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Impacts of *Roots of Resilience* professional development for early childhood teachers on Young children's protective factors

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ABSTRACT

Early care and education (ECE) is an important developmental context for nurturing resilience with young children experiencing adversity. In particular, strengthening the capabilities of adult caregivers, such as ECE teachers, to mitigate the effects of toxic stressors is of central importance to children's learning, health, and development. Yet, few ECE teachers have access to professional supports focused on meeting the needs of children impacted by trauma. The current study examines a new program that aims to help fill this gap for both home-based and center-based ECE programs: *Roots of Resilience: Teachers' Awakening Children's Healing. Roots of Resilience* is a professional development program consisting of an online course and online video-based coaching. In a small randomized controlled trial (RCT) with 17 classrooms/groups, 23 teachers, and 61 children we examine program impacts on three protective factors: emotionally supportive teacher-child interactions, children's engagement and children's school readiness skills. Findings revealed significant impacts of teachers' participation in *Roots of Resilience* on (observed) emotionally supportive teacher-child interactions at post, controlling for baseline scores and teacher education. Children whose teachers were randomly assigned to participate in *Roots of Resilience* showed reductions in (observed) negative engagement and increases in direct assessments of math skills, compared to children whose teachers were assigned to the waitlist control group. No impacts on children's (observed) positive engagement, nor direct assessments of self-regulation or early literacy were detected. Further research with a larger and more diverse sample is needed to more definitively examine program impacts, identify mechanisms of influence, and address questions about which teachers and/or children may benefit most.

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Early care and education (ECE) is an important context for early development, with a majority of young children attending some form of out-of-home care prior to kindergarten entry (National Survey of Early Care and Education, 2016). Quality ECE may be especially important for young children with adverse childhood experiences (ACEs), such as maltreatment, exposure to violence, parental substance abuse, family separation, and discrimination. Yet, effectively supporting children within ECE programs who are impacted by trauma may be complex and challenging. Trauma affects children's developing neurobiology, behavior, and learning (Fisher et al., 2016), which can manifest in more negative engagement (Lipscomb et al., 2021) and behavioral problems within ECE settings (Zeng et al., 2019).

Early intervention can help to prevent and/or mitigate negative effects of trauma on development, for example by increasing sensitive and responsive adult-child interactions (Bruce et al., 2013; Fisher et al., 2016). Strengthening the capabilities of adult caregivers to mitigate the effects of toxic stressors is of central importance to children's learning, health, and development (Shonkoff, 2011). Yet, few ECE teachers have access to professional supports focused on meeting the needs of children impacted by trauma (Cummings et al., 2017; Loomis, 2018). The current study examines a new program that aims to help fill this gap: *Roots of Resilience: Teachers' Awakening Children's Healing* (Lipscomb, Hatfield et al., 2019). In this first study of program outcomes, we

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examine emotionally supportive teacher-child interactions, and children's engagement and school readiness skills, each of which represent protective factors that strengthen resilience (Masten, 2018).

1.1. Nurturing resilience within ECE programs

Resilience is a process of positive adaptation in the face of adversity (Masten, 2018) that transpires within socio-ecological contexts (Liu et al., 2017; Ungar & Liebenberg, 2011). Protective factors support resilience and emanate from individuals, relationships, and communities (Development Services Group, 2013; Ungar & Liebenberg, 2011). Many of the "school readiness skills" that ECE programs aim to strengthen with the young children they serve, such as positive engagement, self-regulation, and other cognitive skills, can act as powerful protective factors for promoting resilience (Masten, 2018). Moreover, positive adult-child interactions and relationships that are the hallmark of high-quality ECE are another important source of protective factors; they help children to feel safe and valued, to solve problems, and to learn new skills (Hayakawa et al., 2013; Masten, 2018). As such, ECE programs, and their focus on responsive adult-child interactions and early skill development, present an opportune context for nurturing resilience with children impacted by ACEs and/or trauma.

When applying a resilience framework to ECE, it is imperative to be inclusive of the wide variety of ECE programs children attend. Although nearly 30% of children in the Child Welfare System have been reported to attend center-based ECE by age 5 years (Ringeisen, 2011), children impacted by trauma also attend home-based programs (Lipscomb, Goka-Dubose et al., 2019). In an analysis of data from the Fragile Families and Child Wellbeing Study, more than 50% of three-year old children attending home- and center-based ECE programs already had at least one ACE; 12% had three or more (Lipscomb, Goka-Dubose et al., 2019). Home-based ECE may be particularly important for families facing adversity because it is more widely available, and accessible across demographic groups, than center-based care (National Survey of Early Care and Education, 2016). Moreover, children with more ACEs may be exposed to a larger variety of ECE programs and teachers; they experience more changes in ECE arrangements and more often attend multiple programs at once (Lipscomb, Goka-Dubose et al., 2019).

An emerging line of research indicates that quality ECE programs support the development of young children with ACEs in areas ranging from early literacy to reduced behavior problems (Dinehart et al., 2012; Lipscomb et al., 2014; Merritt & Klein, 2015). However, despite these benefits, children impacted by trauma continue to struggle both within ECE (Merritt & Klein, 2015) and in elementary school (Blodgett & Lanigan, 2018; Jimenez et al., 2016). One recent study found that children with ACEs show increased odds of being suspended and/or expelled from their ECE programs (Zeng et al., 2019). Another examined young children's experiences within ECE more specifically, and found that children with more ACEs exhibited more negative engagement (less behavior control and more conflict), less positive engagement with tasks, and fewer self-regulation and academic skills (Lipscomb et al., 2021). Thus, there is a clear and compelling need for increased supports for early childhood teachers serving young children impacted by adversity.

1.2. Supporting adult caregivers as a pathway to resilience

Theory and research in the field of translational neurobiology points to adult caregivers as a key mediating pathway to ameliorating impacts of early adversity (e.g., Fisher et al., 2016). Within ECE, children in more sensitive, supportive classrooms demonstrate a less reactive stress response system (Hatfield et al., 2013). Interventions that strengthen caregivers' responsivity to young children's needs may be particularly promising (Fisher et al., 2016). For example, interventions that help adult caregivers with children's behavioral concerns have been shown to reduce stress caregivers experience in relation to children's behavior, and in turn to buffer children from negative effects of adults' stress on their neurobiology (e.g., normalization of activation of the hypothalamic-pituitary-adrenocortical axis; Fisher & Stoolmiller, 2008; Hatfield & Williford, 2017). Evidence within the field of ECE points to the importance of teacher-child relationships for children facing adversities such as those associated with living in non-parental care (Lipscomb et al., 2014). Thus, supporting early childhood teachers to deepen their knowledge, strengthen practices, and reduce stress, may hold promise to strengthening benefits of ECE on development of children facing adversity.

Professional development systems and programs provide an important structure within which to support ECE teachers. Nearly all states require professional development (PD) for teachers in licensed and/or regulated child care programs, although the number of hours and content of the required PD varies widely across states (Gomez et al., 2015; Institute of Medicine and National Research Council, 2015). Even with these requirements, ECE teachers continuously report the need for additional training, especially to help them manage children's challenging behaviors (Vesay, 2008). In consideration of this need, and in response to evidence of the importance of adult-child interactions to children's development, PD for ECE teachers often focuses on strengthening teacher-child interactions and relationships.

Various models of professional development are available to meet teachers' needs, including in-person workshops, online courses, and individualized coaching, yet access to PD is inconsistent (Gomez et al., 2015). Online PD programs promise to increase cost-effectiveness and ultimately scalability (Hamre & Hatfield, 2012), and 1:1 coaching models that encourage application and reflection show promise to strengthen teaching practices (e.g., Pianta, Mashburn et al., 2008). Beyond the format, it is critical that PD programs target specific, evidence-based teaching practices (Hamre et al., 2017). One example of a state-wide mixed delivery PD model focused on increasing effective teacher-child interactions demonstrated improvements in emotionally supportive classroom interactions, compared to the control group (Early et al., 2017). One of those models, MyTeachingPartner, an individualized 1:1 remote-delivery coaching with video feedback, has also been linked to improvements in children's school readiness skills in other large-scale studies (Pianta, Mashburn et al., 2008; Pianta et al., 2017). Coaching models with video feedback also show promise to strengthen quality among home-based providers in the Netherlands (Groeneveld et al., 2011).

However, ECE teachers have few PD opportunities that are specifically focused on understanding and addressing the needs of children impacted by trauma (Cummings et al., 2017; Loomis, 2018). Resources for trauma-informed care are increasingly available to professionals in fields ranging from health to child welfare to education (National Child Traumatic Stress Network, n.d.; Substance Abuse and Mental Health Services Administration, n.d.) yet most are light-touch, such as fact sheets, frameworks, mini presentations, or single lectures or workshops. Despite the growth of trauma-informed initiatives in K-12 schools (Baweja et al., 2016), very few of these resources apply directly to the context of ECE. ECE teachers need professional supports focused on trauma and resilience that are designed for them, including those who work in their own homes, often alone, that focus on the unique needs of young children, and that utilize or reinforce best practices in early childhood. Moreover, even in K-12 schools committed to trauma-informed education staff report needing more training and support to help them understand and address trauma (Alisic, 2012; Baweja et al., 2016).

To be trauma-informed, organizations, programs, and systems must not only be aware of the widespread impacts of trauma, but also recognize its signs, integrate knowledge about trauma into policies, procedures, and practices, and resist re-traumatization (SAMSHA, 2014). Head Start Trauma Smart (HSTS; Holmes et al., 2015) is the only organizational-level trauma-focused intervention in ECE in literature published to-date. HSTS includes training for teachers, staff, administrators and parents, as well as trauma-focused interventions, mental health consultation, and peer mentoring, and has been associated with reductions in children's behavior problems (Holmes et al., 2015). However, HSTS is designed specifically for the wrap-around context of Head Start. For this reason, as well as the high levels of resources it requires, HSTS may not be applicable to other ECE programs. Additionally, interventions or approaches focused on social and behavioral development, such as the Pyramid Model (Hemmeter et al., 2016), may be relevant to supporting children impacted by trauma, through promoting social-emotional skills of all children and targeting more intensive supports to children with behavioral challenges. However, teachers also need specific professional development focused on trauma to understand the impacts of trauma, recognize its signs and resist re-traumatization (SAMHSA, 2014).

Supporting teachers who work directly with young children to be trauma-responsive, and to nurture resilience through their everyday interactions with children, should also be feasible across all types of ECE programs. Enacting trauma-responsive care means that staff behavior and practices reflect trauma-informed principles, as well as partnership with professionals who provide trauma-specific treatment (Bloom, 2016). The current study seeks to help fill this gap by examining the effects of a new model of professional support for early childhood teachers focused on nurturing resilience through daily interactions with young children impacted by trauma (Lipscomb, Hatfield et al., 2019).

1.3. Roots of resilience

Roots of Resilience is a new, online professional development program for ECE teachers in home- and center-based programs to strengthen resilience with children impacted by trauma. The conceptual foundation of the program centers on four key ideas (for more detailed information see Lipscomb, Hatfield et al., 2019). First, *Roots of Resilience* seeks to strengthen resilience through responsive interactions during everyday moments, encouraging teachers to notice and utilize small moments with children, as well as with parents or other caregivers, to strengthen resilience. Second, *Roots of Resilience* supports early childhood teachers as "gardeners" who tend to children's roots of resilience. It focuses on teachers' strengths, and on their own self-regulation, self-care in support of teachers' own well-being, and in turn their responsivity to young children. Third, *Roots of Resilience* builds directly upon teachers' prior knowledge by overlaying a trauma-informed perspective on best practices in ECE established by the National Center on Early Childhood Development, Teaching, and Learning and the Center on the Social and Emotional Foundations for Early Learning. Finally, *Roots of Resilience* provides online, relationship-based PD to support providers who often work in isolation and/or cannot attend traditional professional learning opportunities.

Roots of Resilience was designed to support ECE teachers in caring for all children; they do not need to know children's trauma histories to nurture resilience. Rather, the program guides teachers to consider trauma as a potential source of children's behaviors, to be responsive to all children in their care while also honing in on challenges that may be due to trauma, and to nurture their own self-regulation and care in order to nurture resilience with children.

The program consists of an online course and online video-based coaching that are complementary, but that were also designed so that they could be completed independently because each component requires a substantial time commitment. The online course includes six modules with a total of 27 learning outcomes ranging from identifying sources of trauma and resilience to planning and practicing self-care to partnering with families and specialists, and using a trauma-informed perspective to observe behavior and promote children's self-regulation. The course is facilitated by a masters-level instructor, uses an interactive, self-paced format, includes a workbook to practice and reflect in between modules, and discussion boards to create community and spur reflection about trauma-responsive practice.

The *Roots of Resilience* coaching program is video-based and was designed to allow for delivery online in one-on-one sessions between a coach and teacher. In contrast to the course's broad approach, *Roots of Resilience* coaching focuses specifically on supporting early childhood teachers to employ a trauma-lens to strengthen children's self-regulation in the context of responsive child-teacher interactions, termed "serve and return" by the Center on the Developing Child at Harvard University (2017). It was developed in close partnership with, and based on the foundation of, Filming Interactions to Nurture Development (FIND), a strength-based microsocial model to support caregivers in serve and return interactions (Fisher et al., 2016). The *Roots of Resilience* development team was trained in FIND. Both FIND and *Roots of Resilience* coaching use video to show caregivers microsocial moments in which they are engaged in supportive interactions, and are therefore truly strength-based. *Roots of Resilience* coaching was designed specifically for early childhood teachers working with preschool-aged children, focuses on self-regulation during serve and return interactions, and explicitly discusses trauma and resilience within six sessions. The *Roots of Resilience* coaching sessions focus on self-regulation by isolating interactions in which 1) children's serves show self-regulation (less-regulation or more-regulation), 2) teachers exhibit self-regulation when returning children's serves, and 3) teachers return children's serves in specific ways that support children's growing self-regulation.

The initial research on *Roots of Resilience* focused on implementation (Lipscomb, Hatfield et al., 2019). Findings indicate that the program is feasible for ECE teachers in both home- and center-based programs, and suggest that it may help teachers strengthen their knowledge and application of trauma-responsive practices to identify and respond to children's needs. Results from this mixed methods study pointed to the iterative development process and strengths-based approach as important program attributes. For more information about the theoretical framework and *Roots of Resilience* program see (Lipscomb, Hatfield et al., 2019). The current study provides the first test of program impacts, utilizing a small randomized controlled trial (RCT) on both teacher-level and child-level outcomes that represent key protective factors to strengthening children's resilience.

1.4. Current study

This study compares the effectiveness of participation in the *Roots of Resilience* professional development program to business-as-usual, utilizing a waitlist control design. We examine the overall effect of participation (in either the course or coaching), and explore the specific effects of the course and coaching components, compared to the waitlist control.

The theory of change (Fig. 1) is that the support, knowledge, skills, and reflection that teachers' gain through participating in *Roots of Resilience* will help teachers to identify and respond sensitively to children's needs, which in turn helps children feel safe, empowered, and valued in their ECE environments, partic-

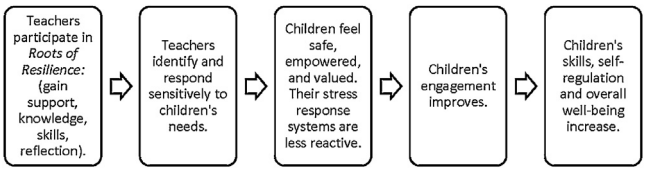

Fig. 1. Theory of change.

ularly among children impacted by trauma. Over time, children's stress response systems should become less reactive in these settings, and their engagement with teachers, peers, and activities should improve (more positive and less negative). Collectively, these improvements should support children's learning (e.g., of early academic skills and self-regulation) and overall well-being. This overall theory of change considers the course and coaching components equivalently, although the specific processes through which the course and coaching support teacher-child interactions may differ, owing to their distinct yet complementary approaches. Examining the specific processes is beyond the scope of this initial small study.

This small initial RCT is based on the theory of change but does not examine the entire model. It focuses on three types of protective factors that nurture development: emotionally supportive and responsive teacher-child interactions, children's engagement in ECE, and children's school readiness skills (self-regulatory and early academics: math and literacy). More specifically, to measure teacher-child interactions this study utilizes the Emotional Support domain of the Classroom Assessment Scoring System (CLASS) Pre-K (Pianta, La Paro et al., 2008) because it captures specific aspects of adult-child interactions (e.g., more sensitive and less negative interactions) aligned with a protective factors and resilience framework. Given that emotionally supportive and responsive teacher-child interactions, and the *Roots of Resilience* program, should support engagement and development of children generally (Curby et al., 2013) as well as those with ACEs, this study prioritized participation of children with more ACEs, but also included other children (without ACEs) attending the same class or group. The study did not reveal children's ACEs status to teachers.

2. Method

2.1. Participants - teachers

Thirty teachers from 22 classrooms/groups participated at baseline: home-based (30%), non Head Start center-based (33%), and Head Start (37%) programs. However, two classrooms were excluded from CLASS observations at both baseline and follow-up due to lack of parent consent (but these classrooms are included in analysis of child assessments). Additionally, three classrooms (14%) were missing post data because teachers (n = 5 teachers; 17%) left the study; they moved, closed their program, or withdrew. Thus, data for analysis of change in teacher-child interactions from baseline to post were only available for 17 classrooms (23 teachers). Teachers who left the study did not significantly differ from those who remained on education level or number of adverse childhood experiences (ACEs). The five classrooms that are not part of the analytic sample for teacher-child interactions included two Head Start and three home-based programs; two had been assigned to the waitlist and three to the intervention (course). Within the analytic sample (17 classrooms with 23 teachers), teachers in the intervention did not differ from those in the waitlist group at baseline on any outcome variables (see analysis section).

Thus, the complete cases intent-to-treat analysis (Groenwold et al., 2014) included 17 classrooms/programs with 23 teachers: 11 (48%) were lead teachers, 3 (13%) were leaders of home-based programs, 9 (39%) were either a co-teacher, assistant, or aid (all referred to as teachers throughout this paper). Five (55%) of the nine assistants/aids participated along with their lead teachers; four (44.44%) participated as the only teacher in their classroom. Teachers worked in home-based (4; 17%), non-Head Start centers (10; 43%), and Head Start (7; 30%) programs. Teachers reported their highest level of education as: high school graduate (8.7%), some college (17.4%), Associates Degree (21.7%), Bachelor's Degree (30.4%), and graduate degree (17.4%); 4.3% missing. One teacher (4.3%) identified as male; 95.7% identified as female; none identified as non-binary or transgender. Teachers reported their race/ethnicity as 8.7% Latino or Hispanic and 95.7% White (91.3% White only). Teachers' reported a range from 0 to 17 out of 17 ACEs: 1 (4.30%) reported no ACEs; 4 (17.4%) reported 1 ACE; 1 (4.3%) reported 2 ACEs, 2 (8.7%) reported 3 ACEs and 15 (65.2%) reported 4 or more ACEs. Teachers' ACEs included exposure before the age of 18 years to conventional ACEs (physical, sexual, or emotional abuse or neglect; incarcerated parent; divorce; violence against mother; household substance abuse or mental illness; Felitti et al., 1998), as well as expanded ACEs (foster care, bullying at school, parent/guardian death, separation from caregiver through deportation or immigration, life threatening illness, neighborhood or school violence; discrimination due to race, sexual orientation, place of birth, disability or religion; Center for Youth Wellness ACE-Questionnaire; Bucci et al., 2015; Burke Harris & Renschler, 2015).

2.2. Participants - children

Seventy-two children participated at baseline, but 11 (15%) children left their programs before the post assessment period. Thus, 61 children (85%) participated at post; they had significantly higher parent education levels ($r = .27$, $p = .02$) and family income ($r = .27$, $p = .02$), but did not significantly differ on intervention status or any of the baseline child assessments or observations, than children who did not participate at post (Appendix A1). Data analysis were conducted using the data from the 61 children who contributed at least partial data at both baseline and post.

Participating children had attended their ECE programs for an average of 15.56 months (SD = 17.54) at baseline, and attended for an average of 28.99 h per week (SD = 16.82). They attended home-based (23%), non Head Start center-based (41%), and Head Start (36%) programs. Children's teachers were in the intervention (44.3%) or waitlist (55.7%) control groups. Children in the intervention group did not differ from those in the waitlist group at baseline groups on any outcome variables (see analysis section). Children were identified by their parents as 62% female, 38% male, 0% transgender or non-binary. They were 4.16 years of age, on average (SD = 0.59), with a range from 2.96 to 5.18 years. Children's parents identified their primary language as English (100%), and their race/ethnicity (identifying all that applied) as: 1.2% Native American, 4.9% Asian/Pacific Islander, 4.9% African American, 3.3% Latino, 91.8% White; 85% were White only.

Parents reported that the majority (63.4%) of children in the current study had experienced at least one adverse childhood experience (ACE): 37.7% had no ACEs, 14.8% had 1 ACE, 13.1% had 2 ACEs, and 32.8% had 3 or more ACEs; 1.6% missing. ACEs included parental separation or divorce, parental incarceration, mental illness of a household member, domestic violence, physical abuse, verbal abuse, sexual abuse, neglect, substance abuse by someone win the home, and feelings of unsupport/unloved, being in foster care, experiencing harassment or bullying at school, living with a parent or guardian who died, being separated from primary caregiver through deportation or immigration, having a serious medical procedure or life threatening illness, seeing or hearing violence in the neighborhood or school neighborhood, often treated badly

because of race, sexual orientation, place of birth, disability, or religion (Center for Youth Wellness ACE-Questionnaire; Bucci et al., 2015; Burke Harris & Renschler, 2015).

Parents completing the demographic questionnaire were primarily mothers (83.6%); 11.5% were fathers; 4.9% were non-parental caregivers (e.g., grandmothers; no children were in formal foster placements). Forty-seven percent of families indicated that they qualified for public assistance such as food stamps or WIC in the past year. Forty-four percent reported incomes less than $35,000 per year and 42% reported an annual household income of $55,000 or more. Nineteen percent of parents reported a high school level of education or lower; 50% reported some college or an Associates Degree, and 31% had attained a Bachelor's or Graduate degree. Parents were married and living together (55.7%), single/never married (23.0%), and married or divorced living apart (21.4%).

2.3. Procedures

2.3.1. Baseline

Recruitment began with phone calls and emails to licensed ECE programs in three counties in the Pacific Northwest. The research team intentionally recruited a mix of home-based, Head Start, and other center-based programs so that findings would be as generalizable as possible. Teachers were invited to participate if they identified as working with young children impacted by trauma and were interested in professional development related to trauma and resilience. To support generalizability of findings (e.g., teachers typically self-select into professional development), teachers were given information about the course and coaching components and allowed to select the one they preferred (teachers in the same classroom/group had to choose together): either course or coaching. Then, within that selection, they were randomly assigned to the intervention (begin right away) or waitlist control groups. Of the 17 classrooms participating in this analysis, 9 (with 11 teachers) had been randomly assigned to the waitlist: 3 Head Start (3 teachers), 4 center-based (6 teachers), and 2 home-based (2 teachers). Eight classrooms (12 teachers) were assigned to the intervention. More specifically, four classrooms/programs were assigned to coaching: 1 home-based (2 teachers), 1 Head Start (2 teachers), and 2 center-based (2 teacher). Four classrooms had been randomly assigned to the course: 2 Head Start (4 teachers), and 2 Centers (2 teachers). Numbers are slightly imbalanced because eight classrooms requested to have two teachers participate; they were assigned together to the intervention or waitlist.

All families of children in participating teachers' care were invited to complete a survey of children's ACEs and child and family demographics at baseline, and to consent to researchers observing and assessing their engagement and skills at baseline and follow-up time periods. In order to limit the length of researcher presence in ECE programs, up to four children with the highest ACE scores within each classroom (or home-based program) were included in assessments and observations. The average number of children participating per classroom/program was 3.39. All observations and assessments were conducted in English, which was the language spoken in all programs.

At baseline, before initiation of the intervention or waitlist status, teachers completed a survey of their demographic characteristics and experiences. Each classroom or group was also observed (emotionally supportive teacher-child interactions), and the participating children were each observed (child engagement) and assessed (self-regulation and academic skills).

2.3.2. Intervention

Teachers assigned to the waitlist participated in whatever their normal professional development might have otherwise been during the waitlist/ intervention period. Teachers in the intervention group were given a welcome kit that contained starter materials (e.g., mindfulness, breathing, yoga activities and recipe cards to make more; a children's book about feelings). The course group were also given access to the online course and a hard copy of the workbook. An instructor sent them a welcome email and checked in with them weekly to provide support, including responding to discussion board posts and tips/memes that reinforced key course ideas. All teachers other than the one who dropped out before starting, completed the course, and did so within an average of 11.40 weeks (*SD* = 2.97). Teachers in coaching were visited by a coach for an in-person orientation to the filming process, to borrow an iPad for filming, and to collect the first round of film for coaching. Four of the five teachers assigned to coaching completed it; one home-based assistant chose not to complete coaching after the initial orientation session due to external life factors, but her classroom is included in the post data as her lead teacher continued. Teachers completed coaching in an average of 8.50 weeks (*SD* = 3.00).

Overall, there was high fidelity in program implementation. All teachers who started the course completed the full course (one dropped before starting due closure of her program and did not have data for analysis). All teachers who started coaching completed the entire coaching program (one dropped after the orientation but has data in the analytic sample because the lead teacher continued). Additionally, coaches rated participants' engagement with an average of 5.33 (SD = 0.56) on a scale from 1 = strongly disagree to 6 = strongly agree with four items (shared experiences, engaged in self-reflection, demonstrated interest in improving, open to trying new things; alpha = .79). Quiz scores for teachers participating in the course reflected a high degree of understanding across the six modules (M = 86.28%, SD = 2.03%), although participation in discussion boards was highly varied (M = 63.17%, SD = 42.69%) with two teachers not engaging in any discussion boards and others participating in all of them.

2.3.3. Post intervention

The observations and assessments were repeated after approximately four months after baseline, at which time teachers in the intervention had completed the course or coaching program. Research assistants conducting observations and assessments were masked to study condition. Finally, after conclusion of these follow-up (post) observations (end of the RCT), teachers in the waitlist were invited to participate in the course or coaching, and teachers who participated in the course were invited to participate in coaching (and vice versa); limited data were collected after the RCT and were not included in this analysis.

2.4. Measures – teachers

2.4.1. Emotionally supportive teacher-child interactions

Research assistants conducted systematic observations of teachers' interactions with children in their care utilizing the PreK *Classroom Assessment Scoring System* (CLASS; Pianta, La Paro et al., 2008). The CLASS measures the overall quality of teacher-child interactions, inclusive of all teachers and children in the class/group as a whole. The Prek CLASS tool is comprised of three domains (Emotional Support, Classroom Organization, and Instructional Support) and has shown strong validity and reliability (La Paro et al., 2004). In alignment with our theory of change, the current study utilized only the Emotional Support domain, which includes four dimensions: positive climate, negative climate (reverse scored), regard for student perspectives, and teacher sensitivity (α = 0.87 in the current study).

The CLASS appears to be appropriate for use in home-based, as well as center-based, programs serving preschool-aged children,

many of which participate in Quality Rating and Improvement Systems (QRISs) that utilize the CLASS (The Build Initiative & Child Trends, 2017). The CLASS was developed through the lineage of the Observational Record of Caregiving Environment, which measures sensitive and responsive adult-child interactions in both home-based and center-based ECE (National Institute of Child Health and Human Development, 1996). Studies of QRISs provide initial evidence that the CLASS does not appear to be biased in favor of center-based programs (Joseph et al., 2011; Lipscomb, Weber et al., 2016, 2019), and that the measurement structure of the CLASS is relatively consistent across home-based and center-based programs (Lipscomb, Weber et al., 2019).

Each dimension was rated on a 7-point scale from 1 (very low) to 7 (very high). Ratings of 1 or 2 are characterized as in the "low range," 3–5 in the "mid-range," and 6–7 in the "high range" although this study utilizes the 1–7 scores. To increase precision, each classroom (or group/child care home) was observed for an average of 7.80 (*SD* = 0.70) cycles over multiple days at baseline and again at post rather than the typical four to six cycles; each cycle lasted 25 min (15 min of observation followed by 10 min of coding). As per guidelines in the CLASS manual, most classroom activities were observed, excluding nap and bathroom time as well as outdoor time. All data collectors were trained by a certified CLASS trainer and met Teachstone's reliability requirements for CLASS certification (i.e., 80% of codes matching standard codes set by Teachstone and no dimensions with more than three ratings consistently scored higher or lower than Teachstone's standard code). During data collection (baseline and post-intervention), 29% of observations and ratings were coded by two data collectors with 80% average agreement in ratings between coders. After the observation, coders met to consensus code and their agreement with consensus codes was 88%. Each observer also maintain reliability with master-coded CLASS videos at 80% or higher to continue collecting data.

2.5. Measures – children

2.5.1. Child engagement

Children's engagement was assessed by researcher observation utilizing the Individualized Classroom Assessment Scoring System (inCLASS; Downer et al., 2010). The inCLASS measure has been shown to have construct validity in prior research (Downer et al., 2010). To enhance precision in the current study, each child was observed an average of 7.8 cycles (*SD* = 0.46) over multiple days at baseline and again at post rather than the typical four to six cycles; cycles lasted 15-minutes each. During the observations, there were an average of 13.28 children (*SD* = 4.42) and 2.34 adults (*SD* = 0.89) present. The average ratio of children to adults was 6.06 (*SD* = 2.37). Each research assistant who conducted inCLASS observations attended a two-day training led by a certified inCLASS trainer, and coded the reliability portion of the training with 80% reliability or higher in order to be certified. During data collection (baseline and post-intervention), 20% of observations and ratings were coded by two data collectors with 86% average agreement in ratings between coders. After the observation, coders met to consensus code and their agreement with consensus codes was 91%. Each observer also maintain reliability with master-coded inCLASS videos at 80% or higher to continue collecting data.

The inCLASS includes four domains of children's engagement and interaction, which are comprised of 10 dimensions, described below. Each dimension is rated during each 15-minute cycle (10 min observation, 5 min to score) on a scale of 1–7. Ratings of 1 or 2 indicate "low", 3–5 indicate "mid range", and 6–7 indicate "high". With the exception of conflict with teachers and conflict with peers, higher scores reflect more positive engagement. Scores for each of the four domains were created by computing the average across cycles for each dimension and then the average of the dimensions within each domain.

Positive engagement with teachers. Positive engagement with teachers includes (a) positive engagement with teacher (i.e., attunement to the teacher, proximity seeking, and shared positive affect), and (b) teacher communication (i.e., initiates conversation with the teacher, sustains conversation, and uses speech for varied purposes), $\alpha = 0.83$ in the current study.

Positive engagement with peers. Positive engagement with peers includes (a) peer sociability (i.e., proximity seeking, shared positive affect, popularity, perspective taking, and cooperation), (b) peer assertiveness (i.e., positive initiations with peers, leadership, and self-advocacy), and (c) peer communication (i.e., initiates conversations with peers, sustains conversations, and uses speech for varied purposes), $\alpha = 0.91$ in the current study.

Positive engagement with tasks. Task orientation includes (a) engagement with tasks (i.e., sustained attention and active engagement), and (b) self-reliance (i.e., personal initiative, independence, persistence, and self-directed leadership), $\alpha = 0.83$ in the current study.

Negative engagement. Negative classroom engagement is made up of (a) conflict with teacher (i.e., aggression, noncompliance, negative affect, attention-seeking directed toward the teacher), (b) conflict with peers (i.e., aggression, noncompliance, negative affect, attention-seeking directed toward peers), and (c) behavior control (i.e., patience, activity level, physical awareness), $\alpha = 0.91$ in the current study.

2.5.2. Self-Regulation

Research assistants assessed children's behavioral self-regulation with the HTKS-R, which is a more complex version of the HTKS for children ages 3–8 years (McClelland et al., 2014). The HTKS-R includes a total possible of 59 items (37 testing and 22 practice). Items were scored 0 for an incorrect response, 1 for a self-corrected response, and 2 for a correct response; item scores were summed for analysis. The HTKS-R and HTKS have shown strong reliability and validity in previous research (e.g., McClelland et al., 2014; Wanless et al., 2011).

2.5.3. Emergent literacy and math skills

Research assistants assessed children's emergent literacy with the Letter-Word Identification subtest of the Woodcock Johnson Tests of Achievement and their early math skills (ability to analyze and solve practical math problems) with the Applied Problems subtest of the Woodcock Johnson Tests of Achievement (Woodcock et al., 2001). Scores were calculated as the total number of correct items.

2.6. Covariates

The very small sample of classrooms led us to include only one covariate for analysis of teacher-child interactions due to limited statistical power. Teacher education level was included because it was associated with both the Emotional Support domain and dimensions within it (Table 1). Post-hoc analysis revealed nearly identical results when substituting type of care dummy variables as covariates; type of care did not predict CLASS scores or child-level outcomes, and was therefore not included as a covariates.

Children's age in years and family SES were included in all analyses of child-level outcomes because of their consistent associations in prior literature (e.g., for self-regulation, literacy, and math), and in the current study (Tables 2 and 3). SES is comprised of family income and parents' education level ($r = .64$, $p < .01$), standardized and aggregated. Analysis of children's engagement (inCLASS) also accounted for the average number of children present across cycles ($M = 13.23$, $SD = 4.14$) because it varied substantially, was correlated

Table 1
Correlations among key study variables (N = 17 classrooms/groups).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Emotional Support@B	1															
2. Positive Climate@B	**.90****	1														
3. Teacher Sensitivity@B	**.91****	**.81****	1													
4. Regard Stud. Pers.@B	**.82****	**.60****	**.59***	1												
5. Neg. Climate (rev)@B	**.71****	**.62****	**.72****	.34	1											
6. Emotional Support@P	**.51***	.40	.33	.66	.14	1										
7. Positive Climate @P	**.43+**	.37	.40	.38	.25	**.81***	1									
8. Teacher Sensitivity@P	**.53***	**.59***	**.42+**	**.43+**	.30	**.81***	.75*	1								
9. Regard Stud. Pers.@P	.20	.06	−.05	**.59***	−.26	**.62****	.11	.20	1							
10. Neg. Climate (rev)@P	.26	−.07	.14	**.47+**	.30	**.49***	.37	.15	.29	1						
11. Teacher Ed Level	−.22	−.27	−.11	−.35	.23	**−.60***	−.33	**−.45***	**−.63****	−.08	1					
12. Home-based care	.01	−.14	−.20	.23	.14	.16	−.11	−.16	**.44+**	.45+	−.15	1				
13. Head Start	−.15	−.15	.07	−.39	.17	−.22	.18	.15	**−.70****	−.15	**.53***	−.34	1			
14. Intervention (vs wait)	−.01	−.10	−.08	.23	−.22	**.42+**	.23	.36	.26	**.43+**	−.16	−.13	.04	1		
15. Course (vs not)	.11	.10	−.02	.26	−.13	**.51***	**.41+**	**.64****	.19	.07	−.38	−.26	.17	**.59***	1	
16. Coaching (vs not)	−.12	−.22	−.08	−.01	−.13	−.02	−.14	−.22	.12	**.43+**	.19	.11	−.12	**.59***	−.31	1

Note. B indicates Baseline; P indicates Post-Intervention.
+ $p < .10$, * $p < .05$, ** $p < .01$.

Table 2
Correlations of child self-regulation, early academic skills, and covariates (N = 58).

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Child age (in years)	1										
2. Family SES	−.08	1									
3. Self-Regulation@B	**.58****	**.34****	**1**								
4. Self-Regulation @P	**.68****	**.25+**	**.73****	**1**							
5. Literacy@B	**.41***	**.42****	**.52****	**.55****	**1**						
6. Literacy@P	**.42****	**.37****	**.58****	**.60****	**.87****	1					
7. Math@B	**.50****	**.23+**	**.71****	**.67****	**.63****	**.59****	1				
8. Math@P	**.60****	.13	**.72****	**.65****	**.61****	**.63****	**.80****	1			
9. Intervention (vs wait)	−.06	.05	**−.21+**	.05	.12	.18	−.15	.12	1		
10. Course (vs not)	−.05	−.14	**−.27***	−.07	−.01	.12	−.13	.17	**.72****	1	
11. Coaching (vs not)	−.01	**.26****	.07	.09	.17	.09	−.04	−.04	**.45****	**−.29****	1

Note. B indicates Baseline; P indicates Post-Intervention.
+ $p < .10$, * $p < .05$, ** $p < .01$.

Table 3
Correlations of child engagement, intervention status, and covariates (N = 53).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Child age (in years)	1													
2. Family SES	−.08	1												
3. N. children present	.13	**−.26+**	1											
4. Pos. Engage Teach@B	−.07	−.03	**−.33***	1										
5. Pos. Engage Teach@P	.05	−.13	**−.26+**	.19	1									
6. Pos. Engage Peer@B	**.29***	.20	−.23	.12	**.31***	1								
7. Pos. Engage Peer@P	**.40****	.11	−.14	.18	−.04	**.48****	1							
8. Pos. Engage Task@B	.20	.19	**−.33***	**.26***	**.40****	**.62****	**.34***	1						
9. Pos. Engage Task@P	.04	−.10	**−.28***	−.14	−.09	.12	**.44****	**.34***	1					
10. Neg. Engage@B	−.20	−.11	−.20	.07	.17	−.09	**−.37***	**−.27***	−.23	1				
11. Neg. Engage@P	.08	**−.27+**	**.25+**	.15	.32*	.10	−.03	.07	−.19	**.43****	1			
12. Intervention (vs wait)	−.06	.05	.05	−.08	−.03	−.14	−.06	−.16	−.02	.08	−.19	1		
13. Course (vs not)	−.05	−.14	.16	−.11	−.10	−.15	−.01	−.14	.05	−.07	−.09	**.72****	**1**	
14. Coaching (vs not)	−.01	**.26***	−.12	.04	.07	.01	−.07	−.03	−.07	.19	−.15	**.45****	**−.29****	**1**

Note. B indicates Baseline; P indicates Post-Intervention.
+ $p < .10$, * $p < .05$, ** $p < .01$.

with multiple domains of the inCLASS (Table 3), and is included in prior research (Sabol et al., 2018). Children's ACEs and type of care were tested for possible inclusion as an additional covariate but were was not associated with children's outcomes while accounting for other variables and was therefore excluded from analysis due to limited power and small sample size.

2.7. Attrition and missing data

Other than the two classrooms where no observations were conducted (described in the Participants section), few data were missing at baseline: teacher-child interaction (0%), self-regulation (8%), early literacy (4%), math (5%), and engagement (5%; including the two classrooms without observations, percent missing for engagement was 13%). Data were typically missing due to child absences, or child declined to complete the task. At post, no teacher-child interaction data were missing for the 17 classrooms in the complete cases intent-to-treat analysis; percentages of missing data at post among the 61 children in the complete cases intent-to-treat analysis were: self-regulation (8%), early literacy (5%), math (5%), and engagement (3%; including the two classrooms without observations, percent missing for engagement was 13%).

Higher family SES was related to less missing data on self-regulation ($r = -0.21$, $p = .07$), early literacy ($r = -0.31$, $p < .01$), math ($r = -0.27$, $p = .02$), and engagement ($r = -0.32$, $p < .01$). Inclusion of family SES in child-level analyses reduced potential bias due to differential attrition. Intervention versus waitlist status was not related to missingness.

2.8. Analysis

Tests of hypotheses utilized full information maximum likelihood (FIML) estimation in Mplus 7th Edition (Muthén & Muthén, 1998–2015) to account for missing data. FIML uses all available information to provide a more efficient estimate, thus addressing missing data where appropriate (Acock, 2005). Models were estimated using robust standard errors to account for nesting within classrooms/programs. Intraclass correlation coefficients for child outcome variables were small (<.01 to .02). Consistent with the complete case intent to treat analysis plan (Groenwold et al., 2014), classrooms and children were omitted from analyses when data at post were missing. Family SES was related to missingness and was included in all models.

The primary analysis of effects of the *Roots of Resilience* intervention (versus waitlist control) were examined by regressing the outcome at "post" on the outcome at "baseline", intervention status, and covariates (Model 1). Participants (both teachers and children) showed equivalence at baseline on all outcome variables (see Appendix A1). Follow-up exploratory analyses were conducted in which the specific interventions (course versus coaching) were examined simultaneously (Model 2). Due to small numbers of classrooms, and children, in each intervention, results from Model 2 should be interpreted with caution. Each outcome was examined in a separate analysis. Moreover, following previous practice (La Paro et al., 2014), when a significant impact on CLASS and inCLASS domains were detected, individual dimensions within domains were examined as outcomes as well.

Effect sizes were calculated for the effect of the *Roots of Resilience* intervention. The estimated mean difference between the intervention and waitlist control groups (Model 1), accounting for covariates, was divided by the overall standard deviation of the outcome variable at baseline (Feingold, 2009). For classroom-level analyses, Hedges g was also calculated to adjust effect sizes for the small sample size (N = 17).

3. Results

Bivariate correlations among classroom-level variables are presented in Table 1. Teachers' education level was significantly correlated with lower scores on Emotional Support, as well as two dimensions within it (regard for student perspectives and teacher sensitivity) at post, affirming the importance of education as a covariate in hypothesis testing. Membership in the course was associated with higher scores on the Emotional Support domain and the positive climate and teacher sensitivity dimensions at post. Membership in the coaching group was correlated with the negative climate dimension (reverse scored) at post.

Tables 2 and 3 present the bivariate correlations among child-level variables. Children's age and family SES were consistently linked with their self-regulation, literacy, and math scores, affirming their importance as covariates in hypothesis testing. Age and family SES were less consistently linked with children's engagement scores. Bivariate relationships among intervention status and children's outcomes were not detected.

Results from predictive models indicate that participation in *Roots of Resilience* had a positive impact on the Emotional Support domain of the CLASS relative to the waitlist control group (Table 4: Model 1). To explore the specific interactions within Emotional Support that may be behind this association, follow-up analysis indicate that two dimensions of Emotional Support: teacher sensitivity ($\alpha = .73$) and negative climate (reversed; [$\alpha = .67$]) drive that association. The size of these effects were moderate. Cohen's d estimates were: Emotional Support (.60), teacher sensitivity (.78) and negative climate (.46). Adjusting for the small sample size, Hedges g estimates of effect size were: Emotional Support (.54), teacher sensitivity (.62) and negative climate (.41). Exploratory analyses (Table 4: Model 2) suggest that participation in the course predicted increases in teacher sensitivity while participation in the coaching predicted improvements in negative climate (reversed).

Teachers' participation in *Roots of Resilience* was also associated with (less) observed negative engagement among children (Table 5) and higher math scores (Table 6). The size of the effects (cohen's d) were modest (math: .35 and negative engagement .23). Results from exploratory analysis suggest that teachers' participation in the online course predicted increases in math (Table 6) while participation in coaching predicted less negative engagement (Table 5). Additionally, exploratory analysis of the dimensions within the negative engagement domain (conflict with peers ($\alpha = .76$), conflict with teacher ($\alpha = .81$), and behavioral control, reversed ($\alpha = .90$)) were conducted to unpack the association between *Roots of Resilience* participation and (less) negative engagement. Results suggest that the effect of the intervention may be driven by improvements in conflict with peers ($\beta = -.08$, $p = .02$; cohen's d = .19) and behavioral control, reverse scored ($\beta = -.30$, $p = .07$; cohen's d = .29). When exploring specific effects of the course and coaching, coaching was associated with improvements in both peer conflict ($\beta = -.12$, $p = .02$; cohen's d = .28) and behavior control (reversed; $\beta = -29$, $p = .07$; cohen's d = .28), while participation in the course was marginally predictive of reductions in children's conflict with teachers ($\beta = -.06$, $p = .05$; cohen's d = .13). Full results from the exploratory analysis of dimensions within negative engagement are available in Appendix A2.

4. Discussion

This is the first study to examine impacts of the *Roots of Resilience* professional development program for early childhood teachers. Given previous evidence that teachers in both home- and center-based ECE report increased knowledge and application of trauma-responsive practices after participating in *Roots of Resilience* (Lipscomb, Hatfield et al., 2019), examination of impacts on systematic observations and assessments of teachers and children is needed. Findings from this small RCT revealed that participation in *Roots of Resilience* was associated with moderately-sized increases in emotionally supportive teacher-child interactions and modestly-sized reductions in children's negative engagement and increases in math scores. No effects on early literacy or self-regulation were detected.

4.1. Emotionally supportive teacher-child interactions

Children in emotionally supportive classrooms, as measured by the CLASS PreK (Pianta, La Paro et al., 2008) are more likely to show protective factors that can help mitigate effects of trauma. For instance, children in classrooms with more consistently warm, responsive interactions are more likely to demonstrate a predictable decline of cortisol while at preschool (Hatfield et al., 2013) and higher literacy and social skills (Curby et al., 2013). The *Roots of Resilience* professional development program aimed to nurture these protective interactions. For instance, the course discusses attachment theory and guides teachers to practice noticing children's cues and interpreting them with a trauma lens to enhance

Table 4
Regression of CLASS scores post-intervention on baseline scores, intervention status, and teacher education (N = 17).

	Domain				Dimensions															
	Emotional support				Positive climate				Teacher sensitivity				Regard for student perspectives				Negative climate (reverse scored)			
	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p
Model 1: Waitlist versus either Intervention																				
Intercept	5.15	.08			4.93	.21			4.79	.15			4.27	.16			6.59	.06		
Score at Baseline	**0.37**	**.12**	**.47**	**<.01**	0.36	.25	.34	.12	**0.51**	**.19**	**.49**	**.01**	0.42	.14	.48	**<.01**	**0.28**	**.13**	**.45**	**.02**
Teacher Education	**−0.11**	**.04**	**−.43**	**<.01**	−0.09	.10	−.19	.40	−0.13	.07	−.32	.07	−0.21	.08	**−.44**	**.01**	−0.01	.03	−.10	.63
Intervention	**0.32**	**.12**	**.40**	**.01**	0.33	.31	.24	.28	**0.50**	**.22**	**.42**	**.02**	0.23	.22	.16	.30	0.23	.09	**.54**	**<.01**
R squared			**.68**	**<.01**			.24	.20			**.51**	**<.01**			**.64**	**<.01**			**.39**	**.04**
Model 2: Waitlist versus Course and Coaching																				
Intercept	5.14	.08			4.92	.21			4.78	.12			4.28	.15			6.59	.06		
Score at Baseline	**0.37**	**.11**	**.46**	**<.01**	0.33	.24	.32	.15	**0.52**	**.15**	**.50**	**<.01**	**0.43**	**.13**	**.49**	**<.01**	**0.29**	**.12**	**.47**	**.01**
Teacher Education	**−0.10**	**.04**	**−.39**	**.01**	−0.05	.10	−.12	.61	−0.06	.06	−.16	.29	**−0.24**	**.08**	**−.51**	**<.01**	−0.03	−.03	−.21	.30
Interv: Course	**0.40**	**.14**	**.43**	**.01**	0.56	.38	.36	.12	**0.91**	**.22**	**.66**	**<.01**	−0.01	.27	−.01	.96	0.14	.10	.27	.19
Interv: Coach	**0.25**	**.14**	**.27**	**.08**	0.11	.36	.07	.76	0.15	.21	.11	.48	**0.43**	**.25**	**.26**	**.09**	**0.32**	**.10**	**.64**	**<.01**
R squared			**.68**	**<.01**			.29	.13			**.69**	**<.01**			**.68**	**<.01**			**.46**	**<.01**

Table 5
Regression of child engagement on intervention status (N = 53).

	Positive engagement with teacher				Positive engagement with peers				Positive engagement with tasks				Negative engagement			
	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p
Model 1: Waitlist versus either Intervention																
Intercept	2.03	0.12			2.58	0.14			4.18	.11			1.41	.05		
Score at Baseline	0.05	0.11	0.05	.66	**0.38**	**0.14**	**0.42**	**.01**	**.20**	**.11**	**.29**	**.06**	**0.26**	**.11**	**0.50**	**.03**
Child age (years)	0.10	0.16	0.09	.55	0.35	0.21	0.26	.10	.03	.13	.03	.85	0.05	.04	0.10	.28
Family SES	−0.17	0.11	−0.20	.38	0.11	0.15	0.11	.46	.07	.08	.10	.39	−0.02	.04	−0.06	.61
# of children	−0.03	0.02	−0.14	.23	0.01	0.04	0.02	.90	−.01	.02	−.01	.96	**0.02**	**.01**	**0.28**	**.03**
Intervention	0.05	0.23	0.04	.82	−0.08	0.20	−0.05	.70	.03	.12	.03	.83	**−0.13**	**.06**	**−0.24**	**.04**
R squared			**0.06**	**<.01**			**0.31**	**<.01**		0.10	.32		**0.34**	**.04**		
Model 1: Waitlist versus Course and Coaching																
Intercept	2.03	0.12			2.58	0.14			4.18	.10			1.41	0.05		
Score at Baseline	0.02	0.12	0.02	.61	**0.38**	**0.14**	**0.42**	**.01**	**.22**	**.10**	**0.31**	**.05**	**0.26**	**0.10**	**0.38**	**.01**
Child age (years)	0.11	0.13	0.11	.26	0.35	0.22	0.27	.11	.01	.13	−.01	.97	0.05	0.05	0.12	.30
Family SES	−0.19	0.11	−0.23	.43	0.11	0.16	0.11	.48	.09	.08	−.08	.63	−0.02	0.04	0.28	.62
# of children	−0.02	0.03	−0.12	.64	0.01	0.04	0.03	.88	−.01	.02	−.06	.26	**0.02**	**0.01**	**0.26**	**.02**
Interv: Course	−0.09	0.31	−0.06	.85	−0.10	0.18	−0.05	.61	.13	.11	.10	.26	**−0.13**	**0.08**	**−0.17**	**.08**
Interv: Coach	0.25	0.18	0.15	.31	−0.06	0.36	−0.03	.88	−.12	.13	−.08	.35	**−0.13**	**0.06**	**−0.17**	**.04**
R squared			**0.09**	**<.01**			**0.32**	**<.01**		0.12	.23		**0.39**	**.04**		

Table 6
Regression of self-regulation and early academic skills on intervention status (N = 58).

	Self-regulation				Emergent literacy				Early math			
	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p
Model 1: Waitlist versus either Intervention												
Intercept	52.56	3.87			8.52	0.80			13.24	0.61		
Score at Baseline	**0.37**	**0.13**	**0.31**	**<.01**	**1.10**	**0.25**	**0.83**	**<.01**	**0.73**	**0.08**	**0.71**	**<.01**
Child age (years)	**32.34**	**5.82**	**0.51**	**<.01**	0.71	0.88	0.06	0.42	**2.01**	**0.69**	**0.23**	**<.01**
Family SES	**10.09**	**3.99**	**0.21**	**.01**	0.27	0.72	0.03	0.71	0.13	0.43	0.02	.77
Intervention	3.25	5.56	0.05	.56	0.42	1.04	0.03	1.70	**1.70**	**0.82**	**0.16**	**.04**
R squared			**0.68**	**<.01**			**0.77**	**<.01**			**0.73**	**<.01**
Model 2: Waitlist versus Course and Coaching												
Intercept	52.49	3.88			8.48	0.79			13.25	0.62		
Score at Baseline	**0.37**	**0.13**	**0.30**	**.01**	1.13	0.25	**0.85**	**<.01**	**0.73**	**0.08**	**0.70**	**<.01**
Child age (years)	**33.56**	**5.96**	**0.51**	**<.01**	0.73	0.90	0.06	.42	**2.01**	**0.69**	**0.23**	**<.01**
Family SES	**9.67**	**4.43**	**0.20**	**.03**	0.03	0.84	0.01	.98	0.17	0.46	0.03	.70
Interv: Course	2.48	6.48	0.03	.70	−0.13	1.15	−0.01	.91	**1.80**	**0.87**	**0.16**	**.04**
Interv: Coach	5.81	8.49	0.06	.49	1.40	1.81	0.08	.44	1.48	0.98	0.11	.13
R squared			**0.68**	**<.01**			**0.77**	**<.01**			**0.73**	**<.01**

responsiveness to children's needs. Both the course and coaching support teachers in serve and return interactions. Results indicate that teachers who participated in *Roots of Resilience* showed more emotionally supportive interactions after participation than those in the waitlist group, controlling for baseline levels and teacher education.

Other teacher-focused interventions show similar, and often smaller, effect sizes than these initial effects of *Roots of Resilience* (d = .60 for Emotional Support). For instance, a course focused on effective-teacher child interactions in center-based ECE demonstrated an effect size of .41 for Emotional Support (Hamre et al., 2012). A recent meta-analysis of coaching on overall classroom

instruction across education levels reveals a pooled effect size of .49 on instruction (Kraft et al., 2018). Other studies have not detected positive impacts of teacher-focused interventions on Emotional Support (Williford et al., 2017). The follow-up, exploratory analyses on Emotional Support in this *Roots of Resilience* study suggest that these effects may be driven by improvements in the dimensions of teacher sensitivity and negative climate. The moderate effect size on Emotional Support suggests that *Roots of Resilience* demonstrates promise to strengthen emotionally supportive teacher-child interactions in ECE, even considering the small sample.

4.2. Children's engagement and skill development

Findings also partially supported expectations that teachers' participation in *Roots of Resilience* would lead to more positive and less negative engagement among children in their care. Children showed significantly less negative engagement (but not more positive engagement) at post, controlling for baseline scores and covariates. This is the first study of which we are aware that documents impacts of a teacher-focused intervention on observed child engagement in ECE. Interventions such as LOOK (Downer et al., 2018) and Banking Time (Williford et al., 2017) have documented impacts on teachers' reports of children's behavior but not on observed engagement. This current finding of reduced negative engagement among children whose teachers participated in *Roots of Resilience* is particularly promising in light of recent evidence that negative engagement may be the domain of engagement most consistently linked with ACEs (Lipscomb et al., 2021). The present study included children with varying ACEs; most experienced early adversity (63% had at least one ACE and 48% had two or more).

Post-hoc, exploratory analysis indicated that the impacts on negative engagement were driven by a combination of reductions in conflict with peers and increases in behavioral control. This may indicate an impact on underlying inhibitory control processes. Previous studies have documented associations between children's observed negative engagement and difficulties on direct assessments of inhibitory control during preschool, controlling for classroom quality (Sabol et al., 2018; Williford, Whittaker et al., 2013). Moreover, emotionally supportive teacher-child interactions have been linked with improvements in children's inhibitory control during preschool, although Emotional Support may have to reach a high threshold prior to impacting outcomes (Hatfield & Williford, 2017). Future research on the *Roots of Resilience* program should examine children's inhibitory control as both a potential outcome and as a potential mechanism linking program effects with additional outcomes, such as early math skills.

Although *Roots of Resilience* is not a child-level self-regulation intervention, both the course and coaching contain a focus on supporting children's self-regulatory development. This, combined with prior evidence that children's engagement supports gains in self-regulatory skills (Sabol et al., 2018), led to a hypothesis that *Roots of Resilience* would have positive impacts on children's self-regulation skills. However, the current study did not detect significant impacts of teachers' participation in *Roots of Resilience* on a direct assessment of children's self-regulation using the Head Toes Knees Shoulder-Revised (HTKS-R) measure. Although children whose teachers participated in *Roots of Resilience* increased three points more on the HTKS-R, on average, than children whose teachers were on the waitlist, the standard error of this effect was large. This suggests the possibility to examine in future research that a subgroup of children may experience an improvement in self-regulation while others do not. Studies of self-regulation interventions often show either greater gains in self-regulation among children with low baseline levels of self-regulation, or that gains are only significant for those with low baseline levels (McClelland et al., 2019; Tominey & McClelland, 2011). The small sample size of the current study prohibited examination of these types of subgroup effects. Future studies with larger samples should also examine mechanisms of influence; the literature linking children's engagement with development of various types of self-regulatory skills is still emerging and yields mixed evidence (e.g., Sabol et al., 2018; Williford, Maier et al., 2013; Williford, Whittaker et al., 2013).

The current study findings of a positive impact of teachers' participation in *Roots of Resilience* on children's early math skills is consistent with expectations, and contributes to a growing body of evidence linking interventions that include a focus on self-regulation to gains in children's early math skills (Blair and Raver, 2015; Schmitt et al., 2017), even in the absence of direct effects on self-regulation (McClelland et al., 2019). Such findings are consistent with evidence of links between growth in self-regulatory processes and development of early math skills (e.g., McClelland & Cameron, 2019; Schmitt et al., 2017). Moreover, there is some evidence to suggest that children's engagement supports learning of math skills (Robinson & Mueller, 2014) and that engagement may mediate links between adult-child interaction and math outcomes (McCormick et al., 2016), as laid out in the theory of change (Fig. 1). However, this literature base is small, and the current study's finding that only one of the three school readiness skills (math) increased in association with teachers' participation in *Roots of Resilience* calls for caution and much more research in this area.

Roots of Resilience was not associated with gains in children's early literacy skills. Prior research (Sabol et al., 2018), and our theory of change, suggests that children's engagement in their ECE settings is important for acquiring early academic skills. Thus, the reductions in negative engagement shown by children in the current study should contribute to learning; Sabol et al. (2018) found that negative engagement predicted less language, literacy, and self-regulatory skills in preschool, accounting for the overall quality of teacher-child interactions. Due to the small sample size, the current study was unable to examine a path model in which engagement mediated the impact of *Roots of Resilience* on children's early academic skills, and did not find evidence of a main effect of teachers' participation in the program on children's early literacy. Future research should examine indirect or mediated pathways, as well as a broader array of language and literacy outcomes than the current study's focus on letter and word recognition.

This difference in findings between early math and literacy outcomes may also stem from differences in the neurodevelopmental pathways through which they develop. Literacy acquisition involves long-term memory recall and decoding (Blair & Raver, 2015; Lonigan et al. 2017). Given that trauma impacts hippocampal volume (Thomason & Marusak, 2017), children with ACEs may be delayed in early literacy skills due to underlying difficulties in memory. However, little is presently known about links between ACEs or trauma and early literacy development specifically. A systematic review (Liming & Grube, 2018) found only one study (Jimenez et al., 2016) examining early academic outcomes, including literacy skills, for young children impacted by ACEs. Additionally, aspects of teacher-child interaction quality (e.g., Instructional Support) beyond those emphasized in *Roots of Resilience* may be more consistently predictive of gains in children's early literacy (e.g., Soliday Hong et al., 2019). Further research of early experiences and skill development, with more robust measurement of cognitive processes, is needed to strengthen understanding of how teacher-focused interventions may affect outcomes among children impacted by trauma.

4.3. Supporting adult caregivers as a pathway to children's resilience

Contextualized within a resilience framework (e.g., Masten, 2018), these relational processes and individual skills impacted by

participation in *Roots of Resilience* (emotionally supportive interactions, negative engagement, early math skills) represent important protective factors that help mitigate effects of adversity on development. Findings have relevance beyond the *Roots of Resilience* program in that they offer initial evidence that these protective factors can be intentionally strengthened within ECE through professional supports for ECE teachers.

Although exploratory, the pattern of findings of specific effects of coaching on less overall negative climate (dimension within the Emotional Support domain of the CLASS) as well as less negative engagement among children is particularly interesting, especially as it is detected at both the classroom/group-level and the individual child-level. *Roots of Resilience* coaching, and the FIND framework upon which it is built, is completely strength-based. Findings suggest that showing teachers clips of the moments in which they are maintaining their own self-regulation and responding sensitively to children's self-regulation serves (less- or more-regulated) may reduce the occurrence of negative interactions. Multiple mechanisms for this pattern of effects are plausible. Social cognitive learning theory (e.g., Bandura, 2005) and differential reinforcement (Cooper et al., 2007) would suggest that by reinforcing the positive (self-regulated, responsive interactions) and strengthening self-efficacy, negative interactions naturally become less frequent. Additionally, it could be that the specific focus of the coaching on self-regulation indeed builds self-regulation in both teachers and children, which is responsible for the reductions in negative interactions. Moreover, it is also possible that strength-based coaching supports teachers' confidence and feelings of support (as reported in previous work, Lipscomb, Hatfield et al., 2019) in a way that contributes to a shift in the classroom/group climate to be less negative overall. Examining these types of potential mechanisms is an important direction for future research on strengths-based microsocial coaching programs including *Roots of Resilience* and FIND.

Further research is also needed to better understand the finding of an (exploratory) sizeable effect of the online course on increased teacher sensitivity (dimension within the Emotional Support domain of the CLASS), as well as modest decreases in children's conflict with teacher (dimension within negative engagement of the inCLASS) and increases in math scores. The course includes case studies, applied practices, and discussion questions that prompt teachers to reflect on situations affecting individual children in their care, and to make plans for identifying and responding to children's needs. More in-depth research, such as through a mixed-methods design, is needed to identify the active ingredients within the course, and the processes transpiring within teachers, that may lead to outcomes initially detected in the current study.

4.4. Strengths, limitations and future directions

Key strengths of the current study are the use of a RCT design and the inclusion of home-based, as well as center-based and Head Start programs. Robust observational measurement of teacher-child interactions and individual children's engagement, coupled with direct assessments of children's skills is another noteworthy strength. A central limitation is the small sample with limited racial/ethnic and linguistic diversity. Findings should therefore be interpreted with caution, particularly those we refer to as exploratory (specific effects of the course and coaching components as well as specific dimensions within domains of the CLASS and inCLASS). Limited statistical power due to the small sample may also have hindered detection of statistically significant effects in some instances (e.g., of *Roots of Resilience* on self-regulation; of the coaching on Emotional Support).

Findings provide an important foundation for future research with larger and more diverse samples to examine generalizability (e.g., across racial/ethnic groups and type of ECE program), explore subgroup effects, and identify more specific mechanisms of influence including which aspects of the *Roots of Resilience* course and/or coaching are most impactful for which outcomes. In addition to examining whether certain children (e.g., those with more ACEs, lower self-regulation or particular racial/ethnic or gender groups) experience more benefit from teachers' participation in Roots of Resilience it may also be important to examine whether baseline levels of teacher-child interaction quality moderate effects of the program on outcomes (e.g., Williford et al., 2017). Additionally, a longer prospective study should be conducted to examine the extent to which teachers maintain improvements in emotionally supportive interactions (e.g., with a different group of children the following year) and how children's outcomes play out during the transition to kindergarten.

Future research is also needed to develop measures of trauma-responsive care. Although the Emotional Support domain of the CLASS is aligned with the *Roots of Resilience* aim to increase interactions that support children's sense of security, connection, and closeness with their teachers, it was not designed as a measure of trauma-responsive practice. It does not capture, for example, how well a teacher identifies specific needs of individual children, particularly those impacted by adversity or trauma, or how responsive teachers' are to the children experiencing more stress, or internalizing or externalizing behavior problems. The current study's measurement of individual children's engagement helps to fill some of this gap, but the inCLASS is more focused on the child than on the teacher. Future research should also strive to measure additional aspects of children's experiences within ECE, such as emotional security, belongingness, and liking school, as well as family-teacher relationships, partnerships with specialists, and teacher outcomes such as wellness, self-regulation, and self-efficacy.

To further identify the essential components of *Roots of Resilience,* future studies may examine a potential added benefit of teachers' completing both the course and coaching components. Further, given that in-person workshops remain a common PD delivery method, it will be important to examine whether programs like *Roots of Resilience* may incorporate workshops, such as a model that includes a workshop followed by coaching. Future research should also examine dosage (Pianta et al., 2014) including whether larger impacts are observed when multiple teachers in the same classroom or program participate. It is unclear how long and how often PD programs should support teachers, although there is some evidence that more cycles of coaching support more change, and that two years of participation (rather than one) results in larger benefits for children (Hamre et al., 2017).

5. Conclusions

Early care and education (ECE) is an important developmental context for strengthening resilience with young children experiencing adversity. High quality ECE programs can help children build skills and relationships that serve as protective factors. Yet, teachers need additional, focused supports to help them in their efforts to nurture children's resilience during the early years that set the foundation for subsequent development, learning, and well-being. This small RCT suggests that the *Roots of Resilience* program holds promise to help fill this gap. It is notable that *Roots of Resilience* is designed to complement and extend models of best practices teachers are already using (e.g., Pyramid model) by overlaying a trauma-lens. Findings indicate that the program may be working at least partially as-intended, resulting in improvements in both teacher-child interactions and in children's engagement and skill development. Further research with a larger and more diverse

sample is needed to more definitively examine program impacts, identify mechanisms of influence, and address questions about which teachers and/or children may benefit most. This study also sets the stage for further research of other interventions that aim to nurture resilience within ECE programs through professional supports for early childhood teachers.

Declaration of interest

Dr. Lipscomb is the lead developer of the Roots of Resilience program.

CRediT authorship contribution statement

Shannon T. Lipscomb: Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Supervision, Writing - original draft, Writing - review & editing. **Bridget Hatfield:** Conceptualization, Funding acquisition, Methodology, Writing - original draft, Writing - review & editing. **Emiko Goka-Dubose:** Investigation, Writing - review & editing. **Hillary Lewis:** Formal analysis, Writing - review & editing. **Phillip A. Fisher:** Conceptualization, Writing - review & editing.

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Appendix A1. Descriptive Statistics and Significance Tests for Equivalence in Outcome Variables at Baseline

Note. B indicates Baseline; P indicates Post-Intervention.

+Difference between intervention and waitlist is marginally significant, F (1, 65) = 2.91, p = .09. No other differences are either statistically or marginally significant.

Variable	All M (SD)	Intervention M (SD)	Waitlist M (SD)	Missing post M (SD)	Not missing post M (SD)
Classroom-level					
Emotional	5.35 (0.58)	5.34 (0.63)	5.37 (0.57)	5.45 (0.98)	5.34 (0.53)
Support@B	n = 20	n = 9	n = 11	n = 3	n = 17
Child-level					
Pos. Engage	2.48 (0.73)	2.43 (0.63)	2.54 (0.84)	2.79 (0.77)	2.43 (0.72)
Teach@B	n = 62	n = 33	n = 29	n = 9	n = 53
Pos. Engage	2.66 (0.87)	2.54 (0.79)	2.79 (0.94)	2.62 (0.79)	2.66 (0.89)
Peer@B	n = 62	n= 33	n = 29	n = 9	n = 53
Pos. Engage	3.98 (0.85)	3.85 (0.89)	4.13 (0.78)	4.03 (0.88)	3.97 (0.85)
Task@B	n = 62	n = 33	n = 29	n = 9	n = 53
Neg. Engage@B	1.56 (0.57)	1.60 (0.55)	1.51 (0.61)	1.79 (0.77)	1.52 (0.53)
	n = 62	n = 33	n = 29	n = 9	n = 53
Self-Regulation@B	34.48 (27.56)	**28.42 (25.94)+**	**39.86 (28.20)**	21.90 (17.62)	36.73 (28.51)
	n = 66	**n = 31**	**n = 35**	n = 10	n = 56
Literacy@B	6.28 (4.92)	6.85 (5.81)	5.71 (3.89)	5.64 (5.04)	6.40 (4.93)
	n = 69	n = 34	n = 35	n = 11	n = 58
Math@B	11.16 (4.89)	10.42 (5.20)	11.86 (4.54)	10.10 (4.88)	11.34 (4.90)
	n = 68	n = 33	n = 35	n = 10	n = 58

Appendix A2. Regression of Dimensions within Negative Child Engagement on Intervention Status

	Conflict with teacher				Conflict with peer				Behavior control (reversed)			
	B^1	SE	B	p	B^1	SE	B	p	B^1	SE	B	p
Model 1: Waitlist versus either Intervention												
Intercept	1.07	.02			1.22	.03			1.93	.06		
Score at Baseline	0.01	.05	.04	.84	−0.05	.01	−.08	.55	**0.36**	**.10**	**.56**	**<.01**
Child age (years)	−0.01	.02	−.01	.95	0.03	.04	.09	.41	0.09	.10	.08	.38
Family SES	−0.02	.02	−.13	.29	0.03	.03	.09	.34	−0.09	.11	−.10	.41
# of children	0.01	.01	.20	.17	0.01	.01	.18	.15	0.04	.03	.19	.16
Intervention	−0.03	.03	−.14	.31	**−0.08**	**.04**	**−.18**	**.02**	**−0.30**	**.17**	**−.23**	**.07**
R squared			.10	.23			**.09**	**.04**			**.40**	**.01**
Model 2: Waitlist versus Course and Coaching												
Intercept	1.07	.02			1.23	.03						
Score at Baseline	.01	.05	.04	.82	−0.05	.09	−.07	.60	0.36	.10	.56	<.01
Child age (years)	.01	.02	.02	.87	0.03	.04	.07	.49	0.09	.10	.08	.39
Family SES	−.02	.02	−.17	.23	0.03	.03	.11	.28	−0.09	.11	−.11	.41
# of children	**.01**	**<.01**	**.24**	**.04**	0.01	.01	.16	.21	0.04	.03	.19	.16
Interv: Course	**−.06**	**.03**	**−.22**	**.05**	−0.05	.04	−.10	.22	−0.31	.20	−.21	.13
Interv: Coach	.01	.05	.03	.86	**−0.12**	**.04**	**−.22**	**.02**	**−0.29**	**.16**	**−.18**	**.07**
R squared			**.13**	**.08**			**.10**	**.02**			**.40**	**.01**

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