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Longitudinal association of child maltreatment and cognitive functioning: Implications for child development

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ABSTRACT

Although research investigating associations among child maltreatment, cognitive functioning, and academic achievement has grown in recent years, important questions remain. In particular, assessing the influence of maltreatment apart from that of other co-occurring and confounding factors remains difficult. This study was developed to further the field's understanding by investigating cognitive functioning in association with time-variant maltreatment patterns. Using multiple time-variant linear mixed models, we investigated the relationships between maltreatment timing and three domains of cognitive functioning (i.e., knowledge, comprehension, and analysis). In general, the cognitive functioning of students who experienced maltreatment was lower than that of their peers who had yet to experience maltreatment at the time of testing. Results of LMM indicated that the cognitive functioning of students who experienced maltreatment *concurrent* with the testing year fluctuated over time whereas the cognitive functioning of students who experienced maltreatment *prior to* or *after* the testing year remained stable. Students who experienced concurrent maltreatment showed the lowest functioning of any group. While maltreatment timing was a significant predictor of cognitive functioning over time, the addition of poverty into the model resulted in a non-significant effect of maltreatment timing. Additional research is needed to disentangle the longitudinal effect of maltreatment on cognitive functioning and address the interacting role of poverty and chronic maltreatment.

1. Introduction

Child maltreatment is broadly defined as consisting of abuse (emotional, physical, and sexual) and neglect ([Centers for Disease Control & Prevention, 2017](#)). In 2015, approximately 683,000 children were victims of such abuse and neglect across the United States, an increase of 3.8% from 2011 (658,000 child victims; [U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, & Children's Bureau, 2017](#)). Neglect was the most common type of child maltreatment (experienced by 75.3% of victims), followed by physical and sexual abuse (experienced by 17.2% and 8.4% of victims, respectively). The fatality rate attributed to child maltreatment in 2015 was estimated to be 2.25 per every 100,000 children ([U.S. Department of Health & Human Services et al., 2017](#)).

The consequences of child maltreatment have been well documented in the literature. For example, child maltreatment has been

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shown to cause, or has been associated with, a wide range of outcomes ranging from poor psychosocial development to unhealthy behaviors and other negative mental health outcomes (e.g., alcoholism, depression, drug abuse, suicidal behaviors, and high-risk sexual behaviors) across the lifespan (Agnew-Blais & Danese, 2016; Chen et al., 2010; Choi, DiNitto, Marti, & Segal, 2017; Irigaray et al., 2013; Li, D'arcy, & Meng, 2016; Maniglio, 2009, 2010; Norman et al., 2012; Pacheco, Irigaray, Nunes, & Argimon, 2014; Ports et al., 2017). However, when compared to these psychosocial factors and/or behavioral problems as primary outcomes of interest across the lifespan, relatively little research has been conducted on the relationship between child maltreatment and cognitive reasoning (Stone, 2007). In general, previous research has documented a negative association between child maltreatment and academic performance, such that maltreated children often present lower academic achievement than their non-maltreated counterparts (Ayoub et al., 2006; Eckenrode, Laird, & Doris, 1993; Irigaray et al., 2013; Kurtz, Gaudin, Wodarski, & Howing, 1993; Piescher, Colburne, LaLiberte, & Hong, 2014; Stone, 2007; Trickett & McBride-Chang, 1995).

However, these findings often convey less insight into how or why these relationships are formed. In addition, much of these research findings relied on methodologies that were not able to parse the influence of maltreatment from other co-occurring factors. For example, characteristics and experiences of families likely vary among maltreated and non-maltreated children, yet non-maltreated children often serve as the reference group in extant research. Differences in the characteristics and experiences of these groups of families may contribute to some of the dissimilarities between the academic achievement of maltreated and non-maltreated children. Deeper understanding of such a relationship is needed in order to conceptualize, create, and target adequate education-related services for maltreated children.

Research has suggested that children who have experienced maltreatment face challenges in executive functioning (DePrince, Weinzierl, & Combs, 2009), leaving them with limited cognitive capacity to devote to learning tasks (Aas et al., 2011). This is consistent with research suggesting that children who have experienced maltreatment perform more poorly on standardized achievement tests than their peers (Delaney-Black et al., 2002; Duplechain, Reigner, & Packard, 2008; Eckenrode et al., 1993; Piescher et al., 2014). In these studies, maltreatment is often measured in a dichotomous fashion, representing the presence or absence of maltreatment history (ever). Although a history of experiencing maltreatment generally has been associated with lower scores on cognitive functioning measures among children, these studies have rarely disentangled the timing of maltreatment from the overall effect of maltreatment on cognitive functioning during childhood. If the degree of cognitive functioning varies dependent on the timing of maltreatment (e.g., a general history of maltreatment vs. more proximal experiences of maltreatment), it would suggest that educational and psychological interventions for children who have experienced maltreatment should be differentiated and based on both their cognitive development and the timing of maltreatment experiences.

Using integrated, administrative, longitudinal data, we followed children living in Minnesota, who were enrolled in third through sixth grades in the 2008 academic year, and had child maltreatment experiences. This is the first population-based observational study to investigate the following objectives: (1) to examine if three domains of cognitive functioning (i.e., knowledge, comprehension, and analysis) varied by maltreatment experience timing (i.e., those with a history of maltreatment which preceded cognitive assessments [similar to how previous studies measured maltreatment history], those whose maltreatment experiences occurred concurrently with the first year of cognitive assessment, and a comparison group of children whose maltreatment experiences occurred after cognitive assessment was completed [representing a comparison group of similarly situated children who had yet to experience maltreatment at the time of assessment]), (2) to describe the variation of in cognitive functioning by maltreatment experience timing, and (3) to investigate the associations of maltreatment experiences with each domain of cognitive functioning. We hypothesized that children with earlier or concurrent maltreatment experiences may have lower levels of educational achievement as compared to those who experienced maltreatment at a later point in time. Further, the current study was designed to provide a deeper understanding of a previous population-based study about the child protection achievement gap (Piescher et al., 2014). In particular, Piescher et al.'s (2014) study showed that achievement gaps varied by academic performance of youth, but did not distinguish the timing of maltreatment or the effects of differential maltreatment timing on academic outcomes. Answering these research questions fills in gaps in existing knowledge, and will help educators and policymakers conceptualize and create education-related services specifically targeted to maltreated children.

2. Methods

2.1. Data source

This study relied on statewide secondary administrative data from the Minnesota Linking Information for Kids project (Minn-LInK) at the University of Minnesota, Twin Cities. The statewide administrative data consist of data from the Minnesota Departments of Education (MDE) and Human Services (DHS). DHS Social Service Information System (SSIS) data, which included a child's history of CPS involvement from birth, were also incorporated to identify youth with a maltreatment experience prior to, during, or following their first assessment of cognitive functioning in this study (April 13, 2008). The records for these children were then matched to their corresponding MDE Minnesota Automated Reporting Student System (MARSS) and MDE Minnesota Comprehensive Assessment II (MCA-II) records (i.e., the assessment of cognitive functioning). MARSS and MCA data provided demographic and academic information for all Minnesota youth named as alleged victims in at least one child maltreatment report. For this study, the academic year was defined as August 1 – July 31.

A quasi-experimental multiple baseline methodology using administrative data was chosen to examine the effect of maltreatment experience on cognitive functioning, in which conditions other than the maltreatment experience were used as conditions for assessing maltreatment experience effects (Gall, Borg, & Gall, 1996). This design allowed three groups of students to be compared by

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