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RESEARCH REGARDING EFFECTS OF CHILDHOOD MALTREATMENT

Constellations of Interpersonal Trauma and Symptoms in Child Welfare: Implications for a Developmental Trauma Framework

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Abstract Patterns of trauma exposure and symptoms were examined in a sample of 16,212 children in Illinois child welfare. Data were collected on trauma histories, child and caregiver needs and strengths, and analyzed in light of the proposed Developmental Trauma Disorder diagnostic criteria. Youth exposed to both interpersonal violence and attachment-based ("non-violent") traumas within the caregiving system had significantly higher levels of affective/physiological, attentional/behavioral, and self/relational dysregulation in addition to posttraumatic stress symptoms compared to youth with either type of trauma alone or in relation to other trauma experiences. These complexly traumatized children exhibited higher levels of functional impairment and were more likely to have placement disruptions and psychiatric hospitalizations. Findings suggest a developmental trauma framework can more adequately capture the spectrum of needs of these multiply traumatized youth than existing diagnostic formulations. Utilizing this framework for assessment, treatment planning, and intervention can lead to more targeted and effective services for these children.

Keywords Complex trauma · Developmental trauma disorder · Posttraumatic stress · Child · Youth · Caregiver

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Many children in the child welfare system have been exposed to multiple and chronic traumatic experiences. National surveys of child protection in the United States report the number of children who experience various types of abuse and neglect (e.g., U.S. Department of Health and Human Services [HHS], 2010), but tend not to report specific statistics on the number of children exposed to multiple, interpersonal traumas (e.g., combinations of abuse and neglect). Various studies with youth from child welfare have demonstrated that the experience of combined forms of abuse and neglect is common (Greeson et al. 2011; Griffin et al. 2011; Jonson-Reid et al. 2003; Macdonald et al. 2010; Turner et al. 2010). In fact, researchers in the area of child trauma have proposed that between 46 % and 90 % of all children in child welfare have experienced multiple adverse and/or traumatic experiences (Lau et al. 2005).

Exposure to multiple and chronic interpersonal trauma in childhood, typically occurring within the caregiving system—often referred to as complex trauma exposure—is associated with a complex range of symptoms and impairments across several areas of development. Studies have shown that exposure to complex, interpersonal trauma is linked to a greater number and severity of functional and mental health problems both in child welfare and in other service settings (D'Andrea et al. 2012; Finkelhor et al. 2009; Greeson et al. 2011; Kisiel et al. 2009b; Spinazzola et al. 2005). Existing empirical evidence indicates that children as well as adults exposed to multiple types of interpersonal trauma in childhood exhibit greater symptom complexity and more severe impairment overall (Briere et al. 2008; Cloitre et al. 2009; Ford et al. 2009; Ford et al. 2010; Greeson et al. 2011; Griffin et al. 2011; Kisiel et al. 2009b). Complex trauma responses include difficulties with affect and impulse regulation, self-perception, somatization, attachment and interpersonal relations, attention, and challenges with systems of meaning (Cook et al. 2003;

Kisiel et al. 2009b; van der Kolk et al. 2005) and may also be associated with an increased risk for ongoing psychiatric and medical disturbances over the lifespan (Felitti et al. 1998).

Increasingly, the effects of these adverse childhood experiences are being examined through a neurobiological lens (e.g., Anda et al. 2006). Developmental neuroimaging research confirms the wide-ranging and complex structural, functional, behavioral, and cognitive effects of child trauma on brain development (for a review, see Delima and Vimpani 2011). Research with children and adolescents exposed to trauma has shown that some structural changes in the developing brain are associated with longer-lasting trauma exposure and trauma experienced at an earlier age (De Bellis and Kuchibhatla 2006). Additionally, exploration of the effects of pediatric traumatic brain injury in relation to child abuse is also of relevance as it can further complicate these ongoing challenges that children may face over time (Ewing-Cobbs et al. 1998). Finally, new theories are also emerging in terms of assessment and treatment of traumatized children based on disruptions in their neurodevelopment (e.g., Perry 2009) which is of relevance to ongoing work in this area.

Impact of Trauma Types on Symptom Patterns

While for decades the child trauma literature has focused primarily on the impact of individual abuse types (e.g., sexual abuse; Finkelhor et al. 2007; Saunders 2003), the Adverse Childhood Experiences (ACE) Study (Anda et al. 2006; Felitti et al. 1998) has done a compelling job of demonstrating both the range of negative, long-term effects of child trauma and how more types of adverse experiences can result in worse physical and mental health outcomes over time. This study offers a tremendous contribution to understanding the range of long-term consequences associated with trauma and adverse experiences. An important next step to this work is considering the unique effects of various types of trauma in combination.

There is also a tremendous body of developmental psychopathology research assessing the impact of child maltreatment on certain key symptom clusters or areas of dysregulation (e.g., interpersonal difficulties, affect dysregulation; see D'Andrea et al. 2012). While much has been learned from this research, there are certain limitations. Many youth previously identified as exposed to sexual or physical abuse are likely to have experienced other types of trauma which were not assessed because they were outside of the focus of study (Finkelhor et al. 2007). However, given the research addressing the impact of trauma on specific symptoms rather than assessing multiple constellations of symptoms, the full impact of these traumas across areas of functioning remains unclear (Finkelhor et al. 2007).

Recently, there has been greater empirical consideration of how exposure to multiple or chronic, interpersonal traumas is associated with dysregulation and impairment across multiple areas of functioning. In a recent national survey of clinical providers, problems with affect dysregulation, attention/concentration, and negative self-image were prominent in the majority of the children served, which consisted of multiply traumatized youth (Spinazzola et al. 2005). Ford and colleagues found that children exposed to multiple, interpersonal traumas were more likely to have problems with attention, hyperactivity and conduct (Ford et al. 2009) and were more likely to exhibit problem with delinquency, have several diagnoses and exhibit worse clinical outcomes overall (Ford et al. 2010).

Certain studies have focused on these issues within child welfare settings in particular. Kisiel et al. (2009b) found that youth with multiple, interpersonal traumas by caregivers upon entry into Illinois child welfare were more likely to have significant traumatic stress symptoms, emotional/behavioral needs (e.g. depression, oppositional problems), functional impairment, fewer strengths, and a greater likelihood of placement disruptions. In a similar large-scale sample of youth in Illinois child welfare, Griffin et al. (2011) found that the number of clinically significant posttraumatic stress symptoms and broader mental health symptoms increased as the number of trauma experiences also increased. Among a national sample of youth in foster care, those with multiple, interpersonal traumas had significantly higher rates of posttraumatic stress, internalizing problems, and clinical diagnoses compared to other youth without a history of multiple, chronic traumas (Greeson et al. 2011). These difficulties have also been associated with higher service utilization patterns, placement disruptions, and more complex diagnostic patterns within the child welfare system (Greeson et al. 2011; Kisiel et al. 2009b).

Despite recent advances in understanding the relationship between cumulative, interpersonal traumas and range of symptom types and severity, researchers have continued to express a need for further investigation in these areas. Additional empirical attention is needed especially on combined effects of different types of interpersonal traumas on symptom patterns or functional outcomes overall. In particular, there is also a need to further understand the unique effects of interpersonal trauma within the context of inadequate or disrupted caregiving systems (Cook et al. 2005; Kisiel et al. 2009b; van der Kolk 2005).

Research highlights the role of attachment in relation to complex trauma and calls for the need for enhanced collaboration between attachment researchers and trauma experts (Lyons-Ruth et al. 2006). This is particularly important given that disrupted attachment and trauma exposure may have similar negative outcomes and the two combined may have even worse effects on children's development and

functioning. At least one study suggests that disrupted attachment in the form of multiple out-of-home placements has been associated with significant behavioral problems, over and above the effects of impaired parenting or trauma exposure (Ford et al. 2009). Research examining combinations of trauma exposure (e.g., those with exposure to both physically violent and attachment-based abusive events) is currently limited but needed as a next step to understanding the impact of chronic, interpersonal trauma (Kisiel et al. 2009b).

Diagnostic Issues for Complex Trauma

While the diagnosis of Posttraumatic Stress Disorder (PTSD) has been used for almost three decades, it has been proposed for some time that the varied effects of multiple, interpersonal traumas, particularly among children, are not adequately captured by the PTSD diagnosis (Ackerman et al. 1998; Cook et al. 2005; D'Andrea et al. 2012; Herman 1992; van der Kolk 2005) as outlined by the current *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*; American Psychiatric Association 2000). While prevalence studies indicate a wide range in the number of youth who are diagnosed with PTSD following traumatic events (from 0 % to 90 %), many chronically traumatized children fail to meet full diagnostic criteria for PTSD (Dyregrov and Yule 2006; Kisler et al. 1991); alternately, many meet criteria for several other mental health diagnoses (Ackerman et al. 1998; Costello et al. 2002; Kilpatrick et al. 2003). Comorbidity is common among traumatized children and this tendency for a greater number of clinical diagnoses increases with exposure to a greater number of trauma experiences (Copeland et al. 2007; Greeson et al. 2011).

Researchers and clinicians alike have expressed concern that there is no single diagnosis in the current *DSM* system that captures the complex constellation of symptoms often exhibited among children exposed to chronic, interpersonal trauma. As a result, children with complex trauma histories are at increased risk of receiving either multiple diagnoses that may not be clearly related to trauma exposure or in some cases receive no diagnosis at all (D'Andrea et al. 2012; van der Kolk 2005). Two studies suggest this concern may be a reality. Richardson and colleagues found that just under half of their child welfare sample did not meet criteria for any *DSM* diagnosis despite having ongoing histories of maltreatment and clinically significant symptoms (Richardson et al. 2008). Alternately, Greeson et al. (2011) found that a national sample of youth in foster care with multiple and chronic, interpersonal traumas (i.e., complex trauma history) had significantly higher rates of clinical diagnoses compared to other maltreated youth without these complex trauma exposure histories.

Further, children with specific types of abuse histories may be even less likely to receive a trauma-related diagnosis. Chaffin (2006) highlighted that the types of diagnoses that tend to lead to referrals for trauma-focused treatment (e.g., PTSD and depression) are most often given to children with histories of sexual abuse, compared to children with histories of physical abuse and/or neglect. However, youth with histories of neglect and physical abuse actually account for the majority of youth in child welfare who may be more likely to display a range of behavioral, learning, and social problems (rather than classic PTSD and mood symptoms; see Greeson et al. 2011; Kisiel et al. 2009b). Therefore, children who demonstrate a combination of behavioral, emotional, and relational problems following exposure to a range of commonly experienced traumas may receive several other mental health diagnoses as noted above (see Ackerman et al. 1998), but fail to meet criteria for the very diagnoses that would indicate a need for trauma treatment. This has critical implications for treatment, including both referral to mental health treatment and the use of psychiatric medications. While these services may be targeted to several discrete emotional and behavioral problems in isolation, this is often done without the benefit of understanding or treating these difficulties within the context of a broader trauma framework that emphasizes developmental responses to trauma (van der Kolk 2005), which is not only less effective but can be potentially harmful to the child over time.

Several leading experts in the area of complex trauma indicate that the existing diagnostic system fails to accurately identify and fully capture the complexity of trauma exposures, the range of symptoms and impairment, and the developmental disruptions associated with these chronic, interpersonal traumas (Ford 2011; van der Kolk 2005). The proposed diagnosis of Developmental Trauma Disorder (DTD) for *DSM-5* (van der Kolk et al. 2009) is intended to offer a framework that could be used to more appropriately identify and treat children and adolescents with exposure to complex interpersonal trauma and associated patterns of dysregulation across areas of development. The proposed criteria address (a) exposure to "multiple or prolonged adverse events over the period of at least 1 year" including both direct experience or witnessing of events and disruptions in protective caregiving, separation, or emotional abuse; and (b) complex traumatic reactions, including repeated patterns of dysregulation across multiple areas (e.g., affective and physiological, attentional and behavioral, self and relational; van der Kolk et al. 2009). Although the DTD diagnosis is not included in the *DSM-5,* field trials are ongoing to examine its scientific validity and clinical utility (Ford et al. 2013). In addition to the field trials, other research examining the proposed DTD diagnostic criteria has also recently been published (Klasen et al. 2013; Stolbach et al. 2013).

While complex trauma has been more broadly defined in terms of the impact of multiple and chronic interpersonal traumas across several areas of impairment, the term

"developmental trauma" is utilized and assessed in the context of this study in relation to these more specified criteria. This will focus on understanding the impact of different types of interpersonal trauma, including interpersonal violence and attachment-based trauma, that is not typically violent in nature (e.g., emotional abuse), in relation to different areas of developmental impairment and dysregulation (see below and Ford 2011; van der Kolk 2005; van der Kolk et al. 2009). As noted above, existing data provides support for the relationship between complex, interpersonal traumas and significant impairment across several of these identified areas and lends support for understanding the more distinct patterns of trauma exposure and clusters of symptoms within a developmental trauma framework as an area for further research (D'Andrea et al. 2012).

Study Questions

Previous studies have shown that children within the child welfare system have high rates of exposure to complex, interpersonal trauma which are associated with a broad range of symptom areas and significantly higher rates of mental health problems. While complex trauma exposure and reactions have been addressed previously, more empirical evidence is needed to understand how constellations of interpersonal trauma exposure and symptoms relate to each other and co-occur in a meaningful way.

In a previous study, the Child and Adolescent Needs and Strengths (CANS) Comprehensive tool, used in Illinois child welfare as an assessment of trauma experiences and mental health needs, was used to assess complex trauma exposure in relation to severity and types of symptoms (Kisiel et al. 2009b). The current study utilizes the CANS in relation to a developmental trauma framework and the proposed criteria for DTD to determine if specific patterns of chronic, interpersonal trauma within the caregiving system are related to specific constellations of symptoms and dysregulation across several areas; this represents an expansion of the earlier CANS-Complex trauma study and addresses more distinct comparisons between trauma exposures types and symptom patterns. The context of child welfare offers a natural setting in which to further understand these complex issues, particularly given the high prevalence of traumas occurring within the caregiving system as the primary reason for entry into the child welfare system.

The current study was designed to address the following issues:

1. Identify youth with histories of distinct patterns of interpersonal trauma exposure upon entry into the child welfare system, including exposure to significant violent interpersonal trauma, or attachment-based, "non-violent" interpersonal trauma or a combination of both (as defined below).
2. Determine whether there are differences in symptom patterns and severity for youth in these different trauma groups.
3. Determine whether youth with specific constellations of trauma exposure and symptoms are more likely to have negative child welfare-related outcomes (including placement disruptions, psychiatric hospitalizations) compared to youth without these complex interpersonal trauma histories.

Method

Participants

Between July 2005 and April 2012, data were collected from a sample of children and adolescents entering state child welfare custody through the Illinois Department of Children and Family Services (IDCFS). This study divided the sample into four groups of children based on four specific patterns of trauma experience: (a) exposure to "violent trauma," or repeated and severe interpersonal violence, (b) exposure to "non-violent," attachment-based traumas including significant impairments in caregiving and/or emotional abuse, (c) exposure to both interpersonal, violent trauma and attachment-based, non-violent trauma or (d) no identified significant trauma exposure in these particular areas or other types of trauma experiences. The term non-violent trauma is adopted here to describe experiences that are typically not physically violent in nature (in contrast to experiences of interpersonal violence), and in relation to the proposed DTD diagnostic criteria. The IDCFS CANS Comprehensive assessment tool (described below; Lyons et al. 2005) was administered to all children entering the child welfare system during this time period. This is a primary tool used within Illinois child welfare and across several other child welfare and child-serving systems to gather information about trauma experiences, traumatic stress symptoms, mental health needs, and strengths.

Procedures

IDCFS implemented an Integrated Assessment Model beginning in 2005, requiring that all youth (ages 0-18) entering state custody undergo the comprehensive Integrated Assessment (IA) process at the "front end" of their entry into the system. This process aims to capture the mental health, safety, and health care needs of children entering care, and evaluate the needs of the caregiver, family, and the child's social context in order to best match appropriate services to these needs as soon as children enter the child welfare system. This process was

developed in response to research indicating that children entering child welfare have unmet mental health, developmental, and behavioral needs (Burns et al. 2004; Stahmer et al. 2005). The IA process is generally completed within 45 days of the youth entering DCFS care.

Measures

The IDCFS CANS Comprehensive (Lyons et al. 2005) is a clinician-report measure developed by Northwestern University in collaboration with the National Child Traumatic Stress Network and IDCFS clinical staff in order to provide a "roadmap" for identifying needs and services for youth and families served by the child welfare system using a comprehensive trauma framework. It is a comprehensive, trauma-informed and strengths-based structured assessment that incorporates data from multiple sources, such as child and caregiver interviews, caregiver and teacher report tools, clinical observations of the child, and family and case record reviews.

The IDCFS CANS assesses child and caregiver mental health needs and strengths along domains often impacted by exposure to child trauma. It consists of 105 total items across eight primary domains: Trauma Experiences, Traumatic Stress Symptoms, Child Strengths, Life Domain Functioning, Acculturation, Child Behavioral/Emotional Needs, Child Risk Behaviors, and Caregiver Needs and Strengths. Two specific age-related domains are assessed as well: children under the age of 5 are assessed for early childhood needs, and children over the age of 14 are assessed for independent living needs. The Trauma Experiences domain captures the child's lifetime history of exposure to traumatic events while the remaining CANS domains are intended to measure levels of child and caregiver functioning within the last 30 days.

The CANS is completed by clinicians who are trained in its reliable use, and certified after demonstrating a reliability of at least 0.70 on a test case vignette. This vignette is developed and scored for norming by CANS experts, and clinician scores are compared to these "preferred scores" to establish reliability (Lyons 2004). The scoring for the CANS is based on a 4-point scoring system according to two criteria; namely, the degree of strength or impairment, and the degree of urgency for intervention. The scoring system is structured as follows: 0 indicates no evidence of impairment (need) or a core strength = *No need for action plan;* 1 indicates a mild degree of difficulty (need) or a useful strength = *Plan for watchful waiting to see whether action or prevention planning is needed;* 2 indicates a moderate level of difficulty (need) or a potential strength = *Plan for action/intervention;* 3 indicates a severe level of difficulty or no identified strength = *Plan for immediate or intensive action/intervention.* "Actionable" scores are those rated as a 2 or a 3 on any of the needs items; strengths are scored in the same manner as needs, such that higher scores indicate increased difficulty or potential need for strengths building and lower scores indicate greater levels of strengths across specified areas (see Kisiel et al. 2009b for further details).

Of note, the Trauma Experiences items have slightly different anchors emphasizing the degree of severity and the chronicity of the trauma. Therefore, given the way the scoring system is established, scores of 2 or 3 on Trauma Experiences items typically indicate repeated and severe patterns of trauma in a given area; however, these scores could also indicate one instance or more of trauma that is particularly severe trauma experience (e.g., violent or coerced trauma) that does not necessarily occur over a number of years.

While the CANS is not a diagnostic tool, it does offer clinically relevant symptom domain and item level scores that are rated by a clinician after integrating all of the information gathered on a particular child from different sources. Domains are scored by summing all scores for items within each of the eight domains. The measurement properties of the CANS have been studied extensively (Lyons 2004). On an item level, Anderson et al. (2002) found that individual CANS items may reliably be used alone in data analyses. On a domain level, previous psychometric studies suggest that these eight domains of the CANS exhibit strong reliability and validity (Kisiel et al. 2009a; Lyons and Weiner 2009). Finally, the reliability and validity of the CANS has been demonstrated in child welfare, mental health, and juvenile justice settings (Leon et al. 2008; Lyons et al. 2000; Lyons and Weiner 2009; Sieracki et al. 2008).

Data Analysis

The data analytic strategy for the current study included several steps. First, interpersonal violence (defined as violent trauma) was coded based on exposure to repeated and severe interpersonal violence, including the experience of sexual abuse, physical abuse, and/or family violence based on the CANS. Exposure to significant impairments in caregiving or emotional abuse (defined as non-violent trauma) was coded based on exposure to emotional abuse and/or severe neglect on the CANS. For each of these groups, at least one trauma needed to be endorsed at an actionable level (score of 2 or 3) for these to be coded as present, with the exception of neglect which needed be scored at the highest level (score of 3) for it to be coded as present. The rationale for this coding of neglect was based on the item definition, signifying that scores of 3 indicate an "absence in protective caregiving" which is reflective of developmental trauma criteria for non-violent/attachment-based traumas. Alternately, a score of 2 on the neglect item includes several other types of neglect (e.g., physical, emotional) not necessarily related to developmental trauma; this would also potentially encompasses a larger proportion of

the child welfare population and therefore may not be sensitive to differences between these groups. Finally, the combined violent/non-violent trauma group was coded based on at least one actionable score for both of the violent and non-violent trauma types of caregiver-related interpersonal trauma experiences noted above.

Utilizing these trauma experiences as a basis for coding these groups is also consistent with recently published literature on developmental trauma (D'Andrea et al. 2012; Ford 2011) and the proposal for Developmental Trauma Disorder in the *DSM-5,* describing these interpersonal trauma experiences within the caregiving system (van der Kolk et al. 2009). While some published literature on complex trauma emphasizes similar interpersonal trauma experiences within the caregiving system in their definition for complex trauma exposure (Greeson et al. 2011; Kisiel et al. 2009b), the difference here is that these trauma groups are coded based on the more specific combinations of trauma (e.g., violent and non-violent) defined in relation to a developmental trauma framework and the proposed criteria for DTD (see van der Kolk et al. 2009). As noted in previous studies (e.g., Kisiel et al. 2009b), while it is understood that exposure to other types of ongoing interpersonal trauma (e.g., community violence, school violence, war) may also have complex and devastating effects on functioning (Finkelhor et al. 2007), this study focused on the unique impact of specific constellations of caregiver-related traumas, particularly as these are the most prevalent traumas within child welfare.

This initial step resulted in four groups which were defined as: (a) exposure to violent trauma, (b) exposure to non-violent trauma (impaired caregiving or emotional abuse), (c) exposure to combined violent and non-violent trauma, and (d) other trauma but not including chronic and severe violent or non-violent interpersonal trauma exposure. These definitions are consistent with the identified exposure criteria for the proposed DTD (see van der Kolk et al. 2009). As a second step, specific CANS items were mapped onto corresponding symptom domains in accordance with the developmental trauma framework, including the following: (a) Affective and Physiological Dysregulation, (b) Attentional and Behavioral Dysregulation, (c) Self and Relational Dysregulation, (d) Posttraumatic Spectrum Symptoms, and (e) Functional Impairment. This coding process for the trauma groups and symptom domains took place as part of a content analysis of the CANS tool in relation to the proposed DTD criteria and consensus definitions established in collaboration with experts on complex trauma and developmental trauma from the National Child Traumatic Stress Network. It is important to note that because the CANS is not specifically designed as an assessment or diagnostic tool for DTD, the assessment of certain subdomains is not complete across all areas. This will be described more fully below.

Next, children in all four trauma exposure groups were compared in terms of their severity of symptoms (based on the symptom clusters noted above) and in relation to other indicators of level of care and placement stability within child welfare to determine if children with both violent and non-violent interpersonal traumas had higher levels of need across these areas. Finally, Rasch modeling techniques were utilized to determine the natural clustering of items within the symptom domains, illustrating the fit of items by domain and by trauma group. This technique was used to assess the relationship between items within particular symptom domains, and determine how these symptom domains discriminate across the different trauma groups.

Results

The sample for this study included 16,212 children and adolescents entering child welfare in Illinois. Of these youth, 49.1 % were female and 50.9 % were male. The average age of the sample was 5.2 years with a range of 0–16 years ($SD = 5.0$). In terms of race/ethnicity, 47.3 % of the sample was African American, 46.6 % non-Hispanic white, 5.6 % Hispanic, and 0.5 % identified as "Other."

Characteristics of Trauma Experiences

Among youth in this sample, neglect was the most frequent trauma experienced (45.7 %), followed by family violence (29.3 %), traumatic grief/separation (24.7 %), and physical abuse (20.3 %). As noted above, caregiver-related traumas are separated into violent traumas (i.e., physical or sexual abuse, or family violence) and non-violent or attachment-based trauma exposures (i.e., emotional abuse, severe neglect) to mirror the proposed developmental trauma exposure criteria. In the overall sample, 29.9 % of youth were exposed to violent interpersonal trauma alone, measured by at least one score of 2 or 3 on a CANS item for sexual or physical abuse, or family violence; 7.5 % were exposed to non-violent trauma alone as indicated by emotional abuse (score of 2 or 3) and/or severe neglect (score of 3), indicating an absence in protective caregiving. Exposure to both violent *and* non-violent trauma interpersonal trauma (in relation to a developmental trauma framework) was characteristic of 13.4 % of the overall sample while 49.2 % had no reported exposure to caregiver-related violent trauma or attachment-based trauma as defined by this study.

The characteristics of the sample, including the proportion meeting these trauma criteria by age groups and the average number of traumas experienced by each group are listed in Table 1. Percentages are listed as the proportion of children in particular age groups with different trauma experiences. Overall, as children progress in age in this sample, they are more likely to have experienced both violent and non-violent types of interpersonal trauma in combination, while a greater

Table 1 Characteristics of children by age and trauma type

Trauma type	0-5 years	6-12 years	13-16 years	Average # traumas
Violent trauma	841 (8.1 %)	247 (6.1 %)	127 (7.0 %)	1.61 (*SD*=.67)
Non-violent/attachment trauma	2,732 (26.4 %)	1,508 (37.3 %)	605 (32.8 %)	1.20 (*SD*=.40)
Violent and non-violent trauma	837 (8.1 %)	833 (20.6 %)	500 (27.2 %)	3.10 (*SD*=.92)
Other trauma	5,922 (57.3 %)	1,452 (35.9 %)	608 (33.0 %)	0.37(*SD*=.48)
Total proportion of sample	10, 332 (63.7 %)	4, 040 (24.9 %)	1,840 (11.4 %)	Total sample=16, 212

proportion of the younger children (0-5 years) experienced non-violent/attachment-based traumas alone. The older groups of children also experienced a greater proportion of violent trauma in relation to younger children. The largest subgroup of children were those with "other trauma" in the 0–5 age range (n=5,922); this encompasses young children with moderate levels of neglect (at a score of 2), which is the most common trauma/age profile for children coming into care in Illinois (see Kisiel et al. 2009b). The average number of trauma types experienced for the overall sample was 1.16 (SD=1.12). The breakdown in average number of trauma types across groups (see Table 1) highlights that youth in the violent/non-violent trauma group experiencing significantly more types of trauma overall in comparison to the other trauma groups (X= 6496.14, df=3, p<.001).

Symptom Clusters and Outcomes

Several CANS items were mapped onto the specific symptom clusters of developmental trauma. Descriptive statistics were generated to determine the proportion of youth who exhibited clinically elevated symptoms in each of these areas across trauma groups (see Table 2) in conjunction with the symptom criteria threshold for the proposed DTD. Children who experienced a combination of both violent and non-violent interpersonal trauma demonstrated a higher proportion of clinically elevated symptoms across areas of functioning and related to the domains of developmental trauma. When compared with those with other trauma types (i.e., less chronic or severe forms of interpersonal trauma, single incident trauma) or to those with a history of non-violent or violent interpersonal trauma alone, youth with both violent and non-violent trauma exhibited higher levels of needs across areas related to the five proposed developmental trauma symptom domains.

Additionally, youth with combined violent/non-violent trauma exposure also had much higher odds of manifesting symptoms across all areas of impairment (see Table 2). For instance, youth with combined violent/non-violent interpersonal trauma histories were at least 5 times more likely to exhibit Attentional/Behavioral Dysregulation symptoms and Self/Relational Dysregulation symptoms and over 9 times more likely to exhibit Posttraumatic Spectrum symptoms compared to youth in the other trauma group. The odds of the manifesting these symptoms clusters were also much higher for the combined violent/non-violent trauma group than for youth who experienced either violent or non-violent interpersonal trauma alone; those with non-violent trauma had slightly higher odds of exhibiting certain symptom patterns compared to those with violent trauma. Overall, the combination of both types of violent/non-violent trauma appears to have an exponential effect on a range of symptom presentations.

Developmental trauma symptom clusters and related CANS items are included in Table 3. In order to further assess differences between groups on specific symptoms (e.g., CANS items) and symptom clusters, Wald tests were used to test for significance across trauma groups controlling for the number of trauma experiences with logistic regression. The combination of both violent and non-violent types of trauma was associated with significantly higher levels of needs across all symptom clusters including symptoms related to physiological and affective dysregulation, attentional and behavioral dysregulation, self and relational dysregulation, posttraumatic

Table 2 Proportion and likelihood of trauma groups reflecting developmental trauma symptom clusters on the CANS

Developmental trauma symptoms	Other trauma	Violent trauma only	Non-violent trauma only	Violent & non-violent trauma	Odds ratio for violent trauma only	Odds ratio for non-violent trauma only	Odds ratio for violent & non-violent trauma
Affective and physiological dysregulation	7.9 %	14.5 %	18.4 %	26.7 %	1.98	2.65	4.27
Attentional and behavioral dysregulation	2.7 %	6.3 %	6.2 %	14.0 %	2.39	2.35	5.81
Self and relational dysregulation	10.5 %	20.4 %	22.6 %	40.3 %	2.18	2.49	5.74
Posttraumatic spectrum symptoms	4.8 %	13.0 %	12.2 %	31.2 %	2.99	2.77	9.07
Functional impairment	42.3 %	50.2 %	56.1 %	71.3 %	1.37	1.75	3.39

Table 3 Proportion of trauma groups reflecting developmental trauma symptom clusters and items on the CANS

Developmental trauma symptoms and CANS items	Other trauma	Violent trauma only	Non-violent trauma only	Violent & non-violent trauma
Affective and physiological				
Affect dysregulation	4.7 %	11.1 %	10.5 %	21.7 %***
Anger control	8.4 %	17.4 %	14.4 %	29.6 %***
Numbing	2.4 %	6.7 %	6.0 %	17.1 %**
Regulatory problems	3.4 %	3.5 %	10.2 %	5.5 %***
Eating disturbance	1.3 %	1.9 %	4.6 %	6.1 %***
Motor	6.0 %	5.7 %	13.0 %	6.8 %***
Sensory	2.4 %	2.0 %	5.9 %	4.0 %***
Dissociation	0.5 %	2.0 %	1.6 %	7.5 %
Attentional and behavioral				
Attention/impulse	8.4 %	13.9 %	14.1 %	23.7 %**
Social behavior	3.9 %	8.3 %	8.3 %	15.0 %***
Judgment	6.5 %	12.2 %	11.3 %	22.8 %**
Danger to others	3.1 %	6.6 %	5.0 %	12.4 %**
Sexual aggression	0.8 %	2.5 %	1.3 %	5.5 %
Delinquency	2.7 %	4.1 %	3.6 %	7.1 %
Fire setting	0.7 %	1.2 %	1.1 %	3.0 %
Suicide risk	1.0 %	2.6 %	1.7 %	6.8 %
Other self-harm	1.6 %	3.0 %	2.5 %	6.6 %
Sexually reactive behavior	1.1 %	4.9 %	2.1 %	9.4 %***
Regulatory problems	3.4 %	3.5 %	10.2 %	5.5 %***
Behavioral regression	1.3 %	2.7 %	3.6 %	7.6 %**
Self-mutilation	0.8 %	2.4 %	1.4 %	6.6 %***
Self and relational dysregulation				
Optimism[a]	39.4 %	32.6 %	41.6 %	31.9 %***
Well-Being[a]	35.2 %	34.9 %	39.9 %	45.2 %***
Attachment	8.2 %	14.3 %	23.3 %	36.7 %***
Social functioning	8.5 %	16.1 %	18.3 %	28.4 %***
Oppositional	6.0 %	11.2 %	9.4 %	20.8 %***
Anger control	8.4 %	17.4 %	14.4 %	29.6 %***
Danger to others	3.1 %	6.6 %	5.0 %	12.4 %**
Sexually reactive behavior	1.1 %	4.9 %	2.1 %	9.4 %***
Family functioning	17.6 %	30.5 %	35.9 %	60.7 %***
Interpersonal strength[a]	25.2 %	24.0 %	30.0 %	32.8 %***
Posttraumatic spectrum symptoms				
Avoidance	3.4 %	9.2 %	9.8 %	23.9 %***
Numbing	2.4 %	6.7 %	6.0 %	17.1 %**
Dissociation	0.5 %	2.0 %	1.6 %	7.5 %
Functional impairment				
School Behavior	7.5 %	13.4 %	11.1 %	22.8 %***
School achievement	8.1 %	14.1 %	13.6 %	23.5 %**
School attendance	5.3 %	8.4 %	10.5 %	15.8 %***
Family functioning	17.6 %	30.5 %	35.9 %	60.7 %***
Social functioning	8.5 %	16.1 %	18.3 %	28.4 %***
Interpersonal strength[a]	25.2 %	24.0 %	30.0 %	32.8 %***
Legal	4.6 %	6.4 %	5.6 %	9.9 %
Medical	8.0 %	8.3 %	13.3 %	10.7 %***
Physical functioning	1.9 %	2.6 %	5.0 %	4.7 %***
Vocational strength[a]	80.4 %	80.9 %	80.1 %	76.6 %***

Significance values control for number of traumas experienced

[a] "Strength" item. Strength items are reverse-coded to indicate deficits in strengths

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

spectrum symptoms, and functional impairment (see Table 3). Significant differences in symptoms remained when controlling for number of trauma experiences, suggesting differences beyond the effects of cumulative trauma alone.

Further, in addition to showing an increased likelihood of developmental trauma symptom patterns, the complexly (violent/non-violent) traumatized youth in this sample, experienced significantly worse child welfare placement outcomes than did those with either violent or non-violent trauma exposure alone. Based on Poisson regression analysis and Incident Rate Ratios, youth exposed to both violent and non-violent interpersonal trauma were 1.25 times (or 25 %) more likely to experience at least one placement disruption in the 2 years following entry into care in comparison to those youth with other types of trauma ($p<.001$). In comparison, youth exposed to violent trauma alone were also significantly more likely (by 1.14 times or 14 %) to have a placement disruption during this time frame ($p=.001$); there was no significantly increased likelihood of placement changes for youth who had been exposed to non-violent trauma alone. There was a similar pattern for psychiatric hospitalization: the incident rate was 1.7 times higher for youth with violent/non-violent trauma ($p<.001$) and 1.37 times higher for youth with violent trauma ($p<.001$) compared to youth with other types of trauma.

Finally, Rasch analyses were conducted for each of the symptom criteria in order to assess the clustering of CANS items in relation to developmental trauma symptom criteria, the goodness of fit of items in relation to the criterion and by trauma group, and the strength of these relationships. While all of the Rasch models showed similar patterns across symptom criteria, three of the models for Attentional and Behavioral Dysregulation, Posttraumatic Spectrum Symptoms, and Self and Relational Dysregulation are highlighted (Figs. 1, 2, and 3) as they demonstrate some of the more distinct models illustrating differences between trauma groups (refer to Table 3 for a listing of all CANS items mapped onto each symptom domain). The patterns show that specific symptoms (e.g. CANS items) within a given criterion

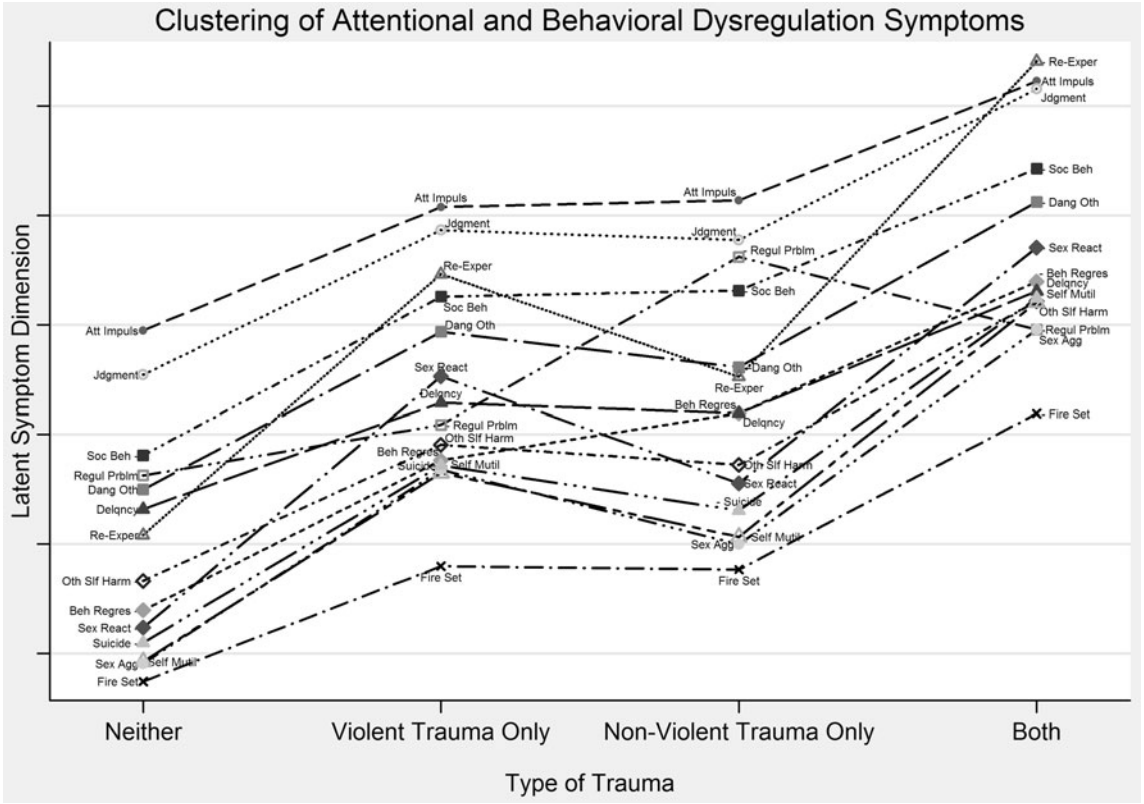

Fig. 1 Patterns of associated Attentional and Behavioral Symptoms/CANS Items by Trauma Exposure Group

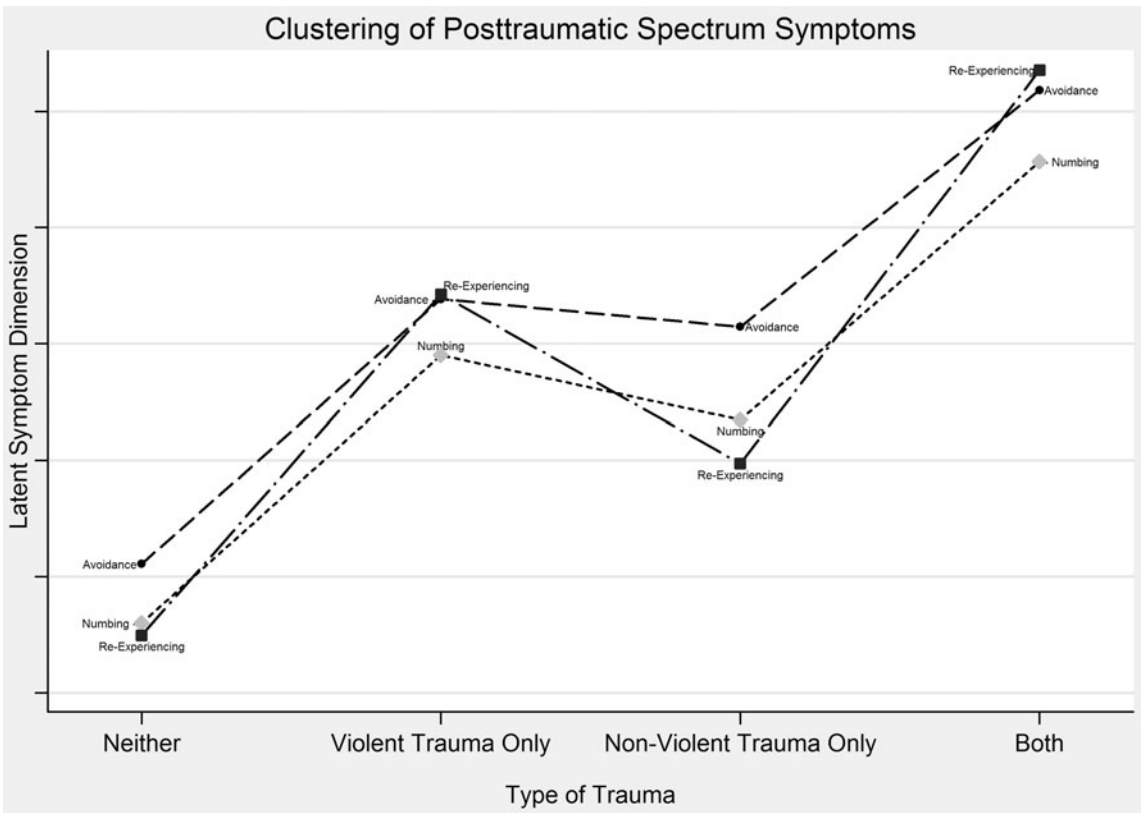

Fig. 2 Patterns of associated Posttraumatic Spectrum Symptoms/CANS Items by Trauma Exposure Group

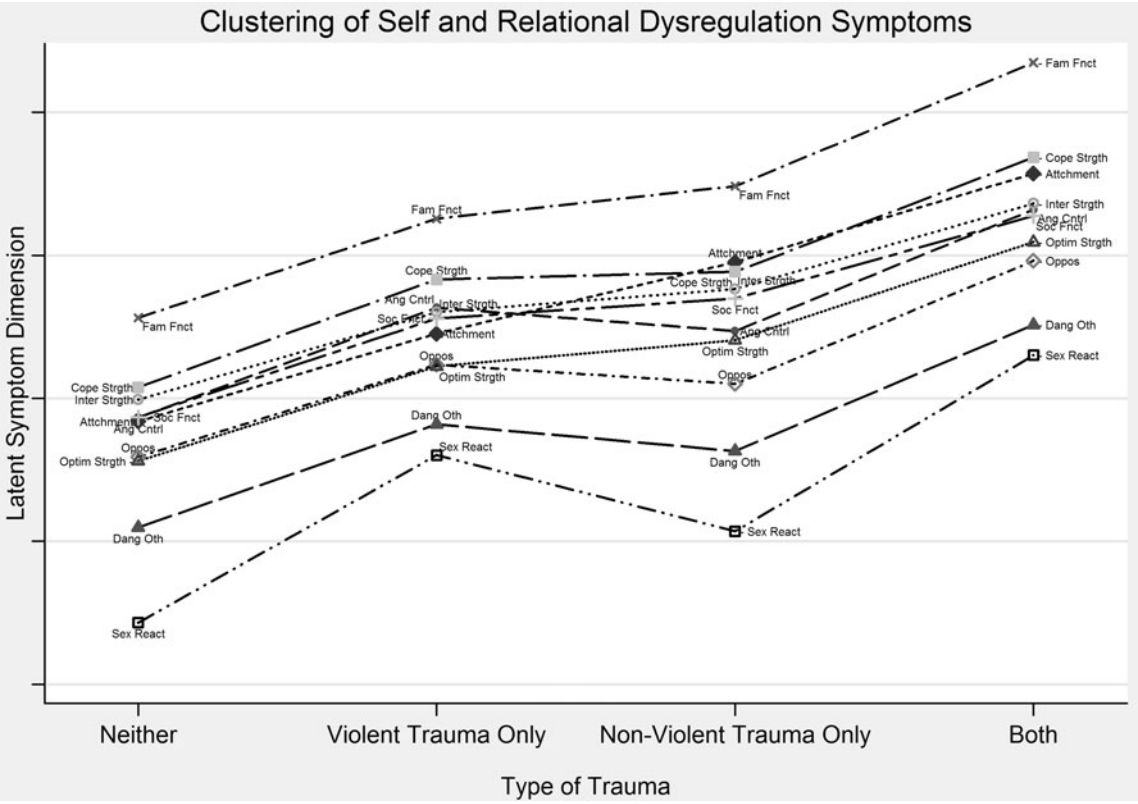

Fig. 3 Patterns of associated Self and Relational Symptoms/CANS Items by Trauma Exposure Group

tend to cluster together more tightly (i.e., illustrated by items listed closer together in the figures) for the combined violent/non-violent trauma group, with the strength of the relationship between items and the degree of impairment steadily increasing overall with the combination of interpersonal trauma exposures. Additionally, the pattern also suggests that when considering non-violent and violent types of interpersonal trauma types separately, there is a slightly stronger relationship between items in the violent trauma group in comparison to the non-violent interpersonal trauma group.

Discussion

Findings from this study provide support for the utility of a developmental trauma framework in order to more fully identify complexly traumatized children, assess the impact of different constellations of interpersonal trauma on areas of impairment, and advance the empirical research in this area. In this study, four specific patterns of interpersonal trauma exposure were examined and assessed in relation to several symptom clusters associated with developmental trauma. Findings revealed that a certain proportion of youth experienced specific patterns of violent and non-violent interpersonal trauma within the caregiver system prior to entry into child welfare; those with complex histories of both interpersonal violence and attachment-based trauma exhibited more significant difficulties across all areas of impairment.

Youth who experienced both interpersonal, violent traumas and attachment-based, non-violent traumas demonstrated more pronounced difficulties across affective/physiological, attention/behavioral, and self/relational domains, as well as more severe posttraumatic stress symptoms. In fact, when comparing across groups, the combined violent/non-violent exposure group demonstrated up to 9 times greater likelihood of clinically significant symptoms than the other trauma groups, with the most pronounced increase in symptoms in the areas of posttraumatic stress symptoms, attentional and behavioral dysregulation, and self and relational dysregulation. Additionally, youth with combined non-violent/violent traumas exhibited more functional impairment than the other groups, including problems with school attendance, behavior problems, and achievement in school. They also had higher service utilization needs, including significantly greater likelihood for psychiatric hospitalization and placement disruptions.

This study extends previous empirical work on complex trauma, that compares youth with multiple, interpersonal trauma to those with single incident or non-interpersonal trauma (Greeson et al. 2011; Kisiel et al. 2009b). It assesses different constellations of interpersonal traumas separately and in combination and identifying the impact of these traumas across several areas of impairment and in conjunction with

the proposed DTD symptom criteria. This detailed investigation of constellations of trauma exposures in relation to a range of symptom patterns represents new empirical findings that can advance research on complex trauma. For instance, the relationships between complex trauma exposure and higher service utilization patterns (Greeson et al. 2011; Kisiel et al. 2009b) and multiple placements (Ford et al. 2009) have been previously studied, but continue to be important areas in need of further research.

Overall, this study suggests that non-violent, attachment-based traumas (e.g., neglect, emotional abuse) in combination with violent interpersonal traumas (e.g., sexual abuse, physical abuse) have an exponential impact on negative outcomes in comparison to other constellations of trauma and beyond the cumulative effects of trauma alone. In other words, while children with both violent and non-violent interpersonal trauma had a greater number of traumas experienced overall and more severe symptom patterns than the other groups, these differences remained across areas of impairment even when controlling for the number of traumas. This suggests that the interaction of interpersonal violence and attachment-based traumas may have a unique impact on specific symptom profiles. This has important implications for work within the child welfare system as these complexly traumatized youth may be an important group to target for more careful assessment and more intensive services to potentially prevent these negative child welfare outcomes and disruptions from occurring. The findings support a constellation of interpersonal trauma experiences and symptoms that appear to "fit" within a developmental trauma framework that may help to discriminate patterns of symptoms from other groups of traumatized youth.

This study has several important benefits that serve to advance research on complex trauma and the construct of developmental trauma. In particular, the use of a large sample and a comprehensive assessment strategy to assess the prevalence of both violent/interpersonal and non-violent/attachment-based traumas among a group of youth in child welfare offers important information to further understand the impact of different constellations of trauma on a range of symptom clusters and areas of impairment related to the proposed DTD. This study provided empirical support for the important role of attachment-based traumas in relation to interpersonal violence and the related impact on impairment and functional outcomes which offer a useful and needed contribution (see Lyons-Ruth et al. 2006). There is also a benefit to assessing these relationships within a child welfare population, often characterized by a high prevalence of caregiver-related traumas and a range of areas of difficulty, allowing for the examination of naturally occurring relationships across different groups of traumatized youth. Additionally, the large sample allowed for a meaningful analysis of proposed symptoms in relation to a developmental trauma framework through the use of innovative modeling techniques to determine the natural clustering of items and "goodness of fit" of the items by symptom domain and by trauma group. This analytic technique helped to determine that the strength of the relationship between these symptoms of developmental trauma was much greater when both violent, interpersonal and non-violent, attachment-based traumas were present, offering important evidence for the utility of a developmental trauma framework.

There are also some important limitations to consider when interpreting these findings. Most notable is that the CANS is not designed as a diagnostic tool; therefore, it does not specifically assess for the presence of the proposed DTD. As a result, the group of youth identified in the developmental trauma exposure group (i.e., combined violent/non-violent trauma) within this study may be smaller than would be expected given the nature of this population; this may be related to issues with the sensitivity of the CANS in fully capturing the nature of trauma experiences. In particular, there is no explicit assessment of duration of trauma on the CANS, as the assessment of chronicity is combined with severity within the Trauma Experiences items, creating some limitations in interpreting this information. Additionally, given the way that CANS items are constructed (often assessing multiple symptom manifestations in one item), some CANS items fit into more than one symptom criterion for DTD based on the item descriptors (e.g., Anger Control item), which may also limit the sensitivity of the CANS in detecting true differences. Finally, analyses for this study were based on retrospective data using a cross-sectional analysis, which may limit the understanding of how youth with various constellations of trauma experiences change in functioning over time. Despite these limitations, this study offers some useful information to further understand patterns of developmental trauma exposures and symptom clusters, particularly given the comprehensive nature of the CANS tool and the large sample size of this study.

Overall, findings from this large-scale study offer initial support for the utility of a developmental trauma framework as a construct for trauma-focused assessment and treatment planning. Further work is needed to refine and test this construct. Some important next steps include continuing to assess the relationship between complex, interpersonal trauma exposure and symptom criteria/areas of impairment using a range of prospective and retrospective, cross-sectional and longitudinal studies in order to offer further empirical support for this construct. It is also important to further determine the differential impact of certain types of trauma (e.g., neglect, sexual abuse) on symptoms and developmental processes and how symptom patterns may evolve or change in relation to developmental periods and over time (D'Andrea et al. 2012). Additionally, it would be useful to further assess patterns of complex, interpersonal trauma exposure by age groups identified in this study to determine if any important differences

exist in the manifestations of symptoms and related treatment recommendations. Finally, it would be beneficial to determine if there are other factors that moderate or buffer the impact of these interpersonal trauma exposures on symptom patterns in order to more fully understand and inform treatment and service planning recommendations across child-serving settings. Other experts also recommend several important next steps, including further research to systematically develop and test the validity and clinical utility of a new potential developmental trauma diagnosis. Prospective studies are also needed to describe the different trajectories of complex trauma-related symptoms over time along with the pathways that link trauma and placement disruptions as youth who are placed in multiple settings may also be at risk for subsequent abuse (D'Andrea et al. 2012; Ford 2011).

The potential for misdiagnosis or "missed" diagnosis among complexly traumatized youth is a complicated issue and an important area for further empirical inquiry. Many child welfare and mental health systems make service and treatment recommendations on the basis of clinical diagnosis (DeJong 2010); thus, if children do not receive a trauma-related diagnosis, the impact of trauma on a child's current emotional and behavioral health problems may be overlooked when the services and treatment are identified. Consequently, it is possible that such children will receive potentially unnecessary interventions as a result (e.g., medication for symptoms mistakenly labeled as attention deficit hyperactivity disorder versus trauma-related symptoms). Indeed, misdiagnosis or missed diagnosis can set the stage for inappropriate or absent mental health services. Recently, the potential for such problematic clinical intervention within the foster care and Medicaid-served youth population was investigated by the U.S. Government Accountability Office (GAO). The inquiry found that children served by Medicaid and foster care were more often prescribed psychotropic (including antipsychotic) drugs than were their privately insured counterparts—and that many youth involved with foster care or Medicaid did not receive any mental health services at all during the same year in which a need for these services were identified (Iritani 2012). The GAO report specifically indicates the importance of disentangling traumatic stress symptoms from those of other mental health conditions when considering appropriate service interventions, and it highlights the need for further research focused on doing so effectively (Iritani 2012).

The findings related to increased risk for placement disruptions and psychiatric hospitalizations for children with complex trauma histories are extremely important for those serving children in the child welfare system. Changes in placement and psychiatric hospitalizations—while also related to the need for more intensive services or settings—are both significant events that may likely create further distress for these children. The deleterious impact of multiple placements has been clearly demonstrated (e.g., Ford et al. 2009). Psychiatric hospitalization for trauma-related difficulties can also lead to children being labeled with diagnoses that will follow them throughout their time in the foster care system and into adulthood. As noted earlier in this paper, this can also result in the inappropriate reliance on psychotropic medication where the long-term effects are not yet well understood or documented. Attention to children's cumulative experience of trauma and their attachment histories is essential to the provision of appropriate interventions (Cloitre et al. 2009). This has the potential to enhance a child's capacity for self-regulation and caregiver capacity for co-regulation, thus likely preempting hospitalizations and other disruptions to placement stability.

Further steps must be taken to ensure that youth in child welfare receive a comprehensive assessment in relation to their trauma experiences to determine the range of needs for both child and caregiver and the most appropriate services. Understanding whether specific subgroups of children can be identified based on trauma exposure history and symptom patterns could certainly lead to better treatment matching and the more effective use of trauma treatments. This type of research may be particularly important in light of the current debate regarding the lack of an appropriate trauma diagnosis to capture the broad needs of youth with complex trauma histories (D'Andrea et al. 2012; Ford 2011; van der Kolk 2005). These next steps in complex trauma research are necessary and important and will serve to advance the field and subsequently the effective treatment and services provided to these traumatized youth.

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