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Identifying Maltreatment Subgroups with Patterns of Maltreatment Subtype and Chronicity: A Latent Class Analysis Approach

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Abstract

Maltreatment experiences are complex, and it is difficult to characterize the heterogeneity in types of maltreatment. Subtypes, such as emotional maltreatment, sexual abuse, physical abuse, and neglect commonly co-occur and may persist across development. Therefore, treating individual maltreatment subtypes as independently occurring is not representative of the nature of maltreatment as it occurs in children's lives. Latent class analysis (LCA) is employed herein to identify subgroups of maltreated children based on commonalities in maltreatment subtype and chronicity. In a sample of 674 low-income urban children, 51.6% of whom experienced officially documented maltreatment, our analyses identified four classes of children, with three distinct classes based on maltreatment subtypes and chronicity, and one group of children who did not experience maltreatment. The largest class of maltreated children identified was the chronic, multi-subtype maltreatment class (57% of maltreated children); a second class was characterized by only neglect in a single developmental period (31% of maltreated children), and the smallest class was characterized by a single subtype of maltreatment (emotional maltreatment, physical, or sexual abuse) occurring in a single developmental period (12% of maltreated children). Characterization of these groups confirms the overlapping nature of maltreatment subtypes. There were notable differences between latent classes on child behavioral and socio-emotional outcomes measured by child self-report and camp counselors report during a one-week summer camp. The largest differences were between the non-maltreated class and the chronic maltreatment class. Children who experienced chronic, multi-subtype maltreatment showed higher levels of externalizing behavior, emotion dysregulation, depression, and anxiety.

Keywords

child maltreatment; Latent class analysis

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Introduction

Child maltreatment is defined by harmful relational experiences perpetrated by parents or caregivers that are severely detrimental to child development. These pathogenic experiences differentially confer risk for maladaptation in psychological and biological developmental domains (Cicchetti & Toth, 2016) and can have a negative organizational influence on child development (Cicchetti, 1989). The etiology of maltreatment has been conceptualized as a transactional process that occurs at multiple ecological levels (Belsky, 1980; Cicchetti & Lynch, 1993; Cicchetti & Rizley, 1981; Sameroff & Chandler, 1975). Distal and proximal factors to the family environment interact to produce risk for perpetration of maltreatment (Cicchetti & Toth, 2006). This ecological complexity contributes to the heterogeneity of maltreatment experienced by a child across development. Furthermore, child maltreatment can initiate developmental cascades in functioning (Cicchetti & Tucker, 1994; Masten & Cicchetti, 2010) that are characterized by maladaptation in biological, interpersonal, psychological, and economic domains throughout the lifespan (Cicchetti & Toth, 2016; Currie & Widom, 2010; Keyes et al., 2012; Kim & Cicchetti, 2009; Sheppes, Suri, & Gross, 2015).

Historically, definitions of maltreatment have varied, contributing to difficulty in communication about the magnitude, prevalence, and negative impact of maltreatment. In recent years, researchers, clinicians, and policy makers have worked to define maltreatment more precisely (Manly, 2005). One effort to assess maltreatment systematically in the United States has been carried out by the National Incidence Study (NIS). In the most recent update of this effort (NIS-4, Sedlak et al., 2010), maltreatment is defined by an experience of abuse and/or neglect that either harms or endangers a child. Furthermore, clear and distinct definitional standards of maltreatment specify the kind of endangerment or harm that has occurred. The subtypes recognized by the NIS are abuse (emotional, sexual, or physical abuse) or neglect (physical, emotional, and educational neglect). The definitions of abuse and neglect are now largely consistent with other classification systems, such as the Maltreatment Classification System (MCS; Barnett, Manly, & Cicchetti, 1993), a widely used approach in research settings for classifying dimensions of maltreatment. Prevalence of maltreatment therefore depends on methodology, including sampling method, definitions of maltreatment, which can vary by state or country, and participant and sample characteristics, such as socio-economic status, age, and country in which research is conducted (Prevoo, Stoltenborgh, Alink, Bakermans-Kranenburg, & van IJzendoorn, 2017; Tran, Alink, Van Berkel, & Van Ijzendoorn, 2017).

Patterns of maltreatment exposure range from a single maltreatment subtype in a circumscribed developmental period to recurrent or chronic maltreatment involving multiple subtypes. These complex and overlapping dimensions are difficult to capture. Timing and chronicity of maltreatment consistently relate to differential outcomes in childhood and adulthood (Barnett et al., 1993; English, Graham, Litrownik, Everson, & Bangdiwala, 2005; Manly, Cicchetti, & Barnett, 1994; Manly, Kim, Rogosch, & Cicchetti, 2001). For example, Manly et al. (2001) found that maltreatment that occurs in infancy through preschool has a lasting effect on personality development and behavioral control in early childhood. Other studies link early and chronic maltreatment to an array of negative outcomes, including

childhood aggression (Manly et al., 1994), adolescent delinquency (Smith & Thornberry, 1995), adolescent marijuana use (Dubowitz et al., 2016), poor inhibitory control (Cowell, Cicchetti, Rogosch, & Toth, 2015), and emotion dysregulation (Kim & Cicchetti, 2009; Shields & Cicchetti, 1997). Early experiences of abuse are also related to neuroendocrine dysregulation (Cicchetti, Rogosch, Gunnar, & Toth, 2010; Cicchetti, Rogosch, Howe, & Toth, 2010; Stalder et al., 2016). More recently, prospective analyses of maltreatment have shown that maltreatment in earlier developmental periods predicts maltreatment in the next developmental period (Villodas et al., 2012). Although maltreatment is defined by specific instances of harm or endangerment, a maltreating familial context is often characterized my an interplay of stressors that confer risk for future maltreatment (Rogosch, Cicchetti, Shields, & Toth, 1995). This summary of research on chronicity is not exhaustive. However, these representative studies align with a developmental organizational perspective because they provide evidence that maltreatment experiences throughout childhood disrupt normative organizational processes during development and have a lasting impact on multiple domains of child functioning (Cicchetti, 1989).

Maltreatment subtype is the most frequently used maltreatment dimension in research studies. The subtypes frequently included in analyses are physical abuse, sexual abuse, emotional maltreatment, and neglect. Although space limits a comprehensive review of this extensive literature (for a recent review, see: Cicchetti & Toth, 2016), findings highlighted here are a sampling of studies that have demonstrated effects of maltreatment subtype on development. Physical abuse has been related to outcomes such as increased childhood aggression (Shields & Cicchetti, 1998), delinquency in early adulthood (Lansford et al., 2007), and social information processing deficits (Shackman & Pollak, 2014) that have been linked to greater risk for intergenerational maltreatment (Azar et al., 2016). Sexual abuse has received considerable attention as a single-subtype. Research indicates that effects of sexual abuse relate to serious mental health outcomes, including substance dependence, suicide, PTSD diagnosis and other health problems (Collishaw et al., 2007; Fergusson, McLeod, & Horwood, 2013; Kwako, Noll, Putnam, & Trickett, 2010; Molnar, Berkman, & Buka, 2001; Molnar, Buka, & Kessler, 2001; Nash, Hulsey, Sexton, Harralson, & Lambert, 1993). Recent international research suggests that even in cultures where harsh parenting is a more accepted parenting practice, child experiences of physical and sexual abuse are related to poorer outcomes, such as perceived physical health (Tran, Van Berkel, Van IJzendoorn, & Alink, 2017).

Neglect is notably the most common form of maltreatment found in Child Protective Service (CPS) records (Kim, Wildeman, Jonson-Reid, & Drake, 2017). Despite the pervasiveness of neglect in CPS records, it is less frequently the focus as a single subtype of interest in empirical studies (Stoltenborgh, Bakermans-Kranenburg, & Van Ijzendoorn, 2013). Evidence does link early neglect to neurobiological outcomes, including lack of facial expression differentiation (Pollak, Cicchetti, Hornung, & Reed, 2000). The lack of emotional support provided by neglectful households has also been related to withdrawal, internalizing, poor self-representations, and increased feelings of shame in children (Bennett, Sullivan, & Lewis, 2010; Manly et al., 1994; Toth, Cicchetti, MacFie, Maughan, & Vanmeenen, 2000). Recent work shows that neglected children entering kindergarten exhibit poorer adaptation to school in cognitive and social domains (Manly, Lynch, Oshri, Herzog,

& Wortel, 2013) and that neglect severity mediates the relationship between maternal drug dependence and child externalizing in middle childhood (Manly, Oshri, Lynch, Herzog, & Wortel, 2013).

Emotional maltreatment often co-occurs with other subtypes of maltreatment (Lau et al., 2005), and presence of emotional maltreatment is related to children experiencing multiple subtypes of maltreatment (English, Upadhyaya, et al., 2005). Studies have investigated both independent effects of emotional maltreatment and interactive effects with other subtypes. Emotional maltreatment severity with later exposure to physical abuse is indicated in the development of externalizing behavior and aggression (Manly et al., 2001). Chronic maltreatment and exposure to emotional maltreatment increases risk for internalizing symptoms, depression, dissociation, and worse adaptive functioning for children (English, Graham, et al., 2005). Emotional maltreatment is often grouped with neglect to create hierarchical maltreatment groups, and children who have experienced emotional maltreatment and/or neglect without exposure to sexual or physical abuse have been shown to have lower rates of secure attachment and more negative maternal representations (Pickreign Stronach et al., 2011).

Despite the focus on single subtype effects, studies from multiple samples have coded maltreatment from CPS records (rather than relying on CPS labels) and report greater than 50% of maltreated children experienced more than one subtype of maltreatment (Lau et al., 2005; Vachon, Krueger, Rogosch, & Cicchetti, 2015). The number of maltreatment subtypes children have experienced relates to poorer emotional and behavioral symptoms (Kim, Cicchetti, Rogosch, & Manly, 2009) and biological measures, including hypercortisolism (Cicchetti & Rogosch, 2001, 2007). A recent study found that co-occurring neglect, emotional maltreatment, and physical abuse was the most common presentation of maltreatment in CPS records (Kim, Mennen, & Trickett, 2016). Pure subtypes of maltreatment, therefore, are not the norm, and children who experience multiple subtypes are at increased risk for a range of adverse outcomes.

A variety of methods have been employed by researchers to address the issue of maltreatment subtype co-occurrence. In some studies, a single maltreatment subtype of interest is included in assessment or analyses independently, without including additional subtypes, making it difficult to understand whether the results are uniquely associated with that subtype or could be characteristic of multiply-maltreated children. This method is frequently utilized by researchers studying sexual or physical abuse, particularly via retrospective self-report. Though findings demonstrate effects relating specific subtypes to child and adult outcomes (e.g.: Fergusson et al., 2013; Molnar, Buka, et al., 2001), this method is limited because it does not capture the complexity of the naturally occurring high rates of overlap among subtypes, and attributes outcomes to the subtype assessed and not the individual's cumulative experience of maltreatment. Furthermore, recruiting a sample of individuals who have only experienced one subtype of maltreatment is not representative of experiences among the majority of children, thus limiting generalizability of the results.

In studies where multiple subtypes of maltreatment are assessed, a hierarchical approach is often used to delineate groups of maltreated children based on the most salient or

detrimental subtype experienced. This approach is similar to methods that analyze the effects of a single subtype because the “primary” subtype in a hierarchy group is determined and used to characterize the child’s experiences of maltreatment. Acts of commission, such as sexual or physical abuse, are thought to confer greater risk and therefore children who experience those subtypes are grouped together (Lau et al., 2005). Like the analysis of single subtypes, this approach focuses on a single subtype of maltreatment to characterize a child’s experience instead of the patterns of maltreatment present for multiply maltreated children.

Another method to address the co-occurrence of maltreatment subtypes involves statistically controlling, or covarying, various subtypes and examining the effect of one subtype over and above the effects of the other subtypes. This approach results in the examination of the unique effect of one subtype after controlling for the effect of the other subtypes. For example, emotional maltreatment experienced in infancy and toddlerhood has been related to symptoms of externalizing behavior and aggression, controlling for severity of other maltreatment subtypes experienced in the same developmental period (Manly et al., 1994). Although this variable-centered method statistically accounts for co-occurring subtypes, this approach does not provide information about the real-life patterning of maltreatment experiences.

Effects of individual subtypes clearly provide information about the ways in which a child’s safety and security was compromised, but a true representation of children’s experiences of maltreatment is not best represented by individual subtype or hierarchal groups. Because there is considerable overlap in maltreatment experiences, modeling subtypes separately, recruiting samples that have experienced only a single subtype of maltreatment, or attributing outcomes based on a single subtype is not consistent with how maltreatment occurs in the lives of children. Addressing the overlap in subtypes is invariably difficult. Considering just four subtypes of maltreatment results in fifteen distinct patterns or combinations of possible maltreatment experiences. Grouping children based on these individual profiles of maltreatment limits power to detect meaningful differences between subgroups and hinders replicability of findings relating to each distinct pattern. It is therefore a daunting task to characterize the most common patterns of maltreatment experiences accurately and parsimoniously. To advance research on maltreatment experiences, intervention and social policy, the field must consider alternate methods to model the patterns of maltreatment experiences that best describe the complex violation of relational and physical safety that occurs when maltreatment is present.

Person-centered approaches to data analysis offer a method of capturing heterogeneity within a sample (Herrenkohl, 2015; Roesch, Villodas, & Villodas, 2010). Latent class analysis (LCA) is a person-centered statistical method designed to classify individuals into groups that are not directly measureable (Collins & Lanza, 2010). Using the example of maltreatment, various dimensions of maltreatment (e.g., subtype, developmental timing, severity) can be used as measured variables to inform a latent class solution. Different latent, or unobserved, classes are characterized by prominent patterns of maltreatment experiences based on these measureable dimensions. This method does not require researchers to assess independent contributions of individual experiences while parceling out other experiences, but rather uses naturally occurring patterns of experiences to assess themes and thereby

create a best-fitting statistical solution. Class solutions are assessed for interpretability, clinical utility, and replicability. Using LCA, the complexity of multiple measured dimensions can be simplified into the creation of a latent class solution that is more parsimonious and representative of dimensional maltreatment information (Collins & Lanza, 2010; Lanza, Bray, & Collins, 2013). Given the substantial overlap among subtypes and the inherent complexity of the way in which children actually experience maltreatment throughout development, LCA represents an important and well-suited tool for modeling the heterogeneity in the true maltreatment experiences among children.

Person-centered approaches have been used with success in identifying subgroups of maltreated children, both by CPS record, or by self-report measures (Armour, Elklit, & Christoffersen, 2014; Berzenski & Yates, 2011; Nooner et al., 2010; Pears, Kim, & Fisher, 2008; Petrenko, Friend, Garrido, Taussig, & Culhane, 2012; Stewart, Livingston, & Dennison, 2008; Villodas et al., 2012; Witt et al., 2016). Findings consistently demonstrate a latent class, or common pattern, that is characterized by multiple subtypes of maltreatment. Children or adults who experienced multiple forms of maltreatment consistently present with worse behavioral and emotional functioning outcomes (Hazen, Connelly, Roesch, Hough, & Landsverk, 2008; Nooner et al., 2010; Pears et al., 2008; Petrenko et al., 2012; Villodas et al., 2012). This growing literature provides evidence of the feasibility of person-centered approaches in the study of maltreatment. However, further research characterizing subgroups in maltreated samples is needed. The literature on self-reported maltreatment is foundational in establishing the use of LCA/LPA to study maltreatment in a person-centered approach. The present study adds to this body of literature with rigorous methods of gaining prospective maltreatment information and using multi-informant data to establish the validity of the latent classes. Of these studies utilizing person-centered approaches, only four (Pears et al., 2008; Petrenko et al., 2012; Stewart et al., 2008; Villodas et al., 2012) used officially-documented CPS record data in their analysis of maltreatment subtype, severity, or chronicity, and two of those studies (Pears et al., 2008; Petrenko et al., 2012) recruited children who had been placed out of home due to severity of maltreatment. The specificity of foster care samples limits generalizability to broader maltreatment samples. To date, only one study (Villodas et al., 2012) characterized maltreatment subtype in a sample of school-aged children using CPS record data and related groupings to child behavioral and psychosocial outcomes. Further research is needed to discern commonly occurring patterns of maltreatment in broader samples using CPS record data and relate prevalent patterns to differences in child functioning.

The Current Study

The current study aims to 1) use latent class analysis to identify distinct classes of children, as defined by presence and number of specific subtypes of maltreatment (emotional maltreatment, physical abuse, sexual abuse, and neglect) and chronicity of experiences in childhood, and 2) describe identified latent classes in terms of child functioning, specifically probing differences in behavioral or emotional functioning between identified latent classes. This study builds on prior literature that provides evidence that LCA is a useful tool in describing heterogeneity in incidence and overlap in maltreatment subtype experiences during childhood, particularly when assessing maltreatment by CPS records (Pears et al.,

2008; Petrenko et al., 2012; Villodas et al., 2012). This study aims to represent both subtype and chronicity of maltreatment for a diverse, low-income sample of children who have officially-documented maltreatment histories and a comparison group of non-maltreated children. Chronicity was selected due to literature suggesting that maltreatment that persists over developmental periods relates to poorer child functioning in multiple domains (English, Graham, et al., 2005; Jonson-Reid, Kohl, & Drake, 2012; Manly et al., 1994; Stewart et al., 2008), and subtype was selected so that patterns of maltreatment experiences could be modeled and overlap between subtypes could be addressed using a person-centered approach.

Methods

Participants

The sample includes a diverse (50.1% male, 71.1% Black, 12.3% White, 12.6% Hispanic, 4.0% other race), low-income inner-city sample (N=674) of children aged 10–12 (Mean=11.28yo, SD=.98). Children attended a week-long summer day camp at Mt. Hope Family Center from 2004–2007. The sample included 348 (51.6%) maltreated children and 326 (48.4%) non-maltreated children, with maltreatment status determined by CPS record data. Recruitment of families and children with and without maltreatment was necessary to ascertain groups comparable in size and socio-economic status for comparison of child outcomes. Children in the maltreated group had substantiated investigations of child maltreatment according to Department of Human Services (DHS) CPS records. A DHS recruitment liaison contacted a random sample of eligible families via mail, and families could choose whether they wished to participate. The demographics of families who declined participation were not disclosed to Mt. Hope Family Center, but interested families were able to contact research staff to enroll.

To recruit a socio-economically equivalent sample of non-maltreating families, families eligible for Temporary Assistance for Needy Families (TANF) were offered the opportunity for participation by the DHS recruitment liaison. DHS CPS record checks were performed for these families to ensure they did not have CPS involvement. Additionally, the Maternal Maltreatment Classification Interview (Cicchetti, Toth & Manly, 2003) was conducted with mothers to confirm that the non-maltreated children did not experience maltreatment that was not captured by the CPS records. This semi-structured interview asks about maltreatment subtype, developmental timing, severity, and perpetrator for each instance of maltreatment. In this sample, non-maltreated children's parents all confirmed their non-maltreated status on the Maternal Maltreatment Classification Interview. Research procedures were reviewed and approved by the University of Rochester Research Subjects Review Board. For interested families, parents provided informed consent for the study procedures that their children completed and for their own participation and consented to a review of their family's DHS records. Children also provided assent agreeing to participate in study activities. Trained camp counselors worked with the same groups of 8–10 children for the duration of each weekly session of summer camp, with a total of 35 hours of contact with the children over the course of the week. Based on their observations and interactions with each child, counselors completed measures relating to child behavioral and emotional

functioning at the end of each week. Children also completed self-report measures of behavior and emotional functioning.

Measures

Measurement of Maltreatment: The Maltreatment Classification System.—The Maltreatment Classification System (MCS; Barnett et al., 1993) is a comprehensive coding system that is able to reliably quantify maltreatment subtype, severity, frequency, perpetrator, and chronicity from written records or by interview. In this study, it was applied to official CPS records obtained through DHS. MCS reliable coders scored records based on the MCS and determined presence and number of subtypes for each child in the sample. The MCS identifies 4 different types of maltreatment (sexual abuse, physical abuse, emotional maltreatment, and neglect). Neglect ratings included lack of supervision, failure to provide, educational neglect, and moral/legal/educational neglect. In these analyses, four subtypes of maltreatment are included: sexual abuse, physical abuse, emotional maltreatment, and neglect, with "neglect" defined by the presence of any of the 4 types of neglect listed above. The average intraclass correlations (ICCs) between pairs of coders ranged from .86–1.0 for presence of each subtype. Developmental timing of each instance of maltreatment was also scored based on dates of maltreatment experiences. Developmental periods used in this analysis include: infancy (birth - 17 months), toddlerhood (18 months - 2 years), preschool age (3 – 5 years), early school age (6 −7 years), and later school age (8–12 years), in accordance with guidelines in the Maltreatment Classification System (Barnett et al., 1993). In this study, maltreatment chronicity was defined by the number of these developmental periods in which maltreatment was present. This conceptualization of chronicity, which measures the extent and not necessarily continuity of maltreatment across developmental periods, is consistent with other investigations and has been related to poorer child outcomes (English, Graham, et al., 2005). Subtype and chronicity were used as indicators of latent classes.

Of the 348 children with CPS records of substantiated allegations of maltreatment (defined as instances of maltreatment that were investigated by CPS and confirmed to have occurred), 294 (84.5%) experienced neglect, 189 (54.3%) experienced emotional maltreatment, 105 (30.2%) experienced physical abuse, and 32 (9.2%) experienced sexual abuse. The average number of subtypes of maltreatment experienced by maltreated children was 1.78 (SD=.79). Of the maltreated children, 42% (146) children experienced one subtype of maltreatment, 40.5% (141 children) experienced 2 subtypes, 14.9% (52 children) experienced 3 subtypes, and 2.6% (9 children) experienced 4 subtypes, indicating substantial co-occurrence of individual subtypes of maltreatment in this sample. Of the children who experienced a single subtype of maltreatment (n=146), the most common single subtype was neglect (73%, 107 children), followed by emotional maltreatment (12%, 17 children), physical abuse (11%, 16 children), and sexual abuse was the least common subtype experienced in isolation (4%, 6 children).

Teacher Report Form (TRF) - Internalizing & Externalizing Subscales (Achenbach, 1991).—The Teacher Report Form of the Childhood Behavior Checklist is a 113-item measure widely used by teachers to assess dimensions of child functioning in

research studies. The TRF is a well-validated measure that was developed to provide information about multiple dimensions of child functioning and mental health problems (Achenbach, 1991). In this study, each child was scored on the TRF by two camp counselors after approximately 35 hours of contact in the research day camp. Counselors rated each item on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, or 2 = very true or often true). Scores for each child were averaged across the two counselor reports. Although the 35-hour observational period used in this study is a deviation from the original use of this form, approximately 20 empirical studies have been published using this modified observation time and demonstrated reliability of measurement (for example: Alink, Cicchetti, Kim, & Rogosch, 2012; Cicchetti & Rogosch, 2012; Cicchetti, Rogosch, & Oshri, 2011; Rogosch, Dackis, & Cicchetti, 2011; Vachon et al., 2015). Both the internalizing and externalizing subscales of the TRF were used as outcomes of identified latent classes. The mean T-score for the internalizing subscale was 47.68 (SD=8.31) and the mean T-score for the externalizing subscale was 52.31 (SD=8.85). The average intraclass correlations between pairs of raters for each child ranged from .79–.83 for or the internalizing and externalizing subscales respectively, thus indicating high reliability between counselors.

Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997).—This measure was used to measure child emotion dysregulation. This 24-item measure was completed by camp counselors rating children they interacted with during the week on a 4-point Likert scale, from “never” to “almost always” for each item. Two counselors rated each child and scores were averaged. Sample items include: “Transitions well from one activity to another,” and “Is prone to disruptive outburst of energy and exuberance.” This is a reliable and construct valid measure developed with a similar age range of maltreated and non-maltreated children in a similar setting as the present study (Shields & Cicchetti, 1997). This instrument yields three subscales: a Negativity/Lability subscale, an Inappropriate Emotion subscale, and an Emotion Regulation subscale. The Negativity/Lability subscale was included as an outcome of the identified latent classes. In this sample, the average intraclass correlation between pairs raters for each child was .81 for the Negativity/Lability subscale. The mean score on this subscale was 1.95 (SD=.62).

Child Depression Inventory (CDI).—The CDI is a 27-item child self-report measure assessing symptoms of depression during the past two weeks. It is widely-used in samples of school-aged children and has shown validity and reliability (Kovacs, 1982; Saylor, Finch, Spirito, & Bennett, 1984). Each item is scored on a scale from 0 to 2. The range of scores on this measure is from 0 – 54, and a higher score is indicative of more severe depressive symptoms. The total score on the CDI was used as an outcome of latent classes. In this sample, the mean self-reported score on this measure was 7.53 (SD=6.70).

Revised Children’s Manifest Anxiety Scale (*RCMAS*; Reynolds & Richmond, 1997).—The RCMAS is a 37-item self-report measure where children respond “yes” or “no” to 37 items that assess for presence or absence of symptoms related to anxiety. The RCMAS is a well-validated measure (Muris, Merckelbach, Ollendick, King, & Bogie, 2002) with good psychometric properties in samples of school-aged children (Reynolds &

Richmond, 1997). The mean total score reported by children was 46.27 (SD=10.11) for this sample.

Data Analytic Plan

As described, latent class analysis (LCA) serves as a person-centered statistical tool for understanding and describing heterogeneous populations and is therefore well-suited to address heterogeneity of maltreatment subtype and chronicity. All analyses were conducted with Mplus7 Version 1.4 (Muthen & Muthen, 2012) using estimation of robust standard errors to account for non-normality of data. There was no missing data for any indicators of latent classes. Full information maximum likelihood (FIML; Arbuckle, 1996) was used to estimate the small amount (<5%) of missing data on child outcomes. Dichotomous and trichotomous (three-level) variables describing maltreatment subtype and chronicity were created from the MCS dimensions. Four variables capturing presence of emotional maltreatment, neglect, physical abuse, and sexual abuse were used as dichotomous indicators of the latent class solutions. Presence of the subtype at any time in development was indicated by a positive response on the dichotomous variable for that subtype. A trichotomous indicator for number of subtypes was also created and included (0=no maltreatment, 1=one subtype, 2=more than 1 subtype experienced) to capture multiple subtype occurrence that is not captured by presence/absence variables for each subtype. A trichotomous variable describing maltreatment chronicity was also included as an indicator (0=no maltreatment, 1=1 developmental period with maltreatment, 2= maltreatment in more than 1 developmental period), for a total of 6 indicators for the categorical latent class solutions presented. The 5 developmental periods were defined as they are in the MCS (infancy, toddlerhood, preschool age, early school age, and later school age). Children who were not maltreated had scores of “0” on all subtype and chronicity indicators.

Multiple fit indices were used to select the best-fitting class solution. Lower values on Akaike Information Criterion (AIC; Akaike, 1987), Bayesian Information Criterion (BIC; Schwarz, 1978), and adjusted Bayesian Information Criterion (aBIC; Sclove, 1987) indicate a relatively better fitting class solution. However, these comparative fit indices may point to the selection of different models; best practice is to use fit indices in conjunction with other indicators of a stable and replicable class solution (Collins & Lanza, 2010; Dziak, Coffman, Lanza, & Li, 2017). Higher entropy values indicate greater separation, or distinction, between classes within a solution. A significant Lo-Mendell-Rubin (aLRT) Adjusted Likelihood ratio test indicates that an *n* class solution is a significantly better fit than the *n-1* model (Collins & Lanza, 2010; Lo, Mendell, & Rubin, 2001). Consistent with recommendations by Collins and Lanza (2010), selection of a best-fitting model depended not only on individual fit indices, but also interpretability of the classes of a solution and empirical identification, or the ability of a given solution to converge on one set of best-fitting parameter estimates. Interpretability of the fit-indicated class solution was based on prevalence of class membership probabilities (percent of the sample that is estimated to belong in a single class) as well as item response probabilities on individual indicators. Class membership probabilities below 5% of the sample (less than 33 children) were thought not to provide adequate predictive utility and could be more difficult to replicate, therefore there was a preference for solutions that provided solutions where each class was >5% of the

sample. In this study, item response probabilities for each indicator are interpreted as the proportion of individuals within a latent class who either experienced or did not experience maltreatment as informed by that variable. For example, if the item response probability for a "yes" response on the emotional maltreatment indicator for a particular class is .6, then the probability that an individual in that class experienced emotional maltreatment is .6, and the probability that they did not experience emotional maltreatment is .4.

After the optimal LCA class solution was identified using comparative fit indices, descriptive and comparative analyses of differences in child behavioral and emotional functioning between classes were conducted. Although individual membership in classes is probabilistic and therefore not certain, most probable class membership was determined by multiply imputed posterior probabilities for individuals, and then based on most probable class membership, means on child outcomes were computed. This analysis was done within Mplus using the Bolck-Croon-Hagenaars Method (BCH method; Bolck, Croon, & Hagenaars, 2004), a recommended statistical procedure for comparing outcome variables between latent classes (Asparouhov & Muthen, 2015; Bakk, Tekle, & Vermunt, 2013). In this approach, latent class solutions are not affected by outcome variables. An omnibus test was conducted to detect differences between groups. If this test was significant, pairwise comparisons of class differences were interpreted as differences in child functioning between latent classes.

Results

Identifying latent classes of maltreatment subtype and chronicity

Using 6 categorical indicators, including four indicators of maltreatment subtype (emotional maltreatment, neglect, physical abuse, sexual abuse) and two trichotomous indicators (for number of subtypes and number of developmental periods), one to six class solutions were considered. Relative model fit, model parsimony, identification, and item response probability interpretability were all considered when selecting the best-fitting class solution.

Model fit for sequential class solutions is presented in Table 1. The 4-class solution was identified as the best-fitting class solution, primarily using BIC, supported by fit indices presented in Table 1. BIC decreased in value until the 5-class solution, when the value increased, indicating relatively worse model fit for models with more than 4 classes. AIC and aBIC continued to decrease through the 6-class solution; however, 5 and 6-class solutions were empirically un-identified models, further indicating that the 4-class solution was the best-fitting solution for this data. The 4-class solution was a significantly better fit than the prior class solution, as indicated by the Lo-Mendell-Rubin adjusted likelihood ratio test. Entropy for this solution was high (.99), indicating that classes were distinct. The smallest class within the 4-class solution was a class that represented 6.2 percent of the sample, which is a large enough proportion of this sample that it can be interpreted as a meaningful pattern of children's experiences of maltreatment. Interpretation of item response probabilities for each class within the 4-class solution was therefore warranted.

All multi-class solutions maintained a class that was made up exclusively of the non-maltreated children (48% of sample). Due to the necessary homogeneity in item responses

among the non-maltreated children, this was expected and useful for comparison purposes. The classes within each solution that emerged showing variation within the maltreated children were therefore of greatest interest when interpreting class solutions. A “neglect only” class was present at the 3-class solution and was maintained through the 6-class solution.

Interpretation of the 4-class solution

Within the 4-class solution, three maltreatment classes were identified in addition to the non-maltreated class (48%). The “chronic, multi-subtype” class was the largest maltreatment class (30% of the total sample, 57% of the maltreated children) and was characterized by high probabilities of multiple types of maltreatment, with particularly high probabilities for neglect and emotional maltreatment. Additionally, members of this class all had 2 or more (of the 4) subtypes of maltreatment, with a relatively high (.61) probability of exposure to maltreatment in more than one developmental period. The next-largest maltreatment class (16% of the total sample, 31% of the maltreated children) was characterized by high probability of neglect, and is therefore described as the “neglect only” class. The majority of children in this class experienced neglect in one developmental period. Finally, the “single subtype” class was the smallest class, with prevalence of 6.2% in the total sample (12% of the maltreated children). This class was characterized by moderate probabilities of sexual abuse (.16), physical abuse (.45), and emotional maltreatment (.45), and a 0-probability of neglect. There was a high probability that children in this group experienced only one subtype of maltreatment, not including neglect, and experienced maltreatment in only one developmental period. Class prevalence, individual item probabilities by indicator level and class of the 4-class solution, as well as overall sample statistics for maltreatment subtype and chronicity indicators are presented in Table 2.

4-Class solution latent class comparisons on child outcomes

To describe differences between the classes within the 4-class solution, measures of child functioning were included as auxiliary variables in the 4-class solution, and mean values on each measure of child functioning for each class were estimated by first using multiple imputation to establish most probable class membership based on item response probabilities (Asparouhov & Muthen, 2015; Bakk et al., 2013). Class means and differences between classes on each distal outcome are presented in Table 3 for externalizing and internalizing (TRF), emotion dysregulation (ERC), and depressive symptoms (CDI), and anxiety symptoms (RCMAS).

Externalizing (TRF counselor report).—Differences between classes in child externalizing were significant ($\chi^2(3)=24.85$, $p<.001$). The mean scores for externalizing for the chronic, multi-subtype class (M=54.34, SE=.66, $p<.001$) and the neglect only class (M=53.58, SE=.84, p=.002) were both higher than the non-maltreated class (M=50.62, SE=.47), indicating more externalizing behaviors present for the neglect and chronic multi-subtype classes.

Internalizing (TRF counselor report).—Differences between classes on counselor report of child internalizing were not significant ($\chi^2(3)=2.45$, p=.49).

Child Emotion Dysregulation (ERC counselor report).—There were significant differences between latent classes on child emotion dysregulation, as measured by the negativity/lability subscale on the ERC ($\chi^2(3)=25.83$, $p<.001$). Pairwise comparisons showed that both the chronic, multi-subtype class (M=2.11, SE=.045, $p<.001$) and the neglect only class (M=2.01, SE=.06, p=.01) were rated higher on emotion dysregulation than the non-maltreated class (M=1.84, SE=.033). There was a trend-level difference between chronic maltreatment class and the single maltreatment subtype (not neglect) class (M=1.88, SE=.11, p=.066) indicating that children in the chronic maltreatment class were scored higher on dysregulation than the children with a single subtype of maltreatment (sexual abuse, emotional maltreatment, or physical abuse).

Child Depressive Symptoms (CDI youth self-report).—There were significant differences between latent classes on child depressive symptoms, as measured by the *CDI* ($\chi^2(3)=12.00$, p=.007). The only significant pairwise comparison indicated higher depressive symptom scores for children in the chronic, multi-subtype class (M=8.75, SE=.51) than children in the non-maltreated class (M=6.69, SE=.35, p=.001).

Child Anxiety Symptoms (RCMAS youth self-report).—There were significant differences between latent classes on anxiety, as measured by the total score on the RCMAS ($\chi^2(3) =8.47$, p=.037). Children in the chronic, multi-subtype class (M=47.75, SE=.75) self-reported higher scores than the non-maltreated class (M=45.17, SE=.56, p=.006). No other pairwise comparisons between latent classes were significant.

Discussion

This investigation provides evidence that person-centered data analytic approaches are useful for identifying distinct groups of maltreated children based on patterns of maltreatment experiences. The present study is unique because it characterizes two dimensions of maltreatment (chronicity and subtype) coded from lifetime CPS records using a well-known maltreatment classification system (Barnett et al., 1993). The most prominent pattern of maltreatment identified was characterized by chronic maltreatment with exposure to two or more subtypes of maltreatment. Children who experienced neglect in a single developmental period comprised a second less prevalent pattern of maltreatment. The smallest subgroup of maltreated children included those who experienced a single subtype of maltreatment (sexual abuse, physical abuse, or emotional maltreatment) in one developmental period. Childhood internalizing and externalizing symptomatology, as well as emotion regulation, varied across the identified latent classes, further validating the utility of these groupings. Maltreatment occurs in different ways for different children, and these findings indicate that differences in experiences are clinically important and provide insight into multifinality associated with maltreatment. Prospective lifetime maltreatment was quantified in this sample using CPS records and the MCS (Barnett et al., 1993), providing an account of the subtype and chronicity of maltreatment that the children in this sample experienced.

Rather than maltreatment experiences being partitioned into classes dominated by distinct subtypes, the present findings indicate that there are very few maltreated children who

experience just one form of maltreatment, and for those who do, it is time-limited. Consistent with prior person-centered work (Armour et al., 2014; Berzenski & Yates, 2011; Pears et al., 2008; Petrenko et al., 2012), we identified a prominent subgroup of maltreated children who experienced multiple subtypes of maltreatment in more than one period of development. Notably, the probability of neglect was very high for these chronically maltreated children. Thus, co-occurrence of abuse and neglect predominated among the maltreated children. Systematically ineffective and dangerous parenting practices can manifest in different types of maltreatment across a child's development, which is exemplified by the range of maltreatment experiences in the group of children with chronic maltreatment. Consistent with prior work on chronicity and subtype of maltreatment (Kim & Cicchetti, 2009; Manly et al., 2001; Stewart et al., 2008; Villodas et al., 2012), familial patterns characterized by chronic maltreatment consistently confer significant risk for symptoms of internalizing, externalizing, and emotion dysregulation.

The one subtype of maltreatment that does commonly occur without presence of other subtypes is neglect. Neglect is the most common form of maltreatment in this sample and in CPS investigations (Kim et al., 2017; Sedlak et al., 2010). This study delineates two patterns of maltreatment experiences for neglected children: those who experience chronic maltreatment characterized by neglect in combination with other subtypes of maltreatment, and those who experience neglect alone. When neglect occurs alone, it is typically limited in duration. Children who experienced neglect as a single subtype were rated higher in externalizing symptoms and emotion dysregulation by camp counselors as compared to their non-maltreated peers. This finding is consistent with prior work showing effects of exposure to neglect in childhood on the development of externalizing symptoms (Manly, Oshri, et al., 2013).

These findings indicate that children who experience chronic, multi-subtype maltreatment are at highest risk for the development of psychological and emotional problems as compared to non-maltreated children. Children who experience time-limited neglect were also likely to display more externalizing and emotion dysregulation problems than non-maltreated children, which adds to a growing literature showing that neglect, without subtypes of abuse, has a detrimental impact on child development (Manly, Lynch, et al., 2013; Manly, Oshri, et al., 2013; Pickreign Stronach et al., 2011). Prior research has found evidence that maltreatment experiences contribute to internalizing and externalizing symptoms and emotion dysregulation, each of which relates strongly to the development of psychiatric disorders (Keyes et al., 2012; Kim & Cicchetti, 2010; Sheppes, Suri, & Gross, 2015). The significant differences in child outcomes found in these two groups validate the usefulness of LCA as a tool in determining clinically important groups of maltreated children.

Limitations

This study has clear strengths in terms of the multiple sources of information regarding child experience and functioning that were ascertained. However, there are limitations that should be addressed. By design, this study recruited a random sample of low-income children who either had substantiated CPS investigations or no involvement with CPS. Detection of

maltreatment by CPS in the U.S. and abroad is directly influenced by public policy and laws regarding child maltreatment definitions. Therefore, the sampling of children involved in CPS can differ depending on the trends in CPS investigations and state definitions of maltreatment. Detection of subtypes of maltreatment has been shown to affect prevalence rates of maltreatment across decades (Sedlak et al., 2010), and these considerations should be acknowledged because this sample was recruited based on CPS involvement.

This study provides cross sectional measurement of child outcomes, which limits our understanding of the trajectories of developmental functioning as a result of maltreatment. We did not address specific developmental timing of maltreatment, a documented factor impacting child functioning (Cowell et al., 2015; Manly et al., 1994; Villodas et al., 2012). Instead, priority was given to a broader measure of chronicity to characterize risk associated with persistent and/or chronic maltreatment. Severity of maltreatment has also been strongly linked to child outcomes (Hazen et al., 2008; Pears et al., 2008; Petrenko et al., 2012) but was not incorporated in this analysis. LCA identifies groups based on categorical indicators, not dimensional scores. Thus, presence or absence of and number of subtype was used herein to provide information about the overlapping nature of individual subtypes of maltreatment; this would be less clearly presented with dimensional severity scores. One limitation of the LCA method used that should be noted is that covariates cannot be included in the comparisons of child functioning for maltreatment subgroups, limiting the inclusion of other contextual factors could influence child functioning. Finally, it should be noted that recall bias may be present for maternal report of child maltreatment, particularly for maltreatment that occurred ten or more years prior during a child's infancy; thus, the decision to use CPS record data minimized this bias, and maternal report was utilized to confirm that children in the non-maltreated group did not have maltreatment experiences that were undetected by CPS.

Conclusions and Future Directions

For most children who experience maltreatment, abuse and neglect are intersecting experiences. A person-centered approach elucidates this overlap and identifies distinct patterns of maltreatment in a more parsimonious way than prior methods of representing maltreatment subtype. This study characterizes maltreatment not by subtype, but by patterns of experiences. Findings from this study and extant literature documenting the overlapping and chronic nature of abuse and neglect in CPS-involved families (K. Kim et al., 2017; Manly et al., 2001; Vachon et al., 2015; Villodas et al., 2012) call into question the validity and usefulness of studying effects of maltreatment using a single-subtype approach. Prior methods that aim to recruit samples of individuals who experience single subtypes of maltreatment or isolate effects of specific subtypes on lifespan functioning fail to account for the overlapping nature of abuse and neglect that occurs for most maltreated children. Research on maltreatment therefore should abandon a subtype-driven method of investigating effects of maltreatment and instead concentrate efforts on characterizing common patterns of maltreatment.

The current study contributes to a growing evidence base demonstrating the utility and advantages of person-centered methods for the study of child maltreatment. However,

maltreatment is not fully represented by this analysis alone. Advancement of the field's understanding of children's experiences of maltreatment depends on future research using person-centered investigations of subtype, chronicity, timing, and severity. Research is needed to model the patterning of these dimensions in different samples. In future studies, covariates predicting latent classes could be used to identify factors that increase risk for membership in certain maltreatment subgroups. In addition to LCA, there are other person-centered approaches that could be useful depending on the dimensions of maltreatment and outcomes of interest. Stewart et al. (2008) approached the study of maltreatment chronicity using group-based trajectory analysis (Nagin & Odgers, 2010), which could be used in future person-centered studies that aim to longitudinally model trajectories of outcomes associated with maltreatment subgroup. Another recent study (Villodas et al., 2012) conducted repeated-measure LCAs (Lanza et al., 2013) during three developmental periods in childhood and predicted latent class membership from one developmental period to the next, incorporating measures of child functioning at each developmental period. These studies provide templates for the utility of different person-centered approaches that could be used in place of prior approaches that focus on independent contribution of individual subtypes.

In addition to research implications, this study has clear implications for interventions and public policy. A recent study reported that in the United States, 37% of youth are involved with CPS during their childhoods, with a lifetime prevalence of substantiated investigations at 11.8% (H. Kim et al., 2017). Child maltreatment represents both an individual and societal burden. The elevated clinical risk associated with children who have chronic involvement with CPS is particularly notable in this study. The significant overlap in subtypes of maltreatment is especially relevant when considering children presenting in clinical settings. Overlap in maltreatment subtypes is an important consideration in screening for trauma in child populations, as a single event of abuse is most often embedded within a developmental context of other co-occurring subtypes of abuse or neglect taking place over time. This is important information for clinicians to have in mind during assessments. Clinicians intervening to treat the effects of maltreatment should be aware that co-occurrence of maltreatment is the most common pattern.

Patterns of maltreatment experiences should be incorporated into the development and evaluation studies for treatment of trauma to inform determinations regarding what treatment approaches work best for whom. Clinical presentations and treatment response could differ depending on the complexity of maltreatment experienced by an individual. Intervention studies that target specific types of maltreatment fail to consider the majority of children who experience multiple types of maltreatment, limiting applicability of these treatments. The findings in the present study characterize maltreatment as a pattern of experiences detrimental to child development. Knowing common profiles of maltreatment patterns could be useful to improve treatment approaches and identify best-fitting interventions for families and children. These future directions have important implications for intervention and particularly prevention efforts that are aimed at decreasing risk and recurrence of maltreatment in families and ameliorating developmental sequelae associated with maltreatment experiences (Guild, Alto, & Toth, 2017).

The nature of maltreatment is complex and difficult to model accurately. In recent years, advanced quantitative methods have been developed and researchers can now more accurately model dimensions of maltreatment, such as chronicity, subtype, developmental timing, severity, and perpetrator, to reflect the patterns of maltreatment that children experience. It is therefore vitally important for researchers to continue to consider implications of maltreatment assessment, measurement, classification, and quantitative analysis in the interpretation and application of findings relating to patterning of maltreatment. Accurate characterization of maltreatment is imperative to understand the lifelong effects that maltreatment in childhood can have on adaptive and maladaptive psychosocial processes, biological and regulatory systems, and the development of psychopathology.

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Table 1.

Fit information for LCAs modeling maltreatment subtype and chronicity (n=674)

Classes	*df*	LL[a]	AIC	BIC	aBIC	Entropy	aLRT[b]
1	135	−2690.43	5396.85	5432.96	5407.56		
2	126	−1651.72	3337.45	3414.17	3360.20	1.0	<.001
3	117	−1479.10	3010.20	3127.55	3045.00	1.0	<.001
4	108	−1420.37	2910.73	**3068.69**	2957.57	**.99**	**<.001**
5	99	−1393.82	2875.64	3074.22	2934.52	.97	<.001
6	90	−1370.75	2847.50	3086.70	2918.42	.98	<.001

[a] Loglikelihood for class solution

[b] p-values for the Lo-Mendell-Rubin adjusted likelihood ratio test comparing *n* class solution fit to *n-1* class solution.

Table 2.

Item response probabilities and class membership proportions for 4-class solution

				Class 1 Non-mal.	Class 2 Neglect	Class 3 Chronic, multi-subtype	Class 4 Single subtype
Overall Class Prevalence (n=674)				.48	.16	.30	.062
Prevalence for Maltreated Children (n=348)				0	.31	.57	.12
		Proportion Overall	Proportion of Mal.				
Emotional Maltx.	No	.72	.46	1	1	.15	.55
	Yes	.28	.54	0	0	.85	.45
Neglect	No	.56	.16	1	0	.063	1
	Yes	.44	.84	0	1	.94	0
Physical Abuse	No	.84	.70	1	1	.57	.55
	Yes	.16	.30	0	0	.43	.45
Sexual Abuse	No	.95	.91	1	1	.87	.84
	Yes	.047	.09	0	0	.13	.16
# Subtypes	0	.48	0	1	0	0	0
	1	.22	.42	0	1	0	.94
	2+	.30	.58	0	0	1	.06
# Dev. Periods	0	.48	0	1	0	0	0
	1	.29	.56	0	.79	.39	.85
	2+	.22	.43	0	.21	.61	.15

Table 3.

4-class solution means of outcomes of child functioning (N=674).

	Class 1: Non-maltreated M(SE)	Class 2: Neglect M(SE)	Class 3: Chronic M(SE)	Class 4: Single subtype M(SE)	Pairwise comparisons (p<.05)
Class Prevalence	.48	.16	.30	.062	
Externalizing (TRF) *	50.62 (.47)	53.58(.84)	54.34 (.66)	52.81 (1.58)	1 < 2, 3
Internalizing (TRF)	47.25(.44)	48.55(.88)	48.04(.61)	47.11(1.24)	
Dysregulation (ERC) *	1.84(.033)	2.01(.060)	2.11(.045)	1.88(.11)	1 < 2, 3
Depression (CDI) *	6.69(.35)	7.52(.64)	8.75(.51)	8.45(1.30)	1 < 3
Anxiety (RCMAS) *	45.17(.56)	46.37(.92)	47.75(.75)	47.65(1.80)	1 < 3

* Denotes significant (p<.05) omnibus Chi Squared test of group difference between latent class means