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Children's executive function in a CPS-involved sample: Effects of cumulative adversity and specific types of adversity

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ABSTRACT

Prior research has identified the presence of executive function (EF) deficits in child protective service (CPS) involved (versus non-involved) children but minimal work has examined predictors that might explain individual differences within these CPS-involved children. Here, we sought to characterize EF in a large sample ($N = 694$) of CPS-involved children and examine how specific adversities (physical abuse, neglect, caregiver domestic violence, and caregiver substance dependence) and cumulative adversity (at ages 0–3 and 3–6 years) predict EF (at approximately 5–6 years). It was expected that the sample would exhibit low EF overall based on previous research in maltreated children. Specific adversity and cumulative adversity analyses were largely exploratory given the limited previous work in this area. Results indicated poor EF overall, with 43.5% of children performing worse than chance. Among children who performed greater than chance, higher cumulative adversity, physical abuse, and caregiver substance use (at ages 3–6 years) predicted better EF. These findings join literature documenting that, within CPS-involved children, the presence of certain adversities predicts variable cognitive function. Findings highlight the potential relevance of evolutionary psychology to understanding how alterations in behavior linked to harsh and unpredictable early environments may cue accelerated brain development underlying relative cognitive advantages, within at-risk, low performing samples. Longitudinal studies are critical to determine if the relative EF advantages linked to higher adversity persist over time or result in lower EF later on, reflecting a more rapid, but overall limited, trajectory of cognitive development.

Children involved with child protective services (CPS) are at risk for a host of negative outcomes across socioemotional, academic, health, and risk-taking domains (Gramkowski et al., 2009; Leslie et al., 2005; Pears, Fisher, Bruce, Kim, & Yoerger, 2010). Although the types of outcomes associated with CPS involvement vary widely, executive function (EF), defined as effortful cognitive process necessary for goal-directed behavior, appears to be a core capacity underlying negative outcomes for CPS-involved children. A growing body of research has demonstrated that individuals exposed to a range of adversities common to CPS-involved children (e.g., trauma, neglect, homelessness) tend to exhibit poor EF, compared with children without such experience (DePrince, Weinzierl, & Combs, 2009; Hostinar, Stellern, Schaefer, Carlson, & Gunnar, 2012; Pechtel & Pizzagalli, 2011). Furthermore, EF has frequently been shown to be a mediator between early adversity and later life outcomes, which underscores the importance of understanding factors associated with EF performance among high-risk samples (Masten et al., 2012; Pears et al., 2010).

Although research that has compared children exposed to adversity (versus those not exposed) has been key for documenting that the presence (versus absence) of adversities is, on average, associated with lower EF, for the most part it has failed to draw consistent conclusions about the influence of specific aspects of rearing environments. Given that adversities (e.g., caregiver transitions, parental substance use, maltreatment, domestic violence) often co-occur in the CPS population at rates of 80%–98%, additional precision regarding the relevance of certain experiences, while controlling for others, is needed (Dong et al., 2004; Pears, Kim, & Fisher, 2008). Children referred to CPS are a particularly important group in which to characterize how different experiences contribute to individual differences in EF given that these children often exhibit EF deficits and associated negative outcomes such as academic and socioemotional difficulties (Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007; Pears & Fisher, 2005).

In an effort to understand individual differences within CPS-involved samples, who exhibit poor EF as a whole, researchers have begun to investigate how specific experiences may differentially predict performance in EF-related tasks. There is a tendency to assume that higher levels of adversity should be associated with worse outcomes (Evans, Li, & Whipple, 2013). However, the nature of the association appears to be nuanced. Although research generally shows that, compared

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with community controls, maltreated and/or CPS-involved children show diminished EF performance (e.g. Fishbein et al., 2009; DePrince et al., 2009; Kirke-Smith, Henry, & Messer, 2014), higher cumulative adversity (i.e. number of types of maltreatment or caregiver risks) does not necessarily predict worse EF within at-risk samples. In fact, multiple studies have reported that cumulative adversity is either unrelated to EF performance or predictive of relatively higher cognitive function (Mothes et al., 2015; Revington, Martin, & Seedat, 2011; Pears & Fisher, 2005). These findings may seem counterintuitive, but they are not inconsistent with "life history" theories that suggest when children are exposed to early life stress, particularly harsh and unpredictable types, biology (and brain function) can be directed toward a fast life history strategy that may accelerate development toward an early-to-mature, adult-like profile (Belsky, Schlomer, & Ellis, 2012). This earlier adaptation is theorized to have costs further down the line (e.g., less-complex total brain development), yet overall benefits for survival and reproduction, given environmental circumstances (Del Giudice, Gangestad, & Kaplan, 2015).

Other research has sought to examine the links between specific types of adversity and EF function to understand if certain experiences can explain within-group variability, but results have been limited because of the typically small size of CPS-involved samples. One study investigating profiles of maltreatment in a foster care sample found that a typology characterized by sexual abuse predicted relatively higher cognitive performance, compared with typologies without sexual abuse (Pears et al., 2008). Other research has found that the presence of severe neglect predicts EF deficits, with longer duration of neglect predicting incremental differences in performance (Hostinar et al., 2012; Pears & Fisher, 2005). Notably, however, the findings regarding neglect were drawn from small samples with a history of severe neglect (e.g., institutionalized care settings), and CPS-involved samples may not consistently experience thresholds of neglect severe enough to cause widespread cognitive impairment.

To better understand how exposure to specific adversities is linked to individual differences in EF, we conducted a systematic assessment of maltreatment and caregiver risk in a large sample ($N = 694$) of CPS-involved children. First, we examined the link between EF performance (at approximately 5–6 years) and sociodemographic and CPS-related covariates (e.g., maternal education, household income, child age, child sex, child out-of-home placements) to determine the extent to which covariates were predictive of EF performance in CPS-involved children. Next, we assessed how cumulative exposure to maltreatment (physical abuse, neglect) and caregiver risk (domestic violence, substance abuse), as assessed via caregiver self-report survey, predicted subsequent EF performance, to build on previous work with CPS-involved samples that linked cumulative adversity to higher EF performance (Pears & Fisher, 2005). Finally, we assessed the specific contributions of each maltreatment and caregiver adversity experience to EF performance.

Previous research has emphasized the importance of timing of environmental experiences for EF function and the overall development. This includes research from the executive function domain noting the changing parental support needs of children in the toddler versus preschool years (see Carlson, 2009 for a review). Evolutionary psychology research has identified the early childhood years, broadly, as being highly relevant to life-history strategies with potential mechanisms including more generalized pathways in infancy/toddlerhood (e.g. attachment, chemical-signalling in breast milk) and more specific pathways in the preschool period (e.g. harsh, unpredictable punishment; Simpson, Griskevicius, Kuo, Sung, & Collins, 2012; Hinde et al., 2014). Based on these theories, we examined two developmental time periods (0–3 and 3–6 years) in order to determine the impacts of adversity exposure during each time period on cognitive performance. Such a separate consideration is also useful given the differential nature of intervention strategies in the infancy/toddlerhood versus preschool years (e.g. Ramey & Ramey, 1998; Pears et al., 2013).

This research was conducted using data drawn from a nationally representative survey of all children with an open CPS case. As a whole, the group was expected to exhibit lower levels of performance than have been reported in previous research among community children. We also expected there would be significant variability in EF performance predicted by different types of adversity, but the directionality of associations was largely exploratory, because of the limited previous research in this area. In regard to cumulative adversity, we expected that higher cumulative adversity would predict relatively better EF performance in this at-risk sample, consistent with previous findings and life-history theory (e.g., Pears & Fisher, 2005). We also anticipated stronger links between EF and adversity at ages 3–6 years given that the preschool years have been identified as a critical period for EF development (Carlson, 2009; Cicchetti & Toth, 1992; Garon, Bryson, & Smith, 2008). Insight gained from this research on individual differences in EF performance may be particularly meaningful in that contact with CPS can offer a critical opportunity for early EF intervention and prevention of negative long-term outcomes.

1. Materials and methods

1.1. Participants

Secondary data analysis was conducted on data from the National Survey of Child and Adolescent Well-Being I (NSCAW I), a longitudinal study designed to evaluate outcomes for children involved in the child welfare system who were referred to CPS between 1999 and 2000 (Dowd et al., 2002). NSCAW data were collected from multiple sources, including children, caregivers, and CPS administrative statistics. The Wave 1 interview occurred within 6 months of the initial CPS investigation, followed by the Wave 2 interview at 12 months post-baseline, Wave 3 at 18 months post-baseline, Wave 4 at 36 months post-baseline, and Wave 5 at 59–97 months post-baseline. Our study excluded Wave 2 data because maltreatment, caregiver risk, and covariates of interest were not assessed at that time point.

Although the entire NSCAW sample is nationally representative of all children with an open CPS case during the study recruitment months (selected from 92 primary sampling units in 97 counties across the nation), our study focused on a subset of the children who completed the flanker task (described in later sections of this article; Webb, Dowd, Harden, Landsverk, & Testa, 2009). All children who were infants (age < 1 year; $N = 1186$) at initial CPA investigation were eligible to participate in the flanker task at Wave 5; 694 children completed at least 2 of the 3 flanker task blocks, (out of 790 children who participated). Because this subset of 694 children who completed the flanker task was not sampled in a nationally representative manner, weights and stratification variables are not included in our analyses.

1.2. Sociodemographic covariates

Sociodemographic covariates (see Table 1.) examined include Wave 5 child age ($M = 5.27$, $SD = 0.45$ years), gender (50.1% male), and race/ethnicity (40.6% black/non-Hispanic, 34.4% white/non-Hispanic, 18.1% Hispanic; 6.9% other). Caregiver education level (23.5% < high school equivalent; 46.9% high school equivalent; 22.5% vocational certificate, diploma, or associates degree; 7.0% bachelor's degree or higher) and annual household income (median = $20,000–$24,999) were also examined. This information was obtained from in-person interviews with primary caregivers.

1.3. Child protective service covariates

Additional variables relevant to CPS involvement were derived from interviews with primary caregivers. They included the total number of out-of-home living arrangements by Wave 5 (46.9% = 0, 14.4% = 1, 13.7% = 2, 25.0% = 3+) and substantiated initial CPS report (66.8%,