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Research article

Parenting intervention effects on reunification: A randomized trial of PMTO in foster care

Becci A. Akin*, Thomas P. McDonald

University of Kansas School of Social Welfare, Twente Hall, 1545 Lilac Lane, Lawrence, KS 66044, USA

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ABSTRACT

Evidence-supported parenting interventions (ESPIs) have expanded into child welfare because a growing research base has demonstrated positive results among children with serious emotional and behavioral problems. Despite a clear federal policy emphasis on reunification, few randomized trials have tested ESPIs with biological families of children in foster care; even fewer studies have investigated the distal outcomes of ESPIs. The aim of the current study was to examine the effects of Parent Management Training, Oregon (PMTO) model on reunification. Children in foster care with emotional and behavioral problems were randomized to in-home PMTO ($n = 461$) or services as usual (SAU) ($n = 457$). Cox regression models tested whether children in the PMTO group achieved higher rates of reunification. We applied life tables data for integrals calculations to estimate days saved in foster care. Analyses were conducted as intent-to-treat (ITT), and per protocol analysis (PPA). ITT results showed reunification rates were 6.9% higher for the PMTO group (62.7%) than the SAU group (55.8%) with 151 days saved per typical child. PPA indicated that intervention completion strengthened effects as PMTO completers' reunification rates (69.5%) were 13.7% higher than the SAU group (55.8%), and were 15.3% higher than non-completers (54.2%). Days saved were also greater for completers as compared to the SAU group (299 days) and non-completers (358 days). Overall, findings suggest that an in-home parenting intervention positively affected reunification as delivered to biological parents of children and youth in foster care with serious emotional and behavioral problems. Implications and future considerations for research are discussed.

1. Introduction

Foster care was originally conceived and used to address the problem of “vagrant” children in urban areas. In this historical configuration, foster care typically severed ties between children and their biological families, placing children permanently with foster families (Kadushin & Martin, 1988). Since its earliest forms in the U.S., foster care has been re-defined as a temporary intervention by which children are returned to a permanent family, be that reunification with the biological or some other permanent family, through adoption or guardianship. As such, lengthy stays in foster care, characterized in the seminal work of Maas and Engler, *Children in Need of Parents* (Maas & Engler, 1959), as “foster care drift,” came to be viewed as a failure of the foster care system. Long stays in foster care meant little likelihood of achieving a truly permanent home under this new conceptualization, and this remains largely true today (Pecora et al., 2012). Indeed, federal legislation has codified the temporary nature of foster care. The Adoption and Safe Families Act of 1997 (ASFA) (Adoption & Safe Families Act of 1997, 1997) required that states hold a permanency hearing at 12

* Corresponding author.

E-mail address: beccia@ku.edu (B.A. Akin).<https://doi.org/10.1016/j.chiabu.2018.07.011>

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months and eliminated long-term foster care as permanency option. In addition, ASFA required states to file a petition to terminate parental rights in the case of a child who has been in foster care for 15 of the last 22 months, allowing few exceptions (Vesneski, 2011). Thus, long stays in foster care have come to be recognized as both a cause and effect that represents a failure for both the child and biological family.

In 2010, when findings from the federal Child and Family Services Reviews revealed challenges in achieving permanency for some populations of children in foster care, the U.S. Children's Bureau issued a request for proposals to address long stays in foster care. This initiative became known as the Permanency Innovation Initiative (PII) and allocated funding to local demonstrations to improve foster care outcomes, including reductions in long-term foster care. The present study reports on the distal outcome of family reunification conducted by local evaluators in one of PII's six federally-funded projects.

During an exploration stage, the [blinded] project identified children with serious emotional disturbance (SED) as the sub-population of children in foster care with the highest risk of long-term foster care. Following the federal definition, SED was considered as a diagnosable mental, behavioral, or emotional disorder of sufficient duration to meet diagnostic criteria specified in the DSM that results in functional impairment that substantially interferes with family, school, or community activities. Analyses of statewide child welfare administrative data found that children's mental health status was the most robust predictor of long-term foster care and that children with SED were 360% more likely to experience long stays (defined locally as three years or longer) (Akin, Bryson, McDonald, & Walker, 2012). Related analyses of the same state's data showed that children with SED were 90% less likely to reunify with their biological families than children without SED (Akin, 2011). Compared to the non-SED population, children with SED experienced more placements in foster care, fewer and slower exits to permanency, and were more likely to age out of care without a permanent family (Akin et al., 2012). These findings were consistent with a sizable body of literature that has identified children's mental health problems as related to placement instability and poor permanency outcomes (e.g., Akin, 2011; Barth et al., 2007; Chamberlain et al., 2006; Connell, Katz, Saunders, & Tebes, 2006; Hurlburt, Chamberlain, DeGarmo, Zhang, & Price, 2010; Landsverk, Davis, Ganger, Newton, & Johnson, 1996; Leathers, 2006; Park & Ryan, 2009; Snowden, Leon, & Sieracki, 2008). Based on this information, project leaders concluded that the greatest impact on long-term foster care in this state would be achieved by targeting families of children in foster care with SED and improving their reunification outcomes.

In addition to selecting the target population, the exploration stage considered current empirical literature to select an intervention. A search for randomized studies of interventions that reported reunification outcomes revealed two experimental studies, which examined in-home intensive reunification services (Fraser, Walton, Lewis, Pecora, & Walton, 1996) and substance abuse recovery coaches (Ryan, Marsh, Testa, & Louderman, 2006). A handful of studies have used administrative data to examine associations between relevant factors and reunification, such as service use (D'Andrade & Nguyen, 2014), father involvement (D'Andrade, 2014) and parental visitation (Davis, Landsverk, Newton, & Ganger, 1996). Quasi-experimental studies have investigated a number of interventions, including intensive family reunification services (Berry, McCauley, & Lansing, 2007; Lewandowski & Pierce, 2004), multidisciplinary team case reviews (Davis et al., 2013), professional foster care (Testa & Rolock, 1999), group-based parenting intervention (Brook, McDonald, & Yan, 2012) and family drug treatment courts (e.g., Bruns, Pullmann, Weathers, Wirschem, & Murphy, 2012; Chuang, Moore, Barrett, & Young, 2012; Worcel, Furrer, Green, Burrus, & Finigan, 2008). In sum, the evidence base using rigorous study designs to identify effective reunification services is sparse.

After consultation with thought leaders and national experts on foster care and children's mental health, the project team narrowed its review to evidence-supported parenting interventions (ESPIs), which had been discussed in the recent literature as interventions deserving further dissemination and evaluation in child welfare (Barth et al., 2005; Barth, 2009; Chaffin & Friedrich, 2004; Horwitz, Chamberlain, Landsverk, & Mullican, 2010). Following review of more than a dozen parenting interventions, interviews with program developers, and consideration of implementation capacity and readiness, the project team selected Parent Management Training Oregon model (PMTO) (Bryson, Akin, Blase, McDonald, & Walker, 2014).

PMTO is a behavioral parent training program developed over the past four decades by the Oregon Social Learning Center (OSLC) and disseminated by its affiliate, Implementation Sciences International, Incorporated (ISII). PMTO represents one of a family of interventions the OSLC created and researched to address child and adolescent antisocial behavior (Forgatch & Patterson, 2010). Other OSLC interventions that have been used with foster care populations include Multidimensional Treatment Foster Care (Chamberlain & Reid, 1991) and KEEP (Keeping Foster Parents Trained and Supported) (Chamberlain et al., 2008). All of these programs are based on social interaction learning theory (SIL), which asserts that parents are the agent of change for influencing children's behaviors and, consequently, problem behaviors can be improved with specific parenting practices (Patterson, 1982). Based on the positive outcomes observed in several randomized studies, PMTO received a scientific rating of 1, *well-supported*, by the California Evidence Based Clearinghouse (California Evidence-Based Clearinghouse for Child Welfare, 2015) and the designation of "Near Top Tier" by the national Coalition for Evidence-Based Policy (<http://evidencebasedprograms.org>).

The present study aims to contribute to the literature on the effectiveness of ESPIs for children with SED and their biological parents involved in the foster care system. Despite widespread calls to scale up ESPIs in child welfare, few rigorous studies have included biological parents of children in foster care. In fact, most prior randomized studies have investigated parenting interventions for foster parents (Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008; Leve et al., 2012; Linares, Montalto, Li, & Oza, 2006; Mersky, Topitzes, Grant-Savelle, Brondino, & McNeil, 2016; Price et al., 2008; Price, Roesch, Walsh, & Landsverk, 2015), biological parents whose children may or may not have been in foster care (Bernard et al., 2012; Chaffin et al., 2004; Chaffin, Funderburk, Bard, Valle, & Gurwitsch, 2011; Hurlburt, Nguyen, Reid, Webster-Stratton, & Zhang, 2013), and biological parents who were already reunified with their children (DeGarmo, Reid, Fetrow, Fisher, & Antoine, 2013; Oxford, Marcenko, Fleming, Lohr, & Spieker, 2016). While efforts to expand and study ESPIs have contributed important findings to the child welfare field, rigorous study of ESPIs with biological families of children are rare. Moreover, most prior research has centered on proximal outcomes, such as child problem

behaviors, parental stress, and parenting practices. Few studies have investigated the effects of ESPIs on longer-term outcomes, such as whether families reunified. This study will advance understanding of ESPIs for children in foster care, most especially by investigating the more distal outcome of reunification. The study's central research question was: Do children in foster care with SED, between the ages of 3 and 16, whose families received in-home PMTO achieve better reunification outcomes than similar children in foster care who received services as usual? Secondarily, we asked whether reunification outcomes differed according to whether families completed in-home PMTO.

2. Method

2.1. Design

The research design was a two-group, longitudinal post-randomized consent trial. Post-randomized consent designs are defined by the randomization occurring first and participants consenting to the study after randomization and with knowledge of their group assignment (Zelen, 1990). Study enrollment occurred over a two-year period (September 2012–September 2014) in the state of [blinded]. The study was preregistered with the National Institute of Health at clinicaltrials.gov (NCT02152618). Human subjects' approval was provided by the University of [blinded] Institutional Review Board. The PMTO developer, ISII, was involved in the implementation of PMTO but did not participate in the design, conduct, analysis, or reporting of this study.

2.2. Participants

The sample comprised children from all regions of the state who were between the ages of 3 and 16, entering or re-entering foster care, and identified as having emotional and/or behavioral problems within six months of this removal episode. Upon intake to foster care, trained caseworkers administered the Child and Adolescent Functioning Assessment Scale (CAFAS) and the Preschool and Early Childhood Functional Scale (PECFAS) (Hodges & Wong, 1996; Hodges, Xue, & Wotrung, 2004) in accordance with the child's age. This assessment of child functioning was used for all children entering care. Children were identified as eligible for the study when one of the following criteria were met: (1) for children 3–5 years old, a PECFAS total score of 50 or higher, or a score of 20 on one subscale; (2) for children 6–16 years old, a CAFAS score of 60 or higher, or a score of 30 on one subscale; or, (3) had been identified by a Community Mental Health Center as having an SED; (4) had an Individual Education Plan for an emotional or behavioral disorder; (5) had a diagnosed mental disorder, and symptoms of that disorder were contributing to placement instability; (6) had a diagnosed mental disorder, a history of outpatient or inpatient mental health treatment, and was currently prescribed psychotropic medications; or, (7) had been admitted for inpatient psychiatric care within the last year. Additionally, family-level criteria included that at the time of study: 1) the child's case plan goal must be reunification; 2) parent must reside in the service area; 3) parent may not be incarcerated for longer than three months; and 4) parent cannot have a court-order of "no contact" with the child. Each case consisted of the identified child and identified parent, which included biological parents, stepparents, adoptive parents, or other adults serving as primary caregiver. The identified parent represented the caregiver with whom the child was to reunify at study enrollment. Among the 918 children allocated to the study, 102 had more than one parent seeking to reunify with them (e.g., divorced parents). For the present study, we selected the parent identified as the primary caregiver (i.e., parent who had spent the most time caring for the child on a daily basis).

2.3. Procedures

Study recruitment began with data coordinators staffed within foster care agencies who entered data on eligible children into a secure web-based system, the Research Electronic Data Capture (REDCap) system (Harris et al., 2009). When two or more siblings met the eligibility criteria, one child was randomly selected from the sibling group. When children and parents were identified as eligible, a program supervisor contacted the parent to explain the study, ask for their consent to participate, and obtain written informed consent. Children also assented to study participation. Both children and parents of the intervention and comparison groups were provided compensation for participating in study-specific assessments. Children received a \$10 gift card for each assessment. Parents received a \$20, \$30, and \$40 gift card for the baseline, post-test, and follow-up assessments, respectively.

2.4. Randomization

Randomization procedures were semi-automated in REDCap. At the time of the study initiation, REDCap did not have a randomization module. Therefore, a university research assistant, who was in a separate unit from the evaluation team, developed a form and file-based procedure with multiple checks to ensure fidelity to a preset randomization assignment schedule. The preset schedule used a blocked randomization approach stratified by region and a 1:1 allocation ratio (1:1). The research assistant managing the randomization process did not recruit families or interact with program-level staff and was the only person who had access to the preset randomization schedule; thus, the allocation was concealed from all other persons until after random assignment. No blinding was used after random assignment. Allocation of cases was conducted by university research staff who were in a separate location from foster care agency staff. All randomized cases were placed into a pool of cases sorted by region, date of referral to foster care (most recent first), and study condition. Allocation was implemented when foster care agency staff contacted the university staff via email, specifying the region with a service opening. University research staff selected the most recent cases for the intervention and

comparison conditions, respectively, and then made the case information available to the agency staff in a separate REDCap project. Participant recruitment and enrollment was led by trained supervisors of the foster care agencies and monitored by the project's principal investigator.

2.5. Intervention

2.5.1. PMTO

PMTO was delivered by the state's private contractors for foster care services across the state. The frontline staff were master's level practitioners, most of whom were licensed social workers, about one quarter were licensed marriage and family therapists, and the other quarter were licensed counselors. The PMTO training regimen required practitioners to participate in 8 days of pre-service training followed by 10 additional days of training over approximately 8 months. Practitioners also participated in two full days of in-person coaching. In addition to this initial coaching, they received observation-based coaching twice per month in one of three formats: written feedback, live feedback via video-conference, and/or live feedback via group.

Fidelity to the PMTO model was monitored by trainers and coaches via videos of the practitioners' work with families. All PMTO sessions were video recorded, uploaded to a secure portal, and could be selected for review by coaches and/or fidelity raters. Certification took an average of 22 months to accomplish and required practitioners to submit four session videos. Once certified, practitioners were rated for fidelity annually.

PMTO was delivered in-home to individual families, focusing on parents as the agents of change, and delivered for up to six months. The program did not require a specific number of sessions or weeks; rather, practitioners worked with families until they completed the PMTO curriculum. Families who were retained for six months but did not complete the curriculum were discharged from the program at six months. Typically, practitioners met with families twice per week for approximately 60–90 minutes per session plus a mid-week check-in that lasted for 20–30 minutes. These weekly sessions followed a three-step process. First, practitioners met with parents without children present. Second, parents were expected to practice new skills, and practitioners followed-up with the parent by phone or in-person to discuss the weekly 'homework.' Third, practitioners conducted a family session with the parents and children together, during which the parents tried newly learned skills with the practitioner present and acting as a live coach.

The PMTO curriculum centered on teaching parents five core parenting practices: 1) positive involvement; 2) skill building; 3) supervision and monitoring; 4) problem-solving; and 5) appropriate discipline (Forgatch & Patterson, 2010). Practitioners were guided by a pre-defined and semi-structured session outline provided by ISII (For sample session outline see: Forgatch & Domenech Rodríguez, 2016). The project requested tailoring of PMTO with regards to trauma. To address pervasive trauma in both children and parents, the project leaders asked that the PMTO training incorporate trauma-specific content. ISII involved Dr. Abi Gewirtz, a PMTO implementer and trauma expert, in the development and implementation of the training. In brief, the PMTO training emphasized trauma content, a focus on emotion regulation, and mindfulness techniques. Besides these modifications made for the training, PMTO did not undergo any other major adaptations during the course of the study.

Other aspects of intervention fidelity were defined by the site implementers and not required by ISII. Based on findings from the exploration stage, other program components included low caseloads, early intervention, treatment completion, service duration and intensity, in-home service, and parent-child contacts (Akin et al., 2012; Bryson et al., 2014).

2.5.2. Service as usual

Participants randomized to the comparison group received services-as-usual (SAU) from the foster care agencies. These services comprised case management delivered by staff with bachelor or master's degrees in a variety of fields and with varying levels of training. The state's foster care contracts required case managers to visit children and to arrange for at least one parent-child visit per week. Additional services and treatments offered to children and parents were not standardized in relation to intensity or modality; rather, they would have been individualized to each family as determined by individual case managers, supervisors, court personnel, and other ancillary service providers.

2.6. Sample size

The sample comprised 918 children enrolled in the study (PMTO, $n = 461$; SAU, $n = 457$). The study's sample size was estimated based on a desired effect size of a 10% improvement in reunification rates for children with emotional and behavioral problems. Given this desired effect size, power analyses indicated that the study required 277 cases per group, a total sample of 554, with $\alpha = 0.05$ and $\beta = 0.20$, and assuming a baseline reunification rate of 25% (Akin et al., 2014).

2.7. Outcomes

The project's outcomes were described prospectively by a logic model that comprised proximal (child, parent, and family) and distal (reunification and re-entry) outcomes (Akin et al., 2013). The present study reports the reunification outcomes. The state's public child welfare agency provided state administrative data to local evaluators to determine children's reunification status. Reunification was defined as legal discharge from foster care to a parent. The dataset provided the date of entry into foster care; the date of discharge from foster care, if it had occurred; and the reason for discharge, including the three types of permanency and four types of non-permanent exit. These fields were required fields and contained dates and discharge reasons based on legal proceedings. Discharge date was observed in June 2017. Children who did not experience reunification were treated as censored cases (i.e., they

either exited without reunification or they remained in foster care) at the end of the study's observation period. Reunification data were available on all participants with no attrition or missing data. Among the entire sample, 59.4% of the children ($n = 545$) had exited to reunification and the remainder were censored (40.6%, $n = 373$).

2.8. Analytic strategy

Data were analyzed with SPSS 24. Cox regression models examined the effect of PMTO on reunification exits from foster care. Cox regression, also called event history analysis and survival analysis, is well-suited to these data for two primary reasons. First, unlike other statistical modeling, survival analysis accounts for both the type of outcome and the duration of time to that outcome (Box-Steffensmeier & Jones, 2007). Second, survival analysis allows observation of time to event when some subjects have not yet experienced the event (a.k.a., censoring) (Allison, 2004). Below is a description of the key metrics observed by applying survival analysis.

2.8.1. Reunification rates

Life tables were produced to describe monthly reunification rates for each group. By plotting these data, we showed reunification rates by group during the entire observation period. Next, Cox regression models estimated hazard ratios (HRs) and tested whether the difference in group's reunification rates was statistically significant. The HR may be interpreted as an effect size, where an HR greater than one indicates an increased likelihood of the outcome while an HR of less than one indicates a decreased likelihood of the outcome.

2.8.2. Days saved in foster care

Survival analysis also provided the data required to calculate days saved. By plotting the cumulative probability of reunification for each group (see Figs. 4 and 5) and observing the area between the curves, total days saved can be visually depicted. To calculate days saved, we performed the following steps for each group. First, we constructed life tables with a one-day interval. Second, we conducted curvilinear regression models by regressing cumulative survival rate on the day associated with each rate. Across the curvilinear regression models, the cubic term was significant for the intervention group; thus, we used cubic equations. Finally, we applied the results of the cubic equations to calculate the integral of the difference between two groups, generating days saved. Fig. 1 displays the application of the cubic equations to the integrals calculation, which provides the "typical" value for days saved per child.

2.8.3. Intent-to-treat and per protocol analysis

The effects of PMTO were examined using two approaches: intent-to-treat (ITT) and per protocol analysis (PPA). Under ITT, children's reunification was observed in the study group to which they were randomized (PMTO, $n = 461$; SAU comparison, $n = 457$) even when families did not complete the intervention. In contrast, the PPA analysis considered whether families adhered to the study protocol (i.e., families randomly assigned to PMTO completed PMTO) and examined reunification by three groups: PMTO completers ($n = 256$), PMTO non-completers ($n = 205$), and SAU comparison group ($n = 467$). Intervention completion was indicated when all PMTO modules were completed by a parent within the six-month service maximum (Akin, Lang, McDonald, Yan, & Little, 2017).

Cubic Equation

$$Y_i = \beta_{1i} \times X_{i+} + \beta_{2i} \times X_{i+}^2 + \beta_{3i} \times X_{i+}^3 + \alpha_i$$

Y_i = Proportion of children still in foster care in group i

i in ITT: $i = 1$, SAU comparison group; $i = 2$, PMTO group

i in PPA: $i = 1$, SAU comparison group; $i = 3$, PMTO non-completers; $i = 4$, PMTO completers

X_i = Time of observation (days) in group i

β_{1i} = Coefficient of X_i in group I ($j = 1, 2, 3$)

α_i = Intercept in group i

Model Fit for ITT:

SAU comparison group: $F(3, 1865) = 31430.12, p < .001$, Adjusted R-squared = 0.981

$$Y_1 = -0.001496143276 \times X + 0.000000947284 \times X^2 + -0.000000000196 \times X^3 + 1.127570435053$$

PMTO group: $F(3, 1865) = 31394.43, p < .001$, Adjusted R-squared = 0.981

$$Y_2 = -0.001699196980 \times X + 0.000001152173 \times X^2 + -0.000000000262 \times X^3 + 1.141289204035$$

Model Fit for PPA:

PMTO non-completers group: $F(3, 1865) = 35295.26, p < .001$, Adjusted R-squared = .983

$$Y_3 = -0.001498335022 \times X + 0.000001017508 \times X^2 + -0.000000000226 \times X^3 + 1.113917298758$$

PMTO completers group: $F(3, 1865) = 27484.37, p < .001$, Adjusted R-squared = .978

$$Y_4 = -0.001854249687 \times X + 0.000001253074 \times X^2 + -0.000000000287 \times X^3 + 1.162552074405$$

Fig. 1. Cubic Equations and Model Fit for ITT and PPA.

3. Results

3.1. Participant flow

Fig. 1 presents the study's participant flow. Over the two-year project period, 6657 children were assessed to determine study eligibility. After applying eligibility criteria, 1652 children were identified as eligible and randomly assigned to the intervention ($n = 855$) or SAU comparison ($n = 797$) group. Among the randomized cases, 394 intervention and 340 comparison cases were not approached due to timing and location of service openings. That is, randomized cases were placed into a pool of cases from which the most recent case was selected for a particular service area when that area had a service opening. Some cases' eligibility expired (i.e., extended past the 6-month eligibility period) as they waited for a service opening. In total, 918 children were allocated to the study (intervention = 461 and comparison = 457). Consent rates were 78.1% and 66.5% for the intervention and comparison groups, respectively. The analytic sample was 918 children.

3.2. Intervention fidelity

Intervention fidelity comprised several core components, including adherence to the PMTO model, low caseloads, early intervention, intervention completion, service duration and intensity, in-home services, and parent-child contacts. Across all core components, fidelity was adequate (Akin et al., 2017).

3.3. Randomization and comparability

To assess the success of the initial randomization, approached children ($N = 918$) were compared to non-approached children ($n = 734$) on fifteen baseline demographic and case characteristics, and children's social-emotional functioning (CAFAS scores). Children were similar on all but two variables: race and age. Although these differences were statistically significant at $p < .05$ level, effect sizes were very small to negligible (Akin et al., 2017).

Regarding baseline comparability, Table 1 shows results for comparisons between the intervention and comparison groups on seventeen variables. All variables were available in the administrative dataset with no missing data. The two study groups were similar on all baseline variables, including children's social-emotional functioning.

3.4. Intervention effects

Table 2 presents the Cox regression model results for ITT and PPA approaches. Fig. 2 shows the integrals cubic equations used to generate days saved.

Reunification rates for ITT. Fig. 4 illustrates the intervention's influence on the rate at which children and families reunified. The plotted data represent the estimated cumulative probability of reunification (vertical axis, y) corresponding to the number of days in foster care (horizontal axis, x), and contrasting the intervention and comparison groups. By observing the distance between lines and the slope of the lines, the graph shows that PMTO and SAU groups' reunification rates started to differ around 365 days and these differences became more distinct over time. Among children in the PMTO group, 62.7% reunified as compared to 55.8% of the children in the SAU group, a difference of 6.9%. As shown in Table 2, Cox regression indicated that children in the PMTO group experienced a 16% increased likelihood of reunification ($HR = 1.16$, $p = .083$).

Table 1
Baseline Characteristics of Children and Parents by Study Condition.

Characteristic	Total	Intervention Group	SAU Comparison Group	p
Child gender is female, n (%)	427 (46.5)	204 (44.3)	223 (58.8)	.167
Child race is White, n (%)	709 (77.2)	350 (75.9)	359 (78.6)	.341
Child is Latino, n (%)	111 (12.3)	55 (11.9)	58 (12.7)	.351
Child age, M (SD)	11.8 (4.2)	11.6 (4.1)	11.9 (4.3)	.248
Caretaker age at first removal, M (SD)	38.4 (10.2)	38.2 (10.4)	38.7 (10.1)	.491
Child has diagnosed disability, n (%)	493 (53.8)	243 (52.9)	250 (54.7)	.592
Removal reason was physical abuse, n (%)	169 (18.4)	87 (18.9)	82 (17.9)	.717
Removal reason was sexual abuse, n (%)	57 (6.2)	27 (5.9)	30 (6.6)	.657
Removal reason was neglect, n (%)	340 (37.0)	170 (36.9)	170 (37.2)	.919
Removal reason was parent sub abuse, n (%)	196 (21.4)	102 (22.1)	94 (20.6)	.565
Removal reason was child behavior, n (%)	467 (50.9)	241 (52.3)	226 (49.5)	.392
Parent was single mother, n (%)	479 (52.2)	255 (55.3)	224 (49.0)	.056
Parent was single father, n (%)	74 (8.1)	38 (8.2)	36 (7.9)	.839
Parents were married/unmarried couple, n (%)	365 (39.8)	168 (36.4)	197 (43.1)	.039
Child had prior removals, n (%)	197 (21.5)	107 (23.2)	90 (19.7)	.194
Child eligible for IV-E payment, n (%)	108 (11.8)	63 (13.7)	45 (9.8)	.073
Time in care at study start, M (SD)	50.2 (81.0)	54.4 (102.0)	45.6 (50.8)	.102
Child social-emotional functioning, M (SD)	85.8 (41.0)	84.2 (41.2)	87.5 (40.7)	.229

Table 2
Cox Regression Models for Reunification, ITT and PPA Models.

Model	HR	HR 95% CI Lower, Upper	SE	Wald	p
ITT Model					
SAU Comparison Group (Reference)					
PMTO Group	1.16	0.98, 1.37	0.086	3.00	.083
PPA Model					
SAU Comparison Group (Reference)					
PMTO Completers	1.32	1.09, 1.60	0.098	8.19	.004
PMTO Non-completers	0.96	0.77, 1.20	0.114	0.15	.701

Notes: HR = hazard ratio; CI = confidence interval; SE = standard error.

ITT Model $\chi^2 = 3.01$, $df = 1$, $p = .083$.

PPA Model $\chi^2 = 10.47$, $df = 2$, $p = .007$.

ITT, SAU comparison group vs PMTO group

$$Total\ Difference\ (survival) = \int_0^{1868} [(-0.001496143276 * X + 0.000000947284 * X^2 + - 0.000000000196 * X^3 + 1.127570435053) - (-0.001699196980 * X + 0.000001152173 * X^2 + - 0.000000000262 * X^3 + 1.141289204035)] dx$$

PPA, SAU comparison group vs PMTO completers

$$Total\ Difference\ (survival) = \int_0^{1868} [(-0.001496143276 * X + 0.000000947284 * X^2 + - 0.000000000196 * X^3 + 1.127570435053) - (-0.001854249687 * X + 0.000001253074 * X^2 + - 0.000000000287 * X^3 + 1.162552074405)] dx$$

PPA, Non-completers vs PMTO completers

$$Total\ Difference\ (survival) = \int_0^{1868} [(-0.001498335022 * X + 0.000001017508 * X^2 + - 0.000000000226 * X^3 + 1.113917298758) - (-0.001854249687 * X + 0.000001253074 * X^2 + - 0.000000000287 * X^3 + 1.162552074405)] dx$$

Fig. 2. Integrals Calculations of Days Saved for ITT and PPA.

3.4.1. Days saved for ITT

Fig. 2 shows the equation used to calculate days saved. The integrals calculation indicated that the typical days saved by PMTO was 151 days per child.

Reunification rates for PPA. Fig. 5 illustrates the associated influence of PMTO completion on reunification rates, contrasting PMTO completers, PMTO non-completers, and SAU group. Again, Fig. 3 shows that the completers’ line separated and became more distinct with a steeper slope at approximately 365 days, and continued to differentiate from non-completers and SAU group over time. However, the slopes of the non-completers’ and SAU group’s lines remained similar. Analyses of the PMTO completers showed that 69.5% of completers reunified as compared to 54.2% of non-completers and 55.8% of children in the SAU group. Cox regression indicated that completers had a 32% increased likelihood of reunification (HR = 1.32, $p = .004$). No significant difference was detected in the rate of reunification between non-completers and the SAU groups (HR = 0.96, $p = .70$).

3.4.2. Days saved for PPA

Fig. 2 shows the equations used to calculate days saved. The integrals calculations indicated that the typical days saved by PMTO completers was 299 days and 358 days when compared to the SAU and non-completers groups, respectively.

4. Discussion

This study was a randomized trial of in-home PMTO versus usual foster care services among a sample of biological families of children (3–16 years) in foster care with SED. The ITT results indicated small but positive effects on reunification rates with children in the PMTO group experiencing reunification rates 6.9% higher than the SAU comparison group. Additionally, our analyses showed that the typical days saved by PMTO in relation to the SAU group was about 5 months (151 days). The PPA results showed greater positive effects on reunification rates as the children whose parents completed PMTO achieved reunification rates 13.7% and 15.3% higher than the SAU group and non-completers, respectively. Days saved per child was notable at 299 and 358 when the PMTO completers group were compared to the SAU and non-completers, respectively. Below is a discussion of these results and their contribution to the existing literature on ESPIs.

First, this study represents one of few rigorous studies that examines an intervention’s effect on reunification outcomes. Further, to our knowledge, this study is the first randomized study of an ESPI with a sample comprised exclusively of biological parents of children in foster care. Most prior studies have included either biological parents whose children were at-risk of foster care entry/re-entry, or foster parents. Few studies have tested parenting interventions with biological parents while their children were in foster care. Given that biological parents of children in foster care often have encountered cumulative risks and disadvantages as well as

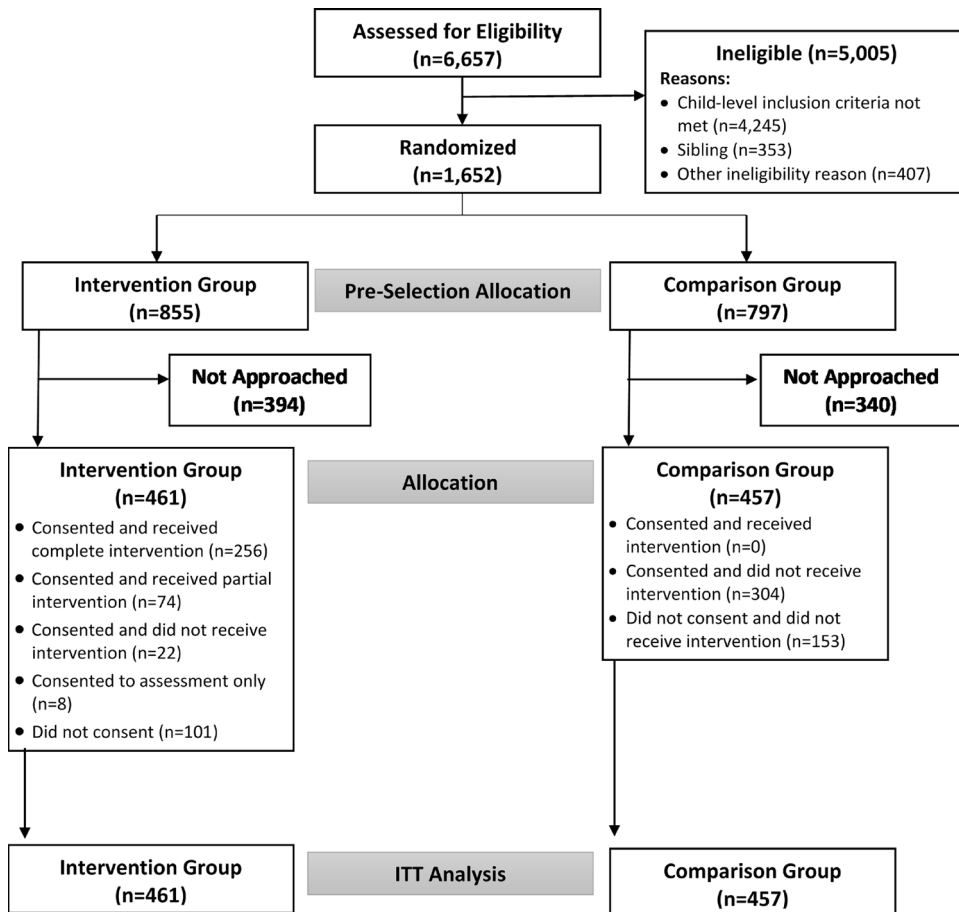


Fig. 3. Participant Flow Chart.

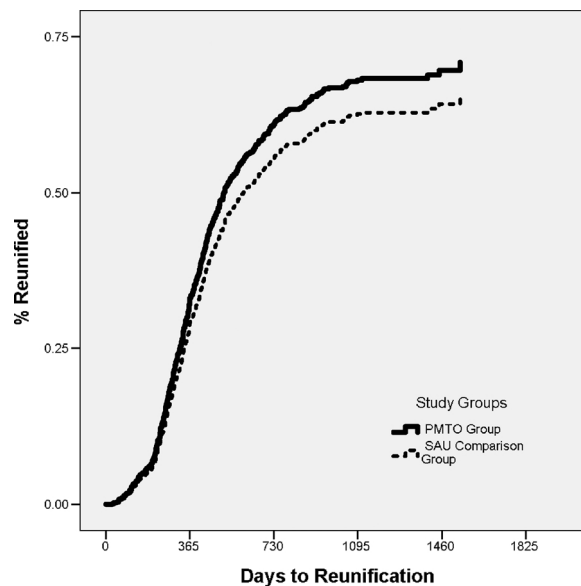


Fig. 4. Cumulative Probability of Reunification by PMTO and SAU Comparison Groups (ITT Results).

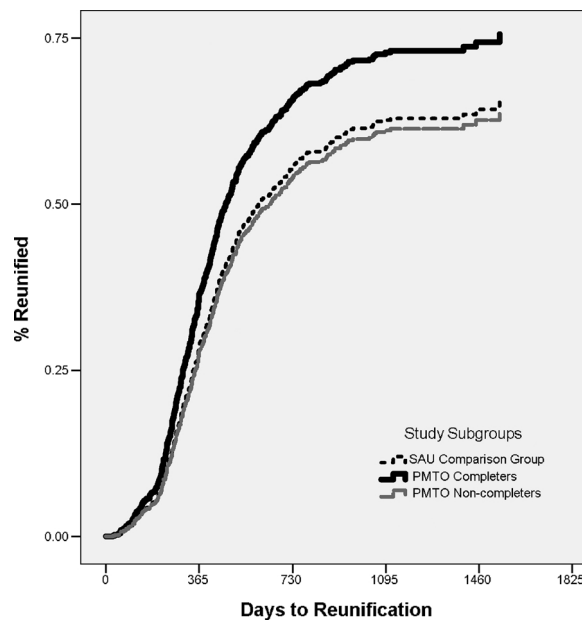


Fig. 5. Cumulative Probability of Reunification by PMTO Completers, PMTO Non-completers, and SAU Comparison Group (PPA Results).

structural barriers (Akin et al., 2012; Kemp, Marcenko, Hoagwood, & Vesneski, 2009; Marcenko, Lyons, & Courtney, 2011), special attention is warranted to ensure fair and equitable practices in foster care services. That is, biological parents, even those whose children were already placed in foster care, need and deserve access to parenting interventions. Our findings suggest that even when parents and children may be separated, a parenting intervention can positively influence reunification. Importantly, parent-child contact was integral to this study's parenting intervention. By protocol, practitioners were to have at least one PMTO parent-child session per week, which was in addition to the SAU requirement of one parent-child visit per week. These sessions likely provided parents with critical opportunities for positive interactions with their children and practicing newly learned skills, both of which have been identified by a meta-analysis as program components contributing toward larger effects in proximal outcomes of ESPIs (Kaminski, Valle, Filene, & Boyle, 2008). Future implementation and research of ESPIs should account for this parent-child interaction component of the intervention.

Second, this study extends the ESPI evidence by including a broad age range of children and youth (3–16 years). In fact, we found no prior studies of ESPI in child welfare settings that included children older than 12. Many parenting interventions have been developed with a prevention focus and therefore have been matched to families of younger children (National Center for Injury Prevention & Control, 2004). While acknowledging the need for age and developmentally tailored features of a parenting intervention, this study opted to include children from 3 to 16 years old. The primary rationale for this age range was that the project's exploration stage indicated that children's behavioral health was the strongest predictor of long-term foster care, and age was considerably less predictive (Akin, 2011; Akin et al., 2012). The present findings suggest that ESPIs may show promise for children and youth of various ages. Future studies should continue to examine whether and how child age affects outcomes.

A third notable contribution of this study is that it moves beyond the assessment of proximal outcomes to a distal outcome, reunification. Our study's findings on reunification warrant careful consideration for several reasons. First, we add to the ESPI evidence base on reunification by using a rigorous design with a sample of biological parents. While prior studies of ESPIs have investigated reunification outcomes, they have been quasi-experimental (e.g., Brook et al., 2012), or included samples exclusively of foster parents or a mix of biological and foster parents (e.g., Chamberlain et al., 2008; Spieker, Oxford, & Fleming, 2014). Moreover, although researchers have demonstrated positive effects of ESPIs on proximal outcomes, such as child problem behaviors and parenting practices, evidence for distal outcomes has been limited to a handful of studies (Chamberlain et al., 2008; DeGarmo et al., 2013; Spieker et al., 2014). Because our study was funded under a federal initiative to reduce long-term foster care, it was paramount to examine whether and when children achieved permanency. We found that the intervention group's advantage in reunification rates may be considered small to moderate (6.9% in the ITT analysis and 13.7% in the PPA analysis) but substantively meaningful. The importance of these findings was further confirmed by our results on days saved, which showed sizable benefits for the PMTO group, particularly for families who completed the intervention. These results on the potential of intervention completion warrant additional research to identify strategies for increasing completion rates.

In addition to observing PMTO's positive effects on reunification, the timing of these effects may be relevant. Our results showed that the differentiation in reunification rates started to occur after children had been in foster care for about 12-months. Although this may seem late in the life of a foster care case, it requires consideration of the chronic nature of children's behavioral health problems and usual course of treatment. Even for families not challenged by the many risk factors common to families involved in foster care, the treatment process for serious emotional and behavioral problems is intense and long-term (Maggin, Wehby, Farmer, & Brooks,

2016). Beyond assessing whether PMTO's influence on reunification was substantive, more study is required to know whether reunification benefits persisted and families sustained reunification. Also, given the positive results of a nine-year follow-up study of PMTO (Patterson, Forgatch, & DeGarmo, 2010), future research of ESPIs in foster care should explore whether other long-term and collateral outcomes emerged, such as reductions in psychiatric hospitalizations, criminal justice system involvement, and academic difficulties.

4.1. Limitations

A notable limitation of this study is the research design. Post-randomized consent designs are advantageous for reducing recruitment bias and strengthening external validity by extending results to an entire population of interest, not just individuals willing to participate in a randomized study (Adamson, Cockayne, Puffer, & Torgerson, 2006; Hinman et al., 2014). On the other hand, these designs may exaggerate attrition and dilute intervention effects by including participants who did not indicate an interest to participate and did not adhere to intervention protocols (Fan, 2015). We have attempted to address this design limitation by including both ITT and PPA results. Despite potential reductions in ITT effects, post-randomized designs may be well suited to the complexity of child welfare settings where non-compliance is common. Thus, this design may optimize studies' capacity to generalize to specific target populations within foster care.

A second limitation is the study's lack of blinding. While our study was strengthened by the use of an administrative dataset with no missing data on reunification variables and a robust observation period (i.e., minimum of two years post intervention completion), neither case managers nor courts were blinded to study condition. Given the logistics of foster care service delivery and court responsibilities, blinding was impractical. Both case managers and courts may interpret parents' compliance with completing an intervention as readiness for reunification (D'Andrade & Nguyen, 2014), and thus complicate the known effect of the intervention on reunification. As discussed by other scholars, the role of compliance may be substantial (Smith, 2008). Future studies should consider case managers' and courts' use of compliance in determining reunification in randomized studies of interventions such as this one.

A third limitation is a lack of information on two potential confounders: parental visitation/contact and other service use. By design of the parenting intervention, the intervention group would have experienced more parent-child contacts. Our study does not account for the role of these additional contacts. Likewise we do not have data on the other services and treatments that may have been received by children and cannot know whether the quality or intensity of other services may have affected reunification rates. Future research should consider the influence of both of these factors.

5. Conclusion

The current study demonstrates that an in-home parenting intervention advances reunification as delivered to biological parents of children and youth in foster care with serious emotional and behavioral problems. We found higher rates of reunification and larger advantages in days saved in foster care among children whose families received the parenting intervention, with the greatest effects among intervention completers. Overall, these findings are significant because a vast body of research has shown this subgroup of children struggle with permanency, stability, and numerous child well-being outcomes. Federal policy prioritizes reunification, providing a clear rationale for making evidence-supported interventions available to facilitate reunification. Yet, few interventions have been rigorously tested in child welfare (Testa et al., 2014), and even fewer have examined distal outcomes, such as reunification. Our findings suggests that an in-home parenting intervention may offer a genuine option for biological families. Although many prior studies have shown positive outcomes of parenting interventions for children with emotional and behavioral problems, few have extended to children with SED in foster care, particularly for biological parents and inclusive of both children and adolescents. Moreover, if this intervention improves reunification for families of children with SED in foster care, it may hold promise for a broader group of families of children in foster care. In sum, this study offers hope for biological families of children and adolescents in foster care, and warrants future investigations to confirm replicability in other sites and other subpopulations of children in foster care.

Conflict of interest

None.

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