updating

(Sarsour, Sheridan, Jutte, & Nuru-Jeter, 2010). These effects were mediated by a number

of factors including the availability of enrichment activities, parental responsivity, and

family companionship. Similar studies have replicated these findings (Noble, McCandliss,

& Farah, 2007; for review, see Hackman, Farah, & Meaney, 2010), which suggests that

socioeconomic disparities in EF are due, in part, to heterogeneity in the home environment

between families with varying socioeconomic resources. Further, SES has been found to

interact with single parenthood such that living in a home with two parental figures

buffers the negative effects of low SES on children's EF performance (Sarsour et al.,

2010). Sarsour and colleagues (2010) posit that children from single-parent families of

higher SES likely had greater access to physical enrichment resources and were less affected by social policies that differentially impact low-SES, single-parent families, providing further evidence for the role of nested social and environmental factors in shaping children's development as the bioecological model predicts.

In addition to SES and home environment, parental education significantly contributes to children's EF. In fact, research has demonstrated that high levels of parental education can moderate the adverse effects of preterm birth on EF development (O'Meagher, Kemp, Norris, Anderson, & Skilbeck, 2017). Parental education also influences the SES-EF relation, as evidenced by a study of 419 Brazilian children between the ages of six and twelve. In this study, Piccolo, Arteche, Fonseca, Grassi-Oliveira, and Salles (2016) found that children's performance on measures of inhibitory control was significantly associated with their SES, such that children from families with greater income performed best on EF tasks. Further, children whose parents—and mothers, in particular—had higher levels of education exhibited enhanced EF performance relative to children of parents with lower education levels. These associations were strongest for younger children, suggesting that other environmental influences, particularly those in school, may provide opportunities for children with lower EF abilities to achieve similar levels of functioning to their peers. However, these opportunities are only afforded to children receiving high quality education in schools with the resources to support individualized attention for students who may be struggling. In the United States, access to such quality education is often limited to families with greater socioeconomic privilege.

The intersection of race, poverty, and trauma. Due to an extensive social and political history that has contributed to systemic oppression, housing segregation, and

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widespread discrimination, race influences access to healthcare, socioeconomic resources, and high quality education in the United States. Consistently, studies have revealed racial disparities in educational and cognitive outcomes that privilege White Americans relative to racial minority peers (Cottrell, Newman, & Roisman, 2015). Inequalities in educational opportunities set the stage for greater imbalances across a range of life outcomes downstream, as education propagates socioeconomic mobility and occupational prestige as well as health-promoting behaviors that contribute to longevity (Mirowsky & Ross, 2005). Poignantly, Olshansky and colleagues (2012) argued that racial and educational disparities have resulted in "two Americas," evidenced by the widening gap in life expectancy between the highest educated White Americans and African Americans with lower levels of education.

Further research supports the notion that these inequalities have been perpetuated by the legacy of segregation, as the greatest differences in educational and cognitive outcomes between African American and White adults are observed in the American South (Liu, Glymour, Zahodne, Weiss, & Manly, 2015). In an illustrative study of over 3,500 children in the American South, Fram, Miller-Cribbs, and Van Horn (2007) found that African American children were more likely than White children to attend high-poverty schools with less qualified teachers and less enriching learning environments, and to live in family structures that were less conducive to educational achievement (i.e., single-parent households with lower levels of maternal education). When these opportunity differences were statistically controlled, the race gap in academic achievement disappeared (Fram, Miller-Cribbs, & Van Horn, 2007). Poverty and racial segregation appear to be among the strongest contributors to racial disparities in educational

achievement, as demonstrated in Entwisle and Alexander's (1992) seminal study showing that African American and White first-graders similarly improved in their mathematics achievement over the course of the school year, but when school was not in session over the summer months, African American children fell nearly half a standard deviation behind their White counterparts. This "summer setback" was found to be driven by racial segregation (i.e., whether children attended a racially segregated school) and SES, with African American children from impoverished families faring worst over the summer months. With the latest statistics revealing that over one in three African American children live in poverty, the opportunity gap between White and racial minority children is widening (Musu-Gillette et al., 2017).

Differences in poverty and educational opportunities are also clear catalysts of racial disparities in EF specifically, although studies in this area that account for additional biological, psychological, and social factors across spheres of environmental influence have yielded more nuanced results. For example, Zahodne and colleagues (2017) tested the role of income, education, health status, locus of control, and perceived discrimination as mediators of the relation between race and EF across three age groups of White and African American adults and found that all variables, with the exception of perceived discrimination, partially mediated observed inequalities in EF across the lifespan. Still, the differences between White and African American participants on measures of EF were not fully explained by these mediating variables. Similar research in youth has paralleled the adult literature; the gap in cognitive outcomes between White and African American children is perpetuated in part by imbalances in access to socioeconomic resources, educational enrichment activities, and health factors (Cottrell, Newman, & Roisman,

2015). Yet despite their comprehensiveness, these models do not fully explain racial disparities in cognitive outcomes, underscoring a need to more fully understand the complex nature of the relation between race and EF.

An understudied area in the field of research on racial disparities in cognitive outcomes involves the increased risk for exposure to trauma in racial minority communities. African American and Hispanic youth are two to three times as likely as their White peers to witness or experience community violence—including physical assault, gun violence, and murder—and this risk is greatest in economically disadvantaged racial minority communities that have fewer social services available for children (Zimmerman & Messner, 2013). The interacting effects of SES and racial minority status are further apparent in the risk for adverse childhood experiences such as parental divorce, caretaker mental illness or substance abuse, parental incarceration, or the death of a loved one, which is greatest among low-income racial minority children (Slopen et al., 2016). Polyvictimization, or exposure to multiple traumas, is more common in racial minorities than in White populations in the United States, and research shows that polyvictimization is most debilitating to low-income Black and Hispanic families for whom the high costs of mental health and medical services prohibit them from receiving the support they need to negotiate their traumatic experiences (Andrews et al., 2015; López et al., 2017).

IPV often occurs in the context of lifetime exposure to other forms of trauma, and racial minority women generally report higher rates of IPV than White women in the United States (Smith et al., 2017). The risk for IPV—and severe IPV in particular—is highest among multiracial, American Indian, and African American women (Smith et al., 2017; for review, see Taft, Bryant-Davis, Woodward, Tillman, & Torres, 2009), and

although African American race appears to be a protective factor against posttraumatic stress following IPV exposure (Lilly & Graham-Bermann, 2009), the development of neurobiological regulatory systems implicated in EF and cognitive outcomes is disproportionately disrupted by IPV in racial minority children and adults (Blair et al., 2011; Suglia et al., 2010). Across samples of African American women, studies have shown lifetime rates of trauma exposure ranging from 65% to 87%, with elevated risk for violent traumas including IPV (Alim et al., 2006; Dailey, Humphreys, Rankin, & Lee, 2011). Repeated exposure to multiple forms of trauma has negative implications for physical, social, mental, and cognitive health, and these consequences are felt across generations of African American and Hispanic families (Reuben et al., 2016). In fact, the cumulative effects of lifetime trauma exposure on racial minority women are associated with adverse perinatal health outcomes for their children, increasing their risk for suboptimal cognitive development from birth (Dailey et al., 2011). Considered within the bioecological framework, racial disparities in EF can be accounted for by interacting proximal biological and environmental influences (i.e., genetic and neurodevelopmental risk) that are perpetuated by factors within the exosystem and macrosystem (i.e., poverty, institutional discrimination, limits to socioeconomic mobility), including a disproportionate risk for IPV.

Intimate Partner Violence and Executive Functioning

There are very few studies that specifically assess the relation between IPV exposure and children's EF; however, research on children's exposure to other forms of trauma indicates that such experiences negatively influence EF development. Pears and Fisher (2005), for example, found that preschool-aged foster children with histories of

child abuse and neglect underperformed on measures of EF relative to peers matched for age and socioeconomic status. These results have been replicated in other samples of maltreated children, and the link between EF and trauma exposure appears to be stronger for children whose mental health is more severely impacted by the traumatic event (De Bellis, Hooper, Spratt, & Woolley, 2009). Research by DePrince, Weinzierl, and Combs (2009) suggests that familial trauma, which includes direct physical abuse and exposure to IPV, may be particularly impactful relative to other forms of trauma. Their study assessed the EF performance of 110 children with exposure to familial and non-familial trauma (e.g., motor vehicle accident or natural disaster). Results indicated that exposure to both types of trauma was associated with decrements in performance on EF tasks, but that this association was greater for children exposed to familial trauma. These findings provide preliminary evidence that childhood IPV exposure may negatively influence children's EF.

Exposure to IPV during surges in the development of EF abilities may be especially debilitating given the cascading effects that deficits in EF could have on children's development. This is particularly true for the preschool period, as this is the time when mastery of fundamental EF tasks is typically achieved. Unfortunately, children are at greatest risk for IPV exposure at ages five and younger (Fantuzzo, Boruch, Beriama, Atkins, & Marcus, 1997) and young age is a known risk factor for IPV victimization among women, with exposure between ages 18 and 24 being the most common (Truman & Morgan, 2014). Because the prefrontal cortex is still developing during this time, women experiencing IPV as young adults may also be at risk for suboptimal development of brain regions central to complex EF tasks.

Women with histories of trauma exposure have indeed been shown to demonstrate poorer performance on measures of EF than non-exposed peers. EF deficits are a known correlate of trauma exposure and posttraumatic stress disorder (PTSD) in adults, and the effects of trauma exposure on EF are strongest in the context of comorbid depressive symptoms (Polak, Witteveen, Reitsma, & Olff, 2012). Specific to the effects of IPV, Dabkowska (2007) conducted a study among women residing in domestic violence shelters and found that IPV had a detrimental effect on women's performance on a number of indices of EF. Women's mental health moderated these effects, such that those with higher levels of depression and traumatic stress showed the greatest deficits in EF performance. These results were mirrored in a study of 55 women with PTSD following experiences of IPV and 20 age-matched controls, which found that more severe PTSD symptoms were associated with the greatest decrements in performance on EF tasks (Twamley et al., 2009). There is evidence to suggest that IPV-related deficits in women's EF abilities are due in part to decreased flexibility in the neural circuitries underpinning attentional control and inhibition responses, indicating that, even in adulthood, trauma exposure poses a unique threat to neurocognitive development (Aupperle et al., 2016).

Few studies have assessed EF in mother/child dyads with exposure to IPV. One such study found that mothers' positive parenting practices were associated with children's planning and problem solving skills as measured by the Wisconsin Card Sorting Test, the Tower of London, the Stroop Color and Word Test, and Digit Span tasks (Samuelson, Krueger & Wilson, 2012). Further, mothers' performance on measures of emotion regulation promoted their children's cognitive flexibility. Jouriles and colleagues (2008) found similar results in an evaluation of 69 mothers and their preschool-aged

children. In this study, degree of IPV exposure was negatively correlated with children's performance on measures of explicit memory, and this relationship was moderated by mothers' positive parenting practices such that the association between IPV and EF was weaker for children of mothers who exhibited more positive parenting. This suggests that mothers' positive parenting practices can promote children's resilience in the wake of IPV by providing a model for effective emotion regulation and coping skills.

Intimate Partner Violence and Attention Problems in Women and Children

Research has further suggested that exposure to IPV may be linked to problems symptomatic of Attention-Deficit/Hyperactivity Disorder (ADHD). ADHD is a neurodevelopmental disorder characterized by symptoms of disorganization, inattention, and impulsivity and affects approximately 5% of children and 2.5% of adults (American Psychiatric Association [APA], 2013). When untreated, ADHD can have detrimental effects on children's academic achievement and social development, and these problems can adversely influence health and wellbeing well into adulthood (Daley & Birchwood, 2010; Hoza, 2007). Although children with ADHD often show signs of hyperactivity during the preschool years, most are diagnosed in elementary school. During this time, symptoms of inattention begin to interfere with academic success, and the magnitude of this interference is greatest for children with the largest EF impairments (Sasser, Beekman, & Bierman, 2015). Motoric hyperactivity tends to subside in adolescence and adulthood; however, impulsivity and inattention can be functionally impairing for adults whose symptoms are untreated (Pingault et al., 2011). Indeed, ADHD is associated with a heightened risk for unemployment, interpersonal conflict, and poor occupational attainment and performance in adults (APA, 2013; Biederman et al., 2006).

Deficits in EF are thought to be fundamental to ADHD symptomatology, driven primarily by deficiencies in inhibition that negatively influence other EF skills. In this "hybrid model" of ADHD (Barkley, 1997), inhibition includes both response inhibition and inhibitory control. When these abilities are compromised, so too is the development of other EF skills, as inhibition provides a buffer from interference that allows adequate delay for other EF abilities to be implemented. Thus, individuals with ADHD show deficits across a range of EF abilities and their difficulties with tasks involving response inhibition and inhibitory control are most pronounced (Boonstra, Oosterlaan, Sergeant, & Buitelaar, 2005).

Despite the strong evidence in support of EF's role in the development of ADHD symptoms, it has been argued that EF deficits do not overtly cause ADHD, but instead moderate genetic risk such that strong EF abilities allow children to cultivate compensatory strategies to cope with otherwise debilitating abnormalities in neurological development (Johnson, 2012). Still, ADHD and EF have similar heritability estimates and there is considerable overlap between candidate genes for ADHD and those implicated in fundamental EF abilities (e.g., Braet et al., 2011; Froehlich et al., 2007; for review, see Gizer, Ficks, & Waldman, 2009). EF and ADHD share a number of environmental risk factors as well, including perinatal complications (Sciberras, Mulraney, Silva, & Coghill, 2017), inadequate nutrition (Wu, Ohinmaa, & Veugelers, 2016), and adverse childhood experiences (Brown et al., 2016), including early exposure to IPV.

Indeed, recent studies suggest a sizeable association between early IPV exposure and symptoms of ADHD. In a prospective cohort study of 2,422 children, Bauer, Gilbert, Carroll, and Downs (2013) found that children exposed to IPV and parental depression

prior to age three were significantly more likely to have a diagnosis of ADHD between ages three and six. A broader cross-sectional study of Spanish children ages six – 17 found that IPV exposure was significantly associated with concurrent attention problems for both boys and girls, although this effect was stronger for boys (López-Soler, Alcántara-López, Castro, Sánchez-Meca, & Fernández, 2017). Experiencing IPV as an adult has also been associated with ADHD symptoms in women. For example, a prospective study of women ages 17-24 revealed that participants with a childhood diagnosis of ADHD were nearly five times more likely than women without childhood ADHD to experience physical IPV in young adulthood (Guendelman, Ahmad, Meza, Owens, & Hinshaw, 2016). The relationship between IPV and ADHD in this study was strongest for women whose ADHD diagnosis was persistent (i.e., their symptoms lasted into adulthood) as opposed to transient (i.e., they were diagnosed with ADHD as children but not as adults). This research suggests that early identification and treatment of ADHD is essential not only to prevent the developmental sequelae of ADHD, but also to prevent IPV victimization in adulthood.

Interventions to Improve Executive Functioning and Attention Problems

Early intervention with children exhibiting symptoms of inattention and hyperactivity can be particularly challenging because although stimulant medications are the most frequently used treatment for ADHD, these medications are not indicated for children younger than six years old and there is little evidence that they are effective in reducing ADHD symptoms in the long-term (Craig, Davies, Schibuk, Weiss, & Hechtman, 2015; Riddle et al., 2013). Behavioral interventions have consequently become increasingly popular alternatives for treating ADHD in preschool-aged children, and the

most successful programs emphasize parent training in either group or individualized formats (Murray, 2010). Broadly, the purpose of parent training is to foster parents' use of behavioral management strategies that promote their children's adherence to a daily routine and facilitate compliance with rules at home and at school. The short-term utility of such programs in reducing preschoolers' ADHD symptoms is well established in the literature (Sanders, Kirby, Tellegen, & Day, 2014; Thompson et al., 2009; Webster-Stratton, Reid, & Beauchaine, 2011); however, the empirical support for the effectiveness of parent training programs beyond one year post-intervention is lacking (Heinrichs, Kliem, & Hahlweg, 2014; Webster-Stratton, Rinaldi, & Reid, 2011).

On a broader scale, efforts to improve EF in non-clinical populations have involved domain-specific games, physical activity, mindfulness training, and classroom curricula incorporating pretend play and other exercises to encourage emotion regulation and perspective taking. Among these, group-based programs that address not only cognitive development, but also emotional wellbeing and social competence, tend to produce the greatest improvements in young children's EF (for review, see Diamond & Lee, 2011). One such program developed for children living in poverty, the Head Start Research-Based, Developmentally Informed (REDI) preschool intervention, has been found to enhance EF in the lowest-performing children up to four years post-intervention (Sasser, Bierman, Heinrichs, & Nix, 2017). REDI is the only known intervention program for preschoolers that has been shown to promote EF in the long term, and its effectiveness among children living under adverse circumstances of poverty is particularly encouraging. However, because children are the express focus of EF and ADHD interventions, even those with a strong evidence base may not be appropriate for use in families where IPV

occurs. To promote adaptive adjustment in children and women who have experienced IPV, interventions that address IPV as a significant source of dysfunction are likely to be most effective.

Of the few interventions that have been tested specifically in families experiencing IPV, there is evidence that manualized treatments that involve both mothers and children yield optimal results (for review, see Austin, Shanahan, Barrios, & Macy, 2017). Both group-based and individualized interventions that emphasize strengthening the parent-child relationship, promoting children's emotion regulation, and supporting mothers' mental health have been found to enhance psychosocial wellbeing in women and children (Jouriles et al., 2009; Lieberman, Ghosh Ippen, & Van Horn, 2006; Graham-Bermann et al., 2007). In light of evidence that comprehensive programs with a focus on improving social, emotional, and physical health as well as aspects of EF including emotion regulation are most beneficial to children's cognitive development (Diamond & Lee, 2011), it is plausible that the benefits of IPV-specific interventions may extend to cognitive outcomes as well. However, no studies to date have documented the effectiveness of psychosocial interventions for women and children experiencing IPV in reducing ADHD symptoms.

The Present Studies

The small but growing literature base on the relation between IPV and EF has established that IPV is likely to have a deleterious impact on EF in both women and children. However, much of this research is limited in its conceptualization of IPV, either by confounding IPV with other types of familial trauma (e.g., DePrince, Weinzierl, & Combs, 2009), or by operationalizing IPV dichotomously and precluding the opportunity

to examine the degree to which experiences of IPV may be associated with EF (e.g., Aupperle et al., 2016; Twamley et al., 2009). The validity of the conclusions drawn from research on the link between IPV and EF is further threatened because most studies examining this question have drawn from relatively small sample sizes (e.g., Dabkowska, 2009; Jouriles et al., 2008; Samuelson, Krueger, & Wilson, 2012) and fail to control for key covariates, including race and SES (e.g., Aupperle et al., 2016; Dabokowska, 2009; Samuelson, Krueger, & Wilson, 2012). Additionally, the vast majority of this work is cross-sectional, with no known investigations of the longitudinal implications of IPV for women and children's EF beyond one year. The lack of longitudinal analyses of these associations in children warrants particular attention, given the possible developmental implications of exposure to IPV during sensitive neurodevelopmental periods. Similarly, examinations of targeted interventions for IPV-exposed children lack evaluations of their effectiveness in reducing children's attention problems, which is a crucial area of research provided that interventions that have been developed to improve EF and attention problems in children have neglected the role of trauma exposure in the development and maintenance of symptoms, and are untested in the longer term.

In view of the contributions and limitations of prior research on the associations between IPV and cognition in women and children, the three studies of this dissertation utilized data from the most extensive longitudinal evaluation of an intervention for children and mothers who had experienced IPV to investigate: 1) the long-term effects of IPV on women's EF; 2) the developmental implications of early exposure to IPV on children's neurocognitive abilities; and 3) the effectiveness of an intervention for mothers and preschoolers with recent experiences of IPV in reducing children's attention problems

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over time. By following a large sample over an extended period of time, and by

incorporating continuous measures of IPV as well as relevant sociodemographic controls,

these dissertation studies aimed to address the current gaps in the literature and broaden

the research base on the implications of IPV experiences for women and children's

cognition.

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CHAPTER II

Elucidating the Relations between Intimate Partner Violence, Depressive Symptoms, Cognitive Flexibility, and Interference Control: A Longitudinal Investigation

Intimate partner violence (IPV)—or physical, psychological, sexual abuse, or stalking by a current or former intimate partner—affects tens of millions of women in the United States each year (Breiding et al., 2014). Women who experience IPV are at high risk for serious injury, and over half of women who are murdered each year are killed by a current or former intimate partner (Petrosky et al., 2017). IPV can have lasting implications for women's physical and emotional wellbeing also, and these effects can persist long after the violence has ended. Women who experience IPV are at an elevated risk for chronic pain, cardiovascular disease, respiratory issues, and gastrointestinal problems, as well as mood, anxiety, and traumatic stress disorders (Dillon, Hussain, Loxton, & Rahman, 2013). In fact, an epidemiological study of Australian women showed that IPV poses a greater health risk for women than high blood pressure, cholesterol, tobacco, and illicit drug use (Vos et al., 2006). Because IPV so profoundly impacts women's global functioning, experiences of IPV contribute to higher health care costs, missed days at work, difficulties carrying out family responsibilities, and reduced quality of life. Accounting for all of these factors, it has been estimated that IPV costs taxpayers in the United States $30,000 per victim, per year (Logan, Walker, & Hoyt, 2012).

The pertinence of IPV as a public health concern is unquestionable, and research has begun to illuminate its broader-reaching impacts, particularly with regard to women's cognitive functioning. An emerging body of literature suggests that IPV is linked to certain cognitive impairments, including deficits in recall for details about personal life events (autobiographical memory; Billoux, Arbus, Telmon, & Voltzenlogel, 2016), compromised ability to make accurate assumptions based on others' nonverbal cues (social perception; Moser et al., 2015), and attentional bias toward threat-related content (selective attention; Minshew & D'Andrea, 2015). Compellingly, each of these abilities—autobiographical memory, social perception, and selective attention—are facilitated by executive functioning (EF), or a network of related skills that promote planning and implementation of goal-oriented behavior. The executive functions are characterized by three general domains of cognition: updating (working memory), shifting (cognitive flexibility, problem-solving, and reasoning), and inhibition (selective attention and self-control). These capacities are related to but statistically distinguishable, through confirmatory factor analysis, from an underlying "Common EF" factor that is highly heritable and facilitates performance across domains (Miyake et al., 2000). However, despite evidence that the heritability of this Common EF factor increases as we age (Engelhardt, Briley, Mann, Harden, & Tucker-Drob, 2015), twin studies show that unshared environmental influences do appear to affect performance on individual measures of updating, shifting, and inhibition well into adulthood (Friedman et al., 2016). Experiencing IPV is one such factor that has been shown to have a detrimental effect on EF in adult women.

The Effects of IPV on EF

A small but growing number of studies have identified IPV as a risk factor for executive dysfunction. In an investigation comparing performance on measures of EF between women with posttraumatic stress disorder (PTSD) following IPV and demographically-matched peers without histories of IPV or PTSD, Twamley and colleagues (2009) found that women who had experienced IPV performed significantly worse on measures of processing speed and reasoning than their peers. Aupperle and colleagues (2012) extended these findings in a brain imaging study to show that impairments among women with PTSD who had experienced IPV on measures of inhibition, cognitive flexibility, and processing speed were attributable to reduced activation in neural networks responsible for cognitive control, as well as heightened activation in areas associated with affective processing. Other imaging studies using similar samples and procedures have found comparable results, lending credence to the notion that EF deficits in populations with histories of IPV are driven by morphological and functional differences in brain regions recruited for higher-order cognition as well as emotional and affective processing (Aupperle et al., 2016; Fennema-Notestine, Stein, Kennedy, Archibald, & Jernigan, 2002).

To determine whether IPV contributes to executive dysfunction in the absence of PTSD, Stein, Kennedy, and Twamley (2002) compared performance on a battery of EF tasks between women who had experienced IPV with and without diagnoses of PTSD, as well as a comparison group with neither PTSD nor IPV histories. Results from this study revealed that women who had experienced IPV exhibited poorer performance on measures of speeded attention, working memory, and interference control relative to

demographically similar women without lifetime experiences of IPV. Notably, IPV

affected performance on these tasks regardless of PTSD status. Similar results were found

in an imaging study comparing brain morphometry and EF performance between two

groups of women who had experienced IPV with and without PTSD, and a nonvictimized

comparison group. In this study, performance deficits and morphological differences were

found among women who had experienced IPV relative to women who had not, and

among women with IPV histories, no differences were found between those with and

without PTSD (Fennema-Notestine et al., 2002). Taken together, these findings indicate

that the impact of IPV on women's neurocognitive functioning is not necessarily

attributable to PTSD symptomatology.

Preliminary evidence further suggests that IPV may differentially impact

functioning in each EF domain. For example, a study examining the effects of IPV on EF

in a mixed-sex sample demonstrated that among women in poverty, those who had

experienced IPV performed more poorly on a measure of speeded attention than women

who had not experienced IPV. However, performance among women with IPV histories

on tasks measuring cognitive flexibility and semantic fluency was not similarly

compromised (Williams, Murphy, Dore, Evans, & Zonderman, 2017). In the context of

the EF literature showing that environmental influences in adulthood are less impactful on

the unitary "Common EF" factor, but that such influences can affect performance on

individual EF tasks (Engelhardt et al., 2015; Friedman et al., 2008), Williams and

colleagues' (2017) results suggest that women's experiences of IPV may affect attention

and processing speed but keep intact the networks responsible for fluency and flexibility.

However, research investigating the unique impact of IPV on individual EF domains is

limited, and because most extant studies have conceptualized IPV dichotomously (as either experienced or not experienced), there is little known research on whether there are dosage effects of IPV on women's EF abilities.

The Role of EF in Promoting Global Functioning

EF is an outcome of critical concern for women who have experienced IPV because EF is directly linked to women's ability to seek help and obtain essential resources following incidents of partner violence (Lee & DePrince, 2017). In a diverse sample of low-income, urban women, Lee and DePrince (2017) found that high levels of IPV were associated with poorer subsequent performance on EF tasks, which in turn contributed to greater difficulty in securing housing and financial resources. These relations persisted after controlling for participants' income, suggesting that interventions aimed at supporting EF following IPV may promote safety and reduce revictimization, even for women with limited access to socioeconomic resources.

EF is linked to a host of other favorable life outcomes as well, including increased longevity (Hall, Crossley, & D'Arcy, 2010), reduced risk for chronic illness and mortality (Hall, Dubin, Crossley, Holmqvist, & D'Arcy, 2009), improved mobility (Gothe et al., 2014), lower levels of functional impairment (Johnson, Lui, & Yaffe, 2007), higher academic and occupational achievement (Miller, Nevado-Montenegro, & Hinshaw, 2012), and greater quality of life (Davis, Marra, Najafzadeh, & Liu-Amrbose, 2010). These associations are generally robust to controls for potentially confounding health factors such as body mass index and cardiorespiratory fitness, as well as relevant markers of socioeconomic status (SES), including educational attainment and income. Indeed, beyond strong positive correlations between SES and EF (Hackman & Farah, 2009), studies show

that EF mediates associations between SES and important life outcomes, and that environmental factors can attenuate the relation between SES and EF (Hackman, Gallop, Evans, & Farah, 2015; Lawson & Farah, 2017). Thus, the literature on EF supports the conclusion that the executive functions make unique, independent contributions to adaptive functioning across the lifespan.

The role of EF in promoting favorable adjustment is especially apparent in its relation to mental health. Dimensional models of psychopathology suggest that executive dysfunction may be a transdiagnostic vulnerability factor for mental illness, as EF is associated with a broad range of mental health problems with high rates of comorbidity in adulthood (Goschke, 2014; Hankin et al., 2016). Psychopathologies that have been linked to executive dysfunction include generalized anxiety disorder (Zainal & Newman, 2018), eating disorders (Wu et al., 2014), obsessive-compulsive disorder (Pauls, Abramovitch, Rauch, & Geller, 2014), bipolar disorder (Martino, Samamé, Ibañez, & Strejilevich, 2015), schizophrenia (Eisenberg & Berman, 2010), borderline personality disorder (McClure, Hawes, & Dadds, 2016), and depression (Rock, Roiser, Riedel, & Blackwell, 2014). The link between EF and psychopathology is particularly evident in depression, where meta-analyses have demonstrated a dose-response relation between symptom severity and EF impairment (Snyder, 2013). The relationship between depression and EF has been understood within a theoretical framework linking the motivation deficits symptomatic of depression to an increased sensitivity to negative feedback, which causes depressed individuals to perform more poorly on EF tasks after they perceive they have failed (e.g., they provided an incorrect response). Experimental evidence appears to support this hypothesis (Drevets, Price, & Furey, 2013; Elliott et al., 1996).

IPV and Depression

Depression is among the most prevalent of all mental health conditions (Lim et al., 2018) and its onset is associated with environmental stress (Kubera, Obuchowicz, Goehler, Brzeszcz, & Maes, 2011), making depressive symptoms a candidate mechanism for the association between experiences of IPV and executive dysfunction. IPV is consistently associated with women's depressive symptoms; one meta-analytic study showed that IPV places women at a two- to three-fold increased risk for developing major depression (Beydoun, Beydoun, Kaufman, Lo, & Zonderman, 2012). The threat that IPV poses to the development of depressive symptoms may be exacerbated by its intersection with socioeconomic and demographic risk factors. For example, in a study of 664 low-income African American women, 73.6% of the sample reported experiences of IPV. Those with the most severe IPV histories were at greatest risk for depression, and this effect was intensified when women also reported low levels of education and socioeconomic resources (Mugoya et al., 2017). Evidence further suggests that both remote and current IPV exposure can uniquely impact depressive symptoms, as one longitudinal study of women who experienced IPV in adolescence demonstrated that higher levels of IPV were associated with sustained high levels of depressive symptoms for ten years, and this effect was greatest for women who reported greater cumulative experiences of IPV over time (Lindhorst & Oxford, 2008).

Among the few studies examining the effects of IPV on women's EF, there is evidence that mood symptoms may influence this relation. For example, Dabkowska (2007) found that IPV was negatively associated with women's EF abilities, and this association was strongest for women reporting higher levels of depressive symptoms. This

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finding parallels what has been demonstrated in the trauma literature more broadly—that the relation between traumatic experiences and executive dysfunction is strongest under conditions of comorbid depression (Polak, Witteveen, Reitsma, & Olff, 2012). Although indicative of compelling relationships between IPV, depression, and EF, these studies have drawn from cross-sectional data, precluding the examination of longitudinal effects of IPV on EF, as well as the potential mediating role of depressive symptomatology.

The Present Study and Hypotheses

Using longitudinal data from three waves (Time 1, Time 2, and Time 3) of a randomized controlled trial (RCT) of an intervention for mothers with recent experiences of IPV, the present study aims to address the gaps in the literature on IPV, depression, and executive dysfunction. Specifically, this study will identify whether there are dose-response relations between IPV and performance on individual EF domains, examine the relative contributions of remote and current experiences of IPV on women's EF, and investigate the mediating role of depressive symptoms in the relation between IPV and subsequent EF performance. The following hypotheses will be tested:

Hypothesis 1. There will be a dose-response relationship between degree of IPV experienced and performance on measures of EF, such that experiencing higher levels of both remote (Time 1) and current (Time 3) IPV will be associated with poorer EF performance at Time 3.

Hypothesis 1b. The negative impact of distal (Time 1) IPV experiences on women's executive functions will persist after controlling for current (Time 3) IPV.

Hypothesis 1c. Because environmental factors have been found to differentially impact individual executive functions in adulthood, the relative effects of IPV will differ between EF domains (i.e., shifting and inhibition).

Hypothesis 2. Due to extensive literature pointing to IPV as a risk factor for depression, higher levels of IPV at Time 1 are hypothesized to be associated with higher levels of depressive symptoms at Time 2, controlling for Time 1 depressive symptoms.

Hypothesis 3. Women with higher measured depression at Time 2 will later exhibit poorer performance on individual measures of EF at Time 3, after controlling for depressive symptoms at both baseline and Time 3.

Hypothesis 3b. The relative impact of both remote (Time 2) and current (Time 3) depressive symptoms will differ between individual measures of EF domains.

Hypothesis 4. The negative relation between distal IPV and subsequent EF performance will be mediated by depressive symptoms, such that women experiencing higher levels of IPV at Time 1 will endorse higher levels of depressive symptoms at Time 2, and in turn, perform more poorly on EF measures at Time 3.

Method

Participants

The study sample ($N = 118$) comprised women who participated in a randomized controlled trial (RCT) of the Preschool Kids' Club (PKC; Graham-Bermann, 2000) and Moms' Empowerment Program (MEP; Graham-Bermann, 2010), joint interventions for mothers and children with recent experiences of IPV. Women were eligible for the study if they endorsed experiences of IPV within the past two years and if they had a child

between the ages of four and six (the target age range for the PKC) living in the home. At

the time of recruitment, women were an average of approximately 32 years old ($M =$

31.79, $SD = 7.23$). The majority of women (59.32%) reported at least some college

education, and their household monthly income was relatively low ($M = \$1,337.53$, $SD =$

$\$1,386.20$) at baseline. Participants predominantly identified as White (48.31%) or

African American (36.44%), with the remaining 15.25% of the sample reporting Asian

American, Biracial, or Latina identities. Most women (77.12%) reported being single,

separated, or divorced at the time of recruitment, although 22.88% were married or living

with a partner. Seven percent of women were living with a violent partner when they were

recruited for the study (See Table 2.1).

[Insert Table 2.1 about here]

Procedures

Upon approval from the University of Michigan Institutional Review Board,

participants were recruited for the study via flyers and advertisements distributed to

domestic violence shelters and community agencies. Interested women contacted the

research team and completed a brief telephone screening to determine eligibility. Criteria

for eligibility were: 1) having experienced IPV within the past two years, and 2) having a

child between the ages of four and six living in the home. Eligible women who agreed to

participate in the study were then sequentially assigned to one of two conditions, either the

no-treatment comparison (Control) group or the Treatment group, in which women

enrolled in the MEP, a ten-session group intervention for mothers who have experienced

IPV. Data for the present study were collected using structured interviews at three time

points: prior to the intervention period (Time 1), immediately following the five-week

intervention period (Time 2; an average of seven weeks after Time 1), and a long-term

follow-up approximately eight years after Time 1 (Time 3; an average of 398 weeks after

Time 1). An additional data collection period occurred approximately one year after initial

recruitment (an average of 50 weeks after Time 2); however, in the interest of model

parsimony these data were not used for the purposes of the current study.

Data collection interviews were scheduled at the location deemed safest and most

convenient for each study participant, either at her home, in the research laboratory, or at

another neutral location selected by the participant. Women were interviewed by graduate

students and advanced undergraduates who were blind to treatment condition and trained

in research ethics and clinical interviewing. Prior to completing their interviews, women

provided informed consent and were aware that they could terminate the interview at any

time without penalty. Participants were compensated $25 for interviews at Times 1 and 2,

and they received $75 in compensation at Time 3.

Measures

Demographic Information. Women provided information about their age,

monthly household income, relationship status, highest level of education attained, and

race. To identify their race, participants chose one or more of the following options:

"Native American," "Asian American," "African American," "Latino/Hispanic,"

"Biracial," "White," and "Other." For the purposes of the present study, race was recoded

into a dichotomous variable indicating racial minority status (0 = White; 1 = Native

American, Asian American, African American, Latina, Biracial, or Other).

Intimate Partner Violence (IPV). Participants' experiences of IPV were

quantified using the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-

McCoy, & Sugarman, 1996). The CTS2 consists of 39 items that evaluate respondents'

exposure to violent and nonviolent conflict resolution strategies. Items fall into one of five

categories: Physical Assault (12 items), Psychological Aggression (8 items), Sexual

Coercion (7 items), Injury (6 items), and Negotiation (6 items; excluded from these

analyses). Example items include, "My partner shouted or yelled at me" and, "My partner

used force to make me have sex." Participants indicated the frequency at which they

experienced each conflict tactic over the past year, and possible responses ranged from 0

("Never") to 6 ("20 times or more"). Scores were calculated by summing responses to

items on each of the four violence victimization subscales, and a total IPV score reflected

the sum of participants' responses to all 33 items assessing partner violence. Because the

CTS2 quantifies IPV experienced within the past year, this measure was not administered

at Time 2 (immediately post-intervention), as the reference period for these scores would

have overlapped with Time 1 CTS2 scores. At Time 1 and Time 3, total CTS2 scores

ranged from 0 to 165. Prior research points to the strong reliability and validity of the

CTS2 in diverse populations (e.g., Connelly, Newton, & Aarons, 2005; Jones, Ji, Beck, &

Beck, 2002; Straus & Douglas, 2004). Internal consistency of the total CTS2 score in the

present study was strong (Time 1 Cronbach's $\alpha = .94$; Time 3 Cronbach's $\alpha = .92$).

Depressive Symptoms. Women's depressive symptoms were assessed at each

time point using the Center for Epidemiologic Studies Depression Scale (CES-D, Radloff,

1977). This 20-item scale includes examples of depressive symptoms, such as, "I felt that

everything I did was an effort," to which respondents indicate how often they felt that way

over the past week. Response options range from 0 ("None of the time") to 3 ("Most or all

of the time"). After reverse-scoring positively-worded items, total scores on the CES-D

reflect the sum of responses to all 20 items on the scale such that higher scores are indicative of more severe depressive symptoms. Scores in the present study ranged from 0 to 54 across time points, and the internal consistency of the measure was strong (Time 1 Cronbach's α = .92; Time 2 Cronbach's α = .91; Time 3 Cronbach's α = .92).

Executive Functioning (EF). Women's EF was evaluated at Time 3 using performance-based tests of cognitive flexibility, selective attention, and response inhibition.

Trail Making Test. Participants completed Parts A and B of the Trail Making Test (TMT; Reitan & Wolfson, 1985) to provide a measure of their cognitive flexibility. In Part A, women were presented with a series of numbers enclosed in circles and were asked to draw a line connecting the numbers in sequential order as quickly and accurately as they were able. If an error was made and the participant did not self-correct, the participant was asked to address the mistake prior to continuing the task. Performance on Part A of the TMT was measured using the time it took (in seconds) to connect all 25 circles, inclusive of self- and administer-corrected errors. To ensure understanding of the task, women completed an abbreviated practice trial before the timed test was administered. Women's scores on the TMT Part A ranged from 12.29 to 51.98 seconds, and the average duration to complete Part A was 22.27 seconds (*SD* = 7.86).

Part B, a more complex version of Part A, included both numbers and letters. Participants were asked to draw a line sequentially alternating between numbers and letters as rapidly and as accurately as possible. For example, participants began by drawing a line from the number 1 to the letter A, then to the number 2, then to the letter B, and so on, until the task was complete. As with Part A, scores on Part B of the TMT

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reflected the time it took (in seconds) to successfully complete the test, inclusive of self- and administrator-corrected errors. The average time to complete Part B was 53.87 seconds ($SD = 22.60$), and scores ranged from 20.63 to 116.77 seconds.

Although both parts of the TMT are empirically-supported measures of aspects of cognitive functioning (Sánchez-Cubillo et al., 2009), scores on Part A correlate most strongly with measures of processing and motor speed, whereas performance on Part B is more strongly associated with other measures of EF (Llinás-Reglá et al., 2015). In order to distinguish the EF (i.e., cognitive flexibility) component from the processing speed component of the TMT, a ratio score was derived by dividing participants' Part B scores by their scores on Part A as recommended by Arbuthnott and Frank (2000). This transformation allowed for the examination of relations between IPV, depression, and EF while accounting for the potential confound of slowed processing speed that is symptomatic of depression. Derived TMT ratio scores ranged from 0.70 to 6.99, and the average TMT score was 2.57 ($SD = 1.16$).

Stroop Color and Word Test. To evaluate interference control, another component of EF characterized by selective attention and response inhibition, participants were administered a truncated version of the Stroop Color and Word Test (SCWT; Stroop, 1935). Color words were printed in incongruous colored ink (e.g., the word "red" was presented in blue ink) and participants were required to state the color of the ink ("blue") as opposed to the printed word ("red"). After completing an abbreviated practice trial, participants' performance was operationalized as the time it took to accurately state the ink color of 27 incongruous color words, inclusive of self- and administrator-corrected errors. Success on the SCWT necessitates continuous inhibition of a prepotent or

automatic response (reading the printed word), as well as sustained attention to maintain

awareness of the goal of the task (stating the color of the ink) and monitor one's

performance (Augustinova & Ferrand, 2014). As such, the SCWT is a widely used

measure of interference control that is highly reliable (MacLeod, 1991; Strauss, Allen,

Jorgensen, & Cramer, 2005). Scores on the SCWT in the present study were an average of

31.91 seconds ($SD = 8.60$) and ranged from 17.65 to 71.85 seconds.

Analytic Strategy

Missing Data. Data were complete for all women ($N = 118$) who consented to

participate in the study at Time 1, with the exception of eight incomplete CTS2 scores

(7%) and two incomplete CES-D scores (2%). Ninety-seven women participated in the

study at Time 2, and aside from three women (3%) who did not report their income, data

were complete for all relevant study measures administered at that time. Data were

missing on the CTS2 for 9% ($n = 6$) of the 69 women who participated at Time 3, and one

CES-D score (2%) was missing for this data collection period. Scores on the TMT and

SCWT were missing for eight women (12%). The use of full information maximum

likelihood (FIML) estimation allowed for the retention of all data from Time 1, yielding

an analytic sample of 118 mothers.

Hypothesis Testing. Two separate path models were tested in Mplus Version 8

(Muthén & Muthén, 1998-2017) to evaluate the relations between women's experiences of

IPV, depression, and performance on the TMT (Model 1) and SCWT (Model 2). In both

models, paths were specified between both Time 1 and Time 3 CTS2 scores and the EF

measure (either the TMT or the SCWT) in order to examine the direct effects of remote

and current IPV on women's EF. The mediating role of depression was tested through

paths that were parameterized between Time 1 CTS2 scores and Time 2 CES-D scores, as

well as between Time 2 CES-D scores and TMT performance in Model 1, and SCWT

performance in Model 2. An autoregressive path between Time 1 and Time 2 CES-D

scores was included in both models to control for baseline levels of depression. To

account for the effect of current depressive symptoms on women's EF, Time 3 CES-D

scores were also included as controls on the EF measures in both models. Other control

variables included in both models were women's age, racial minority status, monthly

household income, highest level of education attained, and treatment group assignment.

Results

Descriptive Statistics

Participants endorsed high CTS2 scores at Time 1 ($M = 63.40$, $SD = 38.63$), and

levels of IPV were significantly lower at Time 3 relative to Time 1 ($M = 13.59$, $SD =$

19.72; $t(59) = 10.54$, $p < .001$). Depression scores significantly decreased between Time 1

($M = 25.66$, $SD = 13.66$) and Time 2 ($M = 20.75$, $SD = 12.71$; $t(95) = 4.79$, $p < .001$), but

the difference between CES-D scores at Time 2 and Time 3 ($M = 19.25$, $SD = 13.14$) was

not statistically significant, $t(57) = 1.49$, $p = .070$. The mean TMT score was 2.57 ($SD =$

1.16), and participants took an average of 31.91 seconds ($SD = 8.60$) to complete the

SCWT. Refer to Table 2.2 for bivariate correlations between study variables.

[Insert Table 2.2 about here]

Mediation Models

Model 1: Trail Making Test (TMT). The mediation model accounted for 20% of

the variation in TMT scores ($R^2 = .198$, $p = .035$), and overall fit was adequate, $X^2(22) =$

20.941, $p = .696$; RMSEA = 0.000 (90% CI = 0.000, 0.058); CFI = 1.000; TLI = 1.043;

SRMR = 0.049. As anticipated, baseline levels of depression were significantly positively associated with depression at Time 2, $\beta = 0.711$, $p < .001$. Time 2 depression was, in turn, positively related to TMT scores at Time 3, such that higher levels of depressive symptoms at Time 2 contributed to poorer performance on the TMT eight years later, $\beta = 0.354$, $p = .009$. Unexpectedly, Time 1 IPV was not predictive of women's depressive symptoms at Time 2 after controlling for baseline levels of depression, $\beta = 0.116$, $p = .157$. Further, Time 1 IPV was not significantly associated with women's TMT performance either directly ($\beta = 0.154$, $p = .277$) or indirectly via Time 2 depression, $\beta = 0.026$, $p = .300$. Neither Time 3 IPV nor Time 3 depression scores were significantly associated with women's TMT performance, ps $> .05$ (See Table 2.3).

[Insert Table 2.3 about here]

Model 2: Stroop Color and Word Test (SCWT). Model 2 did not fit the data as well as Model 1, and yet all indices met Hu and Bentler's (1999) recommended cutoff values and model fit was deemed acceptable, $X^2(25) = 28.076$, $p = .304$; RMSEA = 0.032 (90% CI = 0.000, 0.083); CFI = 0.965; TLI = 0.968; SRMR = 0.059.

As in Model 1, Time 1 depression significantly predicted depression at Time 2 ($\beta = 0.706$, $p < .001$), and Time 1 IPV was not significantly associated with Time 2 depression after controlling for baseline scores, $\beta = 0.127$, $p = .116$. Contrary to Model 1, Time 2 CES-D scores were not significantly associated with SCWT performance, $\beta = 0.088$, $p = .559$. Indeed, Time 3 IPV was the only variable tested that directly affected SCWT scores, $\beta = 0.284$, $p = .044$. There were neither direct effects from Time 1 IPV to SCWT performance ($\beta = -0.028$, $p = .852$), nor indirect effects through Time 2 depression ($\beta =$

0.011, $p =.590$; See Table 2.4). Fourteen percent of the variation in women's SCWT

performance was accounted for by the mediation model ($R^2 = .136$, $p = .116$).

[Insert Table 2.4 about here]

Discussion

The results of the present study demonstrate that IPV has an immediate, adverse

impact on women's fundamental EF abilities, and that these effects can be observed on a

test of response inhibition and selective attention. However, IPV was not found to

compromise long-term performance on either of the EF domains tested, providing only

partial support for the hypothesized relations between IPV and women's EF performance.

These results nevertheless suggest that even in adulthood, interpersonal trauma can

threaten adaptive cognitive functioning—and further, that the executive functions may be

differentially affected by experiences of IPV, whereby more foundational EF capacities

may be impaired in the short-term, but complex EF abilities are preserved. This study is

the first to distinguish between the effects of remote and current IPV on distinct EF

abilities, contributing to the emerging body of research examining the impact of IPV on

women's cognition.

Although it was anticipated that remote and current IPV experiences would

differentially influence women's EF abilities, it was unexpected that while recent

experiences of IPV were directly associated with decrements in performance on a measure

of selective attention and response inhibition, there were no significant relations between

either remote or current IPV and women's cognitive flexibility in this study. These

findings extend work by Williams and colleagues (2017), which showed that women in

poverty with recent experiences of IPV demonstrated impairments in speeded attention,

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but not cognitive flexibility. Williams and colleagues (2017) compared cognitive functioning between populations who had experienced IPV and those who had not, and the results of the present study revealed that within a sample of women with histories of IPV, the degree of IPV experienced was also associated with short-term impairment on measures of more basic executive functions. Taken together, the results of this study as well as those of Williams and colleagues (2017) indicate that the proximate consequences of IPV may be observable on tasks that measure cognitive processing speed, but that EF abilities that are more cognitively demanding may remain intact. These findings again point to the differential effects of IPV between EF domains, and may be indicative of variation in neuroplasticity in brain regions that facilitate selective attention and processing speed relative to those affiliated with cognitive flexibility. Because the executive functions are hierarchically organized, perhaps the immediate detriment to women's processing speed and attentional abilities initiates the development of compensatory strategies that preserve more complex executive functions over time (Zelazo, 2015). Work on the plasticity of and transactions between the executive functions is an exciting development in the field, and further research is needed to more precisely identify how the brain recovers after trauma.

Previous cross-sectional studies have suggested that depression moderates the relation between traumatic experiences and executive dysfunction, such that highly depressed individuals exhibit the greatest EF deficits following trauma (e.g., Dabkowska, 2007; Polak et al., 2012). The results of the present study indicate that whereas depression may be a moderating factor in the link between traumatic experiences and EF as evidenced in prior research, it was not a mediating mechanism through which IPV influenced

women's EF abilities in this investigation. Surprisingly, in fact, women's self-reported IPV experiences were not significantly related to their subsequent depressive symptomatology after controlling for baseline levels of depression as well as sociodemographic covariates. Instead, women's pre-intervention depressive symptoms were strongly predictive of their post-intervention depression, and post-intervention depressive symptoms were found to adversely influence their performance on a measure of cognitive flexibility eight years later. This effect was likely not attributable to the cognitive slowing that can accompany depressive symptoms, as the use of derived scores on the TMT took into account participants' processing speed. These results also do not appear to support Elliott and colleagues' (1996) hypothesis that depression impairs EF performance due to heightened sensitivity to negative feedback, as SCWT scores were not associated with remote or current depressive symptoms, and TMT performance was only affected by remote depression in the present study (i.e., current depressive symptoms were not significantly related to TMT scores). Instead, the longitudinal impact of depression on women's cognitive flexibility—but not selective attention and response inhibition—is perhaps suggestive of a distinct neurological presentation for treatment-resistant depression that sets the stage for inflexible or rigid thinking in the long term. These results indicate that neurocognitive impairments associated with depression are not global, and future work using functional brain imaging techniques could delineate the neural correlates of these phenomena more specifically.

Limitations

Being the first study to examine the long-term impact of IPV on women's mental health and EF, these findings are innovative and also limited in many ways. First, levels of

attrition in this study were high. Because it cannot be concluded with certainty that participants lost to attrition did not differ in meaningful ways from participants who were retained, attrition affects the generalizability of these results. Retaining participants who have experienced IPV in longitudinal studies is characteristically difficult due to safety risks that can lead to housing instability (McFarlane, 2007), and because this study was the first to follow an IPV-exposed sample in a RCT beyond one to two years, conclusions cannot be drawn about the comparative retention rate for this study against others with similar populations. Attempts were made to mitigate attrition bias through the use of FIML to account for missing data, as FIML is a statistical procedure that is robust to high dropout rates (Gustavson, von Soest, Karevold, & Roysamb, 2012). Yet without complete data across time points, the influence of attrition bias on the results of the present study cannot be ruled out.

These findings are further constrained by the unique nature of the study sample. All women who participated in this study were mothers of preschool-aged children living in Ontario, Canada and the Midwest region of the United States. Access to health care, adequate nutrition, and quality educational opportunities varies greatly between communities in North America, and research has emphasized the importance of these factors in promoting adaptive EF across the lifespan (Zahodne, Manly, Smith, Seeman, & Lachman, 2017). Because the mediation models tested in this study accounted for relatively little variance in EF outcomes (20% and 14% of TMT and SCWT scores, respectively), analyses would likely have benefitted from the inclusion of information about women's health and nutrition, as well as richer information on their educational experiences. For example, it is possible that indicators of health and nutrition have a

stronger impact than IPV on EF abilities in extremely impoverished communities, where health and nutrition needs are more acute. Conversely, perhaps IPV intensifies the already detrimental effects of poor health and nutrition in areas where resources are scarce. There is research to suggest that IPV increases the likelihood of depression in low-SES women (Mugoya et al., 2017), which, in light of the results of the present study, may portend poor EF outcomes. This conclusion is supported by studies showing that environmental risk factors interact with SES to exacerbate EF impairments among those who are economically disadvantaged (Sarsour et al., 2011). However, interactions between poverty and IPV experiences are understudied with regard to EF development, and this is especially true for adult populations. Future research in the field would benefit from the use of hierarchical designs with geographically diverse samples in order to control for access disparities between advantaged and disadvantaged communities affected by IPV.

The present study could also be improved in terms of construct validity, particularly with regard to the chosen measures of EF. Although widely used and highly reliable, the TMT and SCWT are not comprehensive indices of EF or the respective domains of shifting and inhibition. A more thorough battery of EF tests—as well as the inclusion of tasks to measure the updating domain of EF—would have allowed for the use of latent variable approaches to investigate the effects of IPV and depression on both the unitary EF component as well as domain-specific functioning. Further, because SCWT scores in the present study represented the time it took women to complete the task, it is possible that the observed negative relation between current IPV and SCWT scores was indicative of a cognitive slowing effect as opposed to reductions in selective attention or interference control abilities. The implementation of a word-reading control condition

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would have provided the opportunity to calculate derived scores that accounted for this processing speed component, affording more valid conclusions with respect to women's functioning in the inhibition domain.

Finally, the current results are limited by aspects of study design. Administration of the EF tasks was not counterbalanced, and the SCWT and TMT were generally administered at the end of the data collection interview. As a result, it is possible that the relationships between IPV and EF performance were attributable to interview fatigue. This is especially likely for the finding that recent IPV was associated with impaired SCWT scores, as women reported on their recent experiences of IPV during the same interview that they completed the SCWT. The use of a counterbalanced design would have alleviated this concern. Moreover, the EF tasks in this study were only administered at Time 3, precluding the use of a cross-lagged or growth model design that would have permitted the analysis of change in EF abilities over time. Without statistical controls for EF abilities at Time 1 or Time 2, it is not known whether there were immediate impairments in EF at Time 1, or how these impairments may have grown or changed between Time 1 and Time 3. Research on EF development in children indicates that the influence of early risk factors does not change over time (Hackman et al., 2015); however, the results of the present study suggest that IPV experienced in adulthood may have a short-term influence on women's selective attention and response inhibition that diminishes over time. The dearth of research on how IPV influences EF in adulthood underscores the need for prospective longitudinal studies in order to further elucidate the relations between women's experiences of IPV, mental health, and executive functions in the long term.

Future Research Directions and Clinical Implications

   The study of EF in populations who have experienced IPV is a burgeoning area in the field, with plentiful opportunities for future research. As discussed previously, prospective longitudinal evaluations of women with histories of IPV are needed to determine whether the immediate effects on EF domains found in this study would be replicable with repeated measures of EF. The current findings indicate that the short- and long-term sequelae of IPV with respect to cognition may differ, and that the initial effects of violence may influence basic EF capacities while complex abilities remain intact. Longitudinal studies could pair EF tasks with neuroimaging techniques to identify how the differential influence of IPV on executive processes is reflected in the brain, and to map how neural networks change depending on whether experiences of IPV are chronic or acute. Because depression has been shown to persist in women with histories of IPV after the violence has ended, with more severe depressive symptoms in the context of chronic IPV (Lindhorst & Oxford, 2008), a similar pattern could potentially be anticipated with regard to EF such that women who experience IPV may exhibit selective EF impairments, with more significant deficits among women whose experiences of IPV are long-lasting.

   Neuroimaging data could also be used to test whether the differential effects of IPV on women's selective attention and cognitive flexibility that were observed in this study were indeed the result of a hierarchical structure by which damages to basic executive functions (e.g., attentional control and processing speed) resulted in the development of compensatory strategies to promote the retention of more complex abilities. Behavioral studies of EF development in infants and children support the notion that mastery of simple attentional functions is necessary in order for increasingly complex

EF abilities to emerge (Garon, Bryson, & Smith, 2008; Johansson, Marciszko, Brocki, & Bohlin, 2016). The imaging research complements these findings to show that connectivity changes in the executive attention network (e.g., anterior cingulate, insula, prefrontal and parietal cortices) coincide with EF development throughout childhood and adolescence (Posner & Rothbart, 2009). However, perhaps in adult populations whose executive control networks are comparably less malleable, temporary disruptions in connectivity may not be as threatening to higher-order executive functions than they would be in children whose EF abilities are just emerging. Although traumatic experiences in adulthood have been found to detrimentally alter connectivity in executive brain regions, which in turn impacts performance on EF tasks (Daniels et al., 2010), the nature and course of EF impairments following traumatic experiences in adulthood has not been well characterized. This presents a clear opportunity for researchers in the field to pair behavioral and neuroimaging data to examine trajectories of both domain-specific and general EF performance after IPV, and compare these trajectories to determine how deficits in one domain influence others over time.

The results of the present study also have implications for applied intervention research, as there is evidence that brief interventions such as yoga (Gothe, Kramer, & McAuley, 2014), aerobic exercise (Northey, Cherbuin, Pumpa, Smee, & Rattray, 2018), and mindfulness meditation (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010) can prompt demonstrable EF improvements across the lifespan. A recent meta-analysis of brief interventions for women who have experienced IPV found that cognitive-behavioral approaches tailored specifically to IPV were most efficacious in reducing mental health symptoms and enhancing safety and quality of life, relative to motivational interviewing,

dialectical behavior therapy, exposure therapy, and nonspecific or "variety" approaches (Arroyo, Lundahl, Butters, Vanderloo, & Wood, 2017). This literature suggests that cognitive-behavioral therapies infused with yoga, exercise, or mindfulness components may promote optimal outcomes in populations with IPV histories. Feasibility studies support the incorporation of trauma-sensitive yoga into group interventions for women who have experienced IPV (Clark et al., 2014). Future trials of interventions for women who have experienced IPV could evaluate extant IPV-specific interventions against enhanced versions of these interventions that include modules on mindfulness, exercise, or yoga to determine whether these additions increase the effectiveness of IPV interventions in the longer term.

Clinically, long-term link between women's depression and cognitive flexibility in this study points to the need for clinicians to promptly assess and address depressive symptoms in women who have experienced IPV. Treating depression following IPV may not only reduce the immediate functional impact of depressive symptoms, but also their protracted, cascading effects on women's EF. There is evidence to support this conclusion, as research on interventions to treat depression reveals that improvements in depressive symptoms are associated with EF improvements of the same magnitude (Ilieva et al., 2018). Accordingly, the results of this study emphasize the need for access to low-cost, evidence-based interventions for depression in populations affected by IPV.

Finally, these findings suggest that women who have experienced IPV may demonstrate impaired EF that could influence their ability to fully engage in and benefit from treatment. Thus, providers working with women with histories of IPV should be mindful of the need to administer interventions in a manner that addresses symptoms of

executive dysfunction. For example, providers could assist women in developing compensatory strategies (e.g., using organizational tools such as calendars and planners), breaking down complex tasks into more manageable steps, and reducing environmental distractions in order to facilitate treatment adherence (Rabinovici, Stephens, & Possin, 2015). By supporting women in managing—and potentially enhancing—their EF abilities, these strategies may have the additional benefit of promoting help-seeking and safety behaviors in women who have experienced IPV. Research has shown that women with more significant EF impairments following IPV demonstrate the greatest difficulties in securing housing and establishing financial independence (Lee & DePrince, 2017), meaning that prioritizing EF interventions may have life-saving implications for women who have experienced IPV, as well as their children.

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Table 2.1

Study One Sample Characteristics

	Mean (Standard Deviation) or Percentage		
	Time 1	Time 2	Time 3
N	118	97	69
Age	31.79 (7.23)		38.80 (6.63)
Monthly Income	$1337.53	$1113.27	$2676.94
	($1386.20)	($1000.93)	($2632.82)
Education			
High school/GED or less	40.68%		14.49%
Post-secondary education	59.32%		85.51%
Racial Identity			
White	48.31%		41.18%
African American	36.44%		35.29%
Asian American	1.69%		2.94%
Latina/Hispanic	5.93%		8.82%
Biracial/Other	7.63%		11.76%
Violence Exposure	63.40 (38.63)		13.59 (19.72)
Depression	25.66 (13.66)	20.75 (12.71)	19.25 (13.14)

Note. Shaded areas represent data for which variables were not assessed.

Table 2.2

Bivariate Correlations between Study One Variables

	1	2	3	4	5	6
1. T1 IPV	1					
2. T3 IPV	0.14	1				
3. T1 Depression	0.37***	0.18	1			
4. T2 Depression	0.38***	0.12	0.76***	1		
5. T3 Depression	0.31*	0.55***	0.49***	0.47***	1	
6. SCWT	0.03	0.28*	-0.00	0.03	0.14	1
7. TMT	0.25	-0.11	0.26*	0.33*	-0.02	0.27*

*$p < .05$, **$p < .01$, ***$p < .001$

Table 2.3

Study One Model One Results

Trail Making Test Path Estimates	β	SE_β	p
Time 1 IPV	0.154	0.141	.277
Time 2 Depression	**0.354**	**0.135**	**.009**
Time 3 IPV	-0.047	0.142	.740
Time 3 Depression	-0.232	0.165	.161
Treatment	-0.290	0.241	.229
Age	0.076	0.140	.588
Race	0.053	0.244	.827
Income	0.039	0.120	.747
Education	-0.099	0.128	.439
Time 2 Depression Path Estimates			
Time 1 Depression	**0.711**	**0.054**	**<.001**
Time 1 IPV	0.116	0.082	.157
Treatment	0.026	0.133	.845
Age	0.097	0.071	.172
Race	0.079	0.133	.551
Income	-0.071	0.067	.290
Education	-0.082	0.070	.238

Table 2.4

Study One Model Two Results

Stroop Color and Word Test Path Estimates	β	SE_β	p
Time 1 IPV	-0.028	0.150	.852
Time 2 Depression	0.088	0.151	.559
Time 3 IPV	**0.284**	**0.141**	**.044**
Time 3 Depression	-0.065	0.176	.714
Treatment	0.039	0.251	.875
Age	0.096	0.142	.501
Race	0.205	0.252	.414
Income	-0.189	0.122	.122
Education	0.081	1.169	.945
Time 2 Depression Path Estimates			
Time 1 Depression	**0.706**	**0.055**	**<.001**
Time 1 IPV	0.127	0.081	.116
Treatment	0.018	0.133	.891
Age	0.102	0.071	.152
Race	0.095	0.133	.473
Income	-0.073	0.067	.277
Education	-0.907	0.797	.255

CHAPTER III

Preschoolers' Intimate Partner Violence Exposure and their Speeded Control

Abilities 8 Years Later: A Longitudinal Mediation Analysis

Executive functioning (EF), or the ability to plan, think flexibly, and exercise cognitive and behavioral control, is robustly associated with adaptive development across the lifespan. Those with strong EF skills perform better academically (Follmer, 2018; Welsh, Nix, Blair, Bierman, & Nelson, 2010), are less likely to exhibit behavior problems in school and young adulthood (Long, Hill, Luna, Verhulst, & Clark, 2015; Monette, Bigras, & Guay, 2015), and are at reduced risk for cardiovascular and respiratory diseases than those with weaker EF (Miller, Barnes, & Beaver, 2011; Riggs, Sprujit-Metz, Sakuma, Chou, & Pentz, 2010). Poor EF is also associated with internalizing and externalizing problems in children (Eisenberg et al., 2009; Young et al., 2009), as well as depression (Snyder, 2013), bipolar disorder (Dickinson, Becerra, & Coombes, 2017), and substance abuse in adults (Goldstein & Volkow, 2011). Given the broad implications of executive dysfunction across the lifespan, substantial research efforts have been made toward understanding ways to support adaptive EF development.

The skills encompassed by EF are predominantly associated with activity in the prefrontal cortex, which is among the slowest developing regions of the brain (Hill et al., 2010). The maturation of EF is hierarchical such that the mastery of more advanced executive functions requires that fundamental EF capacities be successfully negotiated

(Garon, Bryson, & Smith, 2008). The greatest surges in EF development—particularly of these fundamental skills involving working memory, mental flexibility, and response inhibition—occur during the preschool years prior to age six (Brown & Jernigan, 2012; Garon, Bryson, & Smith, 2008). Indeed, evidence suggests that the preschool years are a sensitive period for EF maturation and that environmental threats to neurocognitive development exert an outsized impact during this time (Pechtel & Pizzagalli, 2011).

Preschoolers spend the majority of their time with caregivers at home, and because the home and family are meant to be the safest environments for young children, the implications of early childhood exposure to family violence—including child abuse, neglect, and intimate partner violence (IPV)—can be profound (Cross, Fani, Powers, & Bradley, 2017). For example, a cross-sectional study by Dunn and colleagues (2017) demonstrated that although trauma exposure at any age was associated with mental health symptoms in adulthood, experiences of family violence during early childhood were more strongly associated with depression and posttraumatic stress than traumatic exposures at any other developmental stage. Using a longitudinal design, Enlow and colleagues (2012) found that eight-year-olds' performance on measures of intelligence was negatively associated with lifetime trauma exposure, and experiences of interpersonal trauma during earlier stages of development were especially detrimental to children's cognition.

Familial trauma has been linked to children's reduced performance on measures of EF as well. In a sample of school-aged children, DePrince, Weinzierl, and Combs (2009) found that those who had been exposed to family violence exhibited greater levels of executive dysfunction than children who had experienced non-familial trauma (e.g., accident or natural disaster) and children with no history of trauma exposure. This effect

was dose-dependent, medium in size, and persisted when controlling for children's socioeconomic status (SES) and mental health symptoms. Further, the consequences of childhood family trauma are long-lasting, as early exposure to family violence has been found to contribute to executive dysfunction in middle adulthood, even after accounting for demographic and mental health covariates (Nikulina & Widom, 2013).

Childhood Exposure to Intimate Partner Violence

The effects of exposure to family violence are especially alarming given its prevalence. Family violence affects up to one in five children in the United States each year (Finkelhor, Turner, Shattuck, & Hamby, 2013), and exposure to IPV, or psychological, physical, or sexual aggression by an intimate partner, is especially common. In a nationally representative sample of over 4,500 children, 28% of the oldest participants reported lifetime exposure to IPV against a caregiver (Finkelhor, Turner, Shattuck, & Hamby, 2013). This rate closely matches the 33% of women who experience IPV over the course of their lifetimes (Breiding et al., 2014), as mothers are more likely to experience IPV than women without children (Ernst, Weiss, & Enright-Smith, 2006). Children's IPV exposure imposes a substantial economic burden on society; Holmes and colleagues (2018) estimated that childhood exposure to IPV costs over $55 billion annually in the United States, attributable to increases in healthcare needs, lost productivity, and higher crime rates among children and adolescents with histories of IPV exposure.

Exposure to IPV during childhood is known to have an adverse impact on youths' physical and emotional wellbeing (Kuhlman, Howell, & Graham-Bermann, 2012; Vu, Jouriles, McDonald, & Rosenfield, 2016), with stronger effects for children who are

exposed to IPV at younger ages (Graham-Bermann & Perkins, 2010). Children exposed to

IPV also suffer academically, and some studies have shown that IPV exposure is more

detrimental to children's academic achievement than direct physical abuse (e.g., Kiesel,

Piescher, & Edleson, 2016). These academic deficits may be attributable, in part, to

children's reduced cognitive functioning following IPV exposure. There are indeed strong

associations between children's IPV exposure and adverse cognitive outcomes, as

demonstrated by Jouriles and colleagues' (2008) examination of the relation between IPV

exposure and explicit memory in a sample of preschoolers. Results revealed a negative,

dose-response association between IPV and memory such that children exposed to higher

levels of IPV demonstrated the greatest impairments on measures of explicit memory.

These effects were independent of children's exposure to parent-child aggression, which

was not associated with any of the outcome measures evaluated in this study when IPV

was taken into account (Jouriles et al., 2008). Beyond explicit memory, IPV has been

shown to impair children's verbal skills (Graham-Bermann, Howell, Miller, Kwek, &

Lilly, 2010), visual-spatial abilities (Huth-Bocks, Levendosky, & Semel, 2001), and

intelligence (Koenen, Moffitt, Caspi, Taylor, & Purcell, 2003). Compellingly, these

cognitive domains are all known correlates of EF, which also may be negatively

influenced by children's exposure to IPV.

The Effects of IPV on Children's Executive Functioning

Although there is evidence linking children's trauma exposure—and experiences

of family trauma in particular—to executive dysfunction (DePrince, Weinzierl, & Combs,

2009; Fay-Stammbach, Hawes, & Meredith, 2017), research into the specific relation

between EF and children's IPV exposure is limited. Much of this literature has focused on

childhood exposure to IPV as a risk factor for Attention-Deficit/Hyperactivity Disorder (ADHD), a neurodevelopmental disorder potentiated by executive dysfunction. Children exposed to IPV are indeed at greater risk for subsequent ADHD, and ADHD symptoms are more pronounced for children who are exposed to severe levels of IPV at younger ages (Cater, Miller, Howell, & Graham-Bermann, 2015; Graham-Bermann & Perkins, 2010), again underscoring the importance of minimizing environmental threats to neurocognitive development during the sensitive preschool years. There is evidence that the heightened risk for ADHD among IPV-exposed children is mediated by impairments in EF development, particularly in the mastery of attentional skills that are foundational to higher-order executive functions (Towe-Goodman, Stifiter, Coccia, & Cox, 2011). Other cross-sectional studies have shown associations between childhood IPV exposure and executive dysfunction in incarcerated adolescents, who were at greatest risk for mental health problems when both IPV exposure and executive dysfunction were high (Perkins, Cortina, Smith-Darden, & Graham-Bermann, 2012; Perkins, Smith-Darden, Ametrano, & Graham-Bermann, 2014). However, to date there are no known longitudinal studies investigating the specific relation between early childhood exposure to IPV and EF, and the mechanisms through which IPV may impact children's EF development have not been delineated.

The Spillover Hypothesis

One theory that has been proposed to explain the impact of IPV on children's adjustment is Engfer's (1988) spillover hypothesis, which supposes that relationships between caregivers and relationships between parents and children are positively correlated. Thus, a positive parent-child relationship would correspond with more positive

relationships between caregivers, and strain in the relationship between caregivers would "spill over" into the parent-child relationship, increasing the child's risk for a host of adverse developmental outcomes. Within this framework, the most direct spillover effect of IPV would be on mothers' parenting behaviors. Here, IPV would negatively influence mothers' abilities to parent effectively, which would in turn be associated with decrements in children's functioning.

Research has provided some support for this application of the spillover hypothesis. In one study of 203 mother-infant dyads, Levendosky and colleagues (2006) found that levels of IPV during pregnancy and one year later were both associated with infants' externalizing behaviors at age one, and these associations were mediated by mothers' mental health. IPV during pregnancy was not associated with parenting one year later; however, mothers' parenting did partially mediate the relation between infants' externalizing behaviors at age one and concurrent IPV exposure. These results suggest that the detrimental effects of IPV on mothers' parenting, although important in that they increase children's concurrent risk for externalizing problems, cannot fully explain the longer-term effects of IPV exposure on children. Similar results were obtained in a five-year longitudinal study of 905 mothers and their children (Huang, Wang, & Warrener, 2010). In this study, children of women who experienced IPV at Year One exhibited higher levels of externalizing behavior problems at Year Five. This relation was partially mediated by mothers' depressive symptoms at Year Three, such that IPV at Year One was associated with greater depressive symptoms at Year Three, which predicted higher levels of children's externalizing problems at Year Five. Mothers' endorsement of spanking at Year Three also partially mediated the relation between Year One IPV and Year Five

externalizing problems; however positive parenting behaviors at Year Three were not related to IPV at Year One.

The pathway from IPV to children's externalizing problems through mothers' mental health has also been demonstrated in school-aged children. In a study of 327 Spanish mothers and children ages eight – 17, children who had been exposed to IPV exhibited greater externalizing problems than children without histories of IPV exposure, and this relationship was fully mediated by their mothers' depressive symptoms (Miranda, de la Osa, Grandero, & Ezpeleta, 2013). Longitudinal analyses of mother/child dyads seeking services for victims of domestic violence further revealed that over the course of four years, higher levels of IPV exposure were associated with more maternal mental health problems, which in turn contributed to children's internalizing and externalizing behavior problems. Reductions of adjustment problems were observed in children of mothers whose mental health problems also improved (McFarlane et al., 2017). Notably, the influence of mothers' mental health on children's adjustment appears to be primarily attributable to environmental as opposed to genetic factors, as a large adoption study found that maternal major depressive disorder significantly increased children's risk for depression and externalizing behavior problems, and the strength of these relationships did not differ between adopted and biological children (Tully, Iacono, & McGue, 2008). Taken together, these findings suggest that children's development in the context of IPV can be compromised or supported by interacting environmental factors, including maternal mental health and parenting practices.

Linking Maternal Characteristics to Children's EF

Associations between maternal depression and executive dysfunction in children are well documented. One longitudinal study of children between the ages of two and six revealed that both current and remote maternal depression negatively influenced children's performance on measures of working memory, inhibitory control, and planning, and that improvements in mothers' depressive symptoms coincided with enhanced EF performance in their children (Hughes, Roman, Hart, & Ensor, 2013). Further research on trajectories of maternal depressive symptoms has revealed that children of mothers whose depression improved between measurement points at mid-pregnancy and three years postpartum did not significantly differ with regard to their mental health or EF from children of mothers with consistently low levels of depression during the same time period (Park, Brain, Grunau, Diamond, & Oberlander, 2018). These findings are again suggestive of children's differential sensitivity to environmental threats to EF development during the preschool years, threats that may be compounded by interactions between IPV, maternal depression, and negative parenting practices.

Depression does appear to adversely influence mothers' parenting, and parenting has been found to mediate the link between maternal depression and children's EF. Maternal depressive symptoms were associated with children's EF impairments in a yearlong longitudinal study of kindergarteners, a relation that was fully mediated by reductions in mothers' parental warmth and home learning stimulation (Baker & Kuhn, 2018). Mothers' postpartum depression has also been shown to contribute to harsh or intrusive parenting two to three years postpartum, which in turn negatively influenced preschoolers' performance on EF tasks at age four (Gueron-Sela, Camerota, Willoughby,

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Vernon-Feagans, & Cox, 2018). Emphasizing the express need to reduce negative

parenting behaviors, Gueron-Sela and colleagues (2018) also investigated the mediating

roles of maternal warmth as well as language complexity, finding that only harsh and

intrusive parenting accounted for the longitudinal link between postpartum depression and

preschoolers' EF abilities.

Harsh parenting is known to occur to a greater degree in homes where IPV is

present, and research has established that negative parenting strategies are used most

frequently among women whose depressive symptoms are exacerbated by experiences of

IPV (Gustafsson & Cox, 2012). In light of the associations between maternal depression,

parenting, and children's EF, the spillover hypothesis—that children's IPV exposure

adversely impacts their EF development through the effects of IPV on their mothers'

mental health and parenting—is certainly plausible. Nevertheless, the long-term

implications of IPV exposure on children's EF development have not yet been tested,

which is of concern because the protracted maturation of brain regions responsible for

executive functions means that the consequences of early childhood exposure to IPV may

not be observable until later in development.

The Present Study

Using data from an eight-year longitudinal evaluation of a randomized controlled

trial (RCT) of an intervention for mothers and preschoolers who had been exposed to IPV,

the present study will test the following hypotheses:

Hypothesis 1. Children's performance on measures of speeded control, a

component of EF influenced by processing speed, will be associated with both remote and

current IPV exposure, such that higher levels of IPV exposure will be linked to poorer performance on measures of speeded control.

Hypothesis 1b. The relation between IPV exposure during the preschool years and speeded control in late childhood will persist after controlling for late childhood IPV exposure.

Hypothesis 2. Mothers' depressive symptoms will be positively associated with both remote and current experiences of IPV.

Hypothesis 3. Mothers who report higher levels of depressive symptoms will exhibit more negative parenting behaviors than mothers with lower levels of depression.

Hypothesis 4. The relation between children's IPV exposure and speeded control in late childhood will be mediated by maternal depression and negative parenting practices. Maternal depression will contribute to higher levels of negative parenting, which will be associated with children's poorer performance on measures of speeded control.

Hypothesis 4b. The mediating role of maternal depression and negative parenting will be more pronounced during the preschool years, a sensitive period for EF development.

Method

Participants

Participants ($N = 120$) were preschoolers who, with their mothers, enrolled in a randomized controlled trial (RCT) of joint interventions for mothers who had recently experienced IPV and their children. At the time of recruitment, children were between the ages of four and six ($M = 4.94$, $SD = 0.85$), and 50% ($n = 60$) were girls. Children were

racially diverse: 37% were African American, 5% were Latino/Hispanic, 20% were Biracial, and 38% were White. There was considerable variation with regard to children's access to socioeconomic resources, as mothers' reported monthly household income ranged from $0 to $9,700.00 at baseline ($M = \$1,337.53$, $SD = \$1,386.20$). Forty percent ($n = 48$) of mothers reported that their highest level of education was high school or less (See Table 3.1).

[Insert Table 3.1 about here]

Procedures

The study was advertised to mothers of preschool-aged children via flyers and informational postings in agencies serving women who had recently experienced IPV. Interested women were screened for eligibility after contacting the research team using a toll-free telephone number. Mothers were eligible if they had experienced IPV within the past two years and they had a child between the ages of four and six living in the home. Mother/child pairs were then randomized sequentially into the Treatment ($n = 53$) or no-treatment comparison (Control) group ($n = 67$), and mothers and children completed structured interviews across four time points: at baseline (prior to the intervention or wait period), immediately following the five-week intervention period, approximately one year following recruitment, and a long-term follow-up approximately eight years (401 weeks) after baseline. For the purposes of this study, the baseline assessment will be referred to as Time 1 and the eight-year follow-up interview will be referred to as Time 2, as only data from these two time points were utilized in the present analyses.

Dyads that were randomized into the Treatment condition participated in the Moms' Empowerment Program (MEP; Graham-Bermann, 2010) and the Preschool Kids'

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Club program (PKC; Graham-Bermann, 2000), joint interventions designed to reduce the mental health sequelae of IPV for mothers and children. Both interventions are manualized, group-based, and consist of ten one-hour sessions. In this RCT, the ten sessions were administered over the course of five weeks. Groups were led by graduate students as well as collaborating clinicians and service providers who had been trained by the author of the MEP and PKC manuals.

To minimize expectancy effects, a separate team of graduate students and undergraduates who were trained in structured interviewing and research ethics administered the data collection interviews. During each data collection period, interviews were completed at the time and location most convenient, safe, and accessible to the participants. Mothers were compensated $25 at Time 1 and $75 at Time 2 for completing their interviews, which were 60-90 minutes in duration. Children's interviews lasted approximately 20-30 minutes, and they were compensated with a gift valued at $5 at Time 1 and $10 at Time 2. All mothers and children provided informed consent and assent prior to completing their interviews, and participants were aware that they could refuse to answer any questions or stop the interview at any time without penalty. The University of Michigan Institutional Review Board approved all measures and protocols used in this study.

Measures

All measures were administered at both Time 1 and Time 2 with the exception of the speeded control tasks, which children only completed at Time 2.

Intimate Partner Violence (IPV). Children's exposure to IPV was inferred from their mothers' report on the Revised Conflict Tactics Scale (CTS2; Straus, Hamby,

Boney-McCoy, & Sugarman, 1996). The CTS2 uses 39 items to assess respondents'

experiences of IPV, and items fall onto one of five subscales: Physical Assault,

Psychological Aggression, Sexual Coercion, Injury, and Negotiation (excluded from these

analyses). Example items include, "My partner slapped me" and, "My partner slammed

me against a wall." Response options indicate the frequency of each conflict tactic within

the past year and range from 0 ("Never") to 6 ("20 times or more"). Responses to the 33

items representing IPV exposure were then summed to create a Total IPV score. The

reliability and validity of the CTS2 is well established (Connelly, Newton, & Aarons,

2005; Jones, Ji, Beck, & Beck, 2002; Straus & Douglas, 2004), and the measure was

internally consistent across time points in the present study (Time 1 Cronbach's α = .94;

Time 2 Cronbach's α = .92).

Maternal Depression. Mothers' depression was assessed using the Center for

Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The CES-D is a 20-item

index of depressive symptoms over the past two weeks, with response options ranging

from 0 ("None of the time") to 3 ("Most or all of the time"). Example items include, "I did

not feel like eating" and, "I felt lonely." After recoding positively worded items so that

higher scores indicated higher levels of depressive symptoms, responses to all 20 items on

the CES-D were summed to produce a total score, with a possible range from 0 to 60. The

reliability and validity of the CES-D is supported by research in a range of diverse

samples (e.g., Knight, Williams, McGee, & Olaman, 1997), and internal consistency in the

present study was strong at each data collection period (Time 1 and Time 2 Cronbach's α

= .92).

Negative Parenting. Mothers' use of negative parenting practices was measured using their responses to the Parent Form of the Alabama Parenting Questionnaire (APQ; Frick, 1991). The 42 items of the APQ comprise six subscales, Parental Involvement (e.g., "You have a friendly talk with your child"), Positive Parenting (e.g., "You let your child know when he/she is doing a good job with something"), Discipline Practices (e.g., "You calmly explain to your child why his/her behavior was wrong when he/she misbehaves"), Inconsistent Discipline (e.g., "The punishment you give your child depends on your mood"), Poor Monitoring/Supervision (e.g., "You get so busy that you forget where your child is and what he/she is doing"), and Corporal Punishment (e.g., "You slap your child when he/she has done something wrong"). Mothers responded to each item using response categories that ranged from 1 ("Never") to 5 ("Always") to indicate the frequency with which each parenting practice typically occurred in their home. As indicated by prior studies using factor-analytic approaches (e.g., Hinshaw et al., 2000; Wells et al., 2000), responses to the 19 items comprising the Inconsistent Discipline, Poor Monitoring/Supervision, and Corporal Punishment subscales were then averaged to generate Negative Parenting composite scores, with possible scores ranging from one to five and higher scores representing more frequent use of negative parenting strategies. The APQ has strong psychometric properties (Dadds, Maujean, & Fraser, 2003; Essau, Sasagawa, & Frick, 2006), and the internal consistency of the APQ Negative Parenting items in the present study was adequate and comparable to Cronbach's alpha values that have been reported in the literature (Time 1 Cronbach's $\alpha = .72$; Time 2 Cronbach's $\alpha = .77$).

Speeded Control. Children's speeded control was assessed using Parts A and B of the Trail Making Test (TMT) and the Stroop Color and Word Test (SCWT).

Trail Making Test. The Trail Making Test (TMT; Reitan & Wolfson, 1985) includes two components: Part A, which measures visual attention and processing speed, and Part B, which assesses cognitive flexibility. In Part A, after successfully completing a practice trial to confirm understanding of the task instructions, participants were asked to use a pencil to draw a line connecting a series of numbers enclosed in circles in sequential order from 1-25 as rapidly as possible without making mistakes. If participants committed an error without self-correcting, the administrator prompted participants to correct the mistake before completing the task. Visual attention was operationalized as the time (in seconds) that it took children to complete the task, including self- and administrator-corrected errors. The validity of TMT Part A as a measure of visual attention and processing speed is well established in the literature (Ríos, Periáñez, & Muñoz-Céspedes, 2004; Sánchez-Cubillo et al., 2009). In the present study, completion times on the TMT Part A averaged 29 seconds (*SD* = 13.36) and ranged from 15 to 88 seconds.

Part B, used to measure cognitive flexibility, was similar to Part A of the TMT in that it included 25 labeled circles and required participants to draw lines connecting the labels sequentially as rapidly as possible. However, Part B included both numbered (1-13) and lettered (A-L) circles, and participants were prompted to alternate between numbers and letters in sequential order without making mistakes. For example, children drew a line connecting the number 1 to the letter A, then the number 2, then the letter B, and so on, until completing the task. Success on a shortened version of the task was required of all children prior to administration of the timed trial, and time to complete the task (in

seconds, inclusive of errors) represented children's cognitive flexibility in this study. The validity of the TMT Part B as a measure of cognitive flexibility is empirically supported using both behavioral and neuroimaging studies (Arbuthnott & Frank, 2000; Kortte, Horner, & Windham, 2002; Miskin et al., 2016), and it is indicated for use in both adults and children (Reitan & Wolfson, 2004; Thaler et al., 2012). Prior research suggests that a failure to complete the TMT Part B within 300 seconds may indicate severe neurological impairment (Lezak, 1995), and in the present study one child's score exceeded this recommended cutoff point. Excluding this outlier, completion times on the TMT Part B ranged from 35 seconds to 278 seconds and the average completion time was 80 seconds ($SD = 44.38$).

Stroop Color and Word Test. Children completed the Stroop Color and Word Test (SCWT; Stroop, 1935) in order to assess interference control, or their selective attention and response inhibition abilities. In the SCWT, participants are presented with a set of color words printed in incongruous colored ink and asked to name the color of the ink of the printed word as opposed to reading the word itself. Because word reading is the automatic response, sustained attention and continuous inhibition of an automatic response are required for successful completion of the task (Augustinova & Ferrand, 2014). The SCWT has strong psychometric properties and is a well-established measure of interference control in adults and children (Archibald & Kerns, 1999; Graf, Uttl, & Tuokko, 1995; Ikeda, Okuzumi, & Kokubun, 2013). In the present study, children were asked to read aloud three sample color words to verify their reading ability prior to completing the inhibition trial. Their comprehension of the task instructions was also evaluated through the administration of three untimed practice items, of which they were

required to provide accurate responses to at least two before proceeding to the timed portion. Participants' completion time (in seconds) inclusive of all self- or administrator-corrected errors on the inhibition trial was taken as a measure of their interference control. Children's completion times ranged from 20 seconds to 111 seconds, and the average time to complete the SCWT was 39 seconds ($SD = 15.49$).

Covariates. Because these data were drawn from a RCT of the PKC intervention program, possible treatment effects on IPV exposure, maternal depression, negative parenting, and children's speeded control were accounted for by including a dummy variable coding for experimental group assignment (0 = Control; 1 = Treatment) in the mediation model. Other control variables included children's race (0 = White; 1 = African American, Latino/Hispanic, or Biracial) and monthly household income, as determined by mothers' self-report.

Analytic Strategy

Missing Data. A total of 120 mother/child pairs completed data collection interviews at Time 1. Of these, 2% ($n = 2$) did not complete the CES-D and 7% ($n = 8$) refused the CTS2. There were otherwise no missing data at Time 1. Seventy mother/child pairs participated in the Time 2 follow-up, and of these, 7% ($n = 5$) had incomplete CTS2 and APQ data. Eight children (11%) refused the SCWT and TMT Part A, and an additional three refused Part B of the TMT. There was one outlier among the TMT Part B scores that exceeded the recommended 300-second completion time cutoff (Lezak, 1995), and after this outlier was removed, TMT Part B data were missing for 17% ($n = 12$) of the Time 2 sample. Full information maximum likelihood (FIML) estimation was used to retain the full sample of 120 mother/child pairs.

Hypothesis Testing. Using Mplus Version 8 (Muthén & Muthén, 1998-2017), a cross-lagged panel model was used to examine the relations between children's remote and current exposure to IPV, negative parenting, and maternal depression. Specifically, autoregressive paths were specified between CTS2, Negative Parenting, and CES-D scores at Time 1 and Time 2, as well as paths between Time 1 CTS2 scores and Time 2 CES-D scores, Time 1 CES-D scores and Time 2 CTS2 and Negative Parenting scores, Time 1 Negative Parenting scores and Time 2 CES-D scores, Time 2 CTS2 scores and Time 2 CES-D scores, and Time 2 CES-D scores and Time 2 Negative Parenting scores. Children's speeded control was modeled as a latent distal outcome variable comprised by their completion times on the SCWT and TMT Parts A and B. To test the direct effects of children's remote and current IPV exposure on their speeded control, paths were then parameterized between the latent speeded control variable and CTS2 scores at Time 1 and Time 2. The indirect effects of children's IPV exposure at Time 1 on Time 2 speeded control were tested through each of the paths in the cross-lagged panel model. The indirect effect of Time 2 CTS2 scores on speeded control through Time 2 CES-D and Negative Parenting was also specified to determine the relative impact of current as opposed to remote IPV exposure. The effects of treatment, racial minority status, and monthly household income were included as controls on all variables (See Figure 3.1).

[Insert Figure 3.1 about here]

Results

Descriptive Statistics

Baseline levels of exposure to IPV were high ($M = 64.63$, $SD = 37.61$), and CTS2 scores were significantly lower at Time 2 than they were at Time 1 ($M = 13.97$, $SD = $

19.80; $t(61) = 10.59$, $p < .001$). A similar pattern was seen with regard to mothers'

depression scores, which also significantly decreased between Time 1 ($M = 25.70$, $SD =$

13.49) and Time 2 ($M = 19.46$, $SD = 13.17$; $t(68) = 5.61$, $p < .001$). No significant

differences were found between negative parenting at Time 1 ($M = 1.79$, $SD = 0.39$) and

Time 2 ($M = 1.68$, $SD = 0.40$; $t(63) = 1.93$, $p > .05$). Bivariate correlations between study

variables are reported in Table 3.2.

[Insert Table 3.2 about here]

Mediation Model

The mediation model was an adequate fit for the data, $X^2(24) = 29.903$, $p = .188$;

RMSEA = 0.045 (90% CI = 0.000, 0.091); CFI = 0.968; TLI = 0.915; SRMR = 0.061.

Although the TLI value did not meet Hu and Bentler's (1999) recommended cutoff criteria

of 0.95, the TLI's sensitivity to sample size makes it a less suitable fit statistic for models

with sample sizes below 250 (Hu & Bentler, 1999). Because the sample size of the

mediation model in the present study was limited, the fit of the model was deemed

acceptable based on the SRMR, RMSEA, CFI, and X^2 values.

Autoregressive paths for maternal depression ($\beta = 0.329$, $p = .002$) and negative

parenting ($\beta = 0.502$, $p < .001$) were significant, though IPV exposure at Time 1 did not

significantly predict IPV at Time 2 ($\beta = 0.105$, $p = .426$). As expected, IPV exposure was

positively associated with concurrent maternal depression at Time 1 ($\beta = 0.367$, $p < .001$)

and Time 2 ($\beta = 0.467$, $p < .001$). Time 1 maternal depression also predicted Time 1

negative parenting ($\beta = 0.397$, $p < .001$), but the path between Time 2 maternal depression

and Time 2 negative parenting was not significant ($\beta = 0.161$, $p = .142$). No other

significant paths in the cross-lagged panel were identified (See Table 3.3).

[Insert Table 3.3 about here]

The model accounted for 37% of the variation in children's speeded control ($R^2 =$ 0.369, $p = .003$), and standardized factor loadings for the speeded control latent variable ranged from 0.643 (SCWT) to 0.923 (TMT Part B), ps < .001. Significant effects on children's speeded control included negative parenting at Time 1 ($\beta = 0.495$, $p < .001$) and Time 2 ($\beta = 0.444$, $p = .004$) and IPV exposure at Time 1 ($\beta = 0.350$, $p = .003$). The relation between Time 2 IPV exposure and children's speeded control was not significant ($\beta = 0.201$, $p = .126$). The total effect from Time 1 IPV exposure to Time 2 speeded control was statistically significant ($\beta = 0.371$, $p = .001$), yet the only significant indirect path was through Time 1 maternal depression and negative parenting ($\beta = 0.072$, $p = .018$). The indirect effect of Time 1 IPV exposure on Time 2 speeded control through maternal depression and negative parenting is depicted in Figure 3.2.

[Insert Figure 3.2 about here]

Discussion

By demonstrating that preschoolers' IPV exposure negatively impacted their performance on a set of speeded control measures in late childhood—an average of eight years later—the present study provides further evidence that early childhood is a sensitive period for EF development, during which experiences of interpersonal trauma can have a lasting influence on cognition. This finding contributes to the nascent literature on the "sleeper effects" of interpersonal trauma during the preschool years (e.g., Dunn et al., 2017; Enlow et al., 2012; Holmes, 2013) by specifically linking IPV to poor performance on measures of speeded control in late childhood using a large-scale longitudinal design. This is the most extensive longitudinal evaluation of young children exposed to IPV, and

the first to investigate how exposure to IPV can influence children's speeded control—and more broadly, EF—in the long term.

Moreover, the results of this study indicate that IPV negatively influences children's speeded control through its effects on their mothers, lending support to Engfer's (1988) spillover hypothesis. Specifically, higher levels of IPV at Time 1 were positively associated with maternal depressive symptoms at Time 1, which were in turn associated with more negative parenting behaviors when their children were between the ages of three and five. The path from IPV exposure through maternal depression and negative parenting predicted poorer performance on children's speeded control tasks an average of eight years later (at Time 2), even after accounting for the same variables during late childhood. In fact, Time 2 IPV did not directly affect children's speeded control performance, which was an unexpected finding but may be explained by the protracted maturation of the brain regions responsible for EF (Hill et al., 2010). A five-year longitudinal study comparing developmental trajectories of externalizing problems in children who were and were not exposed to IPV prior to age three found that although IPV-exposed children did not differ from non-IPV-exposed children initially with regard to their externalizing problems, by age eight, children who had been exposed to IPV during early development demonstrated significantly higher levels of aggressive behavior than children without histories of IPV exposure (Holmes, 2013). These findings suggest that there may be delayed effects of IPV exposure on children's self-regulatory development, which is consistent with the literature on EF showing that the executive functions mature hierarchically and that early disruptions to the mastery of EF skills can

have implications for cognitive development that cascade over time (Tillman, Brocki, Sorensen, & Lundervold, 2015; Wahlstedt, Thorell, & Bohlin, 2008).

Prior research has shown that IPV exposure influences children's externalizing behaviors via their mothers' mental health and parenting practices in infancy (Levendosky et al., 2006), early childhood (Huang et al., 2010), and late childhood (Miranda et al., 2013). The present study extends these findings to indicate that similar processes may affect children's long-term speeded control and EF development as well, which has implications not only for their mental health, but also for their academic achievement, physical health, occupational attainment, and quality of life across the lifespan (Brown & Landgraf, 2010; Diestel, Cosmar, & Schmidt, 2013; Follmer, 2018; Miller, Barnes, & Beaver, 2011). The wide-reaching consequences of executive dysfunction, engendered by early childhood exposure to IPV, underscore the pressing need for interventions to improve children's EF following interpersonal trauma. In light of the body of research demonstrating that reductions in mothers' depressive symptoms and improvements in their parenting can facilitate young children's EF development (Hughes et al., 2013; Park et al., 2018), the findings of the present study suggest that interventions targeting mothers' mental health and parenting following recent IPV may have lasting benefits for their children. This appears to be especially true for children who are exposed to IPV during a sensitive period for neurocognitive development, emphasizing the need for early intervention and prevention efforts in order to mitigate the compounding effects of environmental threats to children's EF.

Limitations

Despite their strong theoretical underpinnings, the findings of the current study are limited in a number of ways. First, because the TMT and SCWT only partially captured the speeded control component of EF, a more comprehensive measure or set of measures would have strengthened the construct validity of the EF outcome. This is especially relevant because the outcome measures in the present study were operationalized in terms of completion time, and so the latent speeded control variable was not representative of children's EF per se. The use of derived scores that accounted for processing speed would have allowed for a more accurate and complete characterization of EF. Including tasks evaluating children's working memory and behavioral response inhibition abilities would have further improved the outcome measure, as these domains of EF were relatively untapped by the tasks administered in the present study. Additionally, because the speeded control tasks were only completed at Time 2, the immediate effects of IPV exposure on preschoolers' speeded control—and executive functions more broadly—are unknown. Incorporating EF assessments across time points would have strengthened the results of the present study by allowing for comparisons of the immediate effects of IPV exposure on young children's cognition against the effects that were found to emerge later in development.

The measures used to operationalize children's IPV exposure, maternal depression, and negative parenting were also limited in that they all relied on mothers' self-report. Women traumatized by IPV may have been unable to disclose the extent of their experiences, and perhaps the use of multiple informants—including children's reports of their exposure—would have strengthened the construct validity of the IPV measure.

Similarly, mothers hesitant to disclose their use of negative parenting strategies may have underreported in their responses to the APQ. It is possible that incorporating an index of children's perceptions of their mothers' parenting behaviors would provide a more accurate estimate of the frequency of negative parenting practices among study participants. Finally, despite its widespread use in epidemiologic studies of mental health, the CES-D is not a diagnostic measure of depression and some have argued against its use to quantify depressive symptoms because it contains items that do not directly represent symptoms of depression as prescribed by the American Psychiatric Association (APA, 2013; Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995). Although there is evidence in support of the CES-D as a screening tool for depression (Lewinsohn, Seeley, Roberts, & Allen, 1997), structured diagnostic interviews are the gold standard for evaluating depressive symptoms and their use would have strengthened the validity of the results of this study.

The current study would also have benefited from the inclusion of mediational data from an intermediate time point during middle childhood. The RCT from which these data were drawn comprised four data collection periods, but the first three all fell within children's preschool years. Because the theoretical rationale for the present study involved comparing the long-term effects of exposure to IPV during a sensitive period of neurological development against more recent IPV exposure, the inclusion of additional data from the RCT in these study analyses would not have allowed for more meaningful developmental conclusions. However, if intermediate data had been collected between one and eight years following the baseline assessment, temporal precedence for the

mediational processes found in the present study could be established with greater certainty.

The mediation model in the present study was also limited in its scope, as only multiple-mediator paths between IPV exposure and speeded control were parameterized. It is possible that experiences of IPV influence women's negative parenting behaviors without necessarily affecting their mental health, and it is also possible that negative parenting behaviors are not the only mechanism through which maternal depression affects children's speeded control. For example, perhaps maternal depressive symptoms reduce children's opportunities for home learning, as mothers with depression may have greater difficulty engaging children enrichment activities that support EF development. This hypothesis is supported by Baker and Kuhn's (2018) findings that both parenting and home learning stimulation (e.g., time spent reading to or playing games with their child) mediated the relation between mothers' depressive symptoms and kindergarteners' EF abilities. Although the present study did not include evaluations of children's home learning environments, future research on children's EF development in the context of IPV would benefit from such data.

The generalizability of these findings would also be enhanced by a more diverse and representative sample of children affected by IPV. Race was conceptualized as a dichotomous variable in the present study due to limitations of sample size, and yet there may have been meaningful differences in IPV, mental health, parenting, and speeded control between ethnoracial minority groups that were undetected in the present study. Further, participants were recruited from communities in the Midwest region of the United States and demographically similar locations in Canada, whose access to socioeconomic

and educational resources was fairly uniform. As evidence suggests that racial disparities in cognitive outcomes are more pronounced in more segregated regions of the United States (Liu, Glymour, Zahodne, Weiss, & Manly, 2015), it is possible that similar studies conducted across a broader geographical range would find significant differences in speeded control or EF between White and racial minority children. Future research in the field would do well to incorporate hierarchical models that control for the role of place in influencing children's cognitive development, as there are clear differences in access to health care and high quality education between advantaged and disadvantaged communities, and these factors have been found to influence children's EF development (Cottrell, Newman, & Roisman, 2015; Zahodne, Manly, Smith, Seeman, & Lachman, 2017).

Lastly, the results of the present study were affected by high rates of attrition. Although there is research to suggest that unbiased parameter estimates can be obtained with attrition rates as high as 56%—even when participants significantly differ on study variables at baseline—external validity is threatened by participant dropout (Gustavson, von Soest, Karevold, & Roysamb, 2012). FIML is a robust statistical approach that was used to retain the full analytic sample in this study, but without complete data for all participants across all time points, it cannot be concluded with certainty that these findings would apply to populations that were lost to follow-up. Attrition is a feature of all longitudinal research with high-risk populations, and determining ways to maximize participant retention is an important area of future investigation.

Clinical Implications and Future Directions

The results of the present study highlight the need for prospective longitudinal

research that more comprehensively evaluates children's EF development in the context of

trauma in order to develop interventions that promote resilience across the lifespan. Meta-

analyses suggest that targeted interventions intended to improve EF generally do not

precipitate lasting, generalizable changes in children's EF skills (Rapport, Orban, Kofler,

& Friedman, 2013), and intervention response has been found to be lower among children

exposed to IPV (Shenk, Dorn, Kolko, Rausch, & Insana, 2014). Accordingly, families

with IPV histories are likely to benefit most from interventions that address the trauma,

such as the PKC and MEP. The PKC and MEP have been found to enhance parenting and

reduce mothers' mental health symptoms (Graham-Bermann & Miller-Graff, 2015;

Howell et al., 2015), which, in light of the present study, may consequently promote

adaptive EF development by enhancing speeded control abilities in their children. Thus, it

is recommended that future RCTs of interventions for IPV-exposed families incorporate

evaluations of treatment effectiveness in promoting children's EF development into their

study design. In the event that treatment effects are found, researchers could then

determine whether improvements in children's EF were facilitated by treatment-induced

enhancement of their mothers' mental health and parenting, as the findings of this study

would imply.

Intervention researchers are further encouraged to investigate the effects of

intervention timing on children's neurocognitive adjustment following exposure to IPV.

Because the findings in this study suggest that a sensitive period for EF development

occurs during the preschool years, early intervention and prevention efforts may be

necessary in order to counteract the cascading effects of early childhood exposure to IPV. Meta-analyses of interventions for infants, preschoolers, school-aged children, and adolescents living in homes where IPV occurs could determine the comparative impact of intervention and prevention efforts across developmental stages and further elucidate how best to promote children's long-term resilience.

Future work is also needed to understand the intersection between children's IPV exposure and ADHD risk. Executive dysfunction is a central component of ADHD symptomatology, and the present study indicates that exposure to IPV during a key developmental period can reduce children's speeded control abilities in the long-term. It is possible that trauma-focused treatments that support mothers' mental health and promote positive parenting following IPV could reduce children's risk for ADHD, and yet there are no known RCTs of interventions for IPV-exposed families documenting their effectiveness in treating ADHD symptoms. Similarly, behavioral intervention programs for ADHD have not been evaluated in populations with recent experiences of IPV, representing a substantial gap in the literature on treating ADHD in the context of psychosocial adversity.

Clinically, providers working with children who have ADHD or other behavior disorders propagated by executive dysfunction and slowed processing speed are encouraged to screen for IPV exposure in order to more comprehensively address children's biopsychosocial needs. In cases where IPV is present, it is recommended that clinicians be mindful not only of the direct effects of IPV exposure on children, but also how children may be indirectly influenced by their mothers' reactions to the violence. The findings of this study suggest that treating women's depression following IPV may reduce

their use of negative parenting strategies, which in turn could promote compounding positive changes in their children's speeded control abilities. Indeed, supporting women who have recently experienced IPV is critical to the adjustment of their children, as although parent training has been found to enhance EF in preschoolers (Neville et al., 2013), the effectiveness of parent training protocols is reduced in the context of maternal depression (Reyno & McGrath, 2006). To maximize children's resilience in the wake of trauma, the results of this study point to the need for accessible interventions for both mothers and children, without which the impact of early childhood exposure to IPV may be expressed years later. Early intervention for families experiencing IPV is clearly worth the investment, and activists are encouraged to advocate for research, development, and implementation of low-cost treatment options for parents and children affected by IPV.

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Table 3.1

Study Two Sample Characteristics

	Mean (Standard Deviation) or Percentage	
	Time 1	Time 2
N	120	70
Age	4.94 (0.85)	12.51 (1.78)
Female	50.00%	44.29%
Monthly Income	$1337.53 ($1386.20)	$2676.94 ($2632.82)
Maternal Education		
High school/GED or less	40.00%	14.29%
Post-secondary	60.00%	85.71%
Racial Identity		
White	38.33%	35.71%
African American	36.67%	38.57%
Latino/Hispanic	5.00%	2.82%
Biracial	20.00%	22.90%
Violence Exposure	64.63 (37.61)	13.97 (19.80)
Maternal Depression	25.70 (13.49)	19.46 (13.17)
Negative Parenting	1.79 (0.39)	1.68 (0.40)

Table 3.2

Bivariate Correlations between Study Two Variables

	1	2	3	4	5	6	7	8	9
1. T1 IPV	1								
2. T2 IPV	0.14	1							
3. T1 Depression	0.30***	0.19	1						
4. T2 Depression	0.31**	0.56***	0.49***	1					
5. T1 Parenting	0.11	0.25*	0.42***	0.38***	1				
6. T2 Parenting	0.27*	0.30*	0.51***	0.44***	0.65***	1			
7. SCWT	0.33*	0.27*	0.15	0.29*	0.15	0.11	1		
8. TMT Part A	0.20	0.33*	0.20	0.14	0.17	0.06	0.50***	1	
9. TMT Part B	0.18	0.11	0.17	0.01	0.25	0.02	0.50***	0.63***	1

*$p < .05$, **$p < .01$, ***$p < .001$

Table 3.3

Study Two Mediation Model Results

	β	SE_β	p
Speeded Control Path Estimates			
Time 1 IPV	**0.350**	**0.118**	**.003**
Time 1 Parenting	**0.495**	**0.139**	**<.001**
Time 2 IPV	0.201	0.131	.126
Time 2 Parenting	**0.444**	**0.155**	**.004**
Treatment	0.181	0.112	.107
Race	0.007	0.117	.951
Income	0.112	0.121	.353
Time 1 IPV Path Estimates			
Treatment	0.053	0.093	.565
Race	-0.071	0.093	.444
Income	**-0.180**	**0.090**	**.045**
Time 1 Depression Path Estimates			
Time 1 IPV	**0.367**	**0.086**	**<.001**
Treatment	0.067	0.086	.433
Race	0.054	0.087	.530
Income	-0.046	0.087	.600
Time 1 Parenting Path Estimates			
Time 1 Depression	**0.397**	**0.076**	**<.001**
Treatment	0.006	0.082	.940
Race	0.044	0.082	.590
Income	**-0.178**	**0.081**	**.028**
Time 2 IPV Path Estimates			
Time 1 IPV	0.105	0.132	.426
Time 1 Depression	0.206	0.139	.139
Treatment	0.071	0.118	.547
Race	0.082	0.122	.501
Income	0.144	0.110	.189
Time 2 Depression Path Estimates			
Time 1 IPV	0.114	0.103	.265
Time 1 Depression	**0.329**	**0.108**	**.002**
Time 1 Parenting	0.081	0.104	.437
Time 2 IPV	**0.467**	**0.091**	**<.001**
Treatment	-0.019	0.087	.824
Race	-0.091	0.088	.302
Income	-0.073	0.085	.389
Time 2 Parenting Path Estimates			
Time 1 Depression	0.191	0.123	.120
Time 1 Parenting	**0.502**	**0.099**	**<.001**
Time 2 Depression	0.161	0.110	.142
Treatment	0.016	0.092	.860
Race	0.016	0.097	.869
Income	0.083	0.087	.340

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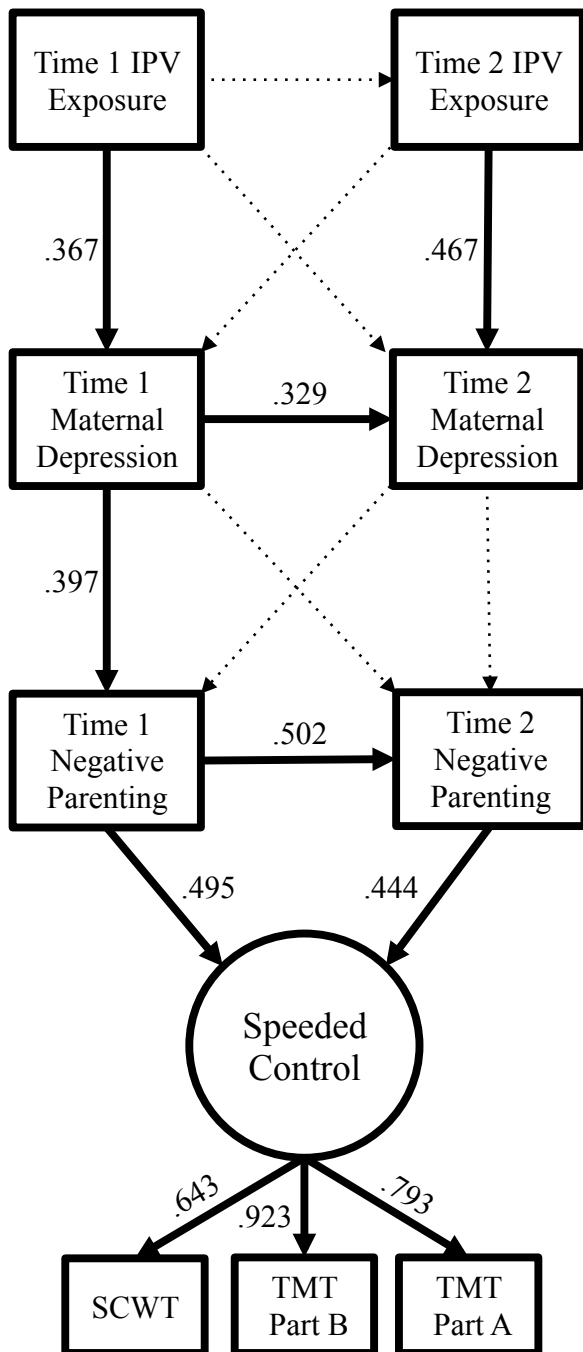
Figure 3.1. Path model estimating the effects of remote and current intimate partner violence (IPV) exposure on children's speeded control through maternal depression and negative parenting.

Note. TMT = Trail Making Test; SCWT = Stroop Color and Word Test. Statistically significant paths with standardized beta estimates are depicted in bold. Not shown are direct paths from Time 1 IPV exposure to Speeded Control, (β = 0.350, p = .003) and Time 2 IPV exposure to Speeded Control (β = 0.201, p = .126). Experimental group assignment, child racial minority status, and monthly household income were also included as controls on all variables.
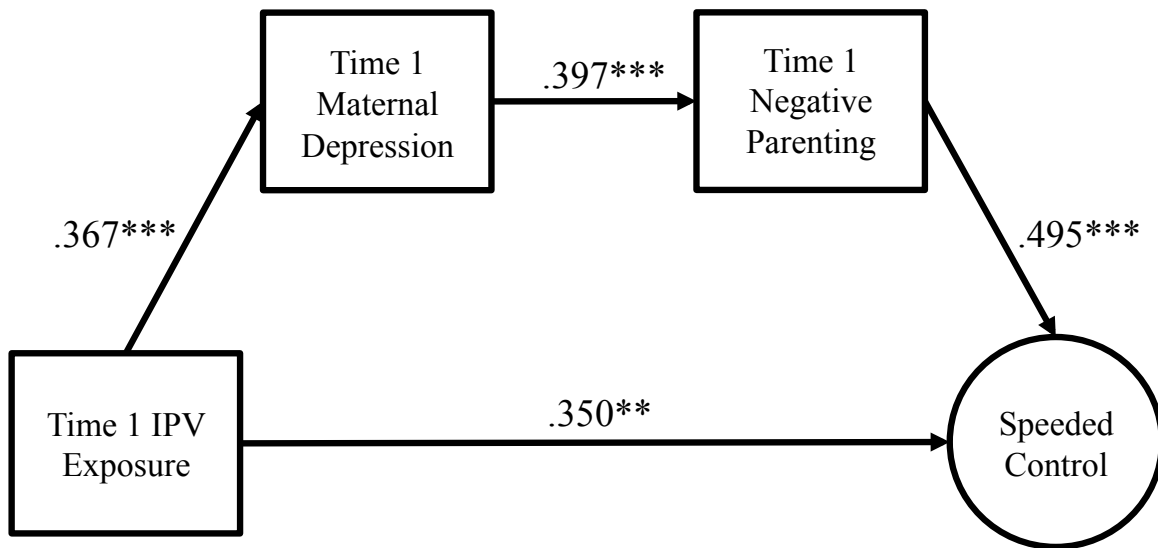
Figure 3.2. Standardized beta estimates of the direct and indirect effects of Time 1 intimate partner violence (IPV) exposure on speeded control through maternal depression and negative parenting.

Note. **$p < .01$, ***$p < .001$. Total effect: $\beta = 0.371$, $p = .001$. Indirect effect: $\beta = 0.072$, $p = .018$.

CHAPTER IV

Treating Attention Problems in Children Exposed to Intimate Partner Violence:

Insights from the Preschool Kids' Club

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental

disorder that emerges during childhood and manifests in symptoms of impulsivity,

inattention, and hyperactivity (American Psychiatric Association [APA], 2013). Affecting

approximately 5 – 7% of children worldwide, ADHD symptoms generally arise during the

preschool years and become increasingly impairing during elementary school (APA, 2013;

Thomas, Sanders, Doust, Beller, & Glasziou, 2015). These impairments can contribute to

poor reading and math achievement in school-aged children, as well as an increased risk

for grade retention and high school drop out (Arnold, Hodgkins, Kahle, Mahoo, &

Kewley, 2015). Untreated ADHD is also associated with poor self-esteem and reduced

social functioning, as well as an increased risk for addictive behaviors and suicide across

the lifespan (Harpin, Mazzone, Raynaud, Kahle, & Hodgkins, 2016; Shaw et al., 2012).

The functional impairment associated with children's attention problems warrants

the considerable efforts that researchers have made to identify factors that increase ADHD

risk. It is well established that ADHD is attributable in large part to genetic vulnerability,

with twin studies yielding heritability estimates around 75% (Biederman & Faraone, 2005;

Faraone et al., 2005). However, the contribution of environmental influences to children's

attention problems is certainly nontrivial. A multitude of environmental risk factors for

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ADHD have been identified—ranging from prenatal chemical exposures to childhood psychosocial adversity—yet all of these influences are thought to interfere with the development of critical neurological systems that facilitate the executive functions of sustained attention, response inhibition, and planning (Froehlich et al., 2011). Executive dysfunction is a core component of ADHD, and children with ADHD tend to show specific delays in inhibition that have cascading effects on other executive functions (Barkley, 1997). Neuroimaging studies have revealed that cortical maturation in brain regions responsible for executive functioning is delayed by up to five years in children with ADHD relative to typically developing peers (Friedman & Rapoport, 2015; Shaw et al., 2007). As such, the emergence of ADHD symptoms during the preschool years can set the stage for delayed cognitive development that compounds across the lifespan—a process that is exacerbated by exposure to environmental risk factors during critical periods of neurological growth.

Developmental Risk Factors for ADHD

One such critical period for the maturation of neural networks responsible for attentional control occurs during the preschool years. Children's exposure to psychosocial adversity during this time poses a substantial threat to their cognitive development, and research points to a number of familial and demographic variables that can increase risk for ADHD in children with genetic vulnerabilities. Among the demographic risk factors for inattention and hyperactivity, limited access to socioeconomic resources is the most strongly linked to maladaptive cognitive outcomes (Rowland et al., 2018). In a representative sample of 76,227 children, Brown and colleagues (2017) found that over 37% of youth with ADHD had a history of socioeconomic hardship, and that after

controlling for child sex, age, race, and other adverse childhood experiences, low

socioeconomic status (SES) increased the odds of clinically significant ADHD symptoms

by nearly 40%. The threat posed by low SES is greatest during early childhood, as

demonstrated in Choi, Shin, Cho, and Park's (2017) study of income trajectories and

ADHD risk. Within the over 18,000 children in their sample, those whose family income

was consistently low or decreased from mid-high to low during their preschool years had

the highest likelihood of ADHD diagnosis prior to age 10, whereas children in families

with consistently mid-high to high SES had the lowest rates of ADHD (Choi et al., 2017).

Children whose family SES increased prior to age 3 had rates of ADHD that were

statistically equivalent to children with consistently high SES during the same time period,

suggesting that access to socioeconomic resources in the preschool years may be more

predictive of attention symptoms over time than SES in infancy and toddlerhood (Choi et

al., 2017).

In the United States, family SES is also determined in large part by one's race and

educational attainment. Low levels of maternal education are linked to an increased risk

for ADHD symptoms (Russell, Ford, Williams, & Russell, 2016), and racial minorities are

more likely to live in poverty and have limited access to high quality education than White

children (Fram, Miller-Cribbs, & Van Horn, 2007). One result of these systemic

inequalities is the underdiagnosis and undertreatment of African American children with

ADHD, despite their increased risk for symptoms of inattention and hyperactivity (Miller,

Nigg, & Miller, 2009). Interactions between SES and early exposure to adverse childhood

experiences raise further concern about the cascading effects of environmental risk for

preschoolers. In an illustrative example, Wade and colleagues (2016) found that the

effects of childhood exposure to abuse, neglect, parental mental illness, and domestic violence on maladaptive psychosocial adjustment in adulthood were five times greater among low-SES (as determined by family income and educational attainment) children relative to those of higher SES. This suggests that the transactional effects of socioeconomic disadvantage and stressful family environments increase the burden on children's cognitive development to an extent that is greater than either risk factor alone.

The Role of Maternal Depression

Familial variables that have been linked to children's ADHD symptoms include parental expressed emotion (Sonuga-Barke et al., 2008), child abuse and neglect (Capusan et al., 2016; Ouyang, Fang, Mercy, Perou, & Grosse, 2008), and maternal depression (Cheung, Aberdeen, Ward, & Theule, 2018). Indeed, there is an extensive literature suggestive of strong links between maternal depression and children's attention problems, with evidence for a dose-response relationship and effect sizes that range from medium to large (Cheung et al., 2018; Wolford et al., 2016). In their proposed model to explain these effects, Goodman and Gotlib (1999) argued that maternal depression influences children's development through biological (i.e., genetic and neurobiological processes) and environmental (i.e., stress and adverse childhood experiences) mechanisms, and that these relationships are moderated by children's age of first exposure to their mothers' depressive symptoms. Specifically, evidence suggests that children first exposed to maternal depression during the preschool years have twice the odds of emotional or adjustment problems in adolescence relative to children first exposed during earlier or later periods of development (Naicker, Wickham, & Colman, 2012). Preschoolers whose mothers' depression is more chronic also exhibit poorer performance on measures of

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executive functioning than their peers whose mothers have lower or remitting levels of depression (Hughes, Roman, Hart, & Ensor, 2013). Clearly, untreated depression among mothers of preschool-aged children can have compounding negative effects on neurological systems that facilitate children's attention and self-regulatory abilities, and studies have shown that reductions in mothers' depressive symptoms coincide with improvements in their young children's behavior problems over time—including symptoms of inattention and hyperactivity (Modell et al., 2001; Shaw, Connell, Dishion, Wilson, & Gardner, 2009).

Childhood Exposure to Intimate Partner Violence

Maternal depression often co-occurs with other environmental stressors that negatively influence children's development, and exposure to family violence is one such stressor that can be especially detrimental. Children who witness intimate partner violence (IPV)—defined as physical, sexual, or emotional violence inflicted by a current or former intimate partner—are at unique risk for a host of physical and mental health problems including ADHD (Evans, Davies, & DiLillo, 2008; Graham-Bermann & Seng, 2005). The effects of IPV exposure on ADHD symptomatology are dose-dependent, with childhood exposure to more severe forms of IPV contributing to a higher likelihood of ADHD diagnosis in adulthood (Cater, Miller, Howell, & Graham-Bermann, 2015). The threat to children's adjustment that is conferred by IPV exposure is greatest for children who witness IPV at young ages, and this effect persists after controlling for the cumulative amount of violent acts to which children are exposed, indicative of a sensitive period during which experiences of IPV are most debilitating to children's development (Graham-Bermann & Perkins, 2010). These effects are exacerbated for preschoolers

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whose mothers report clinically significant levels of depression, as the risk for ADHD among these youth is four times greater for children who have witnessed IPV compared to their peers without histories of IPV exposure (Bauer, Gilbert, Carroll, & Downs, 2013; Slopen & McLaughlin, 2013). IPV is strongly associated with maternal depression both concurrently and longitudinally, and there is evidence to suggest that maternal depression may account for a portion of the relation between early childhood exposure to IPV and subsequent behavior problems (Holmes, Yoon, & Berg, 2017). Despite this compelling evidence, however, there are limited treatment options for mothers and children with histories of IPV that have been shown to improve children's symptoms of inattention and hyperactivity.

Interventions for Children with Attention Problems

Stimulant medications, including methylphenidate and amphetamine preparations, are ubiquitous treatments for children with ADHD. Despite clear evidence for the effectiveness of these medications in the short-term (Maia et al., 2017), there is a dearth of research demonstrating the long-term benefits of stimulants for ADHD (Craig, Davies, Schibuk, Weiss, & Hechtman, 2015; Rajeh, Amanullah, Shivakumar, & Cole, 2017). Further, because most pharmacological treatments for ADHD are not indicated for use prior to age six, very few studies have examined the effectiveness of ADHD medications in preschoolers. The only known long-term placebo-controlled trial for this age group found no significant differences in ADHD symptoms between medicated and non-medicated children between ages three and nine, suggesting that early-emerging ADHD is likely chronic and requires more rigorous, multimodal treatment (Riddle et al., 2013). A recent meta-analysis of 190 randomized trials of treatments for ADHD revealed that

children benefit from both behavioral therapies and pharmacological interventions, but the greatest functional improvements are yielded by multimodal therapies that incorporate both medication and behavioral treatments (Catalá-López et al., 2017).

Most successful behavioral interventions for ADHD in preschoolers involve parent training, which promotes parents' use of strategies that increase desired behaviors in their children and establish a sense of structure and organization to reduce inattention and hyperactivity. There is evidence for the short-term effectiveness of both group-based and individual parent training programs, and most are administered by trained facilitators in modules over the course of 8-20 sessions (Pfiffner & Haack, 2014; Rajwan, Chacko, & Moeller, 2012). For example, the Triple P (Positive Parenting Program; Sanders, 1999) is a five-level intervention system intended to enhance the psychosocial functioning of at-risk children by improving the behavior management skills and self-efficacy of their parents. The five levels of the Triple P increase in intensity ranging from media and communication initiatives (Level 1) to intensive family interventions (Level 5), and parents engage in the level of the intervention that is commensurate with their needs. Randomized controlled trials (RCTs) have demonstrated that Level 4 interventions incorporating manualized group and telephone support sessions that emphasize positive parenting strategies (e.g., praise, physical affection, behavior charts, logical consequences) are effective in reducing problem behaviors in children with ADHD (Aghebati, Gharraee, Shoshtari, & Gohari, 2014). Comparatively, the benefits of Level 4 of the Triple P are indistinguishable from the more intensive Level 5 version that includes sessions on marital conflict and parental mental health, as both meaningfully reduce problem behaviors, inattention, and hyperactivity in children for up to one year following intervention (Bor,

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Sanders, & Markie-Dadds, 2002). Meta-analyses show that the effects of the Triple P are small to medium in size and are greater for younger children with more severe behavior problems at baseline, suggesting that at-risk children have the most to gain from early, targeted intervention (Sanders, Kirby, Tellegen, & Day, 2014). However, longer-term follow-up studies have revealed that although improvements in parenting strategies are maintained for four years post-intervention, the immediate reductions in preschoolers' problem behaviors do not persist into the school-age years (Heinrichs, Kliem, & Hahlweg, 2014).

Similarly comprehensive in its reach, the Incredible Years Series (IY; Webster-Stratton, 2011) is a developmentally tailored set of interventions for parents, children, and teachers designed to enhance children's psychosocial functioning while preventing and treating emotional or behavioral problems. IY programs are group-based and manualized, and an extensive body of work points to their effectiveness in reducing early conduct problems, particularly when parent interventions are paired with either child or teacher training (Webster-Stratton, Reid, & Hammond, 2004; Webster-Stratton, Reid, & Stoolmiller, 2008; for review, see Pidano & Allen, 2015). The 20-week parent and child programs have also been deemed effective in treating preschoolers' ADHD symptoms and improving parenting for up to one year post-intervention (Webster-Stratton, Reid, & Beauchaine, 2011). Unfortunately, these gains do not appear to be maintained in the long-term, as an 8-12 year follow-up study of children whose parents participated in the IY program found that children engaged in high rates of substance abuse, externalizing behavior problems, and delinquency in adolescence (Webster-Stratton, Rinaldi, & Reid,

2011). There are no equivalent follow-up studies specifically evaluating the long-term effectiveness of the IY in treating attention problems in children.

Briefer interventions, including Parent-Child Interaction Therapy (PCIT; Eyberg & Boggs, 1998) and the New Forest Parenting Programme (NFPP; Sonuga-Barke, Daley, Thompson, Laver-Bradbury, & Weeks, 2001) have yielded mixed results. Both programs have demonstrated effectiveness in reducing ADHD symptoms in the short-term (Thompson et al., 2009; Ward, Theule, & Cheung, 2016). However, the NFPP was found to be inferior to a generic (i.e., non-ADHD-specific) parent training program in at least one study (Abikoff et al., 2015) and a RCT comparing methylphenidate, PCIT, and treatment as usual for preschoolers with ADHD found that pharmacological intervention was superior to both PCIT and treatment as usual in reducing ADHD symptoms (van der Veen-Mulders, van den Hoofdakker, Nauta, Emmelkamp, & Hoekstra, 2018). There are no known long-term evaluations of the effectiveness of the NFPP, and the few studies of the PCIT are affected by high rates of attrition and do not consistently suggest that treatment gains are maintained beyond two years post-intervention (Hood & Eyberg, 2003; Pade, Taube, Aalborg, & Reiser, 2006).

Taken together, the literature on parent training for ADHD indicates that most of the existing behavioral interventions engender positive effects in the short-term, but that these improvements are unlikely to be sustained beyond the preschool years (Molina et al., 2009; Rimestad, Lambek, Christiansen, & Hougaard, 2016). Furthermore, although pilot studies have demonstrated that PCIT improves parenting and reduces problem behaviors in children living in domestic violence shelters immediately following intervention (Herschell, Scudder, Schaffner, & Slagel, 2017; Keeshin, Oxman, Schindler, & Campbell,

2015), the long-term effectiveness of behavioral treatments for inattention and hyperactivity in the context of IPV is untested. Designed with an emphasis on reducing problem behaviors in children, traditional parent training programs may require a change in perspective to address dysfunction in the family system where IPV is present. Accordingly, IPV-exposed children with attention problems may require more specialized interventions that were developed to address the distinct intersection of risk factors present among this high-risk group.

Interventions for Children Exposed to IPV

Of the interventions that have been implemented to support children living in homes where family violence occurs, none have been more rigorously tested or far-reaching than the Kids' Club program (Graham-Bermann, 1992). The Kids' Club, developed for the school-aged children of mothers experiencing IPV, is a community-based group intervention that addresses the cognitive, emotional, and social consequences of IPV exposure for children. It includes modules aimed at improving children's attitudes and beliefs about violence, conflict resolution skills, social competence, and emotion regulation. The Kids' Club incorporates art and play therapy approaches to allow children to express their emotions and opinions in a safe and supportive environment. Outcomes studies have demonstrated the effectiveness of the Kids' Club intervention in reducing children's internalizing and externalizing problems and in improving their attitudes and beliefs about violence (Graham-Bermann, Kulkarni, & Kanukollu, 2011; Graham-Bermann, Lynch, Banyard, DeVoe, & Halabu, 2007). These effects are greatest for children whose mothers participate in the Moms' Empowerment Program (MEP; Graham-Bermann, 2010), a group-based intervention for mothers with recent histories of IPV that

emphasizes the development of strategies for emotion regulation, safety planning, and positive parenting in the context of family violence (Graham-Bermann et al., 2007). Indeed, research on the mechanisms of change for families who participate in the joint Kids' Club and MEP programs shows that improvements in children's internalizing problems are mediated by reductions in mothers' mental health symptoms (Graham-Bermann, Howell, Lilly, & DeVoe, 2011). The MEP and Kids' Club are now customarily offered in tandem to facilitate optimal outcomes for youth who have witnessed IPV.

Another manualized intervention for families exposed to IPV is Project SUPPORT (Jouriles et al., 1998), a home-based program for women and children ages four through nine leaving domestic violence shelters. Its two primary components, child management skills for women and instrumental and emotional support for both mothers and children, are intended to reduce children's externalizing problems and enhance women's abilities to become self-supporting. Intervention components are administered flexibly to meet the individual needs of each family, but typically consist of weekly, one-hour home visits. Support continues for up to eight months following departure from the shelter. Project SUPPORT has been found to be effective in producing clinically significant reductions in children's externalizing problems relative to treatment-as-usual approaches, and to improve mothers' child management skills (Jouriles et al., 2001). There is also evidence pointing to the program's effectiveness in reducing children's externalizing behavior problems for up to two years post-intervention, and these changes were found to be partially mediated by improvements in mothers' mental health (Jouriles et al., 2009; McDonald, Jouriles, & Skopp, 2006). Still, there are no known evaluations of Project

SUPPORT's effectiveness beyond two years, and its utility in specifically treating children's attention problems has not been assessed.

A third option available to women and children experiencing IPV is Child-Parent Psychotherapy (CPP; Lieberman, 2004). CPP is a 50-week program consisting of joint sessions with mothers and children aimed at improving the parent-child relationship in the wake of trauma. A randomized clinical trial of CPP found that mothers who participated in the program reported a reduction in PTSD symptoms relative to case management and treatment-as-usual conditions. Children also benefited from CPP participation; improvements in behavior problems and traumatic stress symptoms over time were greatest for children in the CPP compared to other experimental groups (Lieberman, Van Horn, & Ghosh Ippen, 2005). These gains were shown to be maintained at a six-month follow-up (Lieberman, Ghosh Ippen, & Van Horn, 2006) and an investigation of the long-term effects of the intervention found that toddlers who participated in CPP had more positive teacher-reported peer relationships seven years later (Guild, Toth, Handley, Rogosch, & Cicchetti, 2017). However, this is the only known long-term evaluation of the CPP and it did not measure changes in children's attention problems nor was it specific to IPV-exposed families. In fact, the present study is the first known long-term follow-up (i.e., beyond two years post-treatment) of an intervention developed for IPV-exposed children.

The Present Study

Despite the evidence in support of parent training for children with attention problems in the short term, these programs may not be suitable for children who have witnessed IPV and their longitudinal implications for IPV-exposed families are unknown.

Further, among the treatments that have been developed specifically for IPV-exposed children, there are no longitudinal studies beyond two years post-intervention and none of these programs have been evaluated for their effectiveness in improving symptoms of inattention and hyperactivity. This is an especially important area of research, given the associations between attention problems and children's academic achievement, social development, and later IPV victimization (Daley & Birchwood, 2010; Guendelman, Ahmad, Meza, Owens, & Hinshaw, 2016). The purpose of this study is to examine the long-term effect of an adaptation of the Kids' Club program for preschoolers exposed to IPV—the Preschool Kids' Club (PKC; Graham-Bermann, 2000)—on children's attention problems. Using data from an eight-year RCT of the PKC, this study will test the following hypotheses:

Hypothesis 1. Demographic risk factors, including low household family income, low levels of maternal education, and racial minority status, will be associated with higher levels of attention problems.

Hypotheses 2. After controlling for IPV exposure, maternal depression, child race, maternal education, and household family income, children who participated in the PKC will exhibit fewer attention problems over time compared to children assigned to the Control group.

Hypothesis 3. Children of mothers with lower levels of depressive symptoms over time will exhibit fewer attention problems than children whose mothers report higher levels of depression.

Hypothesis 3b. This effect will interact with intervention participation so that children of mothers who benefit most from the intervention with regard to their depressive symptoms will have fewer attention problems over time.

Hypothesis 4. Children exposed to lower levels of IPV over time will demonstrate fewer attention problems than children whose mothers experience higher levels of IPV.

Hypothesis 4b. The effect of the intervention will interact with IPV exposure, such that children with lower levels of IPV exposure over time will demonstrate the greatest benefit from the intervention program with regard to their attention problems.

Method

Participants

Participants ($N = 120$) were children who, with their mothers, were recruited for a randomized controlled trial (RCT) of the Preschool Kids' Club (PKC) and Moms' Empowerment Program (MEP), joint interventions designed for families with recent experiences of IPV. Children were recruited between the ages of four and six ($M = 4.94$, $SD = 0.85$) and followed for approximately eight years until they were an average age of 12.51 years old ($SD = 1.78$). Approximately 62% of the sample ($n = 74$) identified as a racial or ethnic minority (i.e., African American, Asian American, Hispanic/Latino, or Biracial), and an equal proportion of boys and girls were represented. Although predominantly low-income, the sample included children from a range of socioeconomic backgrounds, with monthly household incomes at baseline ranging from $0 to $9,700.00 ($M = \$1,337.53$, $SD = \$1,386.20$). Sixty percent ($n = 72$) of children had mothers with at least some college education at baseline. There were no significant differences between

Treatment and Control groups on any demographic or study variables at baseline,

suggesting successful randomization (See Table 4.1).

[Insert Table 4.1 about here]

Procedures

This study utilized data from a RCT of the PKC and MEP interventions for

mothers and preschool-aged children exposed to IPV (described below). Data from the

RCT utilized in the present analyses included interviews conducted at Time 1, which

occurred prior to intervention, between September 2006 and January 2011; Time 2, a

short-term follow-up approximately one year after the intervention period; and Time 3, a

long-term follow-up approximately eight years after Time 1. An additional data collection

period occurred immediately post-intervention (approximately five weeks after Time 1);

however the interview protocol administered at that time excluded several measures that

were used in these analyses and so data from that time point were dropped for the

purposes of this study.

Upon approval from the University of Michigan Institutional Review Board,

participants were initially recruited for the RCT through flyers, mailings, and referrals

from community agencies serving IPV-exposed families. If interested, mothers contacted

the study staff using a toll-free telephone number and were screened for eligibility.

Children were eligible if they were between the ages of four and six and their mothers

reported experiencing IPV within the past two years. Of the 150 women who contacted the

project coordinator expressing interest in the study, 25 did not meet these eligibility

criteria and five declined to participate, yielding a total study sample of 120 children.

After being recruited for the study, screened for eligibility, and providing informed consent, children and their mothers were sequentially assigned to one of two experimental groups: the treatment condition (Treatment), who would immediately participate in the ten-session interventions described below, or the no-treatment comparison condition (Control). Assignment to experimental groups was sequential such that the first five mother/child pairs to contact the study staff were assigned to the Treatment condition and the next five were assigned to the Control condition, and so on, until all 120 mother/child pairs had been assigned to an experimental group. This modified random assignment procedure was selected to reduce attrition and decrease the time between study enrollment and intervention participation for this high-risk, highly mobile population. Initially, 60 women were assigned to the Treatment group and 60 women were assigned to the Control group. However, upon designation to the Treatment group, 7 mothers expressed that they would be unable to participate in the intervention but would be willing to remain in the study to complete follow-up interviews. These dyads were then re-assigned to the Control group, rendering a final allocation of 53 mother/child pairs in the Treatment group and 67 in the Control group at Time 1.

Data collection interviews were scheduled at the location that was safest and most convenient for each study participant, either at their home, the research laboratory, or an alternative location chosen by the participant. Graduate students and advanced undergraduates trained in research ethics and clinical interviewing administered the assessments and were blind to group assignment. All participants provided informed consent and assent and were free to stop the interview at any time. At Time 1 and Time 2,

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mothers received $25 compensation and children received a small gift valued at $5; at Time 3, mothers were compensated $75 and children's gifts were valued at $10.

A five-week intervention period followed the Time 1 assessment, when participants in the Treatment condition engaged in the MEP and the PKC (described below). All participants were contacted for short-term follow-up an average of 58 weeks (SD = 38.20) after Time 1, and a total of 71 mother/child dyads completed Time 2 interviews. Participants were again contacted approximately eight years (401 weeks) after Time 1 using the information they provided when they entered the study, and 70 mothers and children completed Time 3 interviews. Two mothers declined to participate in the long-term follow-up, and three are deceased (see Figure 4.1 for a full CONSORT flow diagram).

[Insert Figure 4.1 about here]

Moms' Empowerment Program (MEP). Mothers assigned to the Treatment group participated in the MEP (Graham-Bermann, 2010), a ten-session manualized group intervention designed to reduce traumatic stress, improve mood, and bolster parenting skills among mothers with recent experiences of IPV. Each of the ten sessions addresses an issue relevant to IPV-exposed mothers, ranging from child development and safety planning to families of origin and self-care. Informed by Sullivan's (1968) interpersonal theory, the psychoeducational components of the intervention are intended to capitalize on the women's strengths as mothers and empower them to make instrumental changes to improve their lives, and in turn, the lives of their children. As members of a group of mothers with similar traumatic experiences, women in the MEP build a positive social

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support network and a sense of connectedness that provides a space both for practical problem-solving and emotional healing.

In this RCT, the ten sessions were distributed over five weeks and each session was 60 minutes in duration. Groups consisted of between five and eight women whose children participated in the PKC. Sessions were conducted by two therapists who were trained by the program's developer and received four hours of weekly supervision. Supervision included review of process notes and session planning to ensure program adherence.

Preschool Kids' Club (PKC). Children whose mothers engaged in the MEP participated in the PKC (Graham-Bermann, 2000), a manualized intervention for young children who have witnessed IPV in the home. The PKC consists of ten sessions held in tandem with the MEP and covers topics ranging from conflict resolution, feelings about fighting in the family, and safety planning. Within the group format, children learn to identify their emotions and are encouraged to express them through games, art, and other interactive activities. The group provides a safe space for children to develop and practice alternative conflict resolution strategies, and the group facilitators along with other group members are able to model effective coping and social skills. Comparable to the MEP, this RCT included groups of five to eight preschoolers led by two trained therapists who received four hours of supervision per week. PKC groups met twice weekly for 60 minutes over the course of five weeks and were held in local community agencies at the same time as the MEP. All participants enrolled in the PKC and MEP attended at least three sessions, and the average number of total sessions attended was seven ($SD = 2.54$).

Measures

      Demographic Characteristics. Mothers selected their child's race from one of the following categories: White, African American, Latino/Hispanic, Biracial, Asian American, American Indian, or Other. Child race was then recoded as a dichotomous variable indicating children's racial minority status (0 = White; 1 = African American, Latino/Hispanic, or Biracial; no children were identified as Asian American, American Indian, or Other). At each data collection period, mothers reported their highest level of education on a scale ranging from one ("Grade school or less") to seven ("Graduate degree"). Mothers also reported their monthly household family income during each data collection interview.

      Attention Problems. Children's attention problems were assessed at each time point using mothers' reports on the Attention Problems (AP) subscale of the Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL is a 113-item questionnaire assessing children's internalizing (e.g., anxiety, depression, somatic complaints) and externalizing (e.g., delinquency, aggression) problems. The AP subscale comprises eleven items, each representing a particular symptom of inattention or hyperactivity. Example items include, "Impulsive or acts without thinking," and, "Can't concentrate, can't pay attention for long." Mothers responded to each item on a three-point scale ranging from 0 ("Not true") to 2 ("Very or often true") to indicate the degree to which the symptom described their child over the past six months. Prior studies assessing the psychometric properties of the AP subscale of the CBCL have demonstrated its convergent and discriminant validity in a wide range of populations (Derks, Hudziak, Dolan, Ferdinand, & Boomsma, 2006; Lampert, Polanczyk, Tramontina, Mardini, & Rohde, 2004). Internal

consistency of items on the AP subscale in this study was strong (Time 1 Cronbach's α = .83; Time 2 Cronbach's α = .86; Time 3 Cronbach's α = .85).

Intimate Partner Violence (IPV) Exposure. Mothers' responses to the Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996) were used to measure children's exposure to IPV. The 33 violence victimization items of the CTS2 index the frequency with which women have experienced acts of physical (e.g., "My partner beat me up"), sexual (e.g., "My partner used force to make me have sex"), psychological (e.g., "My partner destroyed something that belonged to me"), and injurious violence (e.g., "You passed out from being hit on the head by your partner in a fight") within the past year on a scale ranging from 0 ("Never") to 6 ("20 times or more"). The CTS2 was scored by summing responses to violence victimization items, with a possible scores ranging from zero to 198. The CTS2 is a valid and reliable measure of children's IPV exposure (Calvete, Corral, & Estévez, 2007; Straus & Douglas, 2004; Yun, 2011), and internal consistency in the present study was strong (Time 1 Cronbach's α = .94; Time 2 Cronbach's α = .90; Time 3 Cronbach's α = .92).

Maternal Depression. The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) comprises 20 items that measure current depressive symptomatology and was used to quantify mothers' depression in the present study. Mothers responded to items including, "I felt hopeful about the future" (reverse-scored), and, "I had trouble keeping my mind on what I was doing" on a scale from 0 ("None of the time") to 3 ("Most or all of the time") to indicate how often each symptom was present in the past two weeks. Responses to each item were summed, after reverse-scoring positively worded items, to calculate total depression scores such that higher scores on the

CES-D were suggestive of higher levels of depression. Scores ranged from zero to a maximum of 60. The CES-D was developed by the National Institute of Mental Health and has proven reliable and valid in epidemiologic studies with diverse samples (Murphy, 2011). Across time points in the present study, the internal consistency of the CES-D was strong (Time 1 Cronbach's α = .92; Time 2 Cronbach's α = .89; Time 3 Cronbach's α = .92).

Analytic Strategy

      Missing Data. Of the 120 mother/child pairs who participated in the study at Time 1, data were incomplete for eight participants (7%) on the CTS2, seven participants (6%) on the CBCL AP scale, and two participants (2%) on the CES-D. All other Time 1 data were complete. Due to inconsistent item administration, Time 2 data on the CTS2 were missing for 20 participants (28%). Two mothers (3%) did not respond to the Time 2 CBCL AP items, but there were otherwise no other missing data at Time 2. Time 3 data were complete for all retained participants, with the exception of five mothers (7%) who refused the CTS2 and six (9%) who did not respond to all items on the CBCL AP scale. Multiple imputation with 30 imputed datasets was used to account for missing data.

      Hypothesis Testing. The treatment effect of the PKC on children's attention problems was assessed using multi-level modeling (MLM). MLM was chosen because children's CBCL AP scores were highly correlated across time points, and MLM allows and corrects for correlations between repeated measures (See Table 4.2 for bivariate correlations between study variables). Further, the use of multiple imputation facilitated the retention of data from all mother/child pairs that were interviewed at Time 1, yielding a full analytic sample of 120 children.

First, an unconditional model (Model One) with random intercepts was fitted to test the main effect of the PKC on children's attention problems over time.

Next, to evaluate the moderating effects of maternal depression and IPV exposure on children's attention problems over time, the following model (Model Two) with random intercepts was fitted:

$y_{it} = \beta_0 + \beta_1(\text{Treatment}) + \beta_2(\text{Time}) + \beta_3(\text{Treatment*Time}) + \beta_4(\text{IPV}) + \beta_5(\text{Treatment*IPV}) + \beta_6(\text{Time*IPV}) + \beta_7(\text{Treatment*Time*IPV}) + \beta_8(\text{Maternal Depression}) + \beta_9(\text{Treatment*Maternal Depression}) + \beta_{10}(\text{Time*Maternal Depression}) + \beta_{11}(\text{Treatment*Time*Maternal Depression}) + \beta_{12}(\text{Child Race}) + \beta_{13}(\text{Maternal Education}) + \beta_{14}(\text{Household Income}) + u_{0i} + e_{it}$

Here, y_{it} corresponds to each child's (i) CBCL AP score at time t. β_0 is the intercept, and $\beta_1 - \beta_{14}$ are regression parameters. The interaction term β_3 corresponds to the conditional treatment effect of the PKC. The three-way interaction terms β_7 and β_{11} denote whether the effect of the intervention over time significantly differed depending on the extent of children's exposure to IPV and maternal depression, respectively. The random intercept for each child is denoted by u_{0i}, and e_{it} is the error term, accounting for the specific variation in children's attention problems on each measurement occasion. To allow for direct comparison of children's attention problems across discrete time points, Time was entered into the model as a categorical within-subjects variable. All analyses were conducted in STATA Version 15.

[Insert Table 4.2 about here]

Results

Model One Results

The unconditional model testing the two-way interaction between experimental group assignment and time revealed no statistically significant difference in attention problems over time between children in the Treatment group compared to children in the Control group, ps > .05 (See Table 4.3).

[Insert Table 4.3 about here]

Model Two Covariates

The second multi-level model with random intercepts was fitted to evaluate whether children's AP scores were significantly affected by PKC participation over time, controlling for maternal depression, IPV exposure, child race, maternal education, and household monthly income. Unexpectedly, household income (b = -0.148, p = .263) and race (b = 0.016, p = .982) did not significantly contribute to variation in children's AP scores, and maternal education was positively associated with children's attention problems (b = 0.648, p = .032; See Table 4.3). Maternal depression significantly influenced children's AP as anticipated, such that children of mothers with higher levels of depression exhibited more attention problems (b = 0.123, p <.001). None of the interaction terms between maternal depression, experimental group assignment, and time were statistically significant, indicating that the effect of depression on children's attention problems was invariant over time and between experimental groups.

[Insert Table 4.4 about here]

Model Two Intervention Effects

Model Two did not reveal a conditional intervention effect, as the β_3 regression parameter representing the interaction between experimental group assignment and time was not statistically significant. Results did indicate, however, a three-way interaction suggesting that treatment effects were dependent on children's IPV exposure over time (b = -0.115, p = .036). To investigate the nature of this interaction, simple slopes for the relation between experimental group assignment and AP score at high (one standard deviation above the mean) and low (one standard deviation below the mean) levels of IPV at each time point were assessed. Analyses revealed a significant treatment effect for children exposed to high levels of IPV at Time 2, such that those assigned to the Treatment group had lower AP scores than those in the Control group (b = -7.108, p = .029). Experimental group assignment was not significantly associated with Time 2 AP scores for children whose mothers reported lower levels of IPV (b = 1.560, p = .290). Unfortunately, the benefit of the intervention for children exposed to high levels of IPV did not extend to the long-term, as the three-way interaction between Treatment, Time, and IPV exposure was not significant at Time 3 (b = 0.048, p = .385; See Figure 4.2).

[Insert Figure 4.2 about here]

Discussion

Although these results were not supportive of the hypothesis that children's participation in the PKC would be associated with reduced attention problems in the long-term, this study provides evidence that children exposed to high levels of IPV as preschoolers can benefit from a brief, ten-session group-based intervention up to one year later. This is the first known RCT demonstrating that an intervention developed

specifically for children who have witnessed IPV can be effective in reducing their attention problems, and although these effects did not persist into late childhood, the PKC was effective in reducing attention problems in especially vulnerable preschoolers during a sensitive period of neurological development. These findings are consistent with the literature on parent training programs for ADHD, which generally yield positive results in the short-term but have questionable durability beyond one year (Rimestad et al., 2016). The PKC is thus a viable behavioral treatment option for preschoolers with attention problems who have witnessed high rates of IPV, and it has the benefit of reducing additional sequelae of IPV including internalizing symptoms and maladaptive cognitions about violence (Graham-Bermann, Kulkarni, & Kanukollu, 2011; Graham-Bermann, Lynch, Banyard, DeVoe, & Halabu, 2007). Furthermore, the PKC is a brief, group-based, manualized intervention, making it appropriate for use even in agencies with limited resources, as is often the case for those serving high-risk, IPV-exposed families.

The moderating effect of IPV exposure on treatment effectiveness was an unexpected finding, as it was hypothesized that children exposed to lower levels of IPV over time would maximally benefit from the PKC. This hypothesis was informed by prior research showing that IPV exposure reduced the effectiveness of behavioral interventions for children with disruptive behavior disorders (Shenk, Dorn, Kolko, Rausch, & Insana, 2014). Perhaps, however, the results of the present study point to the need for trauma-focused—as opposed to symptom-specific—interventions for children exhibiting attention problems in the context of psychosocial adversity. Indeed, there is evidence in the adult literature to show that women experiencing higher rates of IPV gain more from trauma-focused cognitive-behavioral interventions than women whose experiences of IPV are less

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chronic (Iverson, Resick, Suvak, Walling, & Taft, 2011). Considered with the results of the present study, such findings are suggestive of the acute need for structured, supportive, and specific behavioral treatment options for families living in high-risk environments.

As anticipated, children's attention problems were associated with maternal depression such that children of mothers with higher levels of depressive symptoms exhibited more attention problems. This effect was invariant over time and was not moderated by experimental group assignment, replicating the robust associations between maternal depression and children's attention problems that have been demonstrated in prior research. Improvements in mothers' depressive symptoms have been found to result in reduced functional impairment for their children with ADHD, indicating that interventions supporting mothers' mental health are likely to improve children's behavioral outcomes (Chronis, Gamble, Roberts, & Pelham, 2006). Although mediation analyses were beyond the scope of the present study, future evaluations of the PKC would do well to assess whether improvements in mothers' mental health mediate treatment effects for their children's attention problems.

Study hypotheses regarding the influence of demographic characteristics on children's attention problems were not supported. Children's race and household family income were not significantly associated with their attention problems, and the relation between maternal education and children's AP scores was in the opposite direction than was anticipated. Although there is support in the literature for the hypothesis that that low levels of maternal education increase children's risk for ADHD (Russell et al., 2016), some studies have shown that the relation between maternal education and ADHD symptoms is in fact curvilinear in nature, such that risk is increased for children of

mothers with the lowest and highest levels of education (Berchick, 2016). Berchick (2016) proposed that the positive association between ADHD and maternal education may be due to an increased ability among highly educated mothers to identify and report their children's problems, as women with higher levels of education may be in a privileged position to detect and treat their children's symptoms. Conversely, children of mothers with lower levels of education may be more likely to exhibit symptoms of ADHD due to the intersection between low educational attainment, poverty, trauma, and health factors that can impair cognitive development. The positive relation between maternal education and child ADHD in this study may have been stronger, then, because all families were recruited under circumstances of psychosocial adversity.

The unique nature of this study sample may also explain the null finding for the influence of child race and family income on children's attention problems. All children in this RCT had experienced early exposure to IPV, and the rates of IPV exposure reported in this study were high compared to most community samples. Further, prior studies linking race and socioeconomic status to children's attention problems after controlling for psychosocial adversity have quantified adverse circumstances as dichotomous variables (e.g., Brown et al., 2017; Wade et al., 2016). The results of this study suggest that the effects of IPV exposure and maternal depression on children's attention problems are dose-dependent, and perhaps more of the variance in children's symptoms of inattention and hyperactivity is explained when the extent of their adverse experiences is taken into account. This does not rule out the possibility that psychosocial hardships are especially damaging to children's cognitive development when their access to socioeconomic resources is limited, as demonstrated in Wade and colleagues' (2016) study. Instead, the

results of the present evaluation suggest that investigations of the interacting effects of race, socioeconomic status, and adverse childhood experiences on ADHD symptomatology could be enhanced by quantifying the extent of children's exposures in addition to dichotomous appraisals of risk.

Limitations

This study is the first long-term evaluation of a RCT of an intervention developed for mothers and children who have experienced IPV. Although the study design and scope are strengths, these findings are not without limitations. First, the participants in this study were recruited from communities in the Midwest region of the United States and nearby towns in Canada. Consequently, these results may not be generalizable to rural populations whose access to local agencies or social support may be more limited, or to urban populations with higher rates of exposure to community violence. Leveraging social support and safety planning are key components of the MEP and PKC interventions, and for women and children who cannot utilize existing resources for any number of reasons (e.g., experiences of discrimination, distrust of local authorities) or for whom there are no local supports, it may be more challenging to engage in these aspects of the intervention. However, there is evidence that adaptations of the MEP and Kids' Club interventions for Spanish-speaking families can reduce participants' exposure to IPV (Clark et al., 2018), suggesting that these programs are flexible and effective in a variety of settings. Still, the effectiveness of the PKC with regard to improving children's attention problems is untested beyond the current study sample.

A second limitation to this study was that there were high levels of attrition at both Time 2 and Time 3 follow-ups. Despite using statistical procedures allowing for

retention of data from all Time 1 participants, the validity of these findings would be improved with complete data from all participants across all time points. The rates of attrition in this RCT are comparable to other longitudinal studies with difficult-to-reach populations, and McEwan and colleagues (2015) proposed incorporating motivational sessions into interventions with high-risk populations in order to facilitate treatment adherence and study retention. Other recommendations include increasing contact between research staff and study participants through reminder cards, calls, and emails, and expanding the visibility of the study by advertising across media platforms (McEwan et al., 2015). In research with families who have recently experienced IPV, efforts to retain participants who are characteristically highly mobile and at risk for study dropout must be intensified.

The measure used to evaluate children's attention problems further limits the validity of the study. Despite being a reliable and valid index of children's inattention and hyperactivity, the CBCL was not developed specifically to measure ADHD symptomatology and does not include reports from teachers, which are considered necessary in order to make an ADHD diagnosis. Including the Teacher's Report Form (Achenbach & Rescorla, 2001) as an adjunct to the CBCL parent report, or utilizing a measure developed for the explicit purpose of evaluating ADHD symptoms, such as the Conners' Parent and Teacher Rating Scales (Conners, 2008), would likely have provided a more accurate assessment of children's attention problems over time. While there is evidence for strong convergent validity between the CBCL and gold-standard measures for ADHD, the CBCL has been found to underperform in terms of diagnostic accuracy relative to the Conners' Rating Scales (Forbes, 2001). In order to draw stronger

conclusions about the effectiveness of IPV-specific interventions in treating symptoms of ADHD, future work in the field would do well to include more comprehensive measures of inattention and hyperactivity.

Clinical Implications and Future Directions

The results of this study demonstrate that an intervention that was designed to improve preschoolers' adjustment following exposure to IPV was effective in reducing attention problems among the most vulnerable children in the sample who were exposed to high rates of violence against their mothers. These effects persisted for up to one year after the intervention, results that parallel the literature on behavioral treatments developed for the express purpose of treating children's ADHD. Accordingly, children exposed to a high degree of psychosocial adversity may have more to gain from participating in interventions that were developed with a focus on these adverse experiences as opposed to symptom reduction alone. In addition to reducing attention problems in the short-term, the PKC and Kids' Club programs have been found to enhance children's social competence, improve safety planning, and reduce internalizing problems and disruptive behaviors (Graham-Bermann, Kulkarni, & Kanukollu, 2011; Graham-Bermann et al., 2007; Howell, Miller, Lilly, & Graham-Bermann, 2013; Miller, Howell, Hunter, & Graham-Bermann, 2012). Thus, clinicians working with high-risk children are encouraged to consider treatments focusing on coping with adverse circumstances—as opposed to symptoms—in order to efficiently address internalizing and externalizing comorbidities.

Neither the treatment effects in this study, nor those found in other longitudinal evaluations of behavioral interventions for children with attention problems, persisted into late childhood. This pattern of results may point to the need for ongoing support services

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for ADHD-prone children, particularly those living in high-risk environments. Being a brief and cost-effective intervention, the relative durability of the PKC is encouraging in that it suggests the possibility that longer term maintenance of treatment gains could be facilitated with few resources (e.g., periodic booster sessions or telephone support). By showing that brief interventions can have powerful effects on children's inattention and hyperactivity—but that these effects may not last beyond the school-age years in the absence of additional services—this study underscores the need for increased availability of intervention programming as vulnerable children navigate the challenges of adjusting to school and developing peer relationships.

Future research investigating the long-term effectiveness of interventions for children with attention problems would benefit from randomized designs that include treatment conditions both with and without ongoing support. Varying the intensity of ongoing support services would further allow researchers to determine the level of services that would most efficiently maximize child outcomes. These data, paired with information from studies examining the mechanisms of change for children who participate in manualized interventions, would allow clinicians to tailor their treatment protocols to best facilitate symptom reduction in the families they treat. To facilitate such work, researchers are encouraged to advocate for funding for large-scale longitudinal RCTs of behavioral treatments for underserved children. In the absence of such data, the present study provides empirical support for the use of the PKC and MEP interventions in families with high levels of exposure to IPV to improve children's inattention and hyperactivity during the critical preschool years.

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Table 4.1

Study Three Sample Characteristics

	Mean (Standard Deviation) or Percentage		
	Time 1	Time 2	Time 3
N	120	71	70
Age	4.94 (0.85)	5.97 (1.27)	12.51 (1.78)
Female	50.00%	46.48%	44.29%
Monthly Income	$1337.53	$1737.74	$2676.94
	($1386.20)	($1705.09)	($2632.82)
Maternal Education			
High school/GED or less	40.00%	29.58%	14.29%
Post-secondary	60.00%	70.42%	85.71%
Racial Identity			
White	38.33%	36.62%	35.71%
African American	36.67%	32.39%	38.57%
Latino/Hispanic	5.00%	7.04%	2.82%
Biracial	20.00%	23.95%	22.90%
Violence Exposure	64.63 (37.61)	18.06 (20.27)	13.97 (19.80)
Maternal Depression	25.70 (13.49)	17.78 (10.61)	19.46 (13.17)
Attention Problems	5.39 (4.27)	4.87 (4.29)	5.11 (4.52)

Table 4.2

Bivariate Correlations between Study Three Variables

	1	2	3	4	5	6	7	8	9
1. T1 AP Score	1								
2. T2 AP Score	0.73***	1							
3. T3 AP Score	0.56***	0.44**	1						
4. T1 IPV	0.29**	0.23	0.24	1					
5. T2 IPV	0.25	0.23	0.19	0.16	1				
6. T3 IPV	0.22	0.12	0.37**	0.14	0.34*	1			
7. T1 Depression	0.40***	0.35**	0.41**	0.30***	0.15	0.19	1		
8. T2 Depression	0.31**	0.27*	0.35*	0.11	0.27	0.15	0.54***	1	
9. T3 Depression	0.35**	0.33*	0.47***	0.31**	0.43*	0.56***	0.49***	0.54***	1

*$p < .05$, **$p < .01$, ***$p < .001$

Table 4.3

Main Effect of the PKC on Children's Attention Problems

Parameter	b	SE_b	t	p
Treatment	-0.957	0.810	-1.18	.237
Time 2	-0.756	0.715	-1.06	.291
Time 3	-0.934	0.780	-1.20	.232
Treatment*Time 2	0.895	1.126	0.80	.427
Treatment*Time 3	1.376	1.091	1.26	.208

Random Effects	b	SE_b	95% Confidence Interval
Individual Random Intercept	2.422	0.355	1.817 – 3.232
Residual	3.649	0.272	3.146 – 4.234

Note. Estimates were obtained using multiply-imputed data.

Table 4.4

Multilevel Model of Children's Attention Problems

Parameter	b	SE_b	t	p
Treatment	-0.673	1.723	-0.39	.696
Time 2	2.402	1.538	1.56	.118
Time 3	0.962	1.428	0.67	.501
Treatment*Time 2	0.193	2.283	0.08	.932
Treatment*Time 3	0.326	2.036	0.16	.873
IPV	0.012	0.012	0.99	.321
IPV*Treatment	0.004	0.019	0.19	.848
IPV*Time 2	0.057	0.032	1.79	.074
IPV*Time 3	-0.023	0.042	-0.55	.585
IPV*Treatment*Time 2	**-0.115**	**0.055**	**-2.10**	**.036**
IPV*Treatment*Time 3	0.048	0.056	0.87	.385
Depression	**0.123**	**0.033**	**3.72**	**<.001**
Depression*Treatment	-0.034	0.058	-0.59	.556
Depression*Time 2	-0.128	0.070	-1.84	.065
Depression*Time 3	-0.031	0.061	-0.51	.613
Depression*Treatment*Time 2	0.134	0.102	1.32	.188
Depression*Treatment*Time 3	0.066	0.092	0.72	.472
Child Race	0.016	0.688	-0.02	.982
Maternal Education	**0.642**	**0.299**	**2.15**	**.032**
Household Income	-0.148	0.132	-1.12	.263

Random Effects	b	SE_b	95% Confidence Interval
Individual Random Intercept	2.789	0.308	2.246 – 3.463
Residual	2.653	0.192	2.302 – 3.057

Note. Estimates were obtained using multiply-imputed data.

Assessed for eligibility ($n = 150$)

Enrollment

Excluded ($n = 30$)
- Not meeting inclusion criteria ($n = 25$)
- Declined to participate ($n = 5$)

Randomized ($n = 120$)

Allocation at Baseline

Allocated to MEP/PKC ITT condition ($n = 60$)
- Received allocated intervention ($n = 53$)
- Did not receive allocated intervention ($n = 7$)

Allocated to comparison condition ($n = 60$)
- The 7 dyads who did not receive the intervention were moved to the comparison group

Follow-Up

At Time 2 ($n = 31$)
- Lost to follow-up ($n = 22$)
At Time 3 ($n = 32$)
- Lost to follow-up ($n = 0$)

At Time 2 ($n = 40$)
- Lost to follow-up ($n = 23$)
- Discontinued the study ($n = 4$)
At Time 3 ($n = 38$)
- Lost to follow-up ($n = 2$)

Analysis

Included for ITT analysis ($n = 53$)
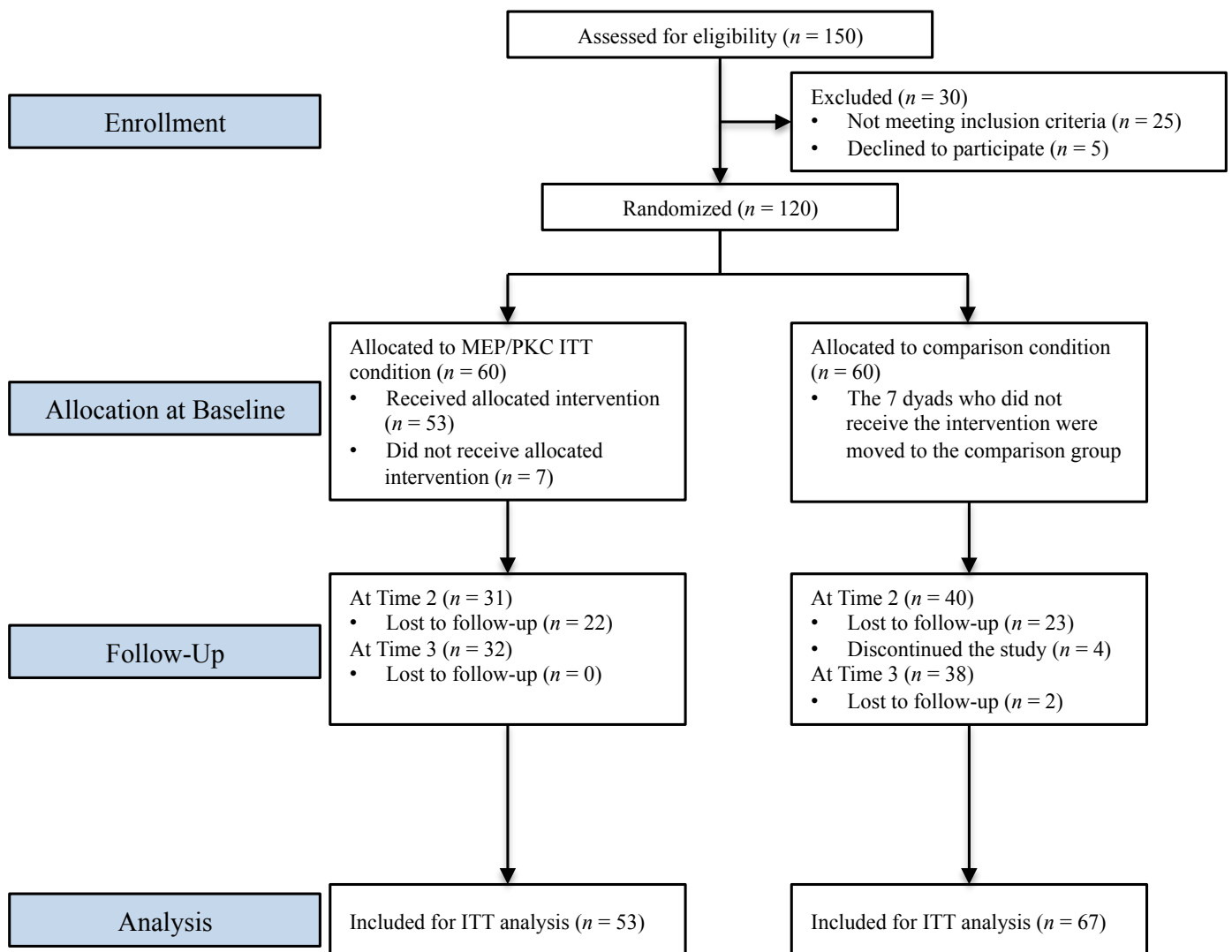
Included for ITT analysis ($n = 67$)

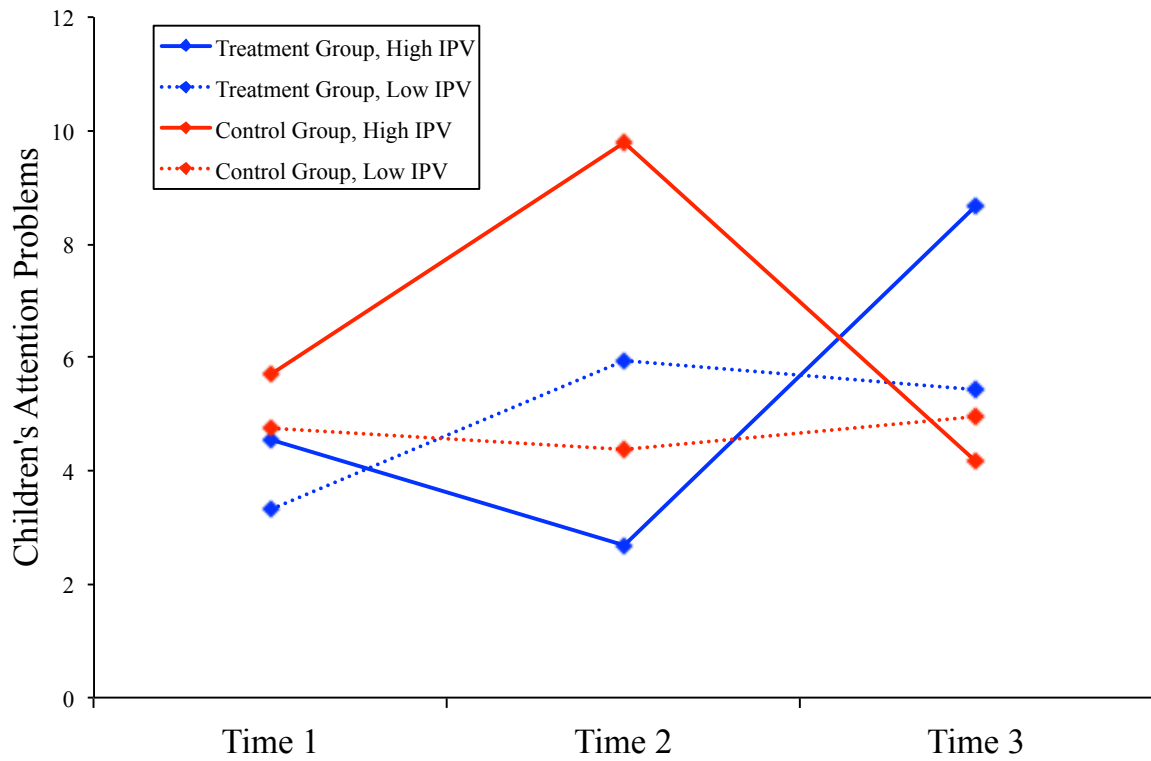*Figure 4.1.* Preschool Kids' Club CONSORT flow diagram.

Figure 4.2. Three-way interaction between intimate partner violence (IPV) exposure, experimental group (Treatment or Control), and time.

*Note. Estimates were obtained using multiply-imputed data.

CHAPTER V

Conclusion

Intimate partner violence (IPV) is a prevalent public health concern, and research on its effects has converged to show that transactions between biological and environmental factors account for much of the variation in outcomes in women and children affected by IPV. Prior literature in the field has largely focused on the physical and mental health sequelae of IPV, and has suggested that IPV exposure during sensitive periods of development may be especially deleterious for children's physical and emotional wellbeing because its immediate effects cascade over time (Graham-Bermann & Perkins, 2010). This dissertation applied the well-supported developmental cascade (Masten & Cicchetti, 2010) and bioecological (Bronfenbrenner & Morris, 1998) perspectives to investigate the prolonged effects of IPV on women and children's cognition—specifically, aspects of their executive functioning (EF) and attention problems. Although linked to a host of outcomes that are relevant for IPV-exposed populations, including quality of life (Brown & Landgraf, 2010), involvement with the criminal justice system (Seruca & Silva, 2016), and physical and mental health concerns (for review, see Diamond, 2013), EF and attention problems are understudied in the field of IPV research.

Because both EF and attention problems are known to be highly heritable (Brikell, Kuja-Halkola, & Larsson, 2015; Engelhardt, Briley, Mann, Harden, & Tucker-Drob, 2015;

Friedman et al., 2008), much of the research on these outcomes to date has emphasized the characterization of genetic risk factors. Such studies have provided compelling support for the developmental cascade theory by showing that environmental influences on EF and attention problems have the greatest impact during earlier stages of development, as heritability estimates tend to increase as children age into adulthood (Friedman et al., 2008). However, the literature on cognitive aging points to the need to understand environmental risk for executive dysfunction even in adulthood, as there is strong evidence for gene by environment interactions across the lifespan (Reynolds & Finkel, 2015). With prior research indicating that IPV may represent one such environmental threat to cognitive development, the three studies of this dissertation integrated two parallel fields of research on IPV and EF to address the following aims: 1) examine how IPV affects two separate domains of women's EF in both the short- and long-term; 2) illuminate the processes through which children's exposure to IPV during early and late childhood influences their speeded control, or performance on EF tasks influenced by processing speed; and 3) evaluate the effectiveness of a group-based intervention for women and their preschool-aged children in treating children's attention problems.

  The first study of this dissertation sought to elucidate whether and how the degree of women's IPV experiences affected their measured performance in two separate EF domains—namely, inhibition and switching. It was hypothesized that both remote and current IPV experiences would be negatively associated with EF performance, and that remote IPV would affect women's EF in both domains even after controlling for current experiences of IPV. The degree to which IPV impaired EF was hypothesized to differ between domains. Drawing from extensive literature showing that depression is associated

with both IPV (Beydoun, Beydoun, Kaufman, Lo, & Zonderman, 2012) and executive dysfunction (Snyder, 2013), the relation between remote IPV and subsequent EF was hypothesized to be mediated by women's depressive symptoms such that IPV at Time 1 (baseline) would be associated with higher levels of depression at Time 2 (five weeks later), which would then negatively influence performance on each EF task at Time 3 (eight years after Time 1).

Results from this study revealed that IPV was differentially associated with performance in each EF domain, providing partial support for study hypotheses. Specifically, the extent of women's current (Time 3) IPV experiences was negatively related to their performance on a measure of inhibition (the Stroop Color and Word Test, or SCWT; Stroop, 1935), but not with performance on a measure of switching (the Trail Making Test, or TMT; Reitan & Wolfson, 2004). Remote IPV experiences were not associated with women's performance on either EF domain. In contrast, although women's Time 3 SCWT scores were not significantly related to either Time 2 or Time 3 depression, women's post-intervention (Time 2) depressive symptoms had a significant, adverse effect on their cognitive flexibility performance eight years later. That is, the degree of women's depressive symptoms at baseline was positively related to their depressive symptoms at Time 2, five weeks later. Higher levels of depression at Time 2 were associated with impaired TMT performance at Time 3, eight years after Time 1. Because possible treatment effects were statistically accounted for in the relation between Time 1 and Time 2 depression, the link between post-intervention depressive symptoms and cognitive flexibility suggests that treatment-resistant depression may be particularly debilitating to women's complex EF abilities following IPV experiences.

Taken together, the findings from Study One of this dissertation may indicate that IPV experienced during adulthood has an immediate detrimental impact on women's basic EF capacities, but that these effects diminish over time and preserve higher-order executive functions. However, because post-intervention depressive symptoms had a protracted effect on women's cognitive flexibility, chronic, treatment-resistant depressive symptoms following IPV experiences may place women at risk for impaired cognitive flexibility in the long term. Indeed, the literature is suggestive of dynamic relationships between EF abilities and depressive symptoms, as studies show that slowed processing speed places adults at risk for later depression (Gale, Harris, & Deary, 2016), whereas shifting abilities are impaired in chronically depressed adults (Snyder, 2013). It is possible that without effective intervention, the immediate detriment to women's processing speed and attentional control abilities incurred by IPV may increase vulnerability to chronic depressive symptoms that reinforce rigid, inflexible thinking patterns over time.

Building on findings from Study One, the second study of this dissertation aimed to evaluate how children's EF—or more specifically, their facility with speeded control—was influenced by the effects of IPV on their mothers. Informed by bioecological and developmental cascade theories, it was hypothesized that children's speeded control would be affected by both current and remote exposure to IPV, but that the effects of IPV exposure during the preschool years would be stronger due to the sensitivity of this period for cognitive development. It was further expected that IPV during both early and late childhood would be associated with higher levels of maternal depression, which, as indicated by prior literature (Baker & Kuhn, 2018; Gueron-Sela, Camerota, Willoughby, Vernon-Feagans, & Cox, 2018), would contribute to more negative parenting behaviors.

This process was hypothesized to mediate the relation between IPV and late childhood speeded control.

Mediation model results largely supported these hypotheses. Children's IPV exposure during the preschool years was significantly associated with impaired performance on speeded control tasks during late childhood eight years later. This relation was mediated by the effects of IPV on their mothers, such that higher levels of IPV contributed to higher levels of depressive symptoms, which in turn were associated with higher levels of negative parenting behaviors while children were of preschool age. The indirect effect of preschoolers' IPV exposure on their speeded control performance in late childhood via maternal depression and negative parenting was significant, and this effect persisted after controlling for the same variables during late childhood. In fact, late childhood IPV exposure was unexpectedly not associated with concurrent speeded control performance, providing further evidence that the preschool years are a sensitive period for EF development and that IPV exposure during this time may have cascading effects on children's cognition that are not immediately observable.

Findings from both Study One and Study Two underscore the need for effective and timely prevention efforts to reduce the effects of IPV experiences in women and children. In addition to promoting health, safety, and emotional wellbeing, such efforts may also support adaptive cognitive development, as these studies indicate that IPV has a demonstrable downstream impact on aspects of EF that may compound over time for both children and adults. EF is positively associated with behaviors that promote safety and reduce revictimization in women who have experienced IPV (Lee & DePrince, 2017), and these two dissertation studies suggest that interventions aimed at reducing depression in

mothers who have experienced IPV may not only enhance their safety by reducing risk for executive dysfunction, but also support their children's cognitive development. This appears to be especially true during sensitive developmental periods, such as the preschool years. Accordingly, the third dissertation study aimed to evaluate the effectiveness of the Preschool Kids' Club (PKC; Graham-Bermann, 2000) in treating attention problems— outcomes that are precipitated by executive dysfunction—in preschoolers exposed to IPV.

Drawing from prior literature supporting the effectiveness of the PKC in improving mental health in both mothers and children (Graham-Bermann, Howell, Lilly, & DeVoe, 2011; Graham-Bermann, Miller-Graff, Howell, & Grogan-Kaylor, 2015), it was hypothesized that preschoolers' participation in the PKC would be associated with fewer attention problems over time. It was further expected that this effect would interact with maternal depression, such that children of mothers whose depressive symptoms improved most following the PKC would show comparable improvements in attention problems. IPV exposure was also hypothesized to moderate the effect of the PKC on children's attention problems, as extant research has demonstrated that interventions for children with behavioral problems are less effective in the context of IPV (Shenk, Dorn, Kolko, Rausch, & Isana, 2014). All hypothesized effects were expected to persist after controlling for known risk factors for IPV and attention problems, including low household income, racial minority status, and low levels of maternal education.

Results using multilevel modeling provided partial support for Study Three hypotheses. As anticipated, maternal depression was significantly associated with children's attention problems, such that children of mothers with higher levels of depression also exhibited higher levels of attention problems. However, the omnibus

treatment effect was not statistically significant, and maternal depression did not interact

with the effect of the PKC in reducing children's attention problems over time. There was

a significant interaction between children's IPV exposure, experimental group assignment,

and time, which unexpectedly revealed that children who participated in the PKC

exhibited fewer attention problems at Time 2 (one year post-intervention) than children in

the control group if they had been exposed to higher levels of IPV, whereas there was no

treatment effect for children with lower levels of IPV exposure. Importantly, the durability

of the treatment effect for this high-risk group of children paralleled that of empirically-

supported interventions for Attention-Deficit Hyperactivity Disorder (ADHD), which have

been found to be effective for one to two years post-intervention but do not have lasting

effects in the long-term without additional booster sessions (Rimestad, Lambek,

Christiansen, & Hougaard, 2016). This suggests that children exposed to high levels of

potentially traumatic events may benefit most from trauma-informed interventions (i.e.,

those intended to address the consequences of particular traumatic experiences), as

opposed to those that are more symptom-specific, such as parent training for ADHD. That

is, IPV-specific interventions (e.g., the PKC) appear to be indicated for IPV-exposed

children who exhibit attention problems, as such interventions are likely to address

attention problems in addition to any internalizing or externalizing comorbidities that may

be present.

Altogether, the three studies of this dissertation illustrate the compounding

consequences of IPV exposure on women and children's cognition. This is a relatively

understudied area of research, and in exploring associations between IPV and executive

dysfunction in women and children, these dissertation studies address gaps in both the IPV

and cognitive development literatures, which had only previously been integrated using cross-sectional data that precluded the examination of longitudinal relationships. These are the first ever studies to examine cognitive development over eight years in a high-risk sample of mother/child dyads, and each of them points to modifiable environmental factors that could have profound effects on women and children's EF, and, as a result, a host of life outcomes that may reduce the risk for revictimization and intergenerational transmission of violence. In doing so, this research highlights exciting new opportunities for intervention that may promote resilience in families affected by adversity.

Limitations

Although compelling, the findings of these three dissertation studies should be interpreted with full consideration of their limitations. First, all three studies utilized data from the same randomized controlled trial (RCT), which was affected by high rates of attrition across time points. Because the efforts of IPV-exposed women to maintain safety can make them a difficult-to-reach population, attrition challenges all researchers working with families affected by IPV (McFarlane, 2007). In this dissertation, efforts were made to mitigate the influence of attrition through the use of statistical techniques that are generally robust to high dropout rates. However, it cannot be concluded with certainty that these findings would be replicated if all participants had been retained.

The operationalization of EF in Study One and speeded control in Study Two further limited the validity of these results. The measures that were selected (the Trail Making Test and the Stroop Color and Word Test) neither comprehensively measured EF, nor the domains of EF that they were intended to represent. By selecting a small subset of EF tasks, construct validity was compromised in order to minimize the effects of

participant fatigue. Yet it is possible that the tasks administered in Study One were more accurately characterized as measures of processing speed or other elements of cognition that are related to, but not explicitly EF. Similarly, the latent outcome variable in Study Two was conceptualized as speeded control, as the construct relied solely on participants' completion time on all three tasks administered. Accordingly, this latent variable captured aspects of children's EF but was confounded by processing speed. The use of a comprehensive battery of EF tasks would have strongly enhanced the validity of these results. These studies would also have been strengthened if the EF measures were administered at multiple time points throughout the RCT. Although findings from Studies One and Two point to possible "sleeper effects" (Holmes, 2013) of IPV on EF, such that the detrimental influence of IPV on women and children's cognition may not be immediately observable but emerge over time, the absence of EF data from multiple time points did not allow for a definitive investigation of this question.

The RCT from which these data were drawn also involved a unique study population, which may limit the generalizability of these results. Participants were racially and socioeconomically diverse, and demographic characteristics that are known to influence IPV exposure, mental health, and cognition were statistically controlled for in all three studies. However, race was conceptualized dichotomously in each study, which did not account for the heterogeneity of experiences between racial minority groups. The systemic factors that influence IPV and EF disparities in the United States vary between racial minority groups, and the relative contribution of these factors to the relations between IPV, mental health, and EF warrants further investigation.

Furthermore, the families involved in this RCT were recruited from areas in the United States and Canada with relatively similar access to health care and educational opportunities. Health care and education are strongly associated with EF and attention problems, meaning that the results from these dissertation studies may not generalize to families living in other geographic regions. Additionally, all participants were seeking help for problems related to IPV and all had experienced high levels of IPV at some point during the RCT. Thus, it is possible that the relationships found in these studies would not generalize to populations with lower levels of IPV exposure or to families who are not ready or able to seek help. Indeed, EF abilities are associated with women's help-seeking behavior following IPV (Lee & DePrince, 2017), suggesting that women who participated in this RCT may have had higher measured EF abilities than what would be found in a community sample.

The potential for genetic confounds to the relationships between maternal characteristics and children's EF and attention problems is an additional caveat to the findings of this dissertation. EF and ADHD symptoms are highly heritable (Engelhardt et al., 2015; Merwood et al., 2013), and there is research to suggest that executive dysfunction is a risk factor for both engagement in and exposure to IPV (Corvo, 2014; Lee & DePrince, 2017). This suggests that there may be underlying genetic influences that increase vulnerability to both IPV and executive dysfunction, a hypothesis that is supported by research demonstrating the heritability of injurious physical and sexual IPV (Barnes, TenEyck, Boutwell, & Beaver, 2013). Considered alongside the results of these dissertation studies, the literature on IPV and EF indicates that both genetic and environmental influences play a role in mediating these relationships, and a study design

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that allowed for statistical controls for genetic confounds would have improved the validity of these findings.

Clinical Implications

All three of these dissertation studies underscore the role of maternal depression in influencing cognitive outcomes for both women and children. In view of these findings, the need to allocate resources to the screening and treatment of depressive symptoms in mothers following experiences of IPV is apparent. There are a number of time-limited, evidence-based approaches to treating depression in women that could be adapted for delivery in settings where women receive services related to IPV experiences. Feasibility research supports the application of brief Interpersonal Psychotherapy (Cort et al., 2014), Dialectical Behavior Therapy (Iverson, Shenk, & Fruzzetti, 2009), and Cognitive-Behavioral Therapy (Johnson, Zlotnick, & Perez, 2011) protocols to reduce women's depressive symptoms in domestic violence shelters and community agencies serving IPV-exposed populations. The results of these dissertation studies suggest that the implementation of such programs would be a valuable use of resources, not only due to their effectiveness in improving women's mental health, but also because of their potential to prevent long-term executive dysfunction in the women who participate and in their children as well.

Findings from this dissertation also point to the express need to provide interventions to women and children as early as possible following experiences of IPV. By establishing that IPV can have a demonstrable impact on components of EF in both youth and adults, the results of these dissertation studies suggest that developmental cascades affect not only the social and emotional sequelae of IPV as evidenced by prior research

(e.g., Enlow, Blood, & Egeland, 2013; Matsuura, Fujiwara, Okuyama, & Izumi, 2013; for review, see Howell, Barnes, Miller, & Graham-Bermann, 2016), but also cognitive outcomes in women and children. There is research indicating that early intervention with the Kids' Club and Moms' Empowerment Program can interrupt these cascades to reduce risk for internalizing and externalizing problems in children, improve mental health in adults, and decrease the likelihood of revictimization for families affected by IPV (Clark et al., 2018; Graham-Bermann et al., 2018; Graham-Bermann et al., 2015). Extending this literature, Study Three of this dissertation revealed that the Preschool Kids' Club was effective in reducing attention problems in especially vulnerable young children for up to one year, but that additional support may be required to prompt longer-lasting changes. Clinically, these findings imply that early intervention is especially indicated for preschoolers exhibiting symptoms of executive dysfunction following IPV exposure, as the rapid cascade that occurs as a result of preschoolers' developmental sensitivity may precipitate behaviors that are more resistant to enduring change without a prompt therapeutic response.

Because the durability of children's treatment response following participation in the Preschool Kids' Club was comparable to that of symptom-specific interventions for inattention and hyperactivity (Rimestad et al., 2016), the results of this dissertation also advance the literature suggesting that targeted, trauma-informed interventions should be a first-line approach for children with histories of IPV exposure. Traumatic experiences increase children's likelihood of developing symptoms of ADHD (Vrijsen et al., 2018), and ADHD can exacerbate mental health problems that emerge following experiences of adversity (Biederman et al., 2013). Trauma-informed interventions for children exposed to

high levels of IPV not only demonstrate effectiveness in treating children's internalizing and externalizing problems (Graham-Bermann, Howell, Lilly, & DeVoe, 2011), improving their social skills (Howell, Miller, Lilly, & Graham-Bermann, 2013), and reducing maladaptive cognitions (Graham-Bermann, Kulkarni, & Kanukollu, 2011), but they also appear to reduce at-risk children's symptoms of ADHD for up to one year post-intervention. Clearly, the need to treat attention problems in children following IPV exposure is great, and the Preschool Kids' Club is an accessible treatment option for highly vulnerable children that can reduce inattention during a sensitive developmental period, while also addressing other relevant social and emotional outcomes that promote resilience.

These recommendations should be interpreted with the caveat that the changes in children's attention problems that were prompted by participation in the Preschool Kids' Club did not last into late childhood. Indicative of the complexity of treating ADHD symptoms in the context of psychosocial adversity, this finding may suggest that children with histories of exposure to potentially traumatic violence who also exhibit symptoms of inattention and hyperactivity require the dose of their treatment to be adjusted accordingly. Although it is remarkable that the PKC—a ten-session intervention administered over the course of five weeks—initiated reductions in children's inattention that lasted for at least one year post-treatment, a greater frequency of sessions over a longer duration of time may be necessary to promote optimal outcomes in these vulnerable youth. Prior research examining treatment outcomes for children with ADHD and comorbid psychopathology lends credence to this conclusion (Halldorsdottir et al., 2015).

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A final recommendation for clinical intervention with women and children affected by IPV is that providers working with these populations be mindful of the potential for executive dysfunction as well as slowed processing speed. Because EF and processing speed impairments are associated with poorer treatment response and higher likelihood of dropout (Crocker et al., 2018; Mckowen et al., 2017), clinicians working with IPV-exposed populations should be prepared to assess for cognitive impairment in order to make appropriate referrals if there is a need for cognitive rehabilitation to specifically target executive dysfunction. Although most often indicated for survivors of traumatic brain injury (TBI), there is evidence to support the application of brief cognitive rehabilitation protocols to enhance EF in children and adults without TBI histories (Fogel, 2018; Fukuta & Mori, 2018). These programs should be considered for women and children showing significantly impaired EF. For patients with lower levels of impairment, it is recommended that providers make adjustments to their intervention protocols to increase accessibility. For example, patients may benefit from the use of compensatory strategies—such as incorporating checklists and reminders, minimizing distractions, and taking breaks from demanding tasks—to facilitate treatment adherence and maximize therapeutic outcomes.

Future Research Directions

This research represents a strong first step toward understanding factors associated with women and children's cognitive development following exposure to IPV. To build on this work, future studies would benefit from applying the bioecological framework more broadly, incorporating methods that assess physiological, neurological, and genetic mediators and moderators of change. Physiologically, researchers could investigate how

neuroendocrine markers of emotion regulation influence the relations between violence exposure, mental health, parenting behaviors, and EF. For example, there is work suggesting that experiencing IPV places women and children at risk for dysregulated HPA-axis functioning (Boeckel, Viola, Daruy-Filho, Martinez, & Grassi-Oliveira, 2016; Martinez-Torteya, Bogat, Levendosky, & von Eye, 2016), and that cortisol reactivity after IPV exposure is linked to mental health symptomatology in women and children (Johnson, Delahanty, & Pinna, 2008; Martinez-Torteya, Bogat, Lonstein, Granger, & Levendosky, 2017). Further, research in the field of infant and child cortisol reactivity suggests that maternal mental health and parenting behaviors influence the trajectory of children's hypothalamic-pituitary-adrenal (HPA) axis functioning, which is in turn associated with developmental outcomes such as internalizing and externalizing problems as well as emotion regulation (Conradt et al., 2016; Laurent, 2017). However, no known studies have integrated these findings to investigate transactions between IPV exposure, HPA-axis responses, maternal risk factors, and EF. This is a critical area of exploration, as a deeper understanding of neuroendocrine responses in women and children following IPV experiences may allow for more precise identification of risk and protective factors, and provide an alternative means of measuring response to intervention at a physiological level.

Future work in the field could also pair neuroimaging methods with performance-based measures of EF to investigate the neurological underpinnings of observed EF impairments. Existing literature indicates that experiences of IPV engender alterations in neural networks associated with emotion regulation and EF (Roos, Fouche, & Stein, 2017); however, there is a dearth of research explicitly linking neurological changes to

functional impairment following IPV, as argued by Wong and colleagues (2014) in their recent review. Finally, twin or adoption study designs could be leveraged to determine the extent to which IPV contributes to EF impairment when genetic risk is taken into account. Although such designs would require a large sample and extensive resources, this is a particularly important area of further investigation because prior studies examining the heritability of executive functions have found that genetic predispositions are incredibly predictive of performance on measures of EF, and yet none are known to have accounted for the potential for trauma to have dramatic effects on EF development.

An additional opportunity for future research involves examining trajectories of EF development in mothers and children. Such studies could incorporate a comprehensive battery of EF tasks at multiple points over time, and utilize latent growth mixture models (Wang & Bodner, 2007) to classify patterns of EF development as well as factors that contribute to change within each EF trajectory. This type of design would allow one to investigate a host of relevant questions, such as: 1) what are the ways that EF can develop following exposure to traumatic violence? 2) Do demographic risk factors (e.g., race, socioeconomic status, access to health care and education) influence one's likelihood of experiencing a particular trajectory? 3) Are children on a particular trajectory more vulnerable to biological or environmental risk factors (e.g., maternal mental health, EF abilities, and parenting behaviors)? 4) How do mothers' and children's EF trajectories influence one another? And 5) How does intervention influence change within and between trajectories? Findings from a study such as this would inform both prevention and intervention efforts, allowing for more targeted approaches to augment cognitive outcomes in women and children with IPV histories.

Finally, the three studies of this dissertation make evident numerous opportunities for intervention research that examines whether and how interventions support cognitive development in women who have experienced IPV and their children. One such study could evaluate directly the comparative effectiveness of symptom-specific approaches (i.e., those developed to treat symptoms of ADHD explicitly) against those that are trauma-informed (i.e., those intended to address the various sequelae of IPV) using a randomized controlled trial (RCT) design with three experimental groups. One group would receive the PKC or an equivalent intervention targeted toward IPV-exposed families; another group would receive a comparable dose of parent management training aimed at reducing ADHD symptoms; and the final control group would receive treatment-as-usual, or perhaps a psychoeducational intervention with material on both IPV and ADHD symptomatology. This type of design would allow for the direct comparison of the relative effect size of each approach, and based on the results from Study Three, one might hypothesize that both the IPV- and ADHD-specific interventions would outperform the control condition, and there would be no difference in effect size between the two active intervention groups. Provided these hypotheses are supported, such a study would be the first to offer direct evidence for the conclusion that trauma-informed interventions are indicated for children with histories of IPV exposure who also exhibit attention problems.

An additional hypothesis based on the results from Study Three—that high-risk children with symptoms of inattention and hyperactivity may require a higher intervention dose to exhibit lasting changes in behavior—could be tested using a RCT design as well. This is an important question for further investigation, as there is mixed support for the efficacy of maintenance treatment in promoting child outcomes. There is strong evidence

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that booster sessions enhance treatment response in children with mood and anxiety disorders (Gearing, Schwalbe, Lee, & Hoagwood, 2013). However, research examining the effectiveness of maintenance treatment for children exhibiting symptoms of psychopathology perpetuated by executive dysfunction is less clear. In their evaluation of the Coping Power intervention program for children with behavior problems, Lochman and colleagues (2013) found that the 24-session intervention was effective in reducing children's externalizing problems, aggression, and impulsivity over the course of four years, and that the implementation of booster sessions did not significantly enhance these effects. Similar results were found in Eyberg, Boggs, and Jaccard's (2014) examination of the effects of maintenance treatment as an adjunct to Parent-Child Interaction Therapy (PCIT). Specifically, the incorporation of monthly relapse prevention telephone sessions did not augment children's treatment response.

In light of these conflicting findings, a RCT comparing different intervention doses against a treatment-as-usual control is warranted. This RCT could include three active treatment groups receiving the same manualized intervention, such as the PKC, in incremental doses. One treatment group could participate in the standard ten-session intervention, another could receive the ten-session intervention and four additional monthly booster sessions (for a total six months of treatment), and the last could receive an expanded version of the PKC administered weekly for six months. A study such as this would provide critical information to assist in resolving the dosage question as it pertains to children's ADHD symptomatology in the context of adversity. In doing so, results from this RCT could be used to inform the delivery of services to IPV-exposed children,

allowing providers to make considered decisions about the balance of resources and patient outcomes.

A final intervention study based on the results of this dissertation could compare extant evidence-based interventions for IPV-exposed women and children against "enhanced" versions of these interventions that incorporate strategies specifically intended to improve EF. Enhanced interventions could include distinct modules informed by cognitive rehabilitation protocols to promote planning, organization, and decision-making in women and children. Reinforcing these principles, group leaders in enhanced interventions could incorporate the use of compensatory strategies into their weekly action planning at the close of each session. It would be expected, based on prior literature, that enhanced interventions would facilitate greater treatment adherence, greater reductions in mental health symptoms, improvements in measured EF, and among women, lower risk for revictimization and higher likelihood of securing housing and employment following intervention participation. This type of study would have obvious implications for service providers, particularly if enhanced interventions were similar to extant treatment options with regard to flexibility and accessibility.

Summary

By examining the processes through which IPV impacts EF and speeded control in women and children, as well as the effectiveness of an intervention in reducing children's inattention and hyperactivity, this dissertation uniquely contributes to both the cognitive development and IPV literatures. Drawing from these rarely integrated fields of research, each dissertation study applied bioecological and developmental cascade perspectives to advance understanding of the long-term consequences of IPV. Findings highlight the

importance of timely and accessible interventions for women and children exposed to IPV, and further research is needed to identify how best to support children's cognitive development in the wake of trauma. Future work assessing physiological, neurological, and genetic correlates of EF and IPV may offer further insight into factors associated with both risk and resilience, allowing for intervention efforts that are more targeted and therefore more likely to promote safety and healthy adjustment following experiences of IPV.

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APPENDICES

Measures

Demographic Information

Child's Birthdate:
Child's Age:

1) We want to get a sense of who are the people in your child's life. Please tell us who are the people (family and friends, including parents, siblings, partners/boyfriends, other relatives, etc.) whom your child sees on a regular basis. For each, tell if you think your child would identify that person as a significant person in their life. Please indicate if that person is a member of the household (living in your home).

Relationship To Child (e.g., mom, dad, family , friend)	Sex	Age	Lives in home with child?	
1._____	___	___	Yes	No
2. ._____	___	___	Yes	No
3. ._____	___	___	Yes	No
4. ._____	___	___	Yes	No
5._____	___	___	Yes	No
6. ._____	___	___	Yes	No
7. ._____	___	___	Yes	No
8. ._____	___	___	Yes	No
9. ._____	___	___	Yes	No
10. ._____	___	___	Yes	No

2) Your relationship status (check one):

[ ]   Single   [ ]   Widowed
[ ]   Living with partner   [ ]   Divorced
[ ]   Married   [ ]   Remarried
[ ]   Separated (How long? _____)

3) What category best describes your and your child's race or ethnicity?

you	child	
[ ]	[ ]	Native American
[ ]	[ ]	Asian
[ ]	[ ]	Black, African-American
[ ]	[ ]	Latino, Hispanic-American
[ ]	[ ]	Biracial (mixed): specify _____
[ ]	[ ]	White
[ ]	[ ]	Other _____

4) What is the highest level of education that you have completed?

[ ]	Grade school or less	[ ]	College degree
[ ]	Some high school	[ ]	Some graduate school
[ ]	High school degree/GED	[ ]	Graduate degree
[ ]	Some college or vocational school		

5) Are you working at this time?

        [ ]   Yes   Hours per week? _____

        [ ]   No

6) What was your total household income last month? $_____

Revised Conflict Tactics Scale

No matter how well a couple gets along, there are times when they disagree, get annoyed with one another, want different things from each other, or just have spats or fights because they are in a bad mood, are tired, or are upset for some other reason. Couples also have many different ways of trying to settle their differences. This is a list of things that might happen when you have differences. Please tell us how many times these things have happened **in the past year**.

	1x	2x	3-5x	6-10x	11-20x	>20x	Never
1. *My partner* showed care for me even though we disagreed.	1	2	3	4	5	6	7
2. *My partner* explained his or her side of a disagreement to me.	1	2	3	4	5	6	7
3. *My partner* insulted or swore at me.	1	2	3	4	5	6	7
4. *My partner* threw something at me that could hurt.	1	2	3	4	5	6	7
5. *My partner* twisted my arm or hair.	1	2	3	4	5	6	7
6. *You* had a sprain, bruise or small cut because of a fight with your partner.	1	2	3	4	5	6	7
7. *My partner* showed respect for my feelings about an issue.	1	2	3	4	5	6	7
8. *My partner* made me have sex without a condom.	1	2	3	4	5	6	7
9. *My partner* pushed or shoved me.	1	2	3	4	5	6	7
10. *My partner* used force to make me have oral or anal sex.	1	2	3	4	5	6	7
11. *My partner* used a knife or gun on me.	1	2	3	4	5	6	7
12. *You* passed out from being hit on the head by your partner in a fight.	1	2	3	4	5	6	7
13. *My partner* called me fat or ugly.	1	2	3	4	5	6	7
14. *My partner* punched or hit me with something that could hurt.	1	2	3	4	5	6	7
15. *My partner* destroyed something that belonged to me.	1	2	3	4	5	6	7
16. *You* went to a doctor because of a fight with your partner.	1	2	3	4	5	6	7
17. *My partner* choked me.	1	2	3	4	5	6	7
18. *My partner* shouted or yelled at me.	1	2	3	4	5	6	7
19. *My partner* slammed me against a wall.	1	2	3	4	5	6	7
20. *My partner* was sure we could work it out.	1	2	3	4	5	6	7
21. *You* needed to see a doctor because of a fight with your partner, but didn't.	1	2	3	4	5	6	7
22. *My partner* beat me up.	1	2	3	4	5	6	7
23. *My partner* grabbed me.	1	2	3	4	5	6	7
24. *My partner* used force to make me have sex.	1	2	3	4	5	6	7
25. *My partner* stomped out of the room or house or yard during a disagreement.	1	2	3	4	5	6	7
26. *My partner* insisted that I have sex when I didn't want to (but did not use physical force).	1	2	3	4	5	6	7
27. *My partner* slapped me.	1	2	3	4	5	6	7
28. *You* had a broken bone from a fight with your partner.	1	2	3	4	5	6	7
29. *My partner* used threats to make me have oral or anal sex.	1	2	3	4	5	6	7
30. *My partner* suggested a compromise to a disagreement.	1	2	3	4	5	6	7
31. *My partner* burned or scalded me on purpose.	1	2	3	4	5	6	7
32. *My partner* insisted that I have oral or anal sex (but did not use physical force)	1	2	3	4	5	6	7
33. *My partner* accused me of being a lousy lover.	1	2	3	4	5	6	7
34. *My partner* did something to spite me.	1	2	3	4	5	6	7
35. *My partner* threatened to hit or throw something at me.	1	2	3	4	5	6	7
36. *You* still felt physical pain the next day because of a fight you had with your partner.	1	2	3	4	5	6	7
37. *My partner* kicked me.	1	2	3	4	5	6	7
38. *My partner* used threats to make me have sex.	1	2	3	4	5	6	7
39. *My partner* agreed to try a solution I suggested.	1	2	3	4	5	6	7

Center for Epidemiologic Studies—Depression Scale

These questions are about how you, the parent, have been feeling within **the past week**. Please tell me how much of the time you have felt a certain way: 1= None of the time, 2= Some of the time, 3 = Occasionally or a moderate amount of the time, and 4 = Most or all of the time.

1= None of the time   2= Some of the time   3 = Occasionally   4 =Most or all of the time

_____ 1. I was bothered by things that don't usually bother me.

_____ 2. I did not feel like eating.

_____ 3. I felt that I could not shake off the blues, even with help from family or friends.

_____ 4. I felt that I was just as good as other people.

_____ 5. I had trouble keeping my mind on what I was doing.

_____ 6. I felt depressed.

_____ 7. I felt that everything I did was an effort.

_____ 8. I felt hopeful about the future.

_____ 9. I thought my life had been a failure.

_____ 10. I felt fearful.

_____ 11. My sleep had been restless.

_____ 12. I was happy.

_____ 13. I talked less than usual.

_____ 14. People were unfriendly.

_____ 15. I felt lonely.

_____ 16. I enjoyed life.

_____ 17. I had crying spells.

_____ 18. I felt sad.

_____ 19. I felt that people disliked me.

_____ 20. I could not "get going".

_____ 21. Is the last week typical of how you have been feeling?

Alabama Parenting Questionnaire

The following are a number of statements about your family. Please tell me how often these events TYPICALLY occur in your home. The possible answers are NEVER (1), ALMOST NEVER (2), SOMETIMES (3), OFTEN (4), ALWAYS (5).

|	Never	Almost Never	Sometimes	Often	Always
1. You have a friendly talk with your child.	1	2	3	4	5
2. You let your child know when he/she is doing a good job with something.	1	2	3	4	5
3. You threaten to punish your child and then do not actually him/her.	1	2	3	4	5
4. You volunteer to help with special activities that your child is involved in (such as sports, boy/girl scouts, church groups).	1	2	3	4	5
5. You reward or give something extra to your child for obeying you or behaving well.	1	2	3	4	5
6. Your child fails to leave a note or to let you know where he/she is going.	1	2	3	4	5
7. You play games or do other fun things with your child.	1	2	3	4	5
8. Your child talks you out of being punished after he/she has done something wrong.	1	2	3	4	5
9. You ask your child about his/her day in school.	1	2	3	4	5
10. Your child stays out in the evening past the time he/she is supposed to be home.	1	2	3	4	5
11. You help your child with his/her homework.	1	2	3	4	5
12. You feel that getting your child to obey you is more trouble than it's worth.	1	2	3	4	5

	Never	Almost Never	Sometimes	Often	Always
13. You compliment your child when he/does something well.	1	2	3	4	5
14. You ask your child what his/her plans are for the coming day.	1	2	3	4	5
15. You drive your child to a special activity.	1	2	3	4	5
16. You praise your child if he/she behaves well.	1	2	3	4	5
17. Your child is out with friends you don't know.	1	2	3	4	5
18. You hug or kiss your child when he/she has done something well.	1	2	3	4	5
19. Your child goes out without a set time to be home.	1	2	3	4	5
20. You talk to your child about his/her friends.	1	2	3	4	5
21. Your child is out after dark without an adult with him/her.	1	2	3	4	5
22. You let your child out of a punishment early (like lift restrictions earlier than you originally said).	1	2	3	4	5
23. You child helps plan family activities.	1	2	3	4	5
24. You get so busy that you forget where your child is and what he/she is doing.	1	2	3	4	5
25. Your child is not punished when he/she has done something wrong.	1	2	3	4	5
26. You attend PTA meetings, parent/teacher conferences, or other meetings at your child's school.	1	2	3	4	5

	Never	Almost Never	Sometimes	Often	Always
27. You tell your child that you like it when he/she helps out around the house.	1	2	3	4	5
28. You don't check that your child comes home at the time he/she was supposed to.	1	2	3	4	5
29. You don't tell your child where you are going.	1	2	3	4	5
30. Your child comes home from school more than an hour past the time you expect him/her.	1	2	3	4	5
31. The punishment you give your child depends on your mood.	1	2	3	4	5
32. You child is at home without adult supervision.	1	2	3	4	5
33. You spank your child with your hand when he/she has done something wrong.	1	2	3	4	5
34. You ignore your child when he/she is misbehaving.	1	2	3	4	5
35. You slap your child when he/she has done something wrong.	1	2	3	4	5
36. You take away privileges or money from your child as a punishment.	1	2	3	4	5
37. You send your child to his/her room as a punishment.	1	2	3	4	5
38. You hit your child with a belt, switch, or other object when he/she has done something wrong.	1	2	3	4	5
39. You yell or scream at your child when he/she has done something wrong.	1	2	3	4	5
40. You calmly explain to your child why his/her behavior was wrong when he/she misbehaves.	1	2	3	4	5

|	Never	Almost Never	Sometimes	Often	Always
41. You use time out (make him/her sit or stand in a corner) as a punishment.	1	2	3	4	5
42. You give your child extra chores as a punishment.	1	2	3	4	5

Trail Making Test, Part A

Interviewer instructions: Ask the mother/child to use a pen or a pencil and ask if she/he is willing to do a different kind of task, a drawing task. If she/he agrees, then state: *"These next questions have to do with different ways of thinking. On this sheet there are numbers 1 through 8. I'm going to ask you to draw a line connecting the numbers in order, starting with 1* (point)*, then 2* (point)*, then 3* (point) *and so on, ending with the number 8* (point)*. Try to go as quickly as you can, without making any mistakes. Are you ready?"* Show the mother/child how to do this if she/he makes any mistakes.
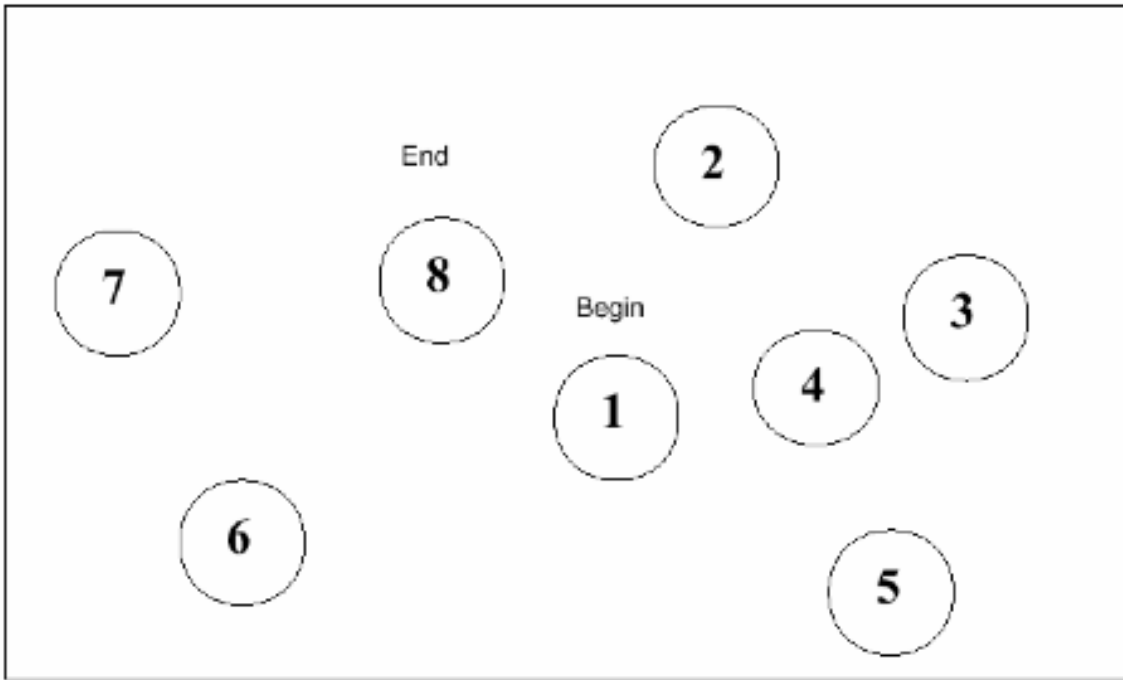
Interviewer instructions: Only continue if the mother/child is able to complete the practice set. Then make the following statement, *"On this sheet, there are numbers 1 through 25. I'm going to ask you to draw a line connecting the numbers, starting with 1* (point)*, then 2* (point)*, then 3* (point) *and so on, ending with the number 25* (point)*. Try to go as quickly as you can, without making any mistakes. Are you ready?"* Instruct the mother/child to begin when you press "start" on the stopwatch. Correct her/him if she/he makes mistakes, keeping the timer running as you do so. Stop timing when she/he reaches the number 25 and record the number of seconds it took her/him to complete the task and the number of mistakes made.

1) Seconds to complete task: _____
2) Mistakes made: _____
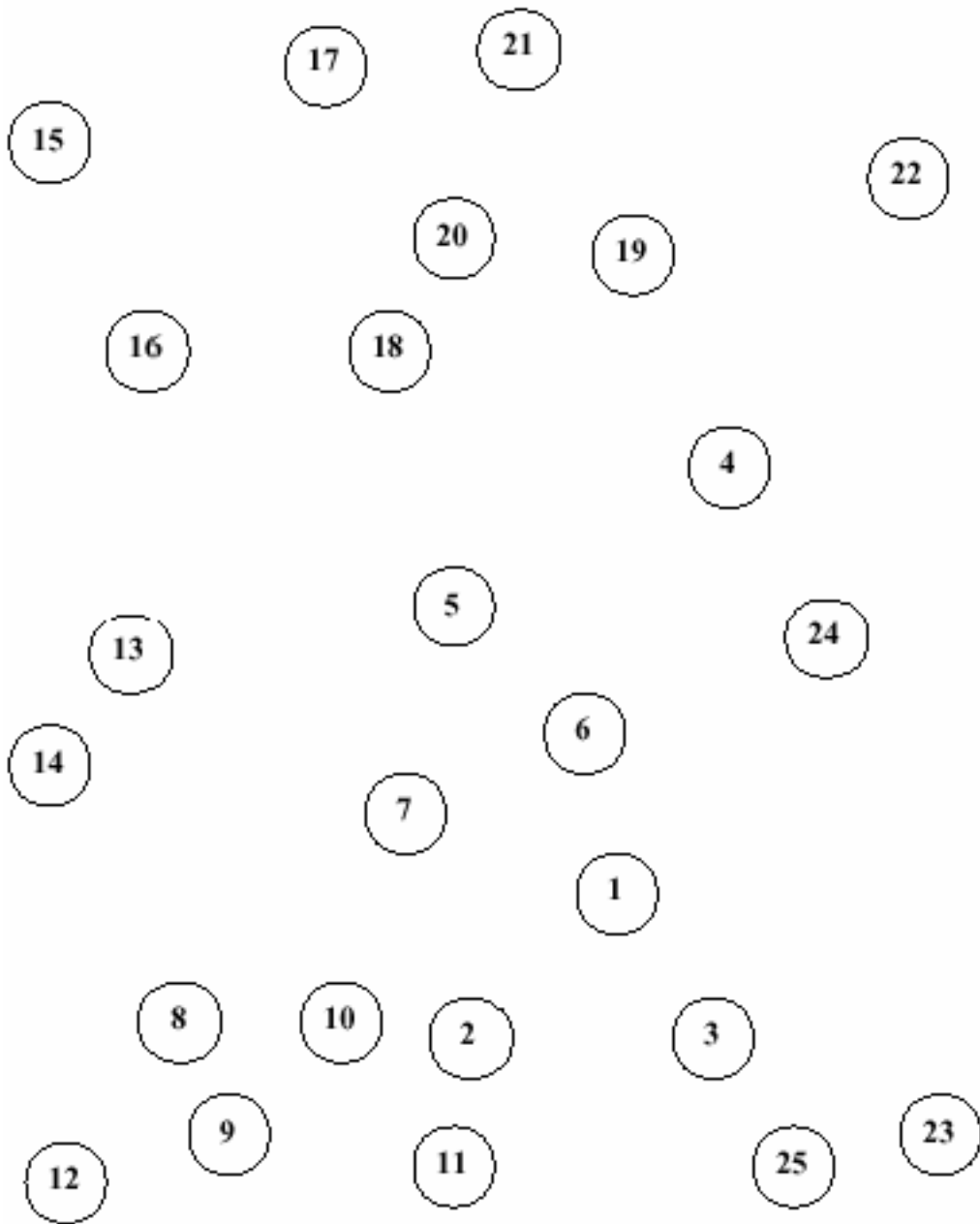
Trail Making Test, Part B

Interviewer instructions: Still using a pen or a pencil, make the following statement, *"On this sheet there are numbers 1 through 4 and letters A through D. Now I'm going to ask you to draw a line alternating between numbers and letters in order, so you'll start with a number, then go to a letter, then a number, then a letter, and so on. For example, you'll start with 1* (point), *then draw the line to A* (point), *then 2* (point), *then B* (point), *then 3* (point), *then C* (point), *and so on, ending with the letter D* (point). *Try to go as quickly as you can, without making any mistakes. Are you ready?"* Show the correct answers if she/he makes any mistakes.
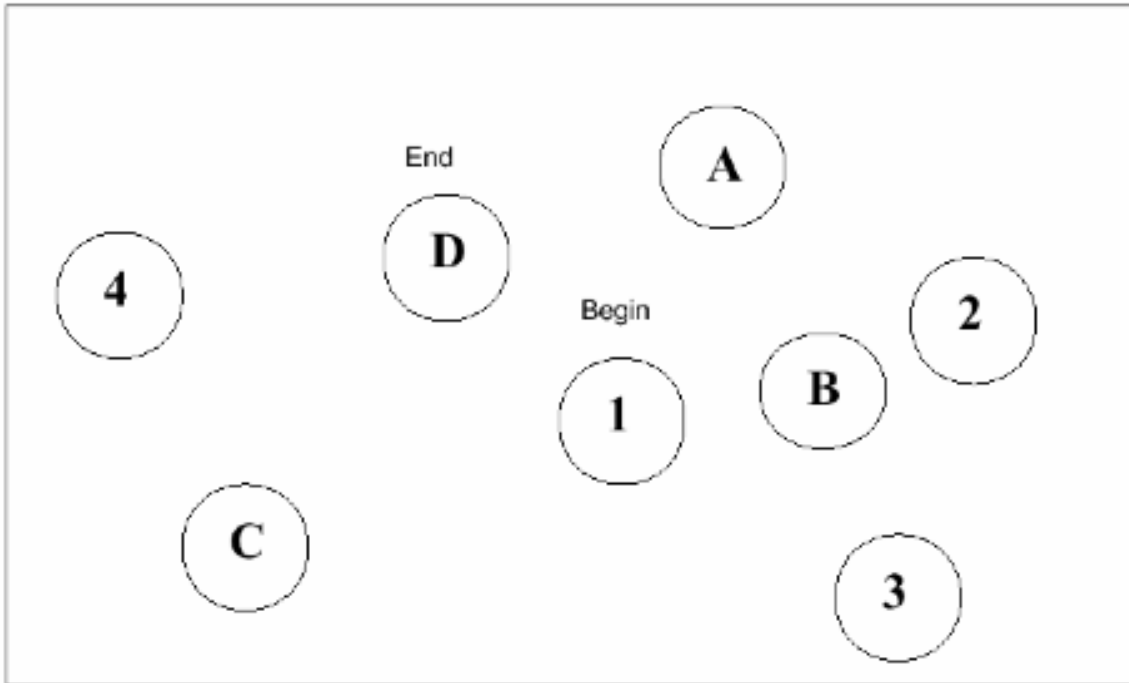
Interviewer instructions: Only continue if the mother/child is able to complete the part B practice set. Then make the following statement, *"On this sheet there are numbers 1 through 12 and letters A through L. Now I'm going to ask you to draw a line alternating between numbers and letters in order, so you'll start with a number, then go to a letter, then a number, then a letter, and so on. For example, you'll start with 1* (point), *then draw the line to A* (point), *then 2* (point), *then B* (point), *then 3* (point), *then C* (point), *and so on, ending with the letter L* (point). *Try to go as quickly as you can, without making any mistakes. Are you ready?"* Instruct the mother/child to begin when you press "start" on the stopwatch. Correct her/him if she/he makes mistakes, keeping the timer running as you do so. Stop timing when she/he reaches the letter L and record the number of seconds it took her/him to complete the task and the number of mistakes made.
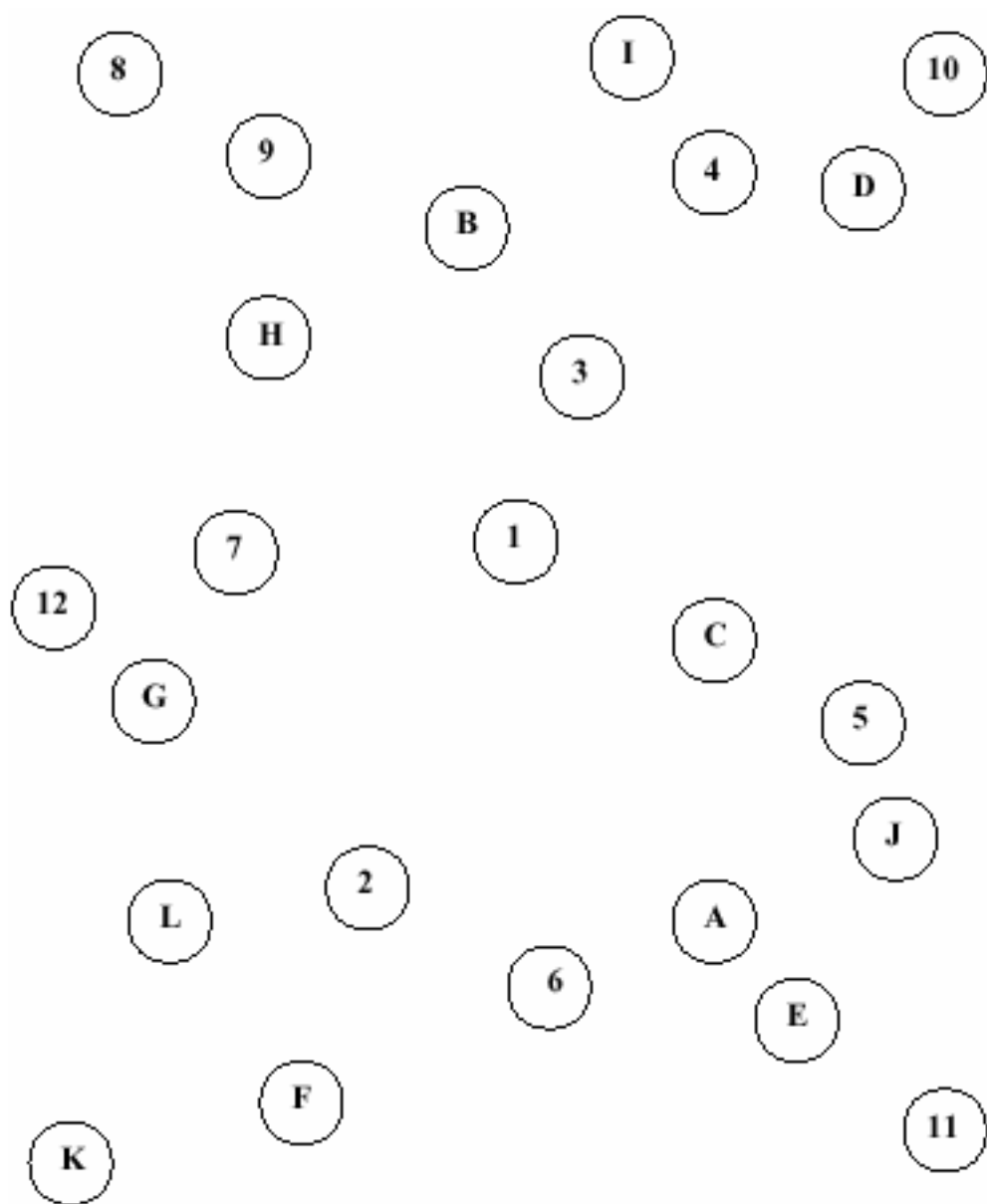
1) Seconds to complete task: _____
2) Mistakes made: _____

Stroop Color and Word Test

Interviewer instructions: Say, *"Now I want you to try something different. See these words* (point)*? Will you please read them to me?*

Only continue if the mother/child reads the words correctly. Then say, *"Now I'd like you to tell me what color they are printed in."* Have the participant state the color of the words and correct any mistakes.

PURPLE YELLOW RED

Interviewer instructions: Only continue if the participant was able to get 2/3 of the practice items correct. Say, *"Now I want you to do the same thing, for more words. Tell me what color the words are printed in, instead of the word itself. Go as quickly as you can, without making any mistakes. Are you ready?"* Instruct the mother/child to begin when you press "start" on the stopwatch. Correct her/him if she/he makes mistakes, keeping the timer running as you do so. Stop timing when she/he states the last color and record the number of seconds it took her/him to complete the task and the number of mistakes made.

    1)   Seconds to complete task: _____
    2)   Mistakes made: _____

BLACK RED GREEN
RED YELLOW ORANGE
BLUE PURPLE BLACK
RED GREEN ORANGE
PURPLE RED GREEN
YELLOW BLUE RED
ORANGE BLACK BLUE
BLACK GREEN YELLOW
RED PURPLE ORANGE

Child Behavior Checklist

Below is a list of questions that have been used in studies of more than 10,000 children across the country -- not all of them will apply to your child. I'm going to go through a list of things that may be true of your child. If one is true of your child **in the last six months**, please let me know. I will then ask you if it happens often or only sometimes.

0=Not True   1=Somewhat or Sometimes True   2=Very or Often True

0   1   2   1. Acts too young for his/her age
0   1   2   2. Allergy (describe):
0   1   2   3. Argues a lot
0   1   2   4. Asthma
0   1   2   5. Behaves like opposite sex
0   1   2   6. Bowel movements outside toilet
0   1   2   7. Bragging, boasting
0   1   2   8. Can't concentrate, can't pay attention for long
0   1   2   9. Cant get his/her mind off certain thoughts or obsessions
0   1   2   10. Can't sit still, restless, or hyperactive
0   1   2   11. Clings to adults or too dependent
0   1   2   12. Complains of loneliness
0   1   2   13. Confused or seems to be in a fog
0   1   2   14. Cries a lot
0   1   2   15. Cruel to animals
0   1   2   16. Cruelty, bullying, or meanness to others
0   1   2   17. Day-dreams or gets lost in his/her thoughts
0   1   2   18. Deliberately harms self or attempts suicide
0   1   2   19. Demands a lot of attention
0   1   2   20. Destroys his/her own things
0   1   2   21. Destroys things belonging to family or other children
0   1   2   22. Disobedient at home
0   1   2   23. Disobedient at school
0   1   2   24. Doesn't eat well
0   1   2   25. Doesn't get along with other children
0   1   2   26. Doesn't seem to feel guilty after misbehaving
0   1   2   27. Easily jealous
0   1   2   28. Eats or drinks things that are not food
0   1   2   29. Fears certain animals, situations, or places, not in school
0   1   2   30. Fears going to school
0   1   2   31. Fears he/she might think or do something bad
0   1   2   32. Fears he/she has to be perfect
0   1   2   33. Fears or complains that no one loves him/her
0   1   2   34. Fears others are out to get him/her
0   1   2   35. Feels worthless or inferior
0   1   2   36. Gets hurt a lot, accident-prone
0   1   2   37. Gets in many fights
0   1   2   38. Gets teased a lot
0   1   2   39. Hangs around with children who get in trouble
0   1   2   40. Hears things that aren't there
0   1   2   41. Impulsive or acts without thinking
0   1   2   42. Likes to be alone
0   1   2   43. Lying or cheating
0   1   2   44. Bites fingernails
0   1   2   45. Nervous, high-strung, or tense
0   1   2   46. Nervous movements or twitching

0	1	2	47. Nightmares
0	1	2	48. Not liked by other children
0	1	2	49. Constipated, doesn't move bowels
0	1	2	50. Too fearful or anxious
0	1	2	51. Feels dizzy
0	1	2	52. Feels too guilty
0	1	2	53. Overeating
0	1	2	54. Overtired
0	1	2	55. Overweight
			56. Physical problems
0	1	2	a. Aches or pains
0	1	2	b. Headaches
0	1	2	c. Nausea, feels sick
0	1	2	d. Problems with eyes
0	1	2	e. Rashes or other skin problems
0	1	2	f. Stomachaches or cramps
0	1	2	g. Vomiting, throwing up
0	1	2	h. Other (describe):
0	1	2	57. Physically attacks people
0	1	2	58. Picks nose, skin, or other parts of body (describe):
0	1	2	59. Plays with own sex parts in public
0	1	2	60. Plays with own sex parts too much
0	1	2	61. Poor school work
0	1	2	62. Poorly coordinated or clumsy
0	1	2	63. Prefers playing with older children
0	1	2	64. Prefers playing with younger children
0	1	2	65. Refuses to talk
0	1	2	66. Repeats certain acts over and over, compulsions (describe):
0	1	2	67. Runs away from home
0	1	2	68. Screams a lot
0	1	2	69. Secretive, keeps things to self
0	1	2	70. Sees things that aren't there without known medical cause
0	1	2	71. Self-conscious or easily embarrassed
0	1	2	72. Sets fires
0	1	2	73. Sexual problems (describe):
0	1	2	74. Showing off or clowning
0	1	2	75. Shy or timid
0	1	2	76. Sleeps less than most children
0	1	2	77. Sleeps more than most children during day and/or night
0	1	2	78. Smears or plays with bowel movements
0	1	2	79. Speech problems
0	1	2	80. Stares blankly
0	1	2	81. Steals at home
0	1	2	82. Steals outside the home
0	1	2	83. Stores up things he/she doesn't need
0	1	2	84. Strange behavior
0	1	2	85. Strange ideas
0	1	2	86. Stubborn, sullen, or irritable
0	1	2	87. Sudden changes in mood or feelings
0	1	2	88. Sulks a lot
0	1	2	89. Suspicious
0	1	2	90. Swearing or obscene language
0	1	2	91. Talks about killing self
0	1	2	92. Talks or walks in sleep
0	1	2	93. Talks too much

0	1	2	94. Teases a lot
0	1	2	95. Temper tantrums or hot temper
0	1	2	96. Thinks about sex too much
0	1	2	97. Threatens people
0	1	2	98. Thumb-sucking
0	1	2	99. Too concerned with neatness or cleanliness
0	1	2	100. Trouble sleeping (describe)
0	1	2	101. Truancy, skips school
0	1	2	102. Underactive, slow moving, or lacks energy
0	1	2	103. Unhappy, sad, or depressed
0	1	2	104. Unusually loud
0	1	2	105. Uses alcohol or drugs
0	1	2	106. Vandalism
0	1	2	107. Wets self during the day
0	1	2	108. Wets the bed
0	1	2	109. Whining
0	1	2	110. Wishes to be of opposite sex
0	1	2	111. Withdrawn, doesn't get involved with others
0	1	2	112. Worrying
0	1	2	113. Are there any other problems you child has?

Participant Consent

Mothers' Consent to Participate

Consent to Participate in a Research Study

Title of the Project: The Early Child Intervention Follow-up Program
Principal Investigator: Sandra Graham-Bermann, Ph.D., The University of Michigan

Co-investigator: Andrew Grogan-Kaylor, Ph.D., The University of Michigan

Invitation to Participate in a Research Study

We invite you to be part of a research study about how domestic violence affects children **over time**. Many children are exposed to violence every year and children can have problems as a result. We know that children do better when their mothers get support after violence. But we don't know very much about how early support affects children in the when they get older. Psychologists and social workers at the University of Michigan are trying to learn more about the best way to help children exposed to domestic violence. In this study we want to do three things. First, we want to find out whether mothers and their young children who take part in group support programs do better over time than mothers and children who do not take part in group support programs. Second, we want to find out which mothers and which children are helped the most. Third, we want to learn more about the ways mothers and children cope with the violence and stress in their lives over time.

Description of Your Involvement

If you agree to be part of the research study, we will ask you and your child who participated in the Early Child Intervention study to complete an interview now, Then we ask permission to contact you for an additional interview in the future. Today we will ask you about both the strengths and problems in your family. The questions ask about the stressful experiences you may have had, including the violence in your life, how you and your child are coping now, and your thoughts on parenting and your child's behavior. We will also ask you to complete some tasks to look at how mothers plan and pay attention to words and feelings. We want to learn how mothers and children are doing over time following violence.

The interviews take place at the University of Michigan or at another convenient and safe place. Money for transportation costs and childcare for younger or older siblings are provided, if needed. The interviewers and childcare providers are graduate students in

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psychology and social work, and junior and senior college students at the University of Michigan.

Benefits of Participation

Although you may not directly benefit from being in this study, others may benefit because this information will be used to improve services for mothers and children who experience domestic violence.

Risks and Discomforts of Participation

There is nor more than minimal risk or discomfort from your participation in this research. However, if you feel uncomfortable or distressed during any part of the interview we will be glad to end it at any time. The interviewers are trained in interviewing women exposed to domestic violence and will be sensitive to your needs. A list of affordable services will be provided to you should you want to contact either a shelter or mental health agency in the future.

Compensation for Participation

For your participation in this research project, you will receive $75 in cash for each interview. You can skip any question or task. You will still be paid $75 even if you choose to end the interview early.

Confidentiality

To help us protect your privacy, we have applied for a Certificate of Confidentiality from the National Institutes of Health. The researchers can use this Certificate to legally refuse to disclose information that may identify you in any federal, state, or local civil, criminal, administrative, legislative, or other proceedings, for example, if there is a court subpoena. The researchers will use the Certificate to resist any demands for information that would identify you, except as noted below. A Certificate of Confidentiality does not prevent you or a member of your family from voluntarily releasing information about yourself or your involvement in this research. For example, if an insurer, medical care provider, or other person obtains your written consent to receive research information, then the researchers will not use the Certificate to withhold that information. The Certificate of Confidentiality will not be used to prevent disclosure to state or local authorities of child abuse and neglect. That means, your responses will be kept confidential with this exception - if you or your child tells us something that makes us believe that your child is being physically harmed, we may report that information to the appropriate agencies. It is possible that other people may need to see the information you give us as part of the study, such as organizations responsible for making sure the research is done safely and properly like the University of Michigan or government offices.

We plan to publish the results of this study, but we will not include any information that would identify you. When information is reported, it will be used to describe groups and not individual people. All the personal information you give us (in other words, your name or any identifying information) will be kept strictly confidential and will not be shared with anyone outside of the Early Child Intervention Follow-up research staff, with the exceptions noted above. Numbers will be substituted for names in our data files for identification purposes. Papers that link names with identification numbers will be kept in

a locked file in the project director's locked office with keys given only to members of the program staff.

Storage and Future Use of Data

We will store your data to use for future research studies. Only the program staff will have access to your interview papers and only data without names or other information that could identify you or your child will be shared with other researchers, including those outside of the University of Michigan. Your personal identifiers will be retained if you give us permission to be contacted for an additional interview (outside of this second interview) at some time in the future.

Voluntary Nature of the Study

Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and end the interview at any time. You do not have to answer a question you do not want to answer. Just tell us and we will go to the next question. If you decide to drop out of the study before this study is over it will not result in negative consequences to you or your child. All documents with your identifying information on them will be shredded should you decide to drop out of the study.

Contact Information for the Study Team

If you have questions about this research, including questions about scheduling or your compensation for participating, you may contact **Sandy Graham-Bermann, Project Director, at the toll-free number – 734-647-0789.**

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the:

University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board
2800 Plymouth Road
Building 520, Room 1169
Ann Arbor, MI 48109-2800
Phone: (734) 936-0933 or toll free, (866) 936-0933
Email: irbhsbs@umich.edu

Consent

You can either sign this consent form or just give your initials below. Either way, you are agreeing to be in the study. We will give you a copy of this consent form for your records. We will keep one copy with the study records. Be sure that I/we have answered any questions you have about the study and that you understand what you are being asked to do. You may contact the researcher if you think of a question later.

I agree to participate in the study.

_____
Printed Name

_____
Signature or Initials   Date

I agree that my data may be used in future research.   YES_____NO_____
_____
Signature or Initials

Mothers' Consent for Child to Participate

Consent for Child to Participate in a Research Study

Title of the Project: The Early Child Intervention Follow-up Program

Principal Investigator: Sandra Graham-Bermann, Ph.D., The University of Michigan

Co-investigator: Andrew Grogan-Kaylor, Ph.D., The University of Michigan

Invitation for Your Child to Participate in a Research Study

We also invite your child to be part of a research study about how domestic violence affects children. Many children are exposed to violence every year and children can have problems as a result. We know that children do better when they and their mothers get support after violence. But we don't know very much about how early support affects children over time. Psychologists and social workers at the University of Michigan are trying to learn more about the best way to help children exposed to domestic violence. In this study we want to do three things. First, we want to find out whether mothers and their young children who take part in group support programs do better over time than mothers and children who do not take part in group support programs. Second, we want to find out which mothers and which children are helped the most. Third, we want to learn more about the ways mothers cope with the violence and stress in their lives.

Description of Your Child's Involvement

If you agree for your child to be part of the research study, we will ask your child who was part of the Preschool Kids' Club study to complete an interview. The interview will take place at the University of Michigan or at another convenient and safe location. When we talk with your child we will ask about both the strengths and problems in your family. For example, we will ask things like what your child thinks about how your family resolves conflicts, what is good about families, and the meaning of everyday words. In addition a 5 minute task is used to find out how your child pays attention to shapes and words. This interview will take about 45 minutes.

Even though you give your permission, your child can skip any question or task and end early if he or she chooses. The interview will end if the child shows any signs of discomfort. Your child will still be given a gift, even if he or she ends the interview early. You are welcome to view the interview questions that we will ask your child now, or at any time in the future, but we will not share your child's answers to the questions.

Benefits of Participation

Although your child may not directly benefit from being in this study, other people may benefit because what we learn will be used to improve how we help mothers and children who experience domestic violence.

Risks and Discomforts of Participation

There is no more than minimal risk of your child being uncomfortable if he or she participates in this research. If your child feels uncomfortable or distressed during any part of the interview we will be glad to end the interview at any time. The interviewers are trained in interviewing children exposed to domestic violence and will be sensitive to your child's needs. There is a small possibility that your child's personal information may become known to individuals who are not part of the study. There is also a chance that if information that you or your child shares makes us believe that the child is being physically harmed, we may report that information to the appropriate agencies.

Compensation for Participation

Your child will receive a small gift worth about $10 as a thank you after each interview, even if your child doesn't want to do the interview or ends early.

Confidentiality

To help us protect your privacy, we have applied for a Certificate of Confidentiality from the National Institutes of Health. The researchers can use this Certificate to legally refuse to disclose information that may identify your child in any federal, state, or local civil, criminal, administrative, legislative, or other proceedings, for example, if there is a court subpoena. The researchers will use the Certificate to resist any demands for information that would identify your child, except as noted below. A Certificate of Confidentiality does not prevent you or a member of your family from voluntarily releasing information about your child or their involvement in this research. For example, if an insurer, medical care provider, or other person obtains your written consent to receive research information, then the researchers will not use the Certificate to withhold that information. The Certificate of Confidentiality will not be used to prevent disclosure to state or local authorities of child abuse and neglect. That means, your child's responses will be kept confidential with this exception - if you or your child tells us something that makes us believe that your child is being physically harmed, we may report that information to the appropriate agencies. It is possible that other people may need to see the information you give us as part of the study, such as organizations responsible for making sure the research is done safely and properly like the University of Michigan or government offices.

We plan to publish the results of this study. We will not include any information that would identify your child. When information is reported, it will be used to describe groups and not individual people. Your child's privacy will be protected and your child's research records will be confidential. All the personal information your child gives us will be kept strictly confidential and will not be shared with anyone outside of the Early Child Intervention Follow-up Program staff. Names will not be used so that confidentiality will be protected. Numbers will be substituted for names for identification purposes. Papers

that link names with identification numbers will be kept in a locked file in the project director's locked office. It is possible that other people may need to see the information your child gives us as part of the study, such as organizations responsible for making sure the research is done safely and properly like the University of Michigan or government offices.

Storage and Future Use of Data

We will store your child's answers without personal information to use for future research studies. Only the program staff will have access to your child's interview papers. We may share the answers with other researchers outside the University of Michigan, however we will not share any names or other information that could identify you or your child.

Voluntary Nature of the Study

Participating in this study is completely voluntary. Even if you and your child decide to participate now, you or your child may change your mind and end the interview at any time. Your child does not have to answer a question they do not want to answer. If you or your child decides to end before this study is completed it will not result in negative consequences to you or your child. All documents with your information on them will be shredded if you decide to withdraw from the study.

Contact Information for the Study Team

If you have questions about this research, including questions about scheduling or your compensation for participating, you may contact **Sandy Graham-Bermann, Project Director, at the toll-free number – 734-647-0789.**

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the:

University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board
2800 Plymouth Road
Building 520, Room 1169
Ann Arbor, MI 48109-2800
Phone: (734) 936-0933 or toll free, (866) 936-0933
Email: irbhsbs@umich.edu

Consent

You can either sign this document or just give your initials below. By doing that you are agreeing for your child to be in the study. We will give you a copy of this form for your records. We will keep one copy with the study records. Be sure that we have answered

any questions you have about the study and that you understand what you are being asked to do. You may contact the researcher if you think of a question later.

I agree to allow my child to participate in the study.

_____
Printed Name

_____
Signature or Initials   Date

I agree that my child's data may be used in future research.   YES_____
          NO_____

_____
Signature or Initials

Child Assent to Participate

CHILD ASSENT TO BE INTERVIEWED FORM

Hello _____. My name is _____ (interviewer's first name)_____.

I am talking to kids about what they think and about what words they know. I also ask children to draw and read some words. Is it OK with you if I ask you some questions and show you some pictures? Even though your mom said it is OK, you don't have to answer questions right now if you don't want to. (IF Yes) You can skip any questions that you don't want to answer and stop any time you like. (IF No) It's OK if you don't want to answer questions right now. (Either way) I have a small gift for you to thank you for your time.

[ ] Child gives assent (agrees) to participate.

[ ] Child would rather not participate.

Child's First Name: _____

Interviewer's Name: _____

Date: _____