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Trauma Systems Therapy

Building Better Systems for Traumatized Children

Trauma Systems Therapy
Transforming the lives of traumatized children

TST as a clinical model

Trauma Systems Therapy (TST) is a comprehensive model for treating traumatic stress in children and adolescents that adds to individually-based approaches by specifically addressing the child's social environment and/or system of care. TST was designed to provide an integrated and highly coordinated system of services guided by the specific understanding of the nature of child traumatic stress. Specifically, this model conceptualizes the development of a 'Trauma System', which is comprised of two main elements:

Given the presence of a 'Trauma System', ***the essence of TST is to help the child gain control over emotions and behavior via enhancing the child's capacity to regulate emotion and diminishing the ongoing stresses and threats in the social environment***. TST was also designed to build the capacity of significant others in the child's environment to help the child control her or his emotional and behavioral responses.

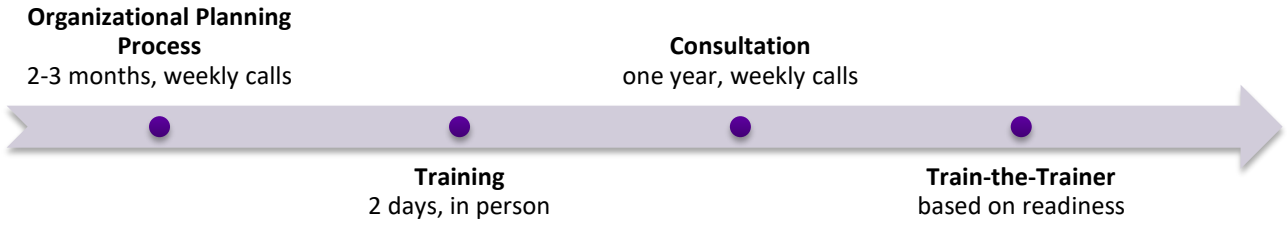
TST as an organizational model

Besides being a unique and innovative clinical model, TST also provides a framework for organizing trauma-informed services. TST takes a phase-based approach to treatment and consists of four primary intervention modules: 1) home- and community-based care; 2) services advocacy; 3) emotion regulation skills training; and 4) psychopharmacology. These various modules are clinically indicated depending on the child's degree of emotional dysregulation and stability of her/his social environment.

To effectively implement TST, several organizational elements must be in place. First, TST must fit with a given agency's mission such that genuine commitment is effected at all levels of the organization. Second, the agency must possess the capacity to form cross-disciplinary TST teams that deliver the disparate treatment modules. Third, individual team members must be trained in, and have enthusiasm for, TST. Lastly, an ongoing evaluation system must exist to ensure that TST is delivered with fidelity. A full description of TST is offered in our book: *Collaborative Treatment of Traumatized Children and Teens: The Trauma Systems Therapy Approach* (Saxe, Ellis, & Kaplow, 2007).

TST implementation

The training of an agency to implement TST typically begins with organizational consulting via telephone followed by an initial, 3-day training. Following this training, weekly conference calls are conducted. During these calls, TST trainers may consult to senior administrators about organizational issues; clinical supervisors regarding treatment fidelity or implementation issues; or the TST team regarding the on-the-ground reality of using TST with individual cases. Treatment fidelity and program evaluation consultation is also provided to the agency so that the success of the TST program can be evaluated in a way that is feasible and useful for demonstrating the outcomes of interest to the agency and potential stakeholders.



TST dissemination and adaptation

TST has generated a great deal of national interest. Several agencies have developed TST programs within their organizations that are representative of varied service settings, including child welfare/mental health collaborations, school-based mental health programs, residential programs, pediatric hospital-based programs, and substance abuse/mental health collaborations.

TST research support

Results of an open trial of 110 families comprising a cohort of children from inner city Boston and another from rural New York state have been published (Saxe, Ellis, Fogler, Hansen, & Sorkin, 2005). These children were largely multiply traumatized and managing significant environmental stressors such as poverty, risk of homelessness, and parental mental illness and substance abuse. While almost 60% of families needed more intensive home- and community-based care at the beginning of treatment, only 39% of families needed this level of treatment after three months. A follow-up study shows that these gains persist and even improve at 15 months after enrollment in treatment (Ellis, Fogler, Hansen, Forbes, Navalta, & Saxe, 2011). A recent study of 1500 youth in foster care in Kansas evaluated the effectiveness of a system-wide reform effort to implement trauma-informed care, *Trauma Systems Therapy (TST)*, across a large, private child welfare system. The longitudinal associations among implementation of *TST* and four measures of children's well-being (functioning, emotional regulation, and behavioral regulation) and placement stability were examined. Measures utilized the *UCLA-Post Traumatic Stress Disorder [PTSD]-Reaction Index*, the *Moment-by-Moment assessment tool*, *Emotion Regulation Guide (ER Guide)*, the *Child Ecology Check-In (CECI),* the *Child and Adolescent Functioning Assessment Scale (CAFAS)* and the *Priority Problem Worksheet*. Results indicate that, as children's care teams implement *TST*, children demonstrate greater improvements in functioning, emotional regulation, and behavioral regulation and they experience increased placement stability. (Murphy, K., Moore, K. A., Redd, Z., & Malm, K. **(2017).** Trauma-informed child welfare systems and children's well-being: A longitudinal evaluation of KVC's Bridging the Way Home Initiative. *Children and Youth Services Review, 75*, 23-34. doi:10.1016/j.childyouth.2017.02.008)

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Trauma-informed child welfare systems and children's well-being: A longitudinal evaluation of KVC's bridging the way home initiative

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ABSTRACT

This study evaluated the effectiveness of a system-wide reform effort to implement trauma-informed care (Trauma Systems Therapy [TST]) across a large, private child welfare system. The longitudinal associations among implementation of TST and four measures of children's well-being (functioning, emotional regulation, and behavioral regulation) and placement stability were examined. A description of the implementation of TST can be found in a separate article in this issue. Latent growth curve models were estimated using child-level administrative data on children's well-being, placement stability, and exposure to TST dosage for 1499 children in out-of-home placements. Results indicate that, as children's care teams implement TST, children demonstrate greater improvements in functioning, emotional regulation, and behavioral regulation and they experience increased placement stability. Moreover, results demonstrate that positive effects of implementation of TST are produced by both those who work closely with the child (caregivers, case managers, and therapists) and those who work more distally with the child (case manager supervisors and family service coordinators), suggesting that no one staff member or caregiver is central to providing trauma-informed care; rather it may be the confluence of the TST skills of the child's entire care team that produces better outcomes.

1. Introduction

While most U.S. children grow up in safe and supportive environments (Moore et al., 2011), many children are exposed to traumatic events that can undermine their development. In fact, approximately 3.6 million referrals for child maltreatment were made to child protective services (CPS) in 2014: involving 6.6 million children, 3.2 million of whom received an investigation or alternative response (U.S. Department of Health and Human Services [DHHS], 2014). Traumatic events, variously referred to as toxic stress, risk factors, child maltreatment, and adverse childhood experiences (ACEs), include events such as exposure to violence, economic hardship, and living with parents or guardians who have a problem with alcohol or drugs, are mentally ill, or have served time in prison. Data from a nationally representative sample of children indicate that, across the U.S., 35% of children age 17 or younger have experienced one or two ACEs and 11% of children have experienced three or more ACEs (Sacks, Murphey, & Moore, 2014). Additionally, data from the National Survey of Children's Exposure to Violence indicate that within the past year, 60% of children in the U.S. were exposed to violence and 46% were assaulted (Finkelhor, Turner, Ormrod, Hamby, & Kracke, 2009).

Adverse childhood experiences are even more prevalent for children served by our nation's child welfare system, with as many as 9 out of 10 children being exposed to violence (Stein et al., 2001). Moreover, data from a study examining the prevalence of ACEs in women who were in foster care as children find that nearly 70% of the study participants experienced five or more ACEs (Bruskas & Tessin, 2013). While disheartening, the findings are not surprising. Many of these children have been victims of abuse and/or neglect (both before and during their time in care; Pecora et al., 2005), lived in poverty, and resided in resource-deficient and dangerous neighborhoods (Crosson-Tower, 2007; Pelton, 1994; Taussig, 2002). Moreover, many of these children experience additional trauma when removed from their caregivers. Further, this trauma may be exacerbated by the high levels of placement instability often prevalent in child welfare systems. Thus, the purpose of this study was to examine the extent to which implementation of trauma-informed care across a child welfare system promoted positive outcomes for children. It was hypothesized that children's exposure to trauma-informed care would be associated with improvements in children's well-being and placement stability over time. While this topic has not been widely researched, it was also hypothesized that the implementation of trauma-informed care by both those who work

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closely with the child and those who work more distally with the child would improve children's outcomes.

1.1. Trauma and the child welfare system

Traumatic experiences can have long lasting and cascading effects on children's development. Beyond being associated with an increased risk for deleterious outcomes, such as depression and anxiety, suicide, poor physical health, substance abuse, and risk taking behavior (Felitti et al., 1998; Moore & Ramirez, 2016), trauma can affect children's impulse control, relationships with others, attachment to caregivers, self-concept, and ability to think, learn, and concentrate. Furthermore, children can exhibit traumatic reactions (such as emotional and behavioral dysregulation) when reminded of their trauma (Anda, Felitti, Bremner, et al., 2006; Cook et al., 2005; National Child Traumatic Stress Network [NCTSN], 2003; Pynoos, Steinberg, Schreiber, & Brymer, 2006).

Although trauma affects children differently—with variability in the types of emotional and behavioral responses as well as the severity of these responses—generally, the more ACEs children experience, the greater the likelihood that trauma will negatively impact their development (Anda et al., 2006; Bruskas & Tessin, 2013; Dube et al., 2003; Chapman et al., 2004; Moore, Sacks, Bandy, & Murphey, 2014; Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Given the extensive trauma histories of many children served by the child welfare system, these children may be particularly vulnerable to the detrimental impact of trauma. Moreover, the effects of trauma can be even more problematic for children served by child welfare agencies given that children's reactions to trauma can serve as barriers to placement stability and permanency—two key predictors of well-being among children in out-of-home placements (Landsverk, Davis, Ganger, Newton, & Johnson, 1996; Lloyd & Barth, 2011; Newton, Litrownik, & Landsverk, 2000; Rubin, O'Reilly, Luan, & Localio, 2007). Thus, the consequences of trauma may be even more profound for children in the out-of-home placements.

1.2. Trauma-informed care in child welfare systems

Although the effects of trauma are evident among children and families served by child welfare agencies, day-to-day child welfare practice (such as placement changes, changes in types of out-of-home placement settings, and school transfers) has not always incorporated appropriate responses to the trauma and resulting behaviors, such as emotional and behavioral dysregulation (Brown, McCauley, Navalta, & Saxe, 2013; Ko et al., 2008; Kletzka & Siegfried, 2008). This is problematic because failure to identify and address children's trauma histories can inadvertently exacerbate symptoms, trigger trauma memories, and further traumatize the child (Child Welfare Information Gateway, 2015; Donisch, Bray, & Gewirtz, 2016; Kletzka & Siegfried, 2008). Accordingly, there has been a movement towards implementing trauma-informed care in child welfare systems (e.g., Bartlett et al., 2016; Lang, Campbell, Shanley, Crusto, & Connell, 2016; Kerns et al., 2016).

Trauma-informed child welfare systems are characterized by a system-wide understanding of how to recognize and respond to the impact of traumatic stress, screening and assessment of children, data systems, workforce development, and evidence-based and evidence-informed treatments (Child Welfare Information Gateway, 2015; Donisch et al., 2016; Kletzka & Siegfried, 2008; Ko et al., 2008; SAMHSA, 2015). Trauma-informed child welfare systems are distinct from other child welfare systems in that there is a system-wide and coordinated approach to recognizing and responding to trauma. However, because this approach aims to create an individualized response to children's unique trauma histories, there are not specific prescribed activities or programs (Bartlett et al., 2016; Berliner & Kolko, 2016; Donisch et al., 2016; Harris & Fallot, 2001). While this flexibility is critical for tailoring responses to individuals' trauma, it has resulted in a lack of consensus on what exactly it means to be a trauma-informed system.

Although there is increasing recognition of the benefit of trauma-informed care in child welfare systems, there is limited evidence exploring the effectiveness of this approach for improving children's outcomes (Hanson & Lang, 2016). Moreover, of this limited research base, much of it has focused on children living in residential settings rather than children in family foster care settings (Brown et al., 2013). This study seeks to help fill this gap by evaluating the effectiveness of a system-wide reform effort to implement trauma-informed care in KVC Kansas, a subsidiary of KVC Health Systems, Inc. (KVC), a large private child welfare and behavioral health organization in Kansas.

This effort integrated Trauma Systems Therapy (TST), a research-informed therapeutic model, across KVC's full continuum of care. For an overview of KVC's implementation of TST, see Redd, Malm, Moore, Murphy & Beltz (this issue). A full description of TST is beyond the scope of this article, but briefly, the core facets of TST are 1) repeatedly assessing children's emotional and behavioral regulation capacity and the functioning of children's social environment to determine their treatment; 2) training all staff in how trauma impacts children's development and how to effectively respond to children's trauma, and 3) embedding the TST model throughout the full organization or system. Thus, TST is both a clinical model and an organizing framework for coordinating services (for an overview of TST, see Saxe, Ellis, & Kaplow, 2007). Because TST is intended to be embedded in the system in such a way that "children receive the right level of care, at the right moment in time, and in a tightly integrated manner" (Brown et al., 2013, p. 694), in KVC, regardless of how closely they worked with children, all members of children's care teams (caseworkers, therapists, foster parents, caseworker supervisors, and family service coordinators) were trained in TST.

1.3. Goals and objectives of the study

The overarching goal of this study was to better understand whether the implementation of trauma-informed care in a child welfare system promoted positive outcomes for children. This study had three major objectives. First, we wanted to describe the process of integrating trauma-informed practice throughout a child welfare system (see Redd, Malm, Moore, Murphy & Beltz, this issue). Second, we wanted to examine the association between the implementation of TST by members of children's care teams and children's placement stability and well-being (functioning, behavioral regulation, and emotional regulation). Third, we wanted to examine the extent to which the implementation of trauma-informed care by both those who work closely with a child (i.e., caregivers, caseworkers and therapists) and those who work less directly with the child (i.e., caseworker supervisors and family service coordinators who work with foster parents) influenced children's outcomes. It was hypothesized that increases in children's exposure to TST would be associated with improvements in children's well-being and placement stability over time. While this topic has not been widely researched, it was also hypothesized that the implementation of TST by both those who work closely with the child and those who work more distally with the child would improve children's well-being and placement stability.

2. Materials and methods

2.1. Study sample

Administrative data from KVC Kansas (KVC) were used to assess the association between KVC's implementation of TST and children's outcomes. These data included information on children's demographic and background characteristics (e.g., intake date, gender, race/ethnicity, date of birth), well-being (i.e., functioning, emotional regulation, and behavioral regulation), placement histories (i.e., type of placement, placement date, and removal date), and staff assignments (i.e., type of staff, start date, and end date). In addition to these child-level data,

administrative data included TST training dates of all staff and foster parents, as well as the TST fidelity scores of all child-serving staff (caseworkers, therapists, behavioral health technicians, and family service coordinators). KVC's meticulous recording of training and fidelity data and tracking of child well-being outcomes represents information that is not routinely captured in public child welfare administrative datasets, but which allowed for our in-depth examination of the association between children's care teams' fidelity to TST and child outcomes.

Our analytic sample was comprised of all children aged six and older who entered KVC (were removed from their caregivers and placed under the jurisdiction of KVC) between January 1, 2011 (one year prior to the implementation of TST) and December 2, 2014—three years of TST implementation. Analyses were restricted to children age six and older because TST was developed to be implemented with children this age. A total of 219 (13%) children were excluded from the sample because KVC felt that they did not represent typical cases or they lacked outcome data on these children because they left their jurisdiction. Specifically, children were excluded from the analytic sample if they were in care for fewer than 30 days ($n = 44$), left KVC's jurisdiction through transferring to juvenile justice ($n = 64$) or moving out of state ($n = 7$), or were discharged from KVC yet remained wards of the state ($n = 104$). This resulted in a final analytic sample of 1499 children.

On average, children in the sample were 11.98 years old ($SD = 3.53$) at entry into KVC and just over half (54%) were female. Approximately 59% of children were Caucasian/White, 23% were African American/Black, 8% were Hispanic/Latino, and 11% were other race/ethnicity. Reasons children were removed from their caregivers were not mutually exclusive and included their own externalizing behavior (33%) as well as a variety of maltreatment experiences: parental incapacity (69%; including substance abuse, incarceration, and mental incapacity); neglect (28%); physical abuse (23%); emotional abuse (18%); and sexual abuse (9%). The vast majority of children (95%) had entered KVC for the first time. Finally, based on the UCLA Post-Traumatic Stress Disorder (PTSD) Reaction Index, at entry into KVC, approximately half of the children in the sample had a likely partial- or full PTSD diagnosis.[1]

2.2. Study design

Initially, we, in collaboration with KVC, sought to design a randomized control trial (RCT) evaluation of TST. However, following numerous discussions with KVC administrators and a careful examination of sample size, logistical, and contamination concerns, we concluded that a RCT design was neither feasible nor appropriate for this context. These reasons include issues such as 1) KVC needed to train *all* staff in TST to effectively integrate TST across the entire continuum of care and this saturation model made random assignment infeasible; 2) changes in children's placements leading to changes in staff involved with children (for example, moving from residential care to a foster placement, or a foster placement to a kin placement) made it difficult to prevent contamination of the control group as well as ensure the treatment group received TST as intended; and 3) the need to tailor the intervention to the unique needs of the child, making it difficult to have a uniform TST treatment "dose." In essence, as envisioned by the developers of TST, KVC implemented TST organization-wide which made random assignment impossible.

Accordingly, an approach was developed to examine administrative data collected by KVC in a longitudinal quasi-experimental evaluation. Specifically, administrative data were collected from 2011 (one year prior to the implementation of TST) through 2014 (three years of TST implementation) that included information on child characteristics and outcomes, training dates of staff and foster parents, and TST fidelity assessments of child-serving staff. Given that training in TST commenced during February of 2012, the possibility of conducting an interrupted time series study was considered. However, as training was implemented, it became clear that training all staff in TST and facilitating their fidelity to the TST model is not an event; rather it is an iterative process that takes place over time and requires substantial investment, coordination and effort. This finding, coupled with the expansion of KVC's contract with the state in 2013, made pre- and post-TST comparisons inappropriate.

Thus, the final approach for the outcomes evaluation leveraged the inherent variability in children's exposure to TST and was based on a longitudinal evaluation of the association between KVC's level of implementation of TST and child outcomes. While this approach may not offer as strong a form of evidence as a randomized control trial, it offers strengths that overcome these limitations. First, it is sensitive to the context of KVC and did not disrupt the daily operations of the organization nor limit their ability to serve the vulnerable children placed in their care. Second, it takes advantage of the variability in staff and foster parents training, and fidelity to TST (especially given turnover that typically occurs in this context), as well as the length of time it takes to integrate training across such a large organization by examining longitudinal associations between TST dosage and child outcomes.

2.3. Analytic strategy

Latent growth curve modeling (LGM) was used to examine the trajectories of children's well-being outcomes (functioning, emotional regulation, and behavioral regulation) and exposure to the implementation of TST or TST "dosage" across their first five quarters in care. LGM is a rigorous and flexible approach to examining longitudinal change. LGM examines intra-individual change by estimating a growth curve to describe the changes within individuals over time. With the inclusion of predictor variables, LGM also examines inter-individual differences in intra-individual change (Byrne, 2012; Chan, Ramey, Ramey, & Schmitt, 2000)—thus affording the assessment of the extent to which variability in individual well-being growth trajectories can be accounted for by variability in exposure to TST.

In the current study, latent growth curve models of each of the well-being variables (functioning, emotional regulation, and behavioral regulation) were paired with latent growth curve models of TST dosage so that the associations between the growth parameters of each variable could be estimated (see Fig. 1 for a diagram of the dosage and well-being analyses). Latent growth curve models use manifest variables from each of the five time points to create two latent variables of intercept (or quarter one score) and slope (change over time). Each of the variables included in the latent growth curve models are described in detail below. For the models examining the association between exposure to TST and children's placement stability, a manifest variable of total placements was regressed upon a LGM of TST dosage (see Fig. 2 for a diagram of the dosage and placement stability analyses). Each of these models included all key covariates. Descriptive analyses were conducted using Stata SE, version 13 (StataCorp, 2013). Mplus, version 7.3 (Muthén & Muthén, 1998–2015) was used to estimate all of the LGM analyses. LGM analyses were based on the full analytic sample ($N = 1499$) and missing values were estimated with the full information maximum likelihood (FIML; Graham, 2009) estimator with robust standard errors.

2.4. Study variables

The study hypotheses are (1) children's care teams' implementation of TST would improve child outcomes and (2) that the implementation of TST by both those who work closely with the child (inner circle) and those who worked more distally with the child (outer circle) would improve child outcomes. These hypotheses were tested using three independent measures of TST dosage (overall dosage, inner circle dosage,

[1] UCLA PTSD Reaction Index data were only available for 60% of participants. As such, this variable was not included in the final models. Results from models that included this variable were aligned with results from models reported in this paper.

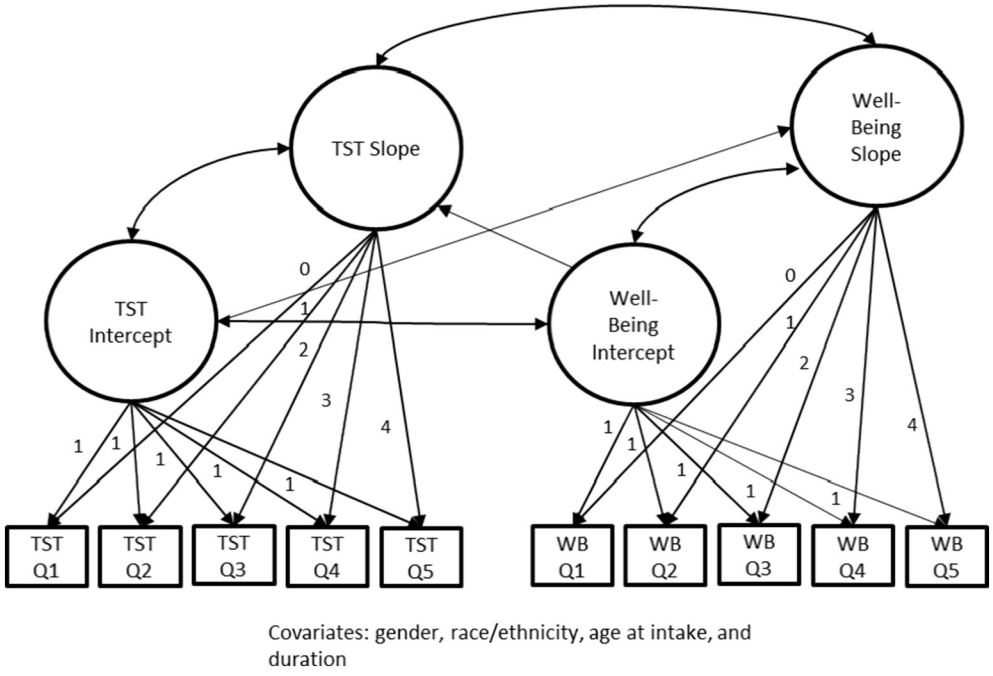

Fig. 1. Multivariate latent growth model. Note. Factor loadings were fixed to predefined values. For ease of presentation, error terms are not presented. The paths from gender, race/ethnicity, age at intake, and duration to all the latent factors for TST and well-being were estimated as covariates (see text for details).

and outer circle dosage), and four dependent variables (children's functioning, emotional regulation, behavioral regulation, and placement stability). Beginning with children's first quarter (90 days) in care, the three independent variables assessing TST dosage and the three variables assessing children's well-being (functioning, emotional regulation, and behavioral regulation) were measured on a quarterly basis

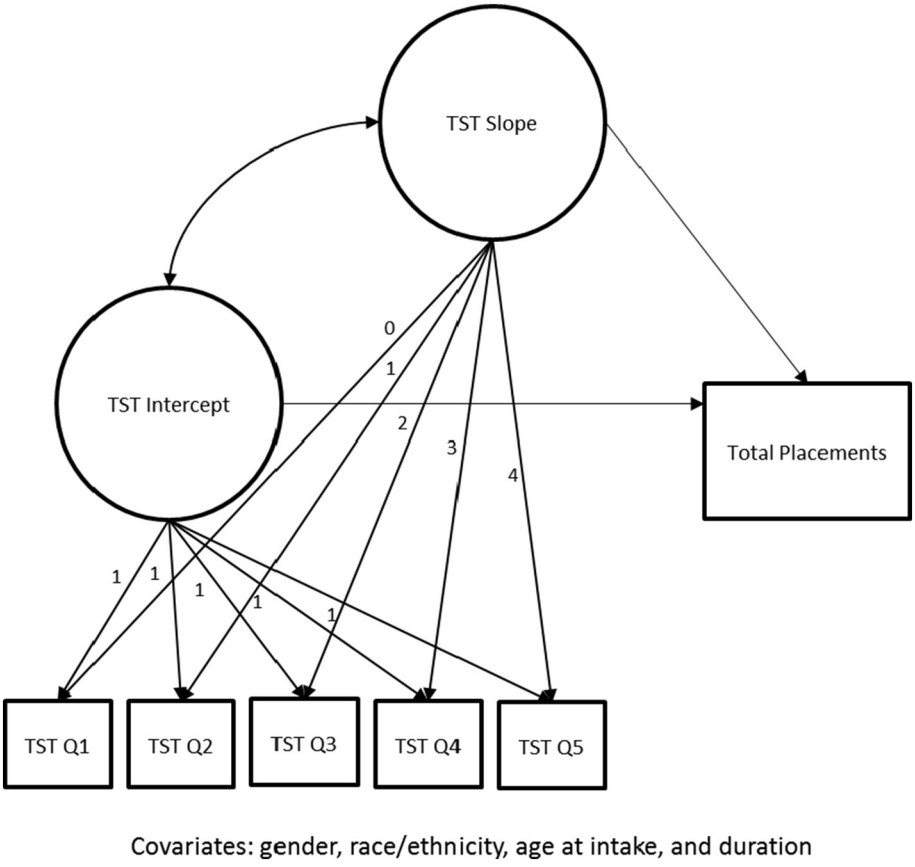

Fig. 2. Multivariate latent growth model. Note. Factor loadings were fixed to predefined values. For ease of presentation, error terms are not presented. The paths from gender, race/ethnicity, age at intake, and duration to all the latent factors for TST and the manifest variable of total placements were estimated as controls (see text for details).

for up to five quarters. Thus, each child in the analytic sample had between one and five quarters worth of TST exposure and well-being data.

In addition to the above-mentioned independent and dependent variables, four covariates (gender, age at entry, race/ethnicity, and duration in KVC) were also included in the analytic models. Originally, we included controls for baseline Posttraumatic Stress Disorder (PTSD) scores, reasons for removal, and whether or not the child had previously been placed in KVC care as covariates. Reasons for removal and previous placements were not found to be statistically significant covariates and, as such, were dropped from the analytic models. Data on children's baseline PTSD scores was limited in that it was not entered consistently across the study window, and it was only available for 60% of the sample. Accordingly, we decided not to include this variable in the final models. However, we conducted sensitivity analyses by running the models with and without baseline PTSD scores and found that the findings remained consistent across the models.

2.4.1. Child functioning

Child functioning was assessed by children's caseworkers using the Child and Adolescent Functioning Assessment Scale (CAFAS; Hodges, 1997) on a quarterly basis (every 90 days). The CAFAS is an established child assessment scale that is used widely in child welfare systems throughout the United States, while it has demonstrated poor to fair internal consistency (ranging from 0.63–0.78), the CAFAS strong interrater reliability (ranging from 0.79–1.00) and predictive validity (Hodges, 2011). The CAFAS is comprised of 165 descriptors across eight domains: school; home; community; behavior towards others; moods; self-harm; substance use; and thinking. Each of these eight domain subscales is rated on a 4-point scale (0 = *no impairment*, 10 = *mild impairment*, 20 = *moderate impairment*, and 30 = *severe impairment*). Total functioning was calculated by summing the eight subscales. This total functioning score translates into different severity levels to guide service provision (e.g., "10 and under" indicates the child exhibits no noteworthy impairment, "50–90" indicates the child may need additional services beyond outpatient care, "140 and higher" indicates the child likely needs intensive treatment).

2.4.2. Emotional and behavioral regulation

The Child Ecology Check-In (CECI) was used to assess children's emotional and behavioral regulation and was completed by children's caseworkers on a monthly basis. Given that children's functioning and TST dosage data were collected on a quarterly basis (once every 90 days), data from the CECI that was administered closest to the end of each quarter were selected for the analyses. The CECI was developed by the developers of TST as a tool to assess the functioning of children's self-regulation and social environment (Brown et al., 2013) rather than a tool to be used in a rigorous evaluation. Each subscale of the CECI is comprised of two items that are rated on a 9-point intensity scale (0 = *not at all*; 8 = *as much as I can imagine*). For each subscale, the two items are summed to create a total subscale score. Emotional regulation was assessed by two items: "to what extent has the child been sad or depressed?" and "to what extent has the child been anxious, worried, nervous or fearful?" Behavioral regulation was assessed by two items: "to what extent has the child's behavior been aggressive, destructive, or harmful towards others?" and "to what extent has the child's behavior been harmful, risky, or potentially harmful to him or herself?" Given that this tool was developed as a tool to facilitate practice, there is limited information available regarding the psychometric properties of the CECI. This limited our ability to ensure that the measure is in fact a reliable and valid measure of children's emotional and behavioral regulation. However, given that the study is based on pre-existing administrative data, we were unable to choose a more robust measurement. Nevertheless, the CECI was positively correlated with the CAFAS, a more rigorously tested measure, at all time points suggesting that this tool is capturing aspects of children's regulation (see Table 1).

2.4.3. Placement stability

Administrative placement history data were used to calculate children's placement stability. These data included the entry and exit date of each placement and the type of placement for each placement children had while in KVC custody. The total number of placements children experienced throughout their stay in KVC care was summed to calculate their level of placement stability. On average, children experienced 4.04 ($SD = 4.39$) placements while in KVC care. Given that children experienced multiple different placements and placement types throughout their time in KVC, we did not control for type of out-of-home placement.

2.4.4. TST dosage

Fidelity scores and TST training dates of children's care teams (caregivers, family service coordinators, caseworkers, supervisors, and therapists) were used to calculate the level of TST or "dosage" that children received. TST fidelity scores were available for all child-serving staff members (caseworkers, therapists, behavioral health technicians, and family service coordinators) trained in TST. Although each fidelity assessment is tailored to the type of staff member, all assessments are based upon the same 10 TST principles (Saxe et al., 2007) and are based on the same 11-point scale (0 = *lacking direct evidence*; 10 = *conclusive evidence*). Each child-serving staff members' fidelity to TST was assessed quarterly by their supervisor. Staff members who were not trained in TST were given a fidelity score of zero. This is because 1) the training of staff was rolled-out over time and 2) given that turnover is inherent in child welfare systems, there was a continuous flow of new, untrained staff. Thus, rather than have missing data for these staff members, we decided that untrained staff would be given a score indicating "lacking direct evidence" of implementing TST until they were trained.

Given that fidelity assessments were not administered to KVC supervisors or foster parents, proxy TST scores were developed based on the length of time since they had been trained in TST. We felt that it was important to develop TST proxy scores for these members of children's care teams because based on the TST model, in order for a system-wide implementation of TST to be successful all members of children's care teams needed to be trained. In addition, not all foster parents, and very few other types of caretakers (such as kin placements) were trained in TST and we wanted to account for this in the analysis. Finally, with turnover there was a continual flow of supervisors and foster parents who would be working with children who had yet to be trained or had much experience in implementing TST.

Aligned with the fidelity scores, these proxies were based on an 11-point scale (0 = *not trained in TST*, 10 = *trained in TST for 15 or more months*). The decision to create proxies that increased with length of time since training was made based on the findings from focus groups held with foster parents that indicated that the more time and experience foster parents had implementing TST, the more comfortable and successful they felt implementing it. In addition, there was a general trend that fidelity scores increased over time. To assess the extent to which these proxy scores were aligned with fidelity scores, we generated proxy scores for child-serving staff with fidelity scores. Fidelity scores and proxy scores were significantly correlated, $r(773) = 0.11$, $p < 0.01$. Although this correlation is low, on average, fidelity proxy scores were lower ($M = 7.82$, $SD = 2.87$) than fidelity scores ($M = 8.96$, $SD = 1.40$), suggesting that fidelity proxy scores may be conservative estimates of actual fidelity to TST. Finally, all placements with caregivers[2] who were not trained in TST were given fidelity scores of zero. We realize that there are limitations to these proxies and because of this we conducted additional analyses (available upon

[2] Caregiver was defined by the type of placement a child was in. If the child was in a residential treatment center or group home, the average fidelity score of the behavioral health technicians who worked in the home were used as caregiver fidelity scores. If the child was in a kin placement and that caregiver had not been trained in TST the caregiver received a fidelity score of zero.

Table 1
Correlations, means, and standard deviations of study variables.

	F Q1	F Q2	F Q3	F Q4	F Q5	ER Q1	ER Q2	ER Q3	ER Q4	ER Q5	BR Q1	BR Q2	BR Q3	BR Q4	BR Q5
F Q1															
F Q2	0.54***														
F Q3	0.52***	0.66***													
F Q4	0.46***	0.58***	0.75***												
F Q5	0.45***	0.5***	0.53***	0.70***											
ER Q1	0.26***	0.32***	0.30***	0.29***	0.26**										
ER Q2	0.26***	0.41***	0.40***	0.37***	0.12	0.46***									
ER Q3	0.25***	0.32***	0.40***	0.43***	0.30***	0.34***	0.44***								
ER Q4	0.16***	0.21***	0.20***	0.53***	0.37***	0.32***	0.36***	0.40***							
ER Q5	0.24***	0.26***	0.34***	0.39***	0.47***	0.37***	0.30***	0.35***	0.47***						
BR Q1	0.35***	0.55***	0.39***	0.49***	0.32***	0.43***	0.31***	0.26***	0.23***	0.30***					
BR Q2	0.39***	0.44***	0.49***	0.43***	0.35***	0.26***	0.47***	0.25***	0.21***	0.22***	0.49***				
BR Q3	0.33***	0.34***	0.42***	0.44***	0.46***	0.27***	0.28***	0.48***	0.27***	0.28***	0.38***	0.41***			
BR Q4	0.32***	0.40***	0.37***	0.61***	0.53***	0.24***	0.26***	0.34***	0.51***	0.38***	0.41***	0.41***	0.52***		
BR Q5	0.36***	0.41***	0.45***	0.46***	0.60***	0.24***	0.24***	0.28***	0.24***	0.55***	0.50***	0.43***	0.48***	0.52***	
TST Q1	0.00	0.05	0.15**	0.01	0.04	0.00	−0.06	−0.04	−0.05	−0.05	−0.04**	−0.10**	−0.08*	−0.01	−0.02
TST Q2	0.04	0.07	0.17**	0.04	0.03	0.03	0.04	0.02	0.00	−0.02	−0.02	−0.08*	−0.07*	−0.04	−0.04
TST Q3	0.03	0.11*	0.17**	0.01	0.09	0.00	0.05	0.01	0.05	0.02	−0.02	−0.07*	−0.06	0.01	0.00
TST Q4	0.04	0.10*	0.12**	−0.01	0.04	0.00	0.06	0.03	0.10**	0.03	0.00	−0.03	−0.04	0.03	−0.02
TST Q5	−0.02	−0.02	0.05	−0.09	−0.10	−0.05	−0.02	−0.04	0.02	−0.01	−0.04	−0.08*	−0.07	−0.07	−0.09*
IC TST Q1	−0.01	0.03	0.18***	0.04	0.05	0.02	−0.04	−0.05	−0.06	−0.08*	−0.04	−0.08*	−0.06	−0.02	−0.04
IC TST Q2	0.03	0.10*	0.20***	0.09	0.07	0.04	0.06	0.04	−0.01	−0.03	−0.02	−0.07*	−0.06	−0.05	−0.05
IC TST Q3	−0.01	0.12**	0.20***	0.02	0.15**	0.01	0.07	0.01	0.07	0.05	−0.01	−0.06	−0.05	0.03	0.02
IC TST Q4	0.03	0.09	0.13**	−0.01	0.04	−0.01	0.06	0.02	0.11**	0.04	0.01	−0.02	−0.02	0.05	0.00
IC TST Q5	0.00	−0.03	0.04	−0.07	−0.11	−0.07	0.00	−0.05	0.04	0.00	−0.05	−0.06	−0.06	−0.04	−0.06
OC TST Q1	0.01	0.07	0.11*	0.00	0.03	−0.06*	−0.06	−0.03	0.00	0.01	−0.02	−0.08*	−0.09**	0.03	0.01
OC TST Q2	0.02	0.02	0.12**	0.00	−0.02	−0.03	−0.07*	−0.04	0.03	0.01	0.01	−0.05	−0.05	0.01	−0.02
OC TST Q3	0.06*	0.04	0.10*	0.00	0.00	−0.07	−0.06	0.00	−0.03	−0.05	−0.06	−0.08*	−0.04	−0.05	−0.03
OC TST Q4	0.02	0.06	0.06	0.01	0.00	−0.02	−0.04	−0.01	0.01	−0.03	−0.105*	−0.12**	−0.09*	−0.03	−0.05
OC TST Q5	0.00	−0.01	0.03	−0.10	−0.13*	−0.03	−0.09*	−0.05	−0.02	−0.05	−0.08	−0.12**	−0.12**	−0.06	−0.14*
Total placements	0.37***	0.48***	0.47***	0.44***	0.43***	0.19***	0.21***	0.27***	0.18***	0.28***	0.29***	0.30***	0.34***	0.31***	0.36***
Mean	44.36	38.17	38.73	37.48	36.73	4.00	3.61	3.16	3.29	3.44	1.95	2.01	1.93	1.84	2.02
SD	44.54	37.31	39.01	41.14	39.70	3.34	3.28	3.11	3.37	3.35	2.85	2.98	2.96	2.74	3.18

	TST Q1	TST Q2	TST Q3	TST Q4	TST Q5	IC TST Q1	IC TST Q2	IC TST Q3	IC TST Q4	IC TST Q5	OC TST Q1	OC TST Q2	OC TST Q3	OC TST Q4	OC TST Q5	Total placements
TST Q1																
TST Q2	0.86***															
TST Q3	0.73***	0.87***														
TST Q4	0.63***	0.74***	0.82***													
TST Q5	0.54***	0.62***	0.66***	0.79***												
IC TST Q1	0.93***	0.77***	0.61***	0.51***	0.46***											
IC TST Q2	0.74***	0.93***	0.79***	0.63***	0.55***	0.76***										
IC TST Q3	0.58***	0.74***	0.93***	0.76***	0.59***	0.53***	0.78***									
IC TST Q4	0.47***	0.56***	0.69***	0.93***	0.72***	0.41***	0.56***	0.73***								
IC TST Q5	0.39***	0.46***	0.51***	0.69***	0.95***	0.36***	0.46***	0.53***	0.73***							
OC TST Q1	0.87***	0.79***	0.71***	0.63***	0.51***	0.62***	0.56***	0.51***	0.43***	0.34***						
OC TST Q2	0.79***	0.84***	0.74***	0.62***	0.52***	0.57***	0.58***	0.49***	0.40***	0.34***	0.88***					
OC TST Q3	0.73***	0.79***	0.81***	0.65***	0.55***	0.54***	0.57***	0.53***	0.40***	0.34***	0.79***	0.88***				
OC TST Q4	0.64***	0.65***	0.66***	0.66***	0.50***	0.47***	0.46***	0.43***	0.37***	0.27***	0.70***	0.72***	0.78***			
OC TST Q5	0.63***	0.65***	0.61***	0.54***	0.53***	0.50***	0.48***	0.40***	0.29***	0.27***	0.66***	0.69***	0.71***	0.71***		
Total placements	−0.09***	−0.04	−0.002	−0.02	−0.10**	−0.06*	−0.01	0.02	0.001	−0.07*	−0.12***	−0.09**	−0.07*	−0.12***	−0.19***	
Mean	12.11	13.29	14.50	15.68	16.69	6.46	7.04	7.50	8.20	8.61	2.90	3.25	3.62	3.97	4.28	4.04
SD	7.97	7.51	7.20	6.24	5.70	3.84	3.51	3.18	2.40	1.82	2.49	2.45	2.45	2.38	2.35	4.39

Note. Variables abbreviated: F Q1–F Q5 = functioning from first quarter to fifth quarter; ER Q1–ER Q5 = emotional regulation from first quarter to fifth quarter; BR Q1–BR Q5 behavioral regulation from first quarter to fifth quarter; TST Q1–TST Q5 = overall trauma systems therapy dosage from first quarter to fifth quarter; IC TST Q1–IC TST Q5 = inner circle trauma systems therapy dosage from first quarter to fifth quarter; OC TST Q1–OC TST Q5 = outer circle trauma systems therapy dosage from first quarter to fifth quarter.

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

request) that looked at the association between TST implementation and children's outcomes for each individual member of children's care teams. The results of these analyses (some of which were purely based on TST fidelity scores) were aligned with the findings that combined both fidelity and proxy scores.

TST dosage scores were calculated for each child on a quarterly basis, beginning with their first quarter in KVC. Unfortunately, we did not have data regarding how much time individual members' spent with each children nor the quality of their interactions, which limited our ability to actually reflect the amount and quality of TST that children received. Given that many children experienced changes in staff and placements within individual quarters; fidelity scores for each type of role (e.g., case manager, therapist, caregiver) were averaged so that each quarterly dosage score a child received reflected the average score of all persons in that role who were assigned to that child during that particular quarter. There were no issues with outliers so data were not transformed prior to creating these averages.

Using these averages, inner circle dosage was calculated by averaging the TST scores of members of children's care teams that work with children the most intensively: caseworkers, therapists, and caregivers. Outer circle dosage was calculated by averaging the TST scores of those who work less directly with children, but still play a key role in children's lives while in care: supervisors of case managers and family service coordinators. Given that outer circle dosage and inner circle dosage scores are based on averages of particular members of children's care teams, both inner circle and outer circle dosage scores are based on an 11-point scale ranging from zero to ten. To calculate overall TST dosage scores, we summed the inner and outer circle dosage scores together. However, to translate inner circle members' more active role in children's lives, the inner circle dosage score was doubled before adding it to the outer circle dosage. Thus, children's overall dosage scores could range between zero and 30 points. It should be noted that we tested the association between children's outcomes and each measure of dosage: overall dosage (combined outer circle and the weighted inner circle dosage scores) as well as inner circle and outer circle dosage on their own.

2.4.5. Age at entry

Children's age at entry into KVC was controlled for in this study and was calculated using their date of birth and intake date into KVC. For the analyses, children's age at entry was centered at the mean ($M = 11.98$, $SD = 3.52$).

2.4.6. Gender

Gender was also controlled for in this study and measured using a dummy coded variable in which 0 reflected female and 1 reflected male.

2.4.7. Race/ethnicity

Race/ethnicity was controlled for in this study and measured using two dummy coded variables (Black/African American, and other) with White/Caucasian as the reference group. We realize that the combination of all racial/ethnic groups other than Black/African American and White/Caucasian is not ideal, however, given the limited diversity of the children served by KVC, we were limited in the way we could break out race/ethnicity.

2.4.8. Duration in care

Children's duration (total months) or time spent in KVC care was controlled for in this study and was calculated using children's intake and discharge dates. If a child had not discharged from care by the end of the observation period, the last date of the observation window (December 31, 2014) was used to calculate duration. For the analyses, duration was centered at the mean ($M = 15.11$, $SD = 9.94$).

3. Results

3.1. Descriptive analyses

Table 1 displays the descriptive statistics for the variables used in our latent growth curve analysis. Both functioning and emotional regulation trend downward over time, indicating children's functioning and emotional regulation generally improved across their first five quarters in care. There was greater fluctuation, however, observed in emotional regulation. Behavioral regulation scores remained somewhat stable across the five quarters. All three measures of TST dosage (overall dosage, inner circle dosage, and outer circle dosage) demonstrated upward trends, indicating that, generally, children's exposure to TST increased over time. We realize that the increases in TST dosage over time may appear to be an artifact of the way in which we developed proxies. To assess the extent to which this was true, we also examined trends in children's exposure to TST based purely on fidelity scores and found an identical pattern emerged. Finally, on average, children experienced just over four placements ($SD = 4.38$) throughout their duration in KVC care.

As can be seen in Table 1, overall, each measure of well-being (functioning, emotional regulation, and behavioral regulation) was positively correlated with one another within and across each quarter. Similarly, each measure of TST dosage (overall dosage, inner circle dosage, outer circle dosage) was positively correlated with one another within and across each quarter.

Generally, correlations between TST dosage and the well-being outcomes (functioning, emotional regulation, and behavioral regulation) were mixed. The total number of placements children experienced in care was positively correlated with each of the well-being outcomes, indicating that children with a greater frequency of placement changes demonstrated worse well-being. Children's total placements and exposure to outer circle dosage were negatively correlated across each quarter, indicating that children with greater exposure to outer circle TST dosage experienced fewer placements. Children's total placements were only correlated with overall dosage and inner circle dosage at their first and fifth quarter, suggesting that greater exposure to overall and inner circle dosage at quarter one and quarter five is associated with fewer placements.

3.2. Means and variances of intercepts and slopes

The means and variances of the intercepts and slopes of each of the models are presented in Table 2. Generally, these estimates are similar to the trends observed in the descriptive analyses. Given that these LGC models have multiple variables in the model, the estimates for the means and variances are conditional on the other variables in the model—that is, the means represent the values when all other variables in the model are set to zero and the variances represent variation remaining after accounting for the variance explained by each variable in the model (Byrne, 2012).

As can be seen in Table 2, across all models, TST dosage (overall dosage, inner circle dosage, and outer circle dosage) had a significant and positive slope, suggesting significant increases in exposure to TST dosage from initial levels over the five quarters. Across all models, child functioning had a significant negative slope. Given that lower scores on the CAFAS indicate better functioning, the negative slopes suggest improvements in well-being from initial levels. Across all models, emotional regulation (CECI-ER) scores increased over time, suggesting a decline in emotional regulation over time. The direction of the slope of behavioral regulation (CECI-BR) changed in different models and it was often non-significant. Finally, across all models the variances of the intercepts and slopes of the well-being and TST variables were significant, suggesting that there was significant variability in baseline (quarter one) scores and trajectories (slope), net of the variability accounted for by all other variables included in the model.

Table 2
Unstandardized estimates of means and variances of latent growth curve models.

Model	Variable	Intercept		Slope	
		Mean	Variance	Mean	Variance
1	Functioning	39.63***	673.17***	−3.01***	25.11**
	Overall dosage	12.19***	59.32***	3.10***	1.23***
2	Emotional regulation	3.72***	5.37***	0.34**	0.24***
	Overall dosage	12.19***	59.26***	3.12***	1.21***
3	Behavioral regulation	1.61***	3.74***	0.03	0.140**
	Overall dosage	12.19***	59.30***	3.13***	1.22***
4	Functioning	39.15***	675.78***	−2.65***	25.39**
	Inner dosage	2.91**	5.41***	0.854***	0.276***
5	Emotional regulation	3.79***	5.29***	0.33***	0.23***
	Inner dosage	2.92***	5.47***	0.91***	0.27***
6	Behavioral regulation	1.66***	3.71***	0.07	0.13**
	Inner dosage	2.92***	5.48***	0.87***	0.27***
7	Functioning	39.83***	680.43**	−1.83*	24.43**
	Outer dosage	6.51***	13.63***	1.71***	0.07***
8	Emotional regulation	3.84***	5.34***	0.163	0.272***
	Outer dosage	6.52***	13.63***	0.071***	0.07***
9	Behavioral regulation	1.71***	3.29***	−0.09*	0.09*
	Outer dosage	6.51***	13.63***	1.75***	0.07***
10	Overall dosage	12.19***	59.26***	3.12***	1.22***
11	Inner dosage	2.92***	5.47***	0.85***	0.28***
12	Outer dosage	6.52***	13.62***	1.71***	0.07***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3.3. Association between TST dosage and children's well-being

Fit statistics from the LGC models examining the association between TST dosage (overall dosage, inner circle dosage, and outer circle dosage) and children's well-being outcomes (functioning, emotional regulation, and behavioral regulation) are displayed in Table 3 and structural parameter estimates for each model are presented in Table 4. Hypothesis one (children's care teams' implementation of TST would improve child outcomes) was tested in the models that examined the associations between overall TST dosage and children's outcomes. Hypothesis two (implementation of TST by both those who work closely with the child and those who worked more distally with the child would improve child outcomes) was tested in the models that examined associations between children's outcomes and inner circle and outer circle dosage. Significant results that correspond with the two hypotheses are presented by outcome and are described below.

3.3.1. Association between TST dosage and children's functioning

As can be seen in Table 3, all three multivariate LGC models (overall, inner circle dosage, and outer circle dosage) fit the data well. Across all three models, there was a significant correlation between the slopes of TST dosage and CAFAS scores (overall dosage: $r = -0.37$, $p < 0.001$; inner circle dosage: $r = -0.27$, $p < 0.001$; outer circle dosage: $r = -0.42$, $p < 0.01$), suggesting that increases in TST dosage over time were associated with greater reductions in CAFAS scores over time (improvements in functioning). In addition, children's level of outer circle dosage in quarter one (intercept) significantly predicted the slope of CAFAS scores ($\beta = -0.16$, $p < 0.001$), suggesting that increased exposure to outer circle TST dosage during children's first quarter in care is associated with greater improvements in children's functioning.

3.3.2. Association between TST dosage and children's emotional regulation

As can be seen in Table 3, all three multivariate LGC models (overall, inner circle dosage, and outer circle dosage) fit the data well. Across the overall TST dosage and inner circle dosage models, children's level of TST dosage in quarter one (intercept) significantly predicted the slope of CECI-ER scores ($\beta = -0.18$, $p < 0.05$; $\beta = -0.23$, $p < 0.001$; respectively), suggesting that increased exposure to overall TST dosage and inner circle dosage during children's first quarter in care is associated with greater improvements in children's emotional regulation (reductions in CECI-ER scores).

There was also a significant correlation between the slopes of outer circle dosage and emotional regulation ($r = -0.16$, $p < 0.05$), indicating that increases in children's exposure to outer circle dosage may be associated with greater reductions in CECI-ER scores over time (improvements in emotional regulation). In addition, there was a significant correlation between the slopes of inner circle dosage and children's emotional regulation ($r = 0.14$, $p = 0.05$). This correlation was in the opposite direction as expected and suggests that increases in children's exposure to inner circle dosage were associated with less improvement in children's emotional regulation over time.

3.3.4. Association between TST dosage and children's behavioral regulation

As can be seen in Table 3, all three multivariate LGC models (overall, inner circle dosage, and outer circle dosage) fit the data well. There was a significant correlation between the slopes of overall dosage and behavioral regulation ($r = -0.17$, $p < 0.05$), indicating that increases in children's exposure to TST dosage are associated with greater reductions in CECI-BR scores over time (improvements in behavioral regulation). There was a trend towards significance in the correlation between the slopes of outer circle dosage and behavioral regulation ($r = -0.27$, $p = 0.09$), suggesting that increases in children's exposure to outer circle dosage may be associated with greater reductions in CECI-BR scores.

3.4. Association between TST dosage and placement stability

As can be seen in Table 5, all three multivariate LGC models (overall, inner circle dosage, and outer circle dosage) fit the data well. Structural parameter estimates for each model are presented in Table 6. Across all three models, the intercept of dosage significantly predicted the total number of placements children experienced throughout their duration in KVC (overall dosage: $\beta = -0.15$, $p < 0.001$; inner circle dosage: $\beta = -0.10$, $p < 0.01$; outer circle dosage: $\beta = -0.60$, $p < 0.001$), whereby higher levels of TST dosage in quarter one were associated with greater placement stability.

Table 3
Model fit indices for latent growth curve models of dosage with well-being.

Model	Variable	χ^2	*df*	CFI	TLI	RMSEA	(90% CI)
1	Functioning & overall dosage	232.58***	67	0.97	0.97	0.04	0.04–0.05
2	Emotional regulation & overall dosage	273.72***	73	0.97	0.96	0.04	0.04–0.05
3	Behavioral regulation & overall dosage	268.25***	85	0.97	0.97	0.04	0.03–0.04
4	Functioning & inner dosage	225.02***	67	0.96	0.96	0.04	0.04–0.05
5	Emotional regulation & inner dosage	264.25***	73	0.96	0.95	0.04	0.04–0.05
6	Behavioral regulation & inner dosage	257.44***	85	0.96	0.96	0.04	0.03–0.04
7	Functioning & outer dosage	230.67***	63	0.97	0.96	0.04	0.04–0.05
8	Emotional regulation & outer dosage	272.29***	76	0.97	0.96	0.04	0.04–0.05
9	Behavioral regulation & outer dosage	257.01***	84	0.97	0.96	0.04	0.03–0.04

*** $p < 0.001$.

Table 4
Standardized parameter estimates, standard errors, critical ratios, and *p* values for latent growth curve models.

Parameter	Functioning				Emotional regulation				Behavioral regulation			
	Est.	*SE*	Critical ratio	*p*	Est.	*SE*	Critical ratio	*p*	Est.	*SE*	Critical ratio	*p*
Correlation of intercepts												
Overall dosage	–	–	–	–	0.103	0.066	1.563	0.118	–	–	–	–
Inner circle dosage	–	–	–	–	0.076	0.051	1.479	0.139	−0.059	0.047	−1.254	0.210
Outer circle dosage	0.065	0.041	1.585	0.113	–	–	–	–	−0.077	0.058	−1.337	0.181
Regression effects of dosage intercepts on well-being slopes												
Overall dosage	–	–	–	–	−0.177	0.070	−2.532	0.011	–	–	–	–
Inner circle dosage	–	–	–	–	−0.233	0.067	−3.498	<0.001	−0.118	0.082	−1.449	0.147
Outer circle dosage	−0.156	0.079	−1.98	0.048	–	–	–	–	–	–	–	–
Regression effects of well-being intercepts on dosage slopes												
Overall dosage	–	–	–	–	–	–	–	–	–	–	–	–
Inner circle dosage	–	–	–	–	−0.048	0.038	−1.256	0.209	–	–	–	–
Outer circle dosage	–	–	–	–	–	–	–	–	−0.570	0.030	−1.886	0.059
Correlation of slopes												
Overall dosage	−0.372	0.103	−3.621	<0.001	0.094	0.068	1.387	0.166	−0.168	0.078	−2.149	0.032
Inner circle dosage	−0.266	0.094	−2.842	0.004	0.144	0.074	1.961	0.050	–	–	–	–
Outer circle dosage	−0.424	0.122	−3.475	0.001	−0.158	0.078	−2.04	0.042	−0.266	0.155	−1.718	0.086

Note. – indicates that the parameter was not estimated in the model as final models did not include parameters with *p* values > 00.25.

Additionally, the slopes of overall dosage and outer circle dosage significantly predicted the total number of placements children experienced throughout their duration in KVC ($\beta = -0.08$, $p < 0.01$; $\beta = -0.51$, $p < 0.01$, respectively), where increases in outer circle dosage over time were associated with greater placement stability. A similar pattern emerged in regards to the association between the slope of inner circle dosage and children's placement stability, whereby increases in inner circle dosage were associated with fewer placements; however, this relationship was only marginally significant ($\beta = -0.07$, $p = 0.07$).

4. Discussion

Each year over 250,000 children enter the child welfare system in the U.S. (U.S. DHHS, 2015). Many of these children have extensive trauma histories, which can have pervasive negative impacts on their development (Bruskas & Tessin, 2013). Moreover, the effects of trauma for children's behavioral regulation, emotional regulation, and functioning can place these children at greater risk, as they often serve as barriers to children's placement stability and permanency—two key predictors of child well-being in the child welfare system. With greater understanding of this dynamic, child welfare systems throughout the country have moved towards implementing trauma-informed practices. Despite the increasing recognition of the value of trauma-informed child welfare systems, there is a paucity of evaluations that have systematically assessed the effectiveness of this approach.

To address this issue, this study examined the extent to which a system-wide reform effort to integrate trauma-informed care (Trauma Systems Therapy [TST]) throughout a large private child welfare system produced improvements in child well-being and placement stability. We predicted that the implementation of TST by children's care teams would lead to improvements in well-being (as measured by functioning, emotional regulation and behavioral regulation scales) and placement stability (total placements). Generally, our hypothesis was upheld. Increases in children's exposure to TST (overall dosage) were associated with significantly greater improvements in functioning and behavioral regulation. Increases in children's exposure to TST (overall dosage) were not associated with greater improvements in emotional regulation; however, higher levels of fidelity to TST in children's first quarter in KVC were associated with significantly greater improvements in emotional regulation. In addition, TST fidelity in children's first quarter in care, as well as increases in fidelity over time, were significantly associated with greater placement stability.

These findings suggest that not all measures of well-being are associated with implementation of TST in the same way. Specifically, improvements in functioning and behavioral regulation were gained by increased exposure to trauma-informed care over time, while improvements in emotional regulation were gained after exposure to TST being implemented during children's early days in care (first three months). This is aligned with the premise of trauma systems therapy that changes in emotional well-being can be sought relatively quickly, while changes in established behavior patterns will take more time.

Our measurement of TST dosage allowed us to distinguish between members of children's care teams based on how closely the member is associated with a child's care: the inner circle includes caseworkers, therapists, and caregivers, and the outer circle includes supervisors and family service coordinators who play a less direct role in a child's day-to-day care. Increases across quarters in inner circle dosage were associated with significant improvements in children's functioning over time. Inner circle members' implementation of TST in quarter one was associated with significant improvements in emotional regulation over time and increased placement stability. Outer circle members' implementation of TST in quarter one was significantly associated with improvements in functioning and placement stability. Additionally, increases in outer circle dosage over time were associated with significant improvements in functioning and greater placement stability.

Table 5
Model fit indices for latent growth curve models of dosage with total placements.

Model	Variable	χ^2	df	CFI	TLI	RMSEA	(90% CI)
10	Overall dosage	193.20***	29	0.97	0.96	0.06	0.05–0.07
11	Inner dosage	186.27***	31	0.96	0.95	0.06	0.05–0.07
12	Outer dosage	202.72***	30	0.95	0.95	0.06	0.06–0.07

*** $p < 0.001$.

Table 6
Standardized parameter estimates, standard errors, critical ratios, and *p* values for latent growth curve models of dosage with total placements.

Parameter	Total placements			
	Est.	*SE*	Critical ratio	*p*
Regression effects of intercept				
Overall dosage	−0.153	0.032	−4.779	<0.001
Inner circle dosage	−0.100	0.03	−3.275	0.001
Outer circle dosage	−0.597	0.13	−4.596	<0.001
Regression effects of slope				
Overall dosage	−0.083	0.041	−2.043	0.041
Inner circle dosage	−0.065	0.035	−1.838	0.066
Outer circle dosage	−0.511	0.15	−3.404	0.001

Given that findings were varied across different types of TST dosage (or members of children's care-teams'), there is some evidence to suggest that individuals across children's care teams may play unique roles in enhancing children's well-being and that no one staff member or caregiver is central to providing trauma-informed care; rather it may be the confluence of the skills and ability of the child's entire care team that produces better outcomes. That expectation is central to the rationale for implementing TST system-wide; and it appears that these results provide some support for that rationale. Moreover, this approach may have additional advantages. Regardless of agency efforts to reduce staff and foster parent turnover, we know that turnover exists. Reliance on any one member of a child's care team is not likely to be sustainable in the long term. Additionally, this finding is compelling since, to date, most trauma-informed interventions have been developed for use by clinical staff. This finding suggests that implementing interventions with non-clinical staff and foster parents shows promise.

The links between fidelity to TST and children's well-being and placement stability highlight the promise of integrating trauma-informed care throughout a child welfare system. Although there is an emerging evidence base indicating that this approach has the potential to improve outcomes for children, our findings are among the first to highlight how increases in fidelity and training over time may relate to improvements of outcomes for children in foster care.

5. Implications and conclusions

Overall, the findings from this study should be encouraging to a wide range of individuals—practitioners, program developers and administrators, funders, and policymakers—both within the child welfare system as well as the broader child-serving system. Implementing a trauma-informed approach within a large system of care—by both clinical and non-clinical staff—can be successfully achieved, and our findings indicate that doing so results in improved well-being and placement stability for the children served. Significant correlations between the slopes of TST dosage and each child well-being outcome (functioning, emotional regulation, and behavioral regulation) ranged from −0.42 to −0.07, with each of the correlations between children's functioning and dosage (overall dosage, inner circle dosage, and outer circle dosage) reaching the recommended minimum effect size representing a "practically" significant effect (0.2; Ferguson, 2009). Correlations between dosage slopes and children's emotional and behavioral slopes did not reach this effect size, however, this may be due to the limitations of the Child Ecology Check-In's psychometric properties. Nevertheless, the findings indicate that the system-wide implementation of TST has the potential to result in meaningful improvements in children's functioning. Finally, this study also represents a first attempt to measure the dosage of such an undertaking at the child-level using administrative data from a large child welfare agency.

5.1. Implications for practitioners, program developers and administrators

The findings of the implementation evaluation show that KVC's implementation of TST provided both the knowledge and the tools necessary for staff and foster parents to better care for children. The degree and care with which KVC focused on implementing and expanding TST—the iterative and complex process that was involved—is remarkable (see Redd, Malm, Moore, Murphy & Beltz, this issue). While similar to public child welfare systems in the numbers of children and families served and the numbers of staff employed, the long tenure and commitment of KVC administrators who were responsible for implementation of TST is rare. The effort to infuse trauma-informed care into their overall system of care was not viewed as a "one-time" initiative or one that would get subsumed by new priorities.

5.2. Implications for policymakers and funders

For policymakers and funders, the findings represent an opportunity to better understand how trauma informed care affects not only the children and families served by large child welfare systems, but also the staff and the foster parents who interact daily, and most closely, with the children. Moreover, this evaluation suggests that agency-wide trauma-informed care is a promising approach.

5.3. Implications for researchers

To measure KVC's efforts to integrate TST across its continuum of care, we relied on training and fidelity data for children's care teams. While fidelity scores are often used in implementation research, associations between fidelity and child outcomes highlight the value of using fidelity data in outcome studies as well. Additionally, the differing patterns of associations between the dependent variables and different measures of TST dosage (overall, inner circle, and outer circle) demonstrate the value of examining how different members of children's care teams can individually and collectively influence child outcomes. Finally, the findings suggest additional research on trauma-informed approaches is warranted in different settings and with different populations. We hope the methods we used to measure dosage are considered and assessed by other researchers.

6. Study limitations and future directions

Our longitudinal evaluation of KVC Kansas' expansion and integration of Trauma Systems Therapy (TST) across their entire system of care was a carefully considered and innovative approach to assessing how the training of staff and foster parents can influence the well-being and placement stability of children. Nevertheless, there are some limitations to the study that warrant discussion.

The inability to randomly assign children to receive or not receive TST limits our ability to definitively identify whether exposure to TST caused the observed improvements in child outcomes. While our approach to assess the association between implementation of TST and children's outcomes may not offer as strong a form of evidence as a randomized control trial, it offers strengths that overcome these limitations. First, it recognizes that the approach is inherently an agency-wide approach. Second, it is sensitive to the context of KVC and did not disrupt the daily operations of the organization nor limit their ability to serve the vulnerable children placed in their care. Third, it takes advantage of the variability in staff and foster parent training, and fidelity to TST (especially given turnover that typically occurs in this context), as well as the length of time it takes to integrate training across such a large organization by examining longitudinal associations between TST dosage and child outcomes.

Another limitation is that, while innovative, the measure of TST dosage may not sensitively measure children's level of exposure to TST. Specifically, we were only able to rely on the fidelity assessments and training dates of KVC staff and foster parents rather than the actual amount and quality of time these individuals spent with the child on a day to day basis. Moreover, supervisors and foster parents did not take fidelity assessments so we had to rely on a proxy we created that was based on the amount of time that had passed since the individual had been trained in TST. Further complicating these efforts were changes in the staff members who worked with children and the caregivers with whom children were placed, as well as the variability in the settings children were placed in, and the types of staff members who worked with them. Despite these limitations, the consistently positive associations between TST and multiple indicators of children's well-being—as well as their placement stability—suggest that we were able to capture children's exposure to TST.

While out of our control, another limitation is the lack of racial and ethnic diversity of children served by KVC and the fact that KVC is a

private child welfare system, as these factors may limit the generalizability of our findings. Finally, reliance on secondary data to measure all outcomes can also limit study findings. Child Trends' outcome evaluation relied on KVC's administrative data to measure child outcomes—well-being and placement stability—as well as TST dosage (as measured by secondary data on training dates and fidelity assessments). While efficient and cost-effective, we were somewhat limited in our selection of variables that we could include in the study as well as the rigor of the measures used to assess child well-being. Further, we were limited in that all measures of child well-being were assessed by a caseworker who may not spend as much time with the child as individuals such as caretakers. However, KVC's meticulous recording of training and fidelity data and tracking of child well-being outcomes represents information that is not routinely captured in public child welfare administrative datasets, but which allowed for our in-depth examination of the association between TST and child outcomes. The responsiveness of KVC, including their data manager, was also critical to the success of the study. Finally, our reliance on secondary data enabled us not to disrupt the day-to-day operations of KVC nor add any additional burden of data collection to staff, foster parents, or children.

Despite these limitations, our study is among the few that have systematically evaluated the effectiveness of a system-wide implementation of trauma-informed care. Further, our data enabled us to understand how fidelity to trauma-informed care was associated with child outcomes as well as how different roles of members' of children's care teams may differentially promote positive outcomes. Although researchers will need to replicate these findings with differing child welfare systems, our results highlight the promise of implementing trauma-informed approaches for improving the outcomes for children in out-of-home placements. In addition to replicating this work in differing child welfare systems, future research should be conducted to examine how trauma-informed care impacts long-term outcomes of children—especially if systems began training biological and adoptive parents in trauma-informed care.

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