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Pilot randomized controlled trial of an attachment- and trauma-focused intervention for kinship caregivers

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ABSTRACT

Background: Kinship care placements are increasing in many Western countries, however families in kinship care are underserved partly due to the lack of evidence-based interventions addressing their unique needs.
Objective: We conducted a pilot randomized controlled trial (RCT) to examine research feasibility and the acceptability, fidelity, and preliminary outcomes of an attachment- and trauma-focused intervention for kinship caregivers in Australia.
Participants and setting: Participants included 26 kinship caregivers (M_{age} = 55.00 years; 54% grandparents) with youth (M_{age} = 10.58 years; 38% female), and 19 practitioners from child protection, out-of-home care and other services.
Method: Kinship caregivers were randomized to Connect for Kinship Parents (Connect-KP) or care-as-usual (CAU), and completed assessments at baseline, post-intervention, and 6-month follow-up. Placement changes were evaluated at 6-month follow-up. A subset of practitioners received both training and supervision in implementing Connect-KP, and their videorecorded sessions were coded for fidelity.
Results: Practitioners rated the training highly and demonstrated excellent fidelity to program content and process. Results supported the research feasibility and all kinship caregivers reported high levels of program satisfaction and had very high attendance and completion rates. Direction of effects favored Connect-KP vs. CAU for all nine caregiver and youth outcomes, with the largest effects observed for significant reductions in caregiver strain, caregiver psychological aggression, and youth affect suppression following intervention. At 6-month follow-up, more youth from CAU (15%) vs. Connect-KP (0%) experienced an unplanned placement change.
Conclusions: Our findings show promise of Connect-KP as a potentially effective intervention that can be successfully implemented in child welfare services, and provide impetus for a larger-scale RCT.

When children are unable to live with their birth parents due to maltreatment or other safety concerns, kinship care placements with members of the child's extended family or community are prioritized over foster care placements with strangers. The prevalence of kinship care has been steadily increasing in many Western countries in recent years. In Australia, of the 44,906 children and young people in out-of-home care (OOHC) in 2019, more were placed with kinship (52%) than foster (39%) caregivers (AIHW, 2020). Similar

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to other countries with colonized Indigenous populations (e.g. Canada), there is an overrepresentation of Indigenous children in the Australian OOHC system (AIHW, 2020). Given Australia's history of forced separation of Indigenous children from their parents' care, preserving youths' connectedness to family and culture in the context of a safe and stable placement is imperative for their healthy development and wellbeing (Krakouer, Wise, & Connolly, 2018). Kinship care is seen to enhance family connection for all children on these placements as caregivers have a pre-existing relationship with the child or young person (e.g. are a relative or family friend), and may be more invested in their caregiving role through familial or cultural ties (Farmer, 2010; Hassall, van Rensburg, Trew, Hawes, & Pasalich, 2021). Despite kinship caregivers being a growing population, little research has examined therapeutic programs for families in kinship care, which is concerning in light of these families' complex vulnerabilities and limited resources.

1. Caregiver and youth wellbeing in kinship care

Although kinship caregivers bring many strengths to their parenting role, including their commitment to caring for their youth and shared culture and/or background of experiences that foster strong emotional bonds (Ainsworth, 1989), they also endure significant challenges. Most youth in their care have experienced serious attachment injuries and multiple adversities, such as abuse and neglect, which can lead to traumatic stress and other behavioral and emotional problems (Tarren-Sweeney, 2013). The stress in caring for trauma-affected youth in kinship care is compounded by complicated and strained family dynamics. For example, kinship caregivers may be processing anger, guilt or remorse in regard to the circumstances of the placement and—like their cared for youth—have to navigate loyalty conflict stemming from competing allegiances with family members that are often exacerbated by family court proceedings (Linares, Rhodes, & Montalto, 2010). Moreover, kinship caregivers must establish a new parenting role when they become the primary caregiver of their youth, with many feeling unprepared and unsupported in this new role and pressured to sacrifice their own needs to provide adequate care (Landry-Meyer & Newman, 2004). They also experience high stress and anxiety in navigating caregiving requirements stipulated by the OOHC system. Finally, compared to foster caregivers, kinship caregivers tend to experience more challenging personal circumstances, including being older and having poorer health, greater likelihood of being a sole caregiver, and more financial burdens (Cuddeback, 2004; Farmer, 2009).

Overall, youth adjustment issues, family and contextual stressors, and role changes contribute significant strain to kinship caregivers, which may spill over into the caregiver-youth relationship and undermine placement quality. However, fortunately there is also evidence for buffering effects of positive qualities of kinship caregiving for youth and placement outcomes in OOHC. For instance, findings from a systematic review suggest that higher levels of positive parenting practices are associated with less youth behavioral and emotional problems in kinship care (Washington et al., 2018). Furthermore, empathy and dutifulness in kinship caregivers are potentially linked to more placement stability (Andersen & Fallesen, 2015). Thus, there is a very timely need to evaluate parent programs that may prove effective in supporting the unique challenges and needs of families in kinship care.

2. Parent interventions in kinship care

Wu, Zhu, Ogbonnaya, Zhang, and Wu (2020) systematically reviewed 28 studies that examined the effectiveness of parent interventions for kinship caregivers and their youth. The overall pattern of findings suggested positive intervention effects on caregiver and youth outcomes, including caregiver stress, parenting competencies, and youth behavior problems; though individual interventions tended to show benefits for some but not all outcomes. Despite these promising findings, only about half of the studies exclusively focused on kinship caregivers (including 'informal' kinship caregivers who are not involved with child protection services [CPS]) — the other studies included both foster and kinship caregivers together, and did not examine specific effects on kinship care families. Traditionally, most parent interventions for kinship caregivers have targeted both kinship and foster caregivers and may not be tailored to unique experiences in kinship care. In addition, when programs are delivered in a group format, mixing kinship and foster caregivers together is not ideal given their significant differences in family dynamics, such as the relational history/family tie with their youth in care and the personal impact of the family's involvement with CPS (Green & Gray, 2013). Furthermore, only seven of the fifteen studies in the Wu, Zhu, Ogbonnaya, Zhang, and Wu (2020) review that focused on kinship caregivers were randomized controlled trials (RCTs), and none of the interventions were evaluated for Australian kinship caregivers. The lack of international research on this topic is a significant limitation as kinship caregivers in the US, where 93% of the studies were conducted, are culturally and socially distinct to kinship caregivers in other countries.

Existing interventions for kinship caregivers also widely vary in their aims and mechanisms; most notably, not all of them directly address both the impact of trauma and relational disruptions. In a systematic review of interventions for foster and kinship caregivers, Kemmis-Riggs, Dickes, and McAloon (2018) identified particular components of interventions that were linked to effectiveness. Regarding studies that included kinship caregivers (alongside foster caregivers), five interventions primarily aimed to improve youth behavior problems through strengthening caregivers' behavior management practices (e.g. positive reinforcement and consistent discipline), whereas only two interventions—both involving caregivers of infants/toddlers—specifically targeted the caregiver-child relationship via improving caregivers' relational skills (e.g. sensitive and attuned responses to children's needs). Kemmis-Riggs, Dickes, and McAloon (2018) concluded that the latter approach is vital for this population as all children in OOHC have experienced significant attachment disruptions, which in turn, can lead to behavior and other adjustment problems (Pasalich, Fleming, Oxford, Zheng, & Spieker, 2016). By contrast, parent programs based on social learning theory that had not been adapted for youth in OOHC, showed the least effectiveness for youth outcomes (Kemmis-Riggs, Dickes, & McAloon, 2018). Trauma psychoeducation was also a common component in effective interventions. Together, findings from these two systematic reviews suggest that families in kinship care may benefit from parent interventions that are targeted to support their specific challenges. However, they also indicate a clear need to

conduct more rigorous evaluations of attachment-based interventions that are tailored for and delivered solely to kinship caregivers, particularly outside of the US.

3. Connect for Kinship Parents: an attachment- and trauma-focused intervention

Parent interventions informed by attachment theory are crucial for building resilience in youth who have experienced maltreatment and attachment injuries (Toth, Gravener-Davis, Guild, & Cicchetti, 2013). Attachment-based interventions help caregivers better understand and empathically respond to youths' underlying needs so as to promote youths' trust and felt security in the relationship. This approach is vital for youth in OOHC because traumatic stress is exacerbated when caregivers fail to sensitively respond to their inner experiences and minimize, deny or ignore trauma in the family. To the best of our knowledge, we are unaware of any attachment-based interventions that have been evaluated with kinship caregivers of older children and adolescents, who face a greater risk of placement breakdown than younger children (Farmer, 2010; Jedwab, Xu, & Shaw, 2020).

Connect is a group-format program designed to support parents of youth, aged 8–18 years, with significant mental health problems (Moretti, 2020; Moretti, Pasalich, & O'Donnell, 2018). It targets caregivers' capacity to reflect on their own and their youth's mental states and sensitively respond to attachment needs, while promoting "shared partnership" and dyadic affect regulation within the relationship. Each session introduces a new principle relating to parenting and attachment using reflection and emotion-based learning exercises and role plays of familiar parent-youth scenarios. The principles cover common relational issues such as recognizing and responding to attachment needs (e.g. connection and independence) underlying youths' challenging behavior, understanding and navigating conflict from an attachment perspective, strengthening empathy, and balancing both caregiver and youth needs. Findings from multiple independent trials with birth parents show benefits of Connect for decreasing caregiver strain and youth attachment insecurity and behavioral and emotional problems (e.g. Högström, Olofsson, Özdemir, Enebrink, & Stattin, 2017; Moretti & Obsuth, 2009).

Connect was recently adapted for kinship and foster caregivers by expanding on the principles and structure of the regular Connect program. Initial trauma-informed adaptations for families in OOHC were developed in consultation with OOHC stakeholders and were shown to be acceptable and potentially effective in an open trial with Canadian foster caregivers (Moretti, O'Donnell, & Kelly, 2019). The tailored version for kinship caregivers, Connect for Kinship Parents (Connect-KP; Moretti, Ostling, & Pasalich, 2017), includes similar trauma-informed content, while in each session also targeting specific challenges in kinship care. For instance, there is a focus on the impact of trauma on attachment relationships, such as in the first session the "attachment suitcase" metaphor is introduced to help caregivers understand the ongoing influence of youths' past relational experiences on their self-concept and social-emotional functioning. Furthermore, the principles have been modified to address issues linked to complex family dynamics in kinship care, including "loyalty conflict" toward relatives and adapting to a new parenting role. The program is also sensitive to culturally diverse experiences of attachment and trauma within and beyond caregiver-child relationships. For example, caregivers generate attachment needs relevant to their family—including culturally-embedded needs such as identity and connection to family and community—and reflection exercises facilitate caregivers' mindfulness of their own and youth's "life stories" in regard to understanding adversity and resilience in relationships. Overall, Connect-KP is informed by the layered and intergenerational trauma, complex family dynamics, and sociocultural diversity that distinguishes families in kinship vs. non-kinship care.

4. Current study

Although kinship caregivers experience more stress than foster caregivers, they receive less training and access less support and services (Cuddeback, 2004; Farmer, 2010; Harding, Murray, Shakespeare-Finch, & Frey, 2020), thus reaching and engaging this underserved group is paramount yet challenging in both research and practice. Other barriers to supporting families in kinship care involve the lack of attachment- and trauma-based programs that are tailored for youth in care. To address these barriers, in partnership with child welfare agencies we conducted a pilot RCT of Connect-KP with Australian kinship caregivers of youth aged 8–16 years, as a necessary step in informing the design and implementation of larger trials with kinship caregivers involved with CPS. Our first aim was to evaluate training and program acceptability, research feasibility, and intervention fidelity. Second, we aimed to explore preliminary outcomes of Connect-KP across the following key domains in kinship care assessed from baseline through 6-month follow-up: caregiver strain, competence, and psychological aggression; youth attachment and social-emotional adjustment; and placement changes. To facilitate comparisons among trials, we included similar outcome measures as those used in our past evaluations of Connect. Based on the strong evidence base for Connect we expected that Connect-KP would show high acceptability and fidelity in child welfare services, and that we would observe initial evidence for the promise of Connect-KP in improving family outcomes.

5. Method

5.1. Participants

The study protocol was approved by ANU ethics and ACT Community Services Directorate and prospectively registered on the Australian New Zealand Clinical Trials Registry ACTRN 12617000946314. Families meeting inclusion criteria were referred by child welfare caseworkers in Canberra, Australia, between January 2018 and January 2019. With caregivers' consent, the principal investigator contacted the referrals to confirm study eligibility — that the caregiver was caring for a youth aged 8–16 years who had resided in the kinship care placement for at least four weeks. Families were excluded from participating if 1) they were currently in a

crisis/emergency situation; 2) youth had a severe mental illness (e.g., schizophrenia), significant physical health care need, and/or severe developmental or intellectual disability; 3) caregivers had a severe mental illness or substance use problem; and 4) caregivers were unable to speak or comprehend English.

Sixty-two participants were assessed for eligibility and the final sample included 26 kinship caregivers (M_{age} = 55.00 years, SD = 13.51) with youth (M_{age} = 10.58 years, SD = 2.55). Most caregivers were grandparents (54%) or aunts (23%), who identified as Australian European (65%) or Aboriginal or Torres Strait Islander (19%). Youth were predominantly Australian European (58%) or Aboriginal or Torres Strait Islander (38%). Most youth (88%) were on a long-term or permanent placement order. Table 1 shows additional demographic information. Families were asked to nominate a primary caregiver to complete the assessments if there were multiple caregivers in the placement, and selected the youth with the most significant mental health concerns to report on if they were caring for two or more youth who were study eligible.

5.2. Procedure and measures

5.2.1. Training and supervision of connect-KP facilitators

One month prior to commencing study recruitment, 19 practitioners from CPS (n = 12), an OOHC agency (n = 2), school psychology service (n = 2), and university clinic (n = 3), attended a 3-day training workshop on the Connect-KP program. The workshop covered attachment and trauma theories and program principles (see Table 2) and delivery. Trainees also practiced delivering Connect-KP on the third day with feedback from program supervisors. At the end of the workshop they anonymously completed a 14-item satisfaction survey. Six of these practitioners (four from CPS and two from an OOHC agency) who were selected by their agencies, consented to study participation and co-facilitated a total of three Connect-KP groups for the trial. They included clinical psychologists (n = 3), psychologists (n = 1) or social workers (n = 2) with varying levels (1 through >15 years) of professional experience in working with OOHC families. In addition to attending the training workshop, to achieve certification as a Connect-KP facilitator the practitioners participated in supervision while delivering the group. This involved watching a videorecording of each session and then completing a facilitator reflection form, and participating in a 1-h weekly supervision meeting. The supervision model parallels the program in terms of encouraging facilitators to reflect on caregivers' needs and behavior in light of the Connect-KP principles.

Table 1
Baseline demographic characteristics and placement and therapy histories of the sample.

Characteristic	Connect-KP (n = 13) M (SD) or n (%)	Care-as-usual (n = 13) M (SD) or n (%)
Child age, mean years	11.00 (2.58)	10.15 (2.54)
Child gender, female	6 (46)	4 (31)
Child ethnicity		
Australian European	10 (77)	5 (38)
Aboriginal or Torres Strait Islander	2 (15)	8 (62)
Other ethnicity	1 (8)	0 (0)
Caregiver age, mean years	58.54 (11.27)	51.46 (15.031)
Caregiver gender, female	10 (77)	12 (92)
Caregiver ethnicity		
Australian European	10 (77)	7 (58)
Aboriginal or Torres Strait Islander	1 (8)	4 (33)
Other ethnicity	2 (15)	1 (8)
Caregiver education		
Below year 12	4 (31)	4 (31)
Year 12	1 (8)	2 (15)
Diploma/TAFE/college	6 (46)	6 (46)
University	2 (15)	1 (8)
Family income		
<$50,000	7 (54)	4 (36)
$50,000–$90,000	4 (31)	2 (18)
>$90,000	2 (15)	5 (45)
Caregiver relationship to child		
Grandparent or great grandparent	7 (54)	7 (54)
Aunt or great aunt	4 (31)	2 (15)
Other (e.g., sister, cousin)	2 (15)	4 (31)
Single caregiver household	7 (54)	5 (39)
Child placement history		
Mean no. years child has been in current kinship placement	5.50 (3.81)	3.89 (3.32)
Earliest age (years) when child was first placed in kinship or foster care	4.89 (3.71)	5.01 (3.55)
Total no. kinship and foster care placements child has had	1.82 (0.87)	2.77 (1.96)
Participation in therapy in past 6 months		
Family therapy	4 (31)	1 (8)
Caregiver individual therapy	3 (23)	1 (8)
Child therapy	6 (46)	6 (46)
Mean no. children on kinship placement currently in caregiver's care	2.08 (1.04)	2.00 (0.91)

Table 2
Connect for Kinship Parents principles

Principle	Caregiving focus
1. *All behavior has meaning*	• Recognize behavior as a form of communication about attachment. • Develop skills in "stepping back" from difficult behavior and being curious about alternate meanings of behavior. • Practice awareness of verbal and nonverbal communication.
2. *Attachment is for life*	• Create an "Attachment Needs" list for children. • Recognize the role of past trauma in shaping how children express their attachment needs in new relationships. • Practice linking behavior with attachment needs.
3. *Conflict is part of attachment*	• Recognize that conflict is a normative part of relationships; practice reframing conflict as an opportunity for growth and connection. • Reflect on experiences of loyalty conflict in care and how our child's "attachment suitcase" shapes their response to conflict. • Use role-plays to practice staying present during conflict by "stepping back" and "stepping into" the child's mind.
4. *Autonomy includes connection*	• Recognize that older children and teens strive for autonomy but continue to need connection with caregivers. • Recognize that without a secure base, children may avoid autonomy and anxiously cling to caregivers; others may move to autonomy precociously. • Use role-plays to practice balancing autonomy support with structure and safety.
5. *Empathy — the heartbeat of attachment*	• Deepen understanding of the impact of the "attachment suitcase" that our children bring with them in shaping how they respond to empathy. • Use role-plays to practice listening and responding sensitively to our child without trying to solve their problems or condone problem behavior. • Reflect on caregivers' own experiences of empathy when they were children.
6. *Balancing our needs with the needs of others*	• Create an "Attachment Needs" list for kinship caregivers. • Use role-plays to practice how to balance caregivers' needs with those of their child and communicate their own needs in developmentally appropriate ways.
7. *Growth and change are part of relationships*	• Recognize that growth and change occur in relationships. • Understand that the stories caregivers and children have about themselves and each other shape growth and create challenges or opportunities. • Use role-plays to practice supporting children's growth, even small changes.
8. *Celebrating attachment*	• Recognize importance of celebrating attachment and joy in our relationships; avoidance of conflict is not sufficient to sustain us. • Use role-plays to explore opportunities for connection while recognizing barriers; reflect on different ways children may express needs for connection.
9. *Two steps forward, one step back: staying on course*	• Promote resilience through relapse prevention; reframe the meaning of setbacks as opportunities for repair and strengthening relationships. • Reflect on the importance of "stepping back" to practice self-compassion for our own setbacks as kinship caregivers. • Use role-plays to practice using all the attachment principles as a "tool kit" for relationship repair with their child after a setback.

5.2.2. Intervention fidelity

Intervention fidelity was assessed via observational ratings of video recordings of group sessions. The coding system captured two components of fidelity that are linked to intervention outcomes (e.g. Berkel et al., 2018): *adherence* to session content and *competence* in group process. *Adherence* comprised of six items (scored as "no"/"yes" for the co-facilitators together) assessing whether key tasks were delivered in the session as per the Connect-KP curriculum. Examples include, "Introduced and reviewed the principle for the session" and "Completed active learning exercises". The total adherence score was the proportion of the six items coded as "yes". *Competence* assessed each facilitator's level of skill in program delivery, including the quality of group process. This component incorporated six items rated using a 4-point scale (0 = "No demonstration of the skill" to 3 = "Good demonstration of the skill"). Examples of items include, "Encouraged participants to explore, and reflect on, attachment principles and issues" and "Worked in a collaborative and balanced relationship with the co-facilitator". The total competence score was the mean of the six items, where a score ≥ 2 indicates proficiency. Four sessions from each of the three Connect-KP groups (total = 12, 46% of all sessions)—watched in their entirety to obtain more valid measures of competence—were randomly selected and coded for fidelity, and 25% of these were re-coded by a second coder to obtain interrater reliability. Both coders were trained in the Connect-KP program and the interrater coder was an experienced Connect-KP supervisor. Interrater reliability was excellent for both the adherence (Cohen's kappa = 1.00) and competence (Intraclass correlation = 0.98) scales.

5.2.3. Randomization and intervention process

Families were randomly allocated to the Connect-KP (immediate intervention) or CAU (delayed intervention) condition in one of

two study cohorts by an independent researcher who was not directly involved in the study. To ensure that the conditions were balanced with respect to the number of pre-teens and teens, and males and females, randomization was stratified by youth age (8–11 years, 12–16 years) and gender. Caregivers assigned to CAU were invited to participate in a Connect-KP group during the school term following the 6-month follow-up assessment. In two caregiver families, both caregivers were invited to participate in Connect-KP. All of the groups were held in local community venues, including an Aboriginal and Torres Strait Islander cultural centre. The number of Connect-KP sessions was slightly adapted to match the shorter length of school terms in Australia. Nine sessions (instead of 10) were delivered by integrating the final session with the feedback session, thereby retaining all of the content in the manual. CAU included typical case management services provided by caseworkers and referrals to health services as required, and was delivered to families in both conditions in the study. At baseline all caregivers reported that they were not currently enrolled/enrolling in another parent/support course. In the second half of the final Connect-KP session, the co-facilitators left the room and an independent researcher invited caregivers to complete a 17-item measure of program satisfaction before conducting a feedback session. Items were rated on a 4-point scale (1 = "Not at all"/"Unhelpful" to 4 = "A great deal"/"Very helpful") and assessed caregivers' satisfaction with specific aspects of the program, perceived usefulness and effectiveness of the skills, and overall experience in the group.

5.2.4. Assessment of intervention outcomes

Prior to randomization, researchers visited families in their home or in a neutral place (e.g. cafe, park) to gain study consent and conduct a baseline assessment. Participants in both conditions completed the assessments again at post-intervention and 6-month follow-up, and received a gift voucher after each of the three 1.5 h research visits.

Caregiver strain was measured using the Caregiver Strain Questionnaire-Short Form (CGSQ-SF; Brannan, Heflinger, & Bickman, 1997), which includes 10 of the 21 items in the original CGSQ and measures caregivers' objective strain (e.g. missing work, disrupted family relations) and subjective internalized strain (e.g. worried about child's future, tired or strained as a result of child's problem behavior). Items are rated on a 5-point scale (1 = "Not at all" to 5 = "Very much") and were averaged to compute a total score. There was excellent reliability ($\alpha = 0.92$) for the scale in this study.

Caregiver competence was assessed using the Parenting Sense of Competence Scale (PSOC; Johnston & Mash, 1989). This measure includes 16 items reflecting parents' satisfaction (e.g. parenting frustration and anxiety) and efficacy (e.g. capability and problem-solving ability) in their parenting role. Items are rated using a 6-point scale (1 = "Strongly disagree" to 6 = "Strongly agree") and were summed to compute a total score, which showed good reliability in this study ($\alpha = 0.81$).

Caregiver psychological aggression was measured using a modified version of the Conflict Tactics Scale (CTS; Straus, 1979). The CTS is a widely used measure of aggressive behavior within relationships and has been modified to assess aggression in the caregiver-youth relationship (Moretti & Craig, 2013; Moretti & Obsuth, 2009). This study included the 8-item caregiver psychological aggression subscale which measures caregivers' verbal and emotional aggression toward their youth (e.g. insulted, swore or shouted at the youth, threatened to kick them out of the house). Items are rated on a 4-point scale (1 = "Never" to 4 = "Always"). Reliability for the subscale was adequate ($\alpha = 0.67$) in this study.

Youth *affect regulation* was assessed by the Affect Regulation Checklist (ARC; Moretti & Craig, 2013; Moretti, Obsuth, Craig, & Bartolo, 2015). This study reported on the affect suppression (5 items; e.g. "My child tries hard not to think about their feelings") and affect dyscontrol (4 items; e.g. "My child has a hard time controlling their feelings") subscales. Items are rated using a 5-point scale (1 = "Not like my child" to 5 = "A lot like my child"). There was good reliability for affect suppression ($\alpha = 0.81$) and affect dyscontrol ($\alpha = 0.85$).

Youth *behavioral and emotional adjustment* was measured using the 25-item Strengths and Difficulties Questionnaire (SDQ; Goodman, Meltzer, & Bailey, 1998), which assesses conduct problems, hyperactivity-inattention, emotional symptoms, peer problems, and prosocial behavior. We reported on the composite total difficulties score—which was computed by summing the scores from the four difficulties subscales (20 items)—and the 5-item prosocial behavior subscale. Items are rated on a 3-point scale (0 = "Not true" to 2 = "Certainly true"). There was reasonable to good reliability for total difficulties ($\alpha = 0.84$) and prosocial behavior ($\alpha = 0.68$). For Australian youth, SDQ total scores $\geq$17 are considered to be in the clinical range (top 10% of scores) (Hayes, 2007).

Youth *attachment insecurity* was measured using the caregiver report version of a brief form of the Adolescent Attachment Anxiety & Avoidance Inventory (AAAAI; Moretti & Obsuth, 2009). The brief AAAAI includes 16 items with the highest factor loadings from the full 56-item measure, and is composed of two subscales assessing attachment anxiety (e.g. "My child worries about being abandoned by me"; 7 items) and avoidance (e.g. "My child tries to avoid getting too close to me"; 9 items). Items are scored on a 7-point scale (1 = "Strongly disagree" to 7 = "Strongly agree"). Consistent with past research (e.g. Moretti, Obsuth, Craig, & Bartolo, 2015), reliability was good for attachment anxiety ($\alpha = 0.85$) and avoidance ($\alpha = 0.76$).

Caregivers also completed a survey regarding *demographic* information such as age, gender, ethnicity, education, family composition, and family income, as well as their youth's placement history.

Placement changes in kinship care were assessed at 6-month follow-up using data provided by a state CPS from their administrative database regarding placement moves that occurred during the course of study participation (i.e. from baseline through to several weeks following completion of the 6-month follow-up assessment when CAU caregivers were invited to a Connect-KP group). Kinship caregiver reports were also used to verify these data. Consistent with prior research (e.g. Waid, Kothari, Bank, & McBeath, 2016), we defined a placement change as any new placement in OOHC or any other unplanned move (given the ambiguity and negative impact of unplanned changes); however, a planned restoration to birth parents was not included. Placement change was binary coded as 0 = "No" and 1 = "Yes".

5.3. Data analysis

5.3.1. Acceptability, feasibility, and fidelity

Descriptive statistics were used to report implementation outcomes, including practitioners' satisfaction with the training workshop, the proportion of facilitators who achieved program certification, and observational ratings of fidelity. Regarding research feasibility, we used descriptive statistics to report enrolment rates and research retention. Descriptive statistics were also used to evaluate intervention acceptability, including kinship caregivers' attendance, completion, and satisfaction with the program.

5.3.2. Preliminary effectiveness

To assess group equivalence at baseline, groups were compared on demographic variables using independent samples *t*-tests and chi-square/Fisher's exact tests for continuous and categorical variables, respectively. Following an intention-to-treat (ITT) strategy, all participants who completed baseline assessments ($N = 26$) were included in the final analysis. As shown in Fig. 1, data were missing for two participants at post-intervention and one participant at 6-month follow-up in the CAU group. Missing data was handled using multiple imputation with 20 imputations. Analysis of covariance (ANCOVA) was used to assess intervention effects on outcome

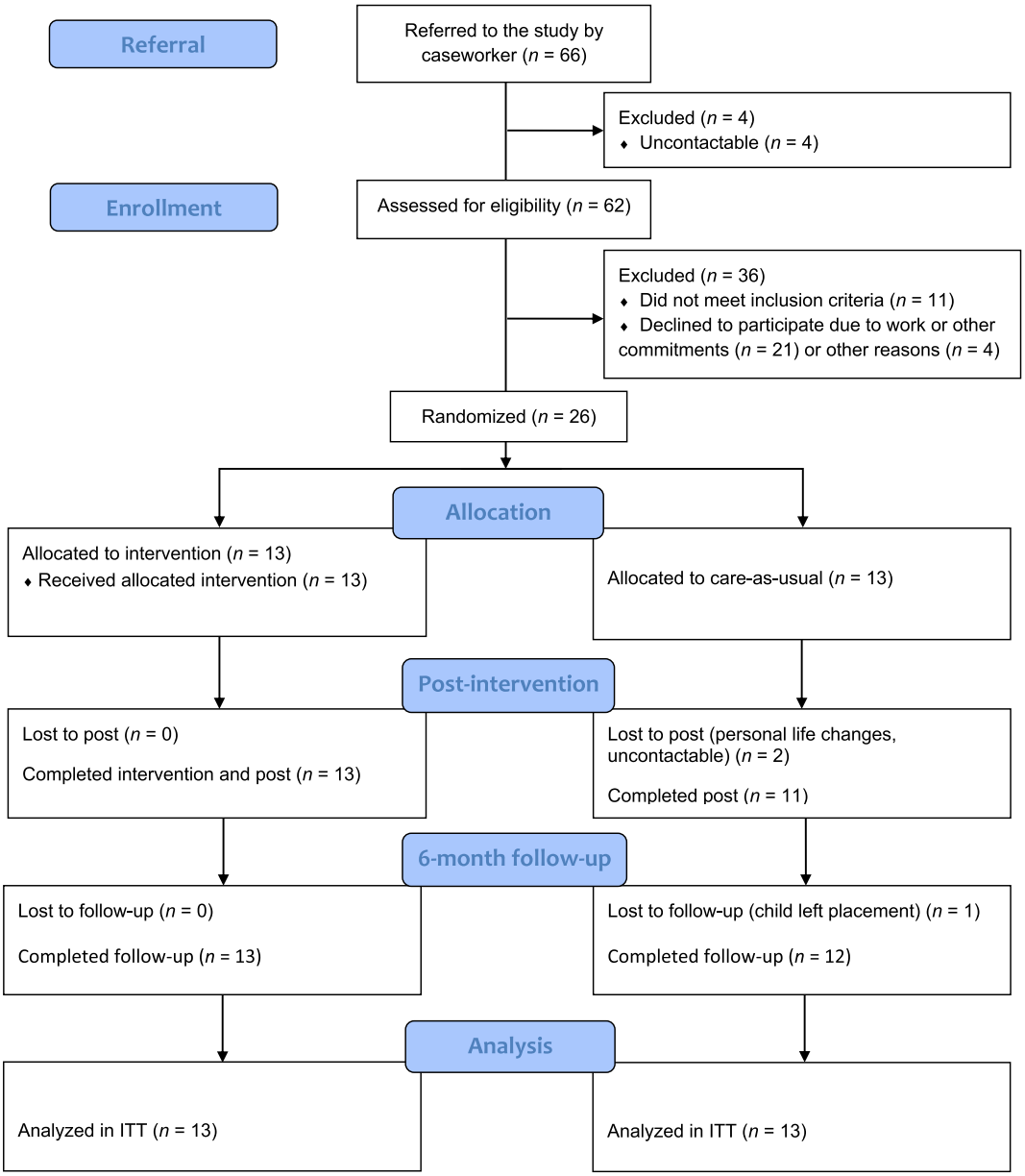

Fig. 1. CONSORT flowchart of participants.

variables at post-intervention and 6-month follow up, controlling for baseline scores (Rausch, Maxwell, & Kelley, 2003). We reported estimates of effect size using partial eta squared, where small = 0.01; medium = 0.06; large = 0.14 (Cohen, 1988; Richardson, 2011), as well as *p* values.

To better understand the impact of the intervention on outcomes, indices for reliable and clinically significant change were computed for any significant results following the Jacobson and Truax (1991) method. Reliable change reflects a statistically important level of change that is not expected due to measurement error alone, and clinically significant change—only computed for individuals showing a reliable improvement—assesses whether a post-intervention score passed a predetermined cut-off point indicative of healthy functioning.

Fisher's exact test was used to examine the association between condition (Connect-KP vs CAU) and placement changes at 6-month follow-up (coded as "no"/"yes"), and Phi coefficient was computed as a measure of the effect size. Bias corrected bootstrapped 95% confidence intervals (CI) with 1000 resamples were computed for the Phi coefficient (where $p < .05$ if 0 is not included in the CI). We reported both statistics as Fisher's exact test has been criticized as being conservative and low in power and bootstrap versions of chi-square tests are preferred when measuring associations between two categorical variables in small samples, including cells with low frequencies (e.g., Amiri & Modarres, 2017).

The effect size estimates were a main focus in investigating preliminary effectiveness in this pilot sample; however, results should be considered as exploratory and interpreted with caution as effect sizes may be unstable in pilot studies with limited sample sizes (Leon, Davis, & Kraemer, 2011).

6. Results

6.1. Training acceptability

Of the 19 practitioners who attended training, 18 were available at the end of the seminar to complete a survey regarding their satisfaction with the 3-day training workshop. Feedback from the training was very positive, with all (100%) trainees finding the roleplays and exercises valuable and relevant to training, and the trainers knowledgeable. Overall, the majority of participants strongly agreed (72%) or agreed (22%) that training met their expectations. Moreover, all staff strongly agreed (88%) or agreed (12%) that they would recommend the training. Six of these practitioners co-facilitated Connect-KP groups for the trial, of which 100% achieved certification as a Connect-KP group facilitator after delivering their first group.

6.2. Intervention fidelity

Twelve group sessions were randomly selected to code for fidelity. The mean adherence score was 100% ($SD = 0.00$), indicating that facilitators consistently delivered all of the key tasks in the sessions. The mean competence score was 2.85 (range = 2.50–3.00, $SD = 0.19$), indicating that facilitators demonstrated a high level of proficiency in delivering the sessions. Thus, facilitators demonstrated very good fidelity to both the content and process of the program.

6.3. Research feasibility

Participant flow is reported in Fig. 1. Of the 62 caregivers assessed for eligibility, 26 participated in the study, producing a 41.9% enrollment rate (51.0% of study eligible caregivers agreed to participate). Of these 26 participants, two caregivers were lost to post-intervention and one caregiver was lost to 6-month follow-up (all in the CAU group), showing a 92.3% and 96.2% research retention rate, respectively. All participants were successfully randomized.

6.4. Intervention acceptability

Overall, the Connect-KP program had a very high attendance and completion rate. Of the 21 caregivers who started the program, 19 (90.5%) completed the program and, on average, attended 85% of the sessions (range = 50%–100%). Two caregivers were considered dropouts as they completed two or fewer sessions due to work or family commitments.

Program satisfaction was assessed at the end of the intervention on a 4-point rating scale (from 1 = "Not at all"/"Unhelpful" to 4 = "A great deal"/"Very helpful"). Caregivers ($N = 19$) found the program concepts (e.g. learning about attachment, discussing how trauma can impact attachment) very helpful in understanding their child's behavior ($M = 3.67$, $SD = 0.43$), and that the group helped them understand themselves better ($M = 3.47$, $SD = 0.61$). On average, they also found the various group activities (e.g. roleplays, reflection exercises) very helpful ($M = 3.51$, $SD = 0.51$). All caregivers reported feeling more confident in their ability to parent ($M = 3.37$, $SD = 0.50$) and had been applying the skills discussed in the group when parenting ($M = 3.42$, $SD = 0.51$). Most caregivers reported a positive change in their relationship with their child ($M = 3.11$, $SD = 0.57$). Finally, all caregivers felt very respected in the group ($M = 4.00$, $SD = 0.00$) and safe and welcomed in the group to discuss their experiences ($M = 3.89$, $SD = 0.32$). In sum, caregivers reported positive experiences and engagement in the program, and that they had benefited from it.

6.5. Preliminary effectiveness

6.5.1. Baseline differences

Group equivalence analyses examined differences between the Connect-KP and CAU groups on demographic variables at baseline. The only significant difference was for child ethnicity; there were more Aboriginal or Torres Strait Islander children in the CAU vs. Connect-KP group, Fisher's exact $p = 0.041$. Child ethnicity was not included as a covariate in main analyses as it was not significantly associated with outcome measures. Furthermore, the two groups did not significantly differ on baseline assessments of outcome variables.

6.5.2. Intervention outcomes at post-intervention

Results of the ANCOVA models for intervention outcomes are shown in Table 3. Kinship caregivers in the Connect-KP group demonstrated significantly lower levels of caregiver strain ($\eta^2_p = 0.24$; large effect) and psychological aggression toward their child ($\eta^2_p = 0.28$; large effect) at post-intervention as compared to caregivers in the CAU group. The intervention showed a non-significant, medium effect size ($\eta^2_p = 0.08$; $p = 0.178$) for caregiver competence, with higher scores observed for caregivers in the Connect-KP vs. CAU group.

Regarding youth affect regulation at post-intervention, kinship caregivers in the Connect-KP group reported significantly lower levels of affect suppression in youth as compared to kinship caregivers in the CAU group, with a large effect ($\eta^2_p = 0.25$). There was also a non-significant, large effect size ($\eta^2_p = 0.13$; $p = 0.083$) for affect dyscontrol, with lower scores reported by kinship caregivers of youth in the Connect-KP vs. CAU group. Furthermore, there was a non-significant, medium effect ($\eta^2_p = 0.06$; $p = 0.233$) for SDQ total difficulties, with both groups showing clinically elevated mean scores at baseline, but only the Connect-KP group demonstrated a mean

Table 3
Intervention outcomes at post-intervention and 6-month follow-up

Outcome variable	Condition	Baseline	Post-intervention	ANCOVA results		*p*	6-month follow-up	ANCOVA results		*p*
		M (*SD*)	*M* (*SD*)	*F* (1,23)	η^2_p (95% CI)		*M* (*SD*)	*F* (1, 23)	η^2_p (95% CI)	
Caregiver outcome										
Caregiver strain	Connect-KP	2.25 (0.76)	1.97 (0.60)	7.19	0.24 [0.03, 0.44]	0.013	2.08 (0.67)	7.54	0.25 [0.03, 0.45]	0.011
	CAU	2.74 (1.14)	2.80 (0.90)				2.97 (0.96)			
Caregiver competence	Connect-KP	66.02 (9.86)	69.46 (11.25)	1.93	0.08 [0.00, 0.27]	0.178	66.31 (12.07)	0.86	0.04 [0.00, 0.21]	0.363
	CAU	63.92 (9.66)	63.17 (12.74)				60.31 (16.02)			
Psychological aggression	Connect-KP	1.51 (0.32)	1.23 (0.22)	8.87	0.28 [0.05, 0.47]	0.007	1.35 (0.34)	1.05	0.04 [0.00, 0.22]	0.316
	CAU	1.52 (0.25)	1.43 (0.20)				1.47 (0.36)			
Youth outcome										
Behavioral and emotional difficulties	Connect-KP	18.08 (7.60)	15.35 (6.87)	1.50	0.06 [0.00, 0.25]	0.233	14.81 (7.77)	1.19	0.05 [0.00, 0.23]	0.288
	CAU	19.46 (7.31)	18.60 (6.76)				18.11 (7.13)			
Prosocial behavior	Connect-KP	6.23 (1.69)	6.46 (2.22)	1.98	0.08 [0.00, 0.27]	0.173	7.00 (2.20)	3.45	0.13 [0.00, 0.33]	0.076
	CAU	5.92 (2.53)	5.43 (2.25)				5.49 (2.61)			
Affect suppression	Connect-KP	12.77 (5.00)	11.46 (4.10)	7.44	0.25 [0.03, 0.44]	0.012	12.00 (5.15)	6.41	0.22 [0.02, 0.42]	0.019
	CAU	12.85 (4.20)	15.51 (4.49)				15.33 (4.49)			
Affect dyscontrol	Connect-KP	12.15 (4.49)	11.38 (3.12)	3.29	0.13 [0.00, 0.33]	0.083	11.69 (3.52)	0.65	0.03 [0.00, 0.19]	0.428
	CAU	14.69 (4.39)	15.18 (4.73)				14.18 (4.74)			
Attachment anxiety	Connect-KP	3.11 (1.17)	2.87 (1.39)	1.14	0.05 [0.00, 0.23]	0.297	3.22 (1.29)	0.74	0.03 [0.00, 0.20]	0.398
	CAU	3.73 (1.28)	3.74 (1.21)				3.41 (1.44)			
Attachment avoidance	Connect-KP	2.36 (0.74)	2.27 (0.60)	1.39	0.06 [0.00, 0.24]	0.250	2.42 (0.55)	1.20	0.05 [0.00, 0.23]	0.285
	CAU	2.53 (0.85)	2.69 (0.99)				2.91 (1.30)			

Note. Connect-KP = Connect for Kinship Parents; CAU = care-as-usual.

score below the clinical cut-off at post-intervention. Similarly, there was a non-significant, medium effect ($\eta^2_p = 0.08$; $p = 0.173$) for levels of SDQ-prosocial behavior reported by kinship caregivers, with youth in the Connect-KP vs. CAU group demonstrating higher (i.e. more adaptive) scores at post-intervention. Kinship caregivers in the Connect-KP group reported lower levels of attachment anxiety ($\eta^2_p = 0.05$; $p = 0.297$) and avoidance ($\eta^2_p = 0.06$; $p = 0.250$) in youth at post-intervention compared to their peers in the CAU group, with small and medium effect sizes (both non-significant), respectively.

Reliable and clinically significant change was computed for significant outcomes. For caregiver strain at post-intervention, six caregivers (Connect-KP = 4; CAU = 2) had a reliable improvement, of which three (Connect-KP = 2; CAU = 1) were clinically significant, and two caregivers in the CAU group showed a reliable deterioration. Three Connect-KP caregivers showed a reliable improvement in caregiver psychological aggression, of which two were clinically significant. For child affect suppression reported by kinship caregivers, two youth in the Connect-KP group showed a reliable improvement (one demonstrating a clinically significant change), and three youth in the CAU group had a reliable deterioration.

6.5.3. Intervention outcomes at 6-month follow-up

ANCOVA results for intervention outcomes at 6-month follow-up are presented in Table 3. At 6-month follow-up, kinship caregivers scored significantly lower on caregiver strain in the Connect-KP vs. CAU group, with a large effect size ($\eta^2_p = 0.25$). There were non-significant, small effects favoring the Connect-KP group for caregiver psychological aggression ($\eta^2_p = 0.04$; $p = 0.316$) and caregiver competence ($\eta^2_p = 0.04$; $p = 0.363$) at 6-month follow-up.

Compared to their CAU peers, kinship caregivers in the Connect-KP group reported significantly lower levels of affect suppression in youth at 6-month follow-up, with a large effect size ($\eta^2_p = 0.22$). The Connect-KP group also showed lower levels of affect dyscontrol, but with a non-significant, small effect size ($\eta^2_p = 0.03$; $p = 0.428$). There was a non-significant, small effect size ($\eta^2_p = 0.05$; $p = 0.288$) for SDQ-total difficulties at 6-month follow-up, with the Connect-KP group continuing to show a mean score below the clinical cut-off, whereas the mean score for the CAU group remained above this threshold. Similarly, only the Connect-KP group demonstrated a mean score for SDQ-prosocial behavior in the non-clinical/healthy range at 6-month follow-up, with a non-significant, large effect size in favour of this group ($\eta^2_p = 0.13$; $p = 0.076$). Kinship caregivers in the Connect-KP group reported lower levels of attachment anxiety ($\eta^2_p = 0.03$; $p = 0.398$) and avoidance ($\eta^2_p = 0.05$; $p = 0.285$) in youth at 6-month follow-up than their CAU peers, with non-significant, small effect sizes observed.

For caregiver strain at 6-month follow-up, five caregivers (Connect-KP = 3; CAU = 2) had a reliable improvement, of which two (both in Connect-KP) were clinically significant, and four caregivers in the CAU group showed a reliable deterioration. One youth in the Connect-KP group had a reliable and clinically significant improvement in affect suppression at 6-month follow-up.

6.5.4. Placement changes at 6-month follow-up

At 6-month follow-up, two CAU youth (15%) experienced a placement change (and a third CAU youth had a planned restoration to their birth parent, which did not count as a placement change in this study), whereas no placement changes were observed for Connect-KP youth. This difference was not statistically significant, Fisher's exact $p = 0.480$; however, there was a significant medium effect for the size of the association between intervention condition and placement change, Phi coefficient = −0.289, bootstrapped 95% CI [−0.498, −0.158].

Regarding reasons for the placement changes, one of the moves involved a placement breakdown and the child entering foster care, and the other was an unplanned change involving the child leaving a long-term kinship placement and returning to their biological parent. Both of these moves occurred shortly after caregivers completed the 6-month follow-up assessment. Given that increased caregiver strain predicts placement breakdowns (Leathers, Spielfogel, Geiger, Barnett, & Vande Voort, 2019), in an exploratory analysis we investigated the reliable change in caregiver strain in the families of the two youth in the CAU group who experienced a placement change. Both kinship caregivers of youth who left placements showed increased caregiver strain from baseline to 6-month follow-up, of which one had a statistically reliable deterioration in caregiver strain.

7. Discussion

Kinship caregivers experience considerable strain as they navigate numerous challenges in caring for their youth, who have often been exposed to maltreatment and other relational disruptions and are at high-risk for mental health problems. Despite the high vulnerability and complex needs of families in kinship care, they often receive and engage in few services, partly due to the limited availability of tailored support. To the best of our knowledge, this study is the first evaluation of an attachment- and trauma-focused program delivered exclusively to kinship caregivers of older children and adolescents. Our pilot RCT aimed to gather initial data on feasibility and implementation outcomes, as well as explore preliminary effectiveness, to inform the design of a full-scale RCT.

Regarding implementation outcomes, practitioners reported high acceptability of the training workshop and the subset of practitioners who co-facilitated Connect-KP groups in the trial all achieved program certification. These practitioners demonstrated high levels of intervention fidelity based on independent ratings of their adherence to the program protocol and competency in delivery. These findings suggest that practitioners from CPS and OOHC services can effectively implement Connect-KP when provided with both training and supervision. There was also good evidence for the feasibility of the research, indicated by the >90% retention rates for kinship caregivers completing surveys in both cohorts, and the successful randomization of all participants. Furthermore, 51% of caregivers who were study eligible agreed to participate, which is comparable to other intervention studies involving kinship caregivers (e.g. N'Zi, Stevens, & Eyberg, 2016). Importantly, kinship caregivers did not self-refer to our study; rather, they were referred by caseworkers and thus are more representative of the general population of kinship caregivers in child welfare services.

To ensure effective implementation, it is also important that kinship caregivers perceive the program to be important and beneficial. At the end of the program, on average kinship caregivers reported that they found the program and activities very helpful, and that they had observed improvements in their relationship with their youth and in their parental efficacy. All caregivers felt very respected and safe and welcomed in the group, which speaks to the cultural competency and inclusivity of the program given the diversity in families' sociocultural backgrounds. These positive reports were backed by caregivers' engaged behavior; that is, 91% of caregivers completed the program and on average attended 85% of the sessions. These data are very encouraging as kinship caregivers are time poor and stressed and are less likely to engage in and access support services than foster caregivers (Farmer, 2010; Harding, Murray, Shakespeare-Finch, & Frey, 2020).

To inform future research we explored initial family outcomes of Connect-KP, focusing on effect sizes in this pilot trial. Regarding caregiver outcomes, results showed that compared to kinship caregivers randomized to CAU, those in Connect-KP had significantly less caregiver strain at post-intervention, and this large effect was maintained at 6-month follow-up. This finding is especially encouraging because caregiver strain adversely impacts caregivers' mental health, caregiving behavior, and family interactions, and is a primary target in interventions for kinship caregivers (Fisher & Stoolmiller, 2008). We also observed significant and large effects of Connect-KP on reduced caregiver psychological aggression toward their youth at post-intervention, with non-significant, smaller effects at 6-month follow-up. This potential intervention effect is important because kinship caregivers tend to endorse harsh parenting attitudes more highly than other parents (Mennen & Trickett, 2011), which may increase risk for coercive caregiver-youth interactions and lead to placement breakdowns (Jedwab, Xu, & Shaw, 2020; Leathers, Spielfogel, Geiger, Barnett, & Vande Voort, 2019). There were also potential (though non-significant) small to medium effects of the program on caregiver competence at both time points, favoring Connect-KP.

Regarding youth outcomes, results suggest promising effects of Connect-KP on improving or at least preventing deterioration in affect regulation. Specifically, compared to youth in CAU, those in Connect-KP showed lower scores on both affect dyscontrol and affect suppression as reported by kinship caregivers, with significant and large effects observed for the latter at post-intervention and 6-month follow-up. This finding is noteworthy because affect suppression is a maladaptive coping strategy linked to child maltreatment, and heightens risk for traumatic stress and comorbid psychopathology (Messman-Moore & Bhuptani, 2017). On average, kinship caregivers in both conditions reported clinically significant levels of behavioral and emotional difficulties in youth at baseline, which is consistent with research demonstrating elevated mental health problems in youth in OOHC (Tarren-Sweeney, 2013). Compared to youth in CAU, those in Connect-KP showed a pattern of greater reductions in behavioral and emotional difficulties, which on average fell below the clinical cut-off at both time points following the intervention. Our results also indicate the potential of Connect-KP for increasing youth prosocial behavior during and following intervention, with a trend for a large effect. Furthermore, kinship caregivers in Connect-KP vs. CAU reported less attachment anxiety and avoidance in youth at post-intervention and 6-month follow-up (non-significant differences), indicating possible intervention effects of a modest magnitude on attachment insecurity.

Given the emphasis on kinship placements for promoting continuity in care, we explored whether there may be a link between condition and placement changes at 6-month follow-up. Two youth (15%) from CAU and none from Connect-KP experienced an unplanned placement change. Consistent with theory that caregiver strain contributes to placement breakdowns (Harding, Murray, Shakespeare-Finch, & Frey, 2018; Leathers, Spielfogel, Geiger, Barnett, & Vande Voort, 2019), an exploratory analysis indicated that both of the caregivers of youth who moved placements reported increased caregiver strain from baseline through 6-month follow-up. Future research should test the hypothesis that Connect-KP, and other kinship caregiver interventions, may reduce risk for placement changes by decreasing caregiver strain.

The overall pattern of findings regarding preliminary effectiveness of Connect-KP suggest possible benefits of the program in important caregiver and youth domains in kinship care. These positive effects are largely consistent with those from prior Connect trials with birth parents (e.g. Högström, Olofsson, Özdemir, Enebrink, & Stattin, 2017; Moretti & Obsuth, 2009), and are similar to a recent open pilot trial of Connect for Foster Parents that reported small to medium effects of the program on foster caregiver strain, family satisfaction, and youth behavior problems (Moretti, O'Donnell, & Kelly, 2019). Given that kinship caregivers report more stress than foster caregivers (Farmer, 2010; Harding, Murray, Shakespeare-Finch, & Frey, 2020), it is not surprising that we observed a large effect for decreased caregiver strain at both post-intervention and 6-month follow-up. In addition to helping caregivers better manage stressful and challenging interactions with their youth, Connect-KP may provide a safe haven for caregivers who often feel isolated and may lack social support due to strained family relationships, stigma and limited time to socialize. Moreover, there was unanimous feedback from all stakeholders regarding the value of the group format for giving kinship caregivers unique opportunities for social connection and peer-based learning. The group format of Connect-KP also makes the intervention portable and cost-effective, thereby promoting its potential for large-scale implementation in child welfare services (Moretti, Pasalich, & O'Donnell, 2018).

Noteworthy strengths of this study include the multi-method and multi-informant approach to assessing implementation and preliminary outcomes, the longitudinal evaluation of intervention outcomes over 6 months, and the partnership with CPS and OOHC practitioners who were trained in and implemented Connect-KP in their usual service settings. The latter is vital for sustainability and scaling up of the intervention. Our findings are limited, however, by the small sample in this pilot trial, meaning that our data are preliminary; the study was not designed to be sufficiently powered to detect significant differences between conditions at baseline and post-intervention time points. Other limitations include the use of caregiver reports which may be affected by social desirability, and the use of an inactive control that only received CAU. Larger RCTs might consider including a control group which receives an identical number of support group sessions to control for the potential social benefits that groups and consistent contact with facilitators may provide. Building on our initial evidence for program acceptability, we plan on conducting a more focused investigation of the cultural appropriateness of Connect-KP in partnership with stakeholders from Indigenous communities, to inform future cultural adaptations and implementation trials in specific communities.

In sum, this pilot RCT of Connect-KP has established a feasible research protocol for future trials conducted in child welfare services and demonstrates initial evidence for high levels of training acceptability and intervention fidelity. Moreover, kinship caregivers perceived Connect-KP to be beneficial and they showed very high attendance and completion rates, which is particularly encouraging in light of their limited engagement in services. Results regarding preliminary outcomes suggest promising effects of Connect-KP on improving important caregiver and youth domains of wellbeing and mental health. If these findings are supported in future large-scale RCTs, Connect-KP will fill a void in attachment- and trauma-focused interventions that are tailored for kinship caregivers of older children and adolescents.

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Marlene M. Moretti is the developer of the Connect Programs and may benefit from positive reports of the intervention. As a result, she maintains an arm's length distance from recruitment and consent of participants, and direct collection and analysis of data.

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