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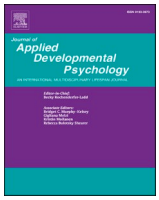

Adverse childhood experiences and children's development in early care and education programs

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ABSTRACT

Early care and education (ECE) programs can support resilience among children with adverse childhood experiences (ACEs). Yet children impacted by ACEs often experience challenges in ECE. To guide interventions to support school-readiness, a better understanding of engagement and development in ECE among children with ACEs is needed. The current study employed multiple methods (observation, teacher-report, direct assessment) to examine children's engagement, social skills and behaviors, self-regulation and early academic skills in relation to their ACEs, including an *extended* ACEs index that includes experiences outside the home. Participants were 92 preschool-aged children attending various ECE programs (24% home-based). Children's negative engagement was consistently linked to their ACEs. The *extended* ACEs index was also negatively associated with self-regulation, math, and task engagement. ACEs were not related to social skills, problem behaviors, or positive engagement with teachers. Findings suggest the need for increased efforts to support children with ACEs within their ECE programs.

Introduction

As many as one in four preschool-aged children experience adverse or traumatic events (Finkelhor, Turner, Ormrod, & Hamby, 2009; Jimenez, Wade, Lin, Morrow, & Reichman, 2016). Adverse childhood experiences (ACEs), such as maltreatment, exposure to violence, and/or substance abuse in the household, impact children's developing neurobiology (Fisher et al., 2016). Studies conducted with older children in schools (e.g., Blodgett & Lanigan, 2018) and homes (McKelvey, Edge, Mesman, Whiteside-Mansell, & Bradley, 2018) point to associations between children's ACEs and their behavior and learning. Some of these challenges may be ameliorated with early interventions to boost sensitive, responsive caregiving (Bruce, Gunnar, Pears, & Fisher, 2013; Fisher et al., 2016), which is a central protective factor that can help mitigate negative impacts of adversity (Masten, 2018).

Quality early care and education (ECE) programs offer a context for protective factors to support positive development among young children with ACEs (Dinehart, Manfra, Katz, & Hartman, 2012; Lipscomb, Pratt, Schmitt, Pears, & Kim, 2013). Yet, effects of ACEs on behavior and development may pose challenges for children, their peers, and their ECE teachers. Little is yet known about how children's ACEs play out in dynamics within ECE programs. However, findings from the National Survey of Children's Health highlight challenges; children's ACEs were linked with an increased odds of being suspended or expelled from preschool (Zeng, Corr, O'Grady, & Guan, 2019). Strengthening resilience with young children impacted by adversity requires deeper knowledge of their experiences in ECE. The current study advances this line of inquiry by examining associations between ACEs and preschool-aged children's observed engagement in ECE, teachers' reports of their social skills and behavioral problems, and direct assessments of self-regulation and early academic skills. This study aims to not only identify areas of concern but also aspects of development thus far unaffected by ACEs, which may represent strengths that ECE teachers can leverage to help children build resilience.

Adverse childhood experiences

Research on ACEs has most commonly examined indicators of abuse and neglect (physical, psychological, sexual) and experiences termed "household dysfunction" (intimate partner violence, household member

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with mental illness or suicidal, household member with substance abuse, incarcerated household member; divorce is often also included; Bethell et al., 2017; Felitti et al., 1998). These ACEs have been linked with a wide array of physical and mental health problems and behaviors in adulthood (Dube et al., 2001; Felitti et al., 1998; Williamson, Thompson, Anda, Dietz, & Felitti, 2002). A newer line of research documents associations between ACEs experienced in childhood and developmental outcomes during childhood. Most of this work has examined behavioral and academic challenges among older children and adolescents (Blodgett & Lanigan, 2018; Giovanelli, Mondi, Reynolds, & Ou, 2019; Hunt, Slack, & Berger, 2017; Jimenez et al., 2016; McKelvey et al., 2018). Yet, effects of ACEs may emerge earlier. For example, one study found that 4–5 year old children with three or more ACEs are two to four times more likely to have behavioral problems and developmental delays, detected in pediatric screenings, than children without ACEs (Marie-Mitchell & O'Connor, 2013). This line of research on ACEs extends a body of knowledge about specific adversities, such as maltreatment, and children's neurobiological development (Fisher et al., 2016).

Further research about the behaviors and skills of preschool-aged children impacted by ACEs is needed. Previous studies have focused on whether or not cumulative ACEs are linked with clinically-relevant levels of behavior or health problems, developmental delays, or academic failure in school-aged children (e.g., Blodgett & Lanigan, 2018; Jimenez et al., 2016; McKelvey et al., 2018). This evidence provides important documentation that at least some of the effects of ACEs are detectable in childhood. The finding that children's ACEs may create challenges so profound that they result in suspension and/or expulsion as early as preschool (Zeng et al., 2019) demonstrates the need for further study of children's experiences that may ultimately lead to expulsion. It is important to identify the ways in which children struggle in their daily life in ECE, and also the areas of development less affected by early adversity that may serve as developmental assets. A closer examination of individual differences in development and engagement within the context of ECE, often a child's first exposure to school, may provide a richer context to understanding the links between early exposure to ACEs and child development. The current study aims to uncover specific aspects of young children's engagement, skills, and behaviors in ECE settings that appear to be more challenging among children with more ACEs, as well as those that appear to be relatively unrelated to ACEs, which could be leveraged as protective factors to promote resilience.

Conceptualizations of ACEs and how to measure them are progressing (Cronholm et al., 2015; Koita et al., 2018; Whiteside-Mansell, McKelvey, Saccente, & Selig, 2019). Researchers increasingly include adversities beyond the 10 abuse, neglect and household dysfunction indicators initially examined by Felitti and colleagues (1998). These expanded ACEs include experiences outside the home (e.g., bullying, witnessing neighborhood or school violence, separation from caregiver via deportation or migration, discrimination), as well as serious medical procedures or life-threatening illness of the child (Cronholm et al., 2015; Koita et al., 2018; Lee et al., 2018). Little is known about the significance of an *expanded* ACEs index. Yet, if these experiences are internalized as traumatic stressors or threats similarly to the *conventional* ACEs (abuse, neglect, and household dysfunction) they would in turn be expected to affect neurobiological processes and developmental outcomes similarly. Alternatively, it is possible that the impact of *expanded* ACEs may be more context dependent. Witnessing violence in the school neighborhood or experiencing bullying at school may especially affect children's functioning in the school context because the school location signals the threat. Preschoolers experience peer victimization (Godleski, Kamper, Ostrov, Hart, & Blakely-McClure, 2015), and children as young as seven years have articulated how fear at school interferes with learning (Hargreaves, 2015).

Measuring ACEs during childhood, when they may be continuing to occur, is also challenging, especially with respect to maltreatment (Bethell et al., 2017; McKelvey, Conners Edge, Fitzgerald, Kraleti, & Whiteside-Mansell, 2017). The Center for Youth Wellness has created one of only a few ACEs measures (see Lee et al., 2018) recommended for use with parents of young children: The Center for Youth Wellness ACE-Questionnaire (CYW ACE-Q Child; Bucci et al., 2015). Respondents report the number of ACEs rather than specific ACEs; two groups of ACEs are reported: a) the *conventional* 10 ACEs and b) an *expanded* set of ACEs (Purewal, Marques, Koita, & Bucci, 2016) that includes experiences outside the home and having a serious medical procedure or life threatening illness. The expanded ACEs were identified by stakeholders including experts and community members as indicators likely to disrupt neuro-endocrine-immune activity but that had not yet been correlated with population level health outcomes (Bucci et al., 2015). Results from research conducted with the CYW ACE-Q are not yet available. The current study examines the importance of including these *expanded* ACEs in understanding children's engagement and skill development in ECE programs.

Early care and education as a developmental context

Early childhood teachers and care providers encounter children impacted by ACEs in wide variety of ECE programs (home- and center-based child care, preschool, and Head Start). A recent analysis of data from the Fragile Families and Child Wellbeing Study found that 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, Hur, & Henry, 2019). These rates are likely to increase, as the U.S. government has created policies, funding mechanisms, and memoranda to increase access to quality ECE programs for children experiencing maltreatment and homelessness (Child Welfare Information Gateway, 2015; U.S. Department of Health and Human Services, 2011). As such, ECE programs offer an opportune context for supporting children and nurturing resilience.

Indeed, a growing body of research suggests that high-quality ECE programs have the potential to support positive development among young children facing ACEs such as those involved in the child welfare system (Dinehart et al., 2012; Merritt & Klein, 2015; Lipscomb et al., 2013). While specific evidence of developmental benefits of quality ECE programs for children with ACEs remains limited, decades of research indicate that high-quality preschool supports children's social, behavioral, and cognitive skills (Hamre, 2014; Phillips et al., 2017), with stronger findings often reported for children living in adverse conditions, such as economic disadvantage (e.g., Magnuson, Ruhm, & Waldfogel, 2007; Peisner-Feinberg et al., 2001). However, these, often small associations between classroom quality and child outcomes (Burchinal, 2018) have led researchers to examine the individual child's experience and engagement.

Children's engagement in ECE programs

Within ECE programs, individual children have varied experiences (Chaparro-Moreno, Justice, Logan, Purtell, & Lin, 2019; Williford, Maier, Downer, Pianta, & Howes, 2013), even in a high-quality classroom (Jeon et al., 2010; Vitiello & Williford, 2020). Children's engagement is one indication of such differences that may be particularly important to understand in relation to early adversity. Children demonstrate variability (Williford, Vick Whittaker, Vitiello, & Downer, 2013) in classroom engagement within four domains: positive engagement with teachers, positive engagement with peers, positive engagement with tasks, and negative engagement (Downer, Sabol, & Hamre, 2010). These individual differences in engagement have implications for children's learning and development (Sabol, Bohlmann, & Downer, 2018; Vitiello & Williford, 2016; Williford et al., 2013). A recent study found that engagement is predictive of increases in children's school readiness, even after accounting for the overall quality of teacher-child interactions in the classroom (Sabol et al., 2018). For example, positive

engagement with peers (e.g., initiating and/or joining in play, communicating) contributed to an increase in language and self-regulatory skills, while negative engagement predicted less language, literacy and self-regulatory skills as well as more conflict with teachers (Sabol et al., 2018). Findings such as these point to engagement in ECE programs as a developmental mechanism through which young children gain skills and practice behaviors.

Little is known about the factors driving individual differences in children's engagement within their preschool or child care programs. Children's age (Downer et al., 2010) and sex (Weber, Lipscomb, Green, Gibbs, & Patterson, 2017) are sometimes linked with particular aspects of engagement, although some studies find no differences in engagement by age, sex, or other characteristics (e.g., race, maternal education, family income; Acar, Rudasill, Molfese, Torquati, & Prokasky, 2015; Booren, Downer, & Vitiello, 2012; Downer et al., 2010; Kim, Duran, Cameron, & Grissmer, 2018). Increasing evidence suggests that aspects of children's temperament and neurobiology may affect their engagement in ECE settings (Acar et al., 2015; Vitiello & Williford, 2020; Weber et al., 2017). For instance, Acar et al. (2015) found that children with higher inhibitory control engaged in less peer conflict (a dimension of negative engagement), whereas children with more attentional focusing exhibited more positive engagement with peers. Given that children who experience stress and/or trauma are more likely to have neurobiological changes (Mead, Beauchaine, & Shannon, 2010) their engagement with tasks, peers, and teachers in their ECE environments may be affected.

School readiness skills and behaviors in ECE

In addition to engagement, children's experiences of adversity may also affect their early school readiness skills in ECE settings. School readiness is multifaceted and includes academic, self-regulatory, and socioemotional skills (Cooper, Moore, Powers, Cleveland, & Greenberg, 2014; Pan, Trang, Love, & Templin, 2019). Understanding these processes may help early childhood teachers nurture resilience, especially given that children's self-regulatory, social, and academic skills can act as important individual-level protective factors that help them overcome adversity and foster resilient outcomes (Masten, 2018).

Evidence of neurobiological effects of early adversity on executive functions, such as attention and inhibitory control (Fisher et al., 2016) would suggest that ACEs may be linked with challenges in self-regulatory and academic skills. Studies of older children and adolescents indicate challenges with self-regulation among children with more ACEs (Lackner et al., 2018) and/or those who have experienced specific ACEs such as maltreatment (Delima & Vimpani, 2011) and parental substance abuse (Crossley & Buckner, 2012). Given the developmental importance of executive function and self-regulation to learning, ACEs may also hinder children's acquisition of academic skills, which has been documented in elementary school (Blodgett & Lanigan, 2018; Jimenez et al., 2016). The extent to which ACEs begin to affect individual differences self-regulation and early academic skills during preschool when they are rapidly developing remains unknown. Given the strong connection between early skills (self-regulatory and academic) and later academic success (Duncan et al., 2007; Pan et al., 2019), understanding processes linking ACEs with early skill development is paramount.

Similarly, the research linking ACEs to children's behavior (e.g., externalizing) have primarily been conducted in kindergarten through 12th grade (Blodgett & Lanigan, 2018; Hunt et al., 2017; Jimenez et al., 2016; McKelvey et al., 2018) and has relied heavily on parent reports (e.g., Hunt et al., 2017; Kerker et al., 2015; McKelvey et al., 2018). This work has also examined whether or not children present high levels of behavioral and/or social problems rather than individual differences along a developmental continuum (Blodgett & Lanigan, 2018; Jimenez et al., 2016; Kerker et al., 2015; McKelvey et al., 2018). No published studies have examined teachers' reports of behavioral concerns, nor positive social skills, among preschool-aged children. This is an important gap because ECE represents a strategic context for developing and practicing behaviors that support adjustment and success in elementary school (Morgan, Farkas, & Qiong, 2009; Rimm-Kaufman & Pianta, 2000), as well as mental and behavioral health (Beyer, Postert, Müller, & Furniss, 2012). Positive social skills, such as empathy, cooperation, and communication, are important individual-level protective factors, and contribute to positive relationships with others, which are also central to resilience processes (Masten, 2018). Evidence of how ACEs may affect various aspects of children's skills and behaviors as well as engagement in ECE is needed to inform practices to support development.

Current study

The current study expands research on ACEs and development by examining effects of ACEs on preschool-aged children's engagement, behavior, and skills in the context of their ECE programs. Based on prior research linking ACEs with behavioral, developmental and academic challenges among older children (Blodgett & Lanigan, 2018; Hunt et al., 2017; Jimenez et al., 2016; McKelvey et al., 2018), and/or with developmental delays or clinical-levels of behavior problems with preschool-aged children (Kerker et al., 2015; Marie-Mitchell & O'Connor, 2013) we expect ACEs to be linked with fewer early academic skills, more behavioral problems, and higher rates of negative engagement. Although links between ACEs and self-regulation are not yet documented in prior research, we expect that children with more ACEs will show less self-regulation because of the neurodevelopmental effects of adversity (Bruce et al., 2013; Fisher et al., 2016). We also explore associations among ACEs and positive aspects of engagement with peers, teachers, and tasks in ECE programs, as well as with teachers' ratings of social skills.

Contributing to progress in the measurement of ACEs, this study examines a cumulative measure of the *conventional* ACEs together with the *extended* ACEs (e.g., foster care, bullying, separation from primary caregiver through deportation or immigration, parent/caregiver death, discrimination, serious illness, neighborhood violence). Moreover, we explore potentially unique effects of the *conventional* and the *extended* ACEs. Findings hold promise to increase understanding of the ways in which the adversities that young children face play out in their engagement in their child care and preschool programs where they practice skills and behaviors, and develop approaches to learning that carry forward into elementary school and beyond.

Method

Participants

Ninety-two children within 17 ECE programs participated in this study. The types of programs they attended included: 24% home-based care, 35% center-based care (non Head Start), and 41% Head Start. Children attended these programs for an average of 27.4 h per week ($SD = 14.9$). Children were identified by their parents as 55% female, 45% male, 0% non-binary. They were 4.10 years of age, on average ($SD = 0.67$), with a range from 2.60 to 5.20 years; five children were between the ages of 2.60 and 2.96 years. Children's parents identified their race/ethnicity as: 2% Native American, 3% Asian/Pacific Islander, 3% African American, 7% Latino, 88% White.

The majority of families (51%) indicated that they qualified for public assistance such as food stamps or WIC in the past year. Forty-eight percent reported incomes less than $35,000 per year and 39% reported an annual household income of $55,000 or more. Twenty-one percent of parents reported a high school level of education or lower; 47% reported some college or an Associates Degree, and 32% had attained a Bachelor's or Graduate degree.

Procedures

Data for this study come from an evaluation of a professional development program for early childhood teachers to promote resilience with children impacted by trauma. A wide variety of licensed home-based and center-based (including Head Start) ECE programs were invited to participate, and then teachers were recruited from these programs. ECE programs and teachers opted into the study because of their interest in the program, but all data for this analysis were collected at baseline, prior to teachers' participation in the professional development program. Although the timing of the baseline data collection period varied depending on when teachers joined the study (from October to March of one academic year), none were collected within the first six weeks of the school year so that teachers, children and peers had time to adjust to one another and their shared routines.

All families of children ages 3–5 years in participating teachers' care were invited to complete a survey of children's ACEs and child and family demographics, and to consent to researchers observing children's engagement (in their ECE program), and teachers and researchers assessing self-regulatory, academic, and social skills and behaviors. A total of 252 children's families completed surveys; 169 of these also consented to observations and assessments. There were no significant differences in the number of ACEs between children whose parents did and did not consent to observations and assessments. To limit the length of researcher presence in ECE programs only four children per class (or home-based program) could be included in assessments and observations. The four children with the highest ACE scores were prioritized for inclusion when more than four were available in a class/home-based program; four classes/home-based programs had fewer than four participating children. Despite this approach, many children (39.5%) had ACE scores of zero, providing ample variability in ACEs. Two classes/home-based programs had only children with zero ACEs participating (total of 4 children across these 2 classes/homes). This procedure resulted in 92 children participating in the current study. Research assistants collecting data did not know the ACEs of individual children, nor the range of ACEs in any particular program. Observations and assessments were conducted in English, which was the language spoken in all programs, and took place within the child's ECE classroom/home-based program.

Of the 30 teachers who participated in the evaluation, and therefore provided ratings of children's social skills and behaviors for the current analysis, seventeen (57%) were lead teachers, 7 (23%) were directors/owners (3 of whom also identified themselves as lead teachers), 9 (30%) were either an assistant teacher or assistant/aid. All thirty teachers identified themselves as female. Ten percent of teachers reported a high school level of education or lower, 43% reported some college or an Associates Degree, 30% reported a Bachelor's Degree, and 13% attained a graduate degree. Teachers reported their race/ethnicity as 6.7% Latino or Hispanic and 96.7% White (93.4% White only).

Measures

Adverse childhood experiences

Parents completed the Center for Youth Wellness ACE-Questionnaire (CYW ACE-Q Child; Bucci et al., 2015) to assess child total ACEs. The CYW ACE-Q includes two parts. In ACEs-Conventional (ACES-C), parents/ guardians indicate the number of ACEs (range 0–10) that apply to their child since birth including: 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 in the home, and feelings of unsupport/unloved. Similarly, in ACEs-Extended (ACEs-E), parents/guardians indicate the number of ACEs (range 0–7) that apply to their child since birth including: 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. ACEs were scored "0", "1", "2", and $\geq 3''$ separately for parts C and E, and a total of parts C and E, combined.

Child engagement

Research assistants coded children's engagement with teachers, peers, and tasks with the Individualized Classroom Assessment Scoring System (inCLASS; Downer, Booren, Hamre, Pianta, & Williford, 2011). The inCLASS typically includes 4–6 cycles of 10-min observations; each cycle is followed by a 5-min coding period. To enhance precision in the current study, each child was observed an average of 7.8 cycles (SD = 0.46) and the primary activity the child was engaged in was recorded. Activities included free play (44%), whole group (27%), small group (5%), individual (2%), meals/snacks (11%), and routines/transitions (11%). Most (79%) observations occurred indoors; 19% occurred outside and < 1% occurred in other locations (e.g., garage set up for gross motor play). There were an average of 13.28 children (SD = 4.42) and 2.34 adults (SD = 0.89) present across all observations; 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 was certified after coding the reliability portion of the training with 80% reliability or higher. During data collection, 20% of observations for the project were coded by two data collectors observing and rating the same child. The average agreement between coders was 86%; after the observation, coders met to consensus code and the average agreement for consensus codes was 91%. To continue collecting data each observer was also required to maintain reliability with master-coded inCLASS videos at 80% or higher. The inCLASS measure has been shown to have construct validity in prior research (Downer et al., 2010).

The inCLASS includes ten dimensions of children's engagement and interaction which comprise four domains, described below. Each dimension is rated during each observational cycle on a scale of 1–7. Ratings of 1 or 2 indicate "low", 3–5 indicate that the child is in the "mid-range", and 6–7 indicate that the child is "high" on that dimension. With the exception of conflict with teachers and conflict with peers, higher scores reflect more positive engagement. Scores for each of the following four domains were created by computing the average across cycles for each dimension and then the average of the dimensions with a particular domain.

Positive engagement with teachers

Positive engagement with teachers includes two dimensions (α = 0.83): (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).

Positive engagement with peers

Positive engagement with peers includes three dimensions (α = 0.91): (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).

Positive engagement with tasks

Task orientation includes two dimensions (α = 0.83): (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).

Negative engagement

Negative classroom engagement is made up of three dimensions (α = 0.91): (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).

Social skills and problem behaviors

Teachers rated children's social skills and problem behaviors using the Social Skills Improvement System–Rating Scales (SSIS-RS; Gresham & Elliott, 2008). Items asked how often a particular behavior occurs; teachers' responses ranged from 1 (*never*) to 4 (*almost always*). Three subscales were utilized: total social skills (comprised of 46 items related to communication, cooperation, assertion, responsibility, empathy, engagement, and self-control; α = 0.97), internalizing behavior problems (7 items; α = 0.83), and externalizing behavior problems (12 items; α = 0.91).

Self-regulation

Children's behavioral self-regulation was assessed by research assistants with the Head Toes Knees Shoulders-Revised (HTKS-R). The HTKS-R assesses aspects of children's attention, working memory, and inhibitory control; it is a more complex version of the HTKS for children ages 3–8 years (McClelland et al., 2014). The HTKS-R includes a total of 59 items (37 testing and 22 practice). Only the 37 testing items were scored: 0 for an incorrect response, 1 for a self-corrected response, and 2 for a correct response. Prior research has shown strong reliability and validity of the HTKS-R and HTKS (e.g., McClelland et al., 2014; Wanless, McClelland, Tominey, & Acock, 2011).

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 (Woodcock, McGrew, & Mather, 2001), scoring the total number of correct items. Children's early mathematical skills (ability to analyze and solve practical math problems) were assessed as the total number of items correct on the Applied Problems subtest of the Woodcock Johnson Tests of Achievement.

Covariates

Characteristics of children and families were reported on the family survey and are included as covariates: child's age in years, sex (0 = *male*; 1 = *female)* and family SES. Family SES was comprised of family income and parents' education level, which were strongly correlated ($r = 0.64$, $p < .01$). These variables were standardizing and aggregated to create the SES variable. Type of ECE program (home, center, Head Start) and the number of months after the start of the academic year the baseline data collection took place were tested for possible inclusion as covariates but were omitted due to non-significant correlations with outcomes once accounting for child age, and limited statistical power to include all potentially relevant covariates. Additional variables were tested for possible inclusion as covariates in the analysis predicting inCLASS domain scores: percent of inCLASS cycles that were of various activities and/or settings (e.g., free play, whole group, meals/snacks), ratio of children to adults, average number of children present across cycles for each child, percent of cycles that were teacher directed. Only the covariates that were significantly correlated with one or more domains were included: average number of children present across cycles ($M = 13.2$, $SD = 4.42$, range from 2 to 27) and the proportion of cycles that were teacher directed ($M = 0.44$, $SD = 0.23$, range from 0 to 1).

Data analysis

Multilevel level modeling (MLM) was conducted to account for the hierarchical nature of the data where children (level 1) were nested within classrooms/program (level 2); the average number of children per classroom/program was 3.5. Intraclass correlation coefficients were as follows: children's positive engagement with teachers = 0.01, positive engagement with peers = 0.01, task orientation = 0.04, and negative engagement ≤0.01, social skills = 0.14, externalizing behavior problems = 0.09, internalizing behavior problems = 0.38, self-regulation ≤ 0.01, early literacy = 0.04, early math = 0.05. Multilevel models were first specified with children's total ACEs (parts C and E combined in Model 1), and then with ACEs parts C and E modeled as separate predictor variables (Model 2). Aces-C and ACEs-E variables were only moderately correlated ($r = 0.38$, $p < .01$). Models were estimated separately for each outcome variable. Predictors and covariates were included at level 1; no variables were entered at level 2.

The percent of missing data was as follows: ACEs-C (1%), ACEs-E (3%), child age (8%), child sex (0%), parent education (0%), household income (5%), engagement (14%), and social skills and behavior problems (24%), self-regulation (12%), early literacy (7%), early math (8%). Missingness was higher for social skills and problem behaviors because some teachers did not complete ratings for all children participating from their classrooms/groups, and for engagement because observations were not allowed in two classrooms due to lack of parent consents for observations. More data were missing for self-regulation than for the early literacy and math assessments because more children either declined to complete the assessment, or started or completed the practice round, but chose to stop the assessment prior to the testing phase. MLM employed 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). The inclusion of age, sex, and family SES in the analyses helped to reduce potential bias related to missing data, as these variables were modestly associated with missingness on social skills, problem behaviors, self-regulation, early literacy and early math outcomes (r ranged from −0.34 to 0.32, $p < .01$).

Results

Preliminary results

Preliminary analysis revealed that the majority (56%) of the preschool-aged children in the current study had experienced at least one ACE (on either part C or E): 39.5% had no ACEs, 16.5% had 1 ACE, 11% had 2 ACEs, and 33% had 3 or more ACEs. When examining ACEs-Conventional only, the rates were: 40% with 0, 20% with 1, 11% with 2, and 28% with 3 or more. Rates of ACEs-Extended were: 78% with 0, 14% with 1, 4% with 2 ACEs, and 0% with 3 or more ACEs. Table 1 shows correlations among key study variables. There were small to moderate positive correlations of ACEs with negative engagement, internalizing behavior problems, and small to moderate negative correlations of ACEs with self-regulation and emergent literacy. There were no associations between ACEs and positive engagement with peers or teachers, or with children's social skills.

Hypothesis testing

Results from multilevel regressions are displayed in Tables 2 (child engagement) and 3 (child skills and behavior). As shown in Model 1 of Table 2, children with more ACEs (C + E) exhibited more negative engagement, controlling for other variables. However, the combined ACEs (C + E) variable did not significantly predict children's positive engagement with teacher, peers, or tasks. Positive engagement with teacher was predicted (negatively) by the number of children present,

Table 1
Correlations among key study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. ACEs combined (C + E)	1												
2. ACEs-Conventional	**0.97****	1											
3. ACEs-Extended	**0.48***	**0.38****	**1**										
4. Pos. Engage w/ Teacher	0.04	0.01	−0.04	1									
5. Pos. Engage w/ Peers	−0.12	−0.12	−0.17	0.14	1								
6. Pos. Engage w/ Tasks	−0.15	−0.10	**−0.21+**	0.18	**0.58****	1							
7. Negative Engagement	**0.32****	**0.23***	**0.38****	0.01	−0.09	**−0.31****	1						
8. Social Skills	−0.14	−0.17	−0.04	0.11	0.11	0.09	**−0.40****	1					
9. Internalizing Beh Prob.	**0.22+**	**0.25***	−0.04	0.04	0.08	−0.02	−0.01	**−0.40****	1				
10. Externalizing Beh Prob.	0.03	0.02	0.01	0.12	−0.07	−0.09	**0.53****	**−0.63****	**0.43***	**1**			
11. Self-Regulation	**−0.20+**	**−0.19+**	−0.10	−0.09	**0.23+**	0.19	−0.16	0.20	0.17	0.07	1		
12. Emergent Literacy	**−0.30****	**−0.35****	−0.10	−0.02	**0.25***	0.03	0.01	0.12	−0.05	0.08	**0.52***	1	
13. Early Math	−0.07	−0.10	−0.12	−0.01	**0.36***	**0.23***	−0.01	0.08	0.08	0.11	**0.64***	**0.66****	1
Mean	1.37	1.27	0.24	2.42	2.57	4.05	1.52	2.93	1.69	1.78	21.89	6.29	11.15
Standard Deviation	1.31	1.27	0.52	0.74	0.84	0.84	0.55	0.42	0.50	0.54	16.92	4.82	5.07
Minimum	0.00	0.00	0.00	1.00	1.08	1.93	1.00	1.89	1.00	1.00	0.00	0.00	0.00
Maximum	3.00	3.00	2.00	4.38	4.63	5.94	3.38	4.00	3.00	3.58	61.00	23.00	24.00

+ p < .10, *p < .05, ** p < .01.

Table 2
Multilevel regression analysis for child engagement.

	Positive Engagement with Teacher			Positive Engagement with Peers			Positive Engagement with Tasks			Negative Engagement		
	B	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***
Model 1												
Intercept	2.38	0.11	<0.01	2.66	0.13	<0.01	3.87	0.13	<0.01	1.38	0.08	<0.01
Predictors (Level 1)												
ACEs (C + E)	0.01	0.07	0.86	0.04	0.09	0.67	0.01	0.08	0.87	**0.18**	**0.05**	**<0.01**
Child age	0.17	0.12	0.16	**0.48**	**0.16**	**<0.01**	0.23	0.15	0.12	−0.07	0.09	0.43
Child sex	0.09	0.19	0.64	−0.25	0.20	0.20	0.16	0.19	0.39	**0.38**	**0.12**	**<0.01**
Family SES	−0.13	0.12	0.27	**0.27**	**0.14**	**0.05**	0.19	0.14	0.16	0.15	0.08	0.08
% Teacher directed	**0.62**	**0.34**	**0.07**	−0.60	0.41	0.15	0.02	0.41	0.97	−0.06	0.25	0.82
N children present	**−0.08**	**0.02**	**<0.01**	−0.00	0.02	0.92	−0.01	0.02	0.60	−0.01	0.02	0.32
R squared	**0.24**	**0.09**	**0.01**	**0.23**	**0.09**	**0.01**	0.08	0.07	0.22	**0.30**	**0.09**	**<0.01**
Model 2												
Intercept	2.37	0.12	< 0.01	2.72	0.13	< 0.01	3.84	0.12	< 0.01	1.39	0.08	< 0.01
Predictors (Level 1)												
ACEs-C	0.04	0.08	0.63	0.10	0.09	0.28	0.14	0.09	0.12	0.08	0.06	0.15
ACEs-E	−0.15	0.17	0.40	**−0.25**	**0.19**	**0.07**	**−0.45**	**0.18**	**0.01**	**0.30**	**0.12**	**0.01**
Child age	**0.24**	**0.13**	**0.06**	**0.58**	**0.17**	**<0.01**	**0.34**	**0.15**	**0.02**	−0.11	0.10	0.23
Child sex	0.15	0.21	0.47	−0.13	0.20	0.52	0.28	0.20	0.15	**0.33**	**0.13**	**0.01**
Family SES	−0.16	0.11	0.17	**0.26**	**0.14**	**0.05**	**0.22**	**0.13**	**0.09**	0.10	0.08	0.24
% Teacher directed	0.56	0.34	0.10	−0.66	0.41	0.11	−0.02	0.39	0.96	−0.07	0.25	0.78
N children present	**−0.08**	**0.02**	**< 0.01**	−0.01	0.02	0.82	−0.02	0.02	0.44	−0.02	0.02	0.31
R squared	**0.25**	**0.09**	**0.01**	**0.27**	**0.09**	**< 0.01**	**0.17**	**0.08**	**0.04**	**0.30**	**0.09**	**< 0.01**

Note. Sex is coded 0 = female, 1 = male. Estimates are unstandardized beta coefficients; standardized estimates are not provided due to the hierarchical nature of the data and analysis.

whereas positive engagement with peers was predicted by children's age. Model 2 probed these associations more specifically by examining ACEs-C and ACEs-E simultaneously. Findings indicated that ACEs-E were significantly predictive of less positive engagement with tasks and more negative engagement, and marginally predictive of less positive engagement with peers (p = .07; Table 2). As with the Model 1, no effect of ACEs-E or —C emerged on positive engagement with teacher.

Table 3 presents findings from multilevel regression analyses predicting children's behavior and skills. Findings from Model 1 show that children with more combined ACEs (C + E) exhibited lower emergent literacy scores, at a trend level (p = .09; see Table 3) but did not differ in their social skills, behavior problems, self-regulation, or early math skills while accounting for covariates. Looking specifically at covariates, children's age predicted social skills, self-regulation, literacy, and math scores. Male sex was linked with fewer social skills, and family SES was related to self-regulation, literacy, and math. Model 2 probed these associations more specifically by examining ACEs-C and ACEs-E simultaneously. Similar to findings from Model 1, in Model 2 ACEs-C negatively predicted children's emergent literacy skills, at a trend level (p = .09; see Table 3). ACEs-E significantly predicted lower scores in both self-regulation and early math, accounting for covariates (Table 3).

Discussion

Recent evidence points to associations between ACEs and clinically-relevant behavioral challenges, developmental delays, and/or academic failures during childhood and adolescence (Blodgett & Lanigan, 2018; Hunt et al., 2017; Jimenez et al., 2016; Marie-Mitchell & O'Connor, 2013; McKelvey et al., 2018). The current study aimed to identify early indications of these challenges exhibited in children's engagement with teachers, peers, and tasks in ECE, as well as in teachers' impressions of their behavior, and researchers' assessments of self-regulation and emerging academic skills. Further, this study explored how these associations may vary depending on how ACEs were conceptualized, such that models explored the combined effect as well as the unique effects of *extended* and *conventional* ACEs on children's engagement, behavior, and

Table 3
Multilevel Regression Analysis for Children's Skills and Behaviors.

	Social Skills			Externalizing Behavior Problems			Internalizing Behavior Problems			Self-Regulation			Emergent Literacy			Early Math		
	B	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*
Model 1																		
Intercept	3.02	0.06	<0.01	1.64	0.09	<0.01	1.71	0.09	<0.01	19.43	2.00	<0.01	6.10	0.59	<0.01	10.39	0.63	<0.01
Predictors (Level 1)																		
ACEs (C + E)	−0.03	0.04	0.48	0.04	0.06	0.50	0.07	0.05	0.19	−2.30	1.51	0.13	**−0.67**	**0.39**	**0.09**	0.04	0.42	0.92
Child age	**0.18**	**0.09**	**0.04**	−0.15	0.12	0.22	0.01	0.11	0.89	**14.55**	**2.84**	**<0.01**	**3.45**	**0.85**	**<0.01**	**4.33**	**0.78**	**<0.01**
Child sex	**−0.25**	**0.10**	**0.01**	**0.41**	**0.13**	**<0.01**	−0.04	0.11	0.74	5.05	3.47	0.15	0.32	0.94	0.73	1.42	1.01	0.16
Family SES	0.06	0.08	0.40	0.05	0.11	0.67	−0.05	0.10	0.65	**6.79**	**2.48**	**<0.01**	**2.14**	**0.75**	**<0.01**	**2.25**	**0.67**	**<0.01**
R squared	**0.22**	**0.10**	**0.03**	**0.20**	**0.10**	**0.05**	0.09	0.09	0.33	**0.42**	**0.09**	**<0.01**	**0.39**	**0.10**	**<0.01**	**0.38**	**0.09**	**<0.01**
Model 2																		
Intercept	3.01	0.07	<0.01	1.64	0.09	<0.01	1.71	0.09	<0.01	19.55	1.96	<0.01	5.94	0.61	<0.01	10.18	0.62	<0.01
Predictors (Level 1)																		
ACEs C	−0.05	0.05	0.32	0.03	0.06	0.61	0.08	0.06	0.17	−1.06	1.58	0.50	**−0.74**	**0.43**	**0.09**	0.44	0.44	0.31
ACEs E	0.01	0.09	0.91	−0.00	0.12	0.98	−0.01	0.11	0.91	**−7.69**	**3.52**	**0.03**	−0.87	0.90	0.34	**−2.69**	**0.93**	**<0.01**
Child age	**0.19**	**0.09**	**0.04**	−0.19	0.12	0.13	0.03	0.11	0.79	**16.04**	**2.94**	**<0.01**	**3.48**	**0.92**	**<0.01**	**4.68**	**0.78**	**<0.01**
Child sex	**−0.21**	**0.10**	**0.04**	**0.37**	**0.14**	**0.01**	−0.06	0.11	0.62	4.75	3.48	0.17	0.72	1.00	0.46	**1.81**	**1.00**	**0.07**
Family SES	0.05	0.08	0.53	0.09	0.11	0.43	−0.05	0.11	0.66	**7.11**	**2.57**	**0.01**	**1.99**	**0.73**	**0.01**	**2.38**	**0.67**	**<0.01**
R squared	**0.22**	**0.11**	**0.04**	**0.18**	**0.09**	**0.06**	0.11	0.10	0.28	**0.45**	**0.09**	**<0.01**	**0.41**	**0.10**	**<0.01**	**0.46**	**0.09**	**<0.01**

Note. Sex is coded 0 = female, 1 = male. Estimates are unstandardized beta coefficients; standardized estimates are not provided due to the hierarchical nature of the data and analysis.

skills. Findings point to negative engagement (less behavioral control and more conflict with peers and teachers) as the indicator linked to total ACEs. This study also uncovered initial evidence that the *extended* index of ACEs, which includes experiences related to school and/or community contexts (e.g., bullying or harassment at school, discrimination, violence in the neighborhood or school neighborhood) as well as other adversities not captured by the conventional abuse, neglect and family dysfunction index (Felitti et al., 1998) may be particularly important.

Children's engagement, behavior, and social skills

Signs of children's exposure to early adversity were detected in their engagement in their ECE programs. Children with more ACEs (total and *extended*) were observed to engage more negatively with tasks, peers, and teachers; they showed less behavioral control and more conflict. Results from a national study indicate that negative engagement tends to be infrequent ($M = 1.38$; Williford et al., 2013). Similarly, in a recent study of peer engagement among children with disruptive behaviors, negative peer engagement was low ($M = 1.17$; Yoder, Williford, & Vitiello, 2019). Children in the current study demonstrated slightly higher averages of negative engagement ($M = 1.52$) than children in other studies, suggesting something different about their experience in ECE as is relates to ACEs. Yoder et al. (2019) found that children with a certain type of disruptive behavior (i.e., high-levels of opposition) demonstrated higher levels of peer negative engagement, indicating that child-level factors and symptoms may prompt negative interactions; this may be similar for children who have experienced ACEs. They may react to stimuli with more fight, flight or freeze reactions due to sensitivity in the sympathetic nervous system (Hornor, 2015; Mead et al., 2010), experience hypervigilance (Shechner, Hong, Britton, Pine, & Fox, 2014), and/or feel more threatened by the actions or facial expressions of others (Pollak, 2008).

Similarly, children with more of the *extended* ACEs indicators (e.g., foster care, bullying, separation from primary caregiver through deportation or immigration, parent/caregiver death, discrimination) exhibited less positive engagement with tasks. This domain of the inCLASS measures children's self-reliance, initiative, and attentive or involved behaviors, such as playing with toys or materials, and participating in group activities or conversations. For example, as a group of children are working together to build an obstacle course, the child displaying low-levels of task orientation would not contribute ideas or suggestions, may stand slightly apart from the group, and appear to be daydreaming (Downer et al., 2011). Such differences in positive engagement with tasks could stem from children with *extended* ACEs experiencing ECE as less of a safe place, having difficulty focusing attention and/or navigating group dynamics. Children as young as seven years have articulated how fear at school interferes with learning (Hargreaves, 2015) and parental deportation, one of the *extended* ACE indicators, is linked to higher fear, anxiety and other emotional challenges in children (Zayas, Aguilar-Gaxiola, Yoon, & Rey, 2015). Further research in this area is clearly needed.

Children's positive engagement with their teachers (conversation, attunement, positive affect, proximity seeking) was not related to their early adverse experiences. Although it is not possible to affirm a null finding, this initial evidence presents a promising sign that teachers working in a variety of ECE programs may be finding ways of facilitating positive engagement with children whose early adversities may heighten the importance of such positive engagement with adult caregivers. Supportive relationships with caring adults are central to resilience processes (Masten, 2018; Ungar & Liebenberg, 2011). Close teacher-child relationships during the preschool years in particular have been shown to be especially beneficial for children impacted by adversities, such as those living in non-parental care (Lipscomb, Schmitt, Pratt, Acock, & Pears, 2014). Further research is needed to examine how teachers and children establish these supportive

relationships and engage in positive communication and affect despite challenges with behavioral control and conflict that may be triggered by heightened stress response among children impacted by trauma and/or ACEs. Finally, ways that classroom-level quality may support individual teacher-relationships and/or strengthen associations between these relationships and school readiness skills for children who have experienced ACEs should be investigated. Previous work shows that classroom-level emotional support can dampen the negative association between children's problem behaviors and approaches to learning (Domínguez, Vitiello, Fuccillo, Greenfield, & Bulotsky-Shearer, 2011).

Children's ACEs were also unrelated to their positive social skills (rated by teachers) and were only marginally related to less (observed) positive engagement with peers. It may be that the attention of ACEs research on deficits overlooks areas of development that tend to be less consistently affected by adversity, such as social skills like empathy, communication, and cooperation. These skills can serve as individual-level protective factors and also help children establish positive relationships with others, which are central to resilience processes (Masten, 2018). Future research is needed to examine the ways in which ECE programs may help children identify, further strengthen and leverage such skills to help promote development in other areas. For example, one could consider a scenario in which a child with good communication and cooperation skills but less well-developed behavioral control may strengthen self-regulation skills through social games or movement activities that activate her/his communication and cooperation skills.

In contrast to previous research, the current study did not detect significant associations between ACEs and children's internalizing or externalizing problems. These discrepancies may be due to methodological differences across studies. Previous research has primarily relied upon parent/caregiver report and clinical cut-offs (e.g.,Kerker et al., 2015; McKelvey et al., 2018) whereas the current study examined individual differences across the normative developmental spectrum with teachers' reports. One possible interpretation of these collective findings could be that ACEs fail to explain variation in behavioral problems within the typical range; a finding noted in preliminary analysis from prior research (Kerker et al., 2015). Similarly, the distributions of ACEs in the study samples may also help explain differences in associations with behavioral problems. The prevalence of ACEs in the current study (60% had one or more ACEs) is similar to the prevalence of those documented by Jimenez et al. (2016) with a sample of children participating in the Fragile Families and Child Wellbeing Study. However, studies linking ACEs with behavioral problems (Kerker et al., 2015; McKelvey et al., 2018) have employed samples of children involved in Child Welfare Services, and/or children eligible for Early Head Start (e.g., due to poverty), with particularly high rates of ACEs (e.g., 81–98% had one or more ACEs).

Alternatively, the difference in reporter (parent versus teacher) may affect differences across studies in associations between ACEs and behavioral problems. Moreover, teachers enrolled in the current study because of their interest in trauma and resilience; it is possible that they are already considering trauma as a source of children's behavior and therefore adjusting their perspectives accordingly. This explanation is consistent with the finding that children's (observed) positive engagement with teachers did not vary based on children's ACEs. It is also possible that challenges in measurement may result in failure to detect underlying differences, particularly in the context of ECE in which teachers are often responsible for large groups of children. Internalizing behaviors, for example, may be underreported because they are difficult to observe (Achenbach, McConaughy, & Howell, 1987; De Los Reyes & Kazdin, 2005).

Self-regulation and early academic skills

Both self-regulation and early math skills were linked with the *extended* ACEs index, accounting for socio-economic status, age, and sex. This is the first study to document associations between an ACEs index of any type and these inter-related skill sets among preschool-aged children. Combined with a finding of a similar association between the *extended* ACEs and children's negative engagement (which post-hoc analysis suggest may be driven by the behavioral control dimension), a pattern may be emerging. These outcomes appear to have common foundations in regulatory processes. In addition to the clear associations between self-regulation, behavioral control, and (less) conflict, research increasingly links young children's emerging math skills with self-regulation (Ponitz et al., 2009; Robson, Allen, & Howard, 2020). No significant effect was evident of ACEs on emergent literacy.

Measurement of ACEs

The current study also contributes to an emerging body of research on the measurement of ACEs. Researchers are increasingly recognizing the need for more inclusive measurement of ACEs (Cronholm et al., 2015; Koita et al., 2018; Lee et al., 2018), yet little is known about the importance of an *extended* ACEs index. In the current study the *extended* ACEs were more consistently linked with young children's outcomes than were the *conventional* ACEs. One possible reason for this pattern of findings is that the ACEs reported in the *extended* category (ACEs-E) may be more closely related to children's experience at or near their ECE programs (e.g., bullying/harassment at school, violence in neighborhood – or school neighborhood, and discrimination/being treated badly due to identity), which may have more direct implications for children's engagement and learning while in ECE. It is not possible to ascertain whether particular experiences within the *extended* ACEs index may be responsible for the associations with children's outcomes (engagement, self-regulation and math); parents simply reported the number of ACEs in the C and E categories. This approach of reporting the number of ACEs rather than specific experiences has been found to be preferred by respondents (Purewal et al., 2016) and is an appropriate format for collecting sensitive information (Bucci et al., 2015). This may be especially important for questions related to child maltreatment and immigration/deportation, and to collection of ACEs data about children (rather than adults), when ACEs may be ongoing or recent. However, only asking for the number of ACEs limits understanding of how specific adverse experiences affect children's engagement, behavior, and skills. The reporting of categories (e.g., *conventional* and *extended*) of ACEs may provide an intermediary option. Much more research is needed on the measurement of ACEs, especially *extended* ACE indexes that are more inclusive than *conventional* ACEs, as well as on effects of these ACEs on young children's development.

Strengths and limitations

The current study provides an important foundation for further study of early development, behavior, and engagement among young children impacted by ACEs. The study of preschool-aged children attending a wide variety of early learning programs is an important advancement from prior research that has typically focused on center-based, or even specifically Head Start, programs. Several key strengths of the measurements employed in this study are also noteworthy. By conducting systematic observations of children's daily lives within ECE programs, this research was able to hone-in on specific aspects of their early experiences that appear to be more versus less related to ACEs during the preschool years. Complementing observations with teacher ratings and direct assessments provided robust measurement of children's early development.

Measurement of family SES separately from ACEs, and controlling for SES in the analysis, increases precision in our understanding of links between ACEs and development, apart from the well-documented effects of socio-economic disadvantage. Accounting for children's age was important during this developmental period; age predicted higher scores in self-regulation, literacy, math, and positive engagement with peers. Moreover, measuring both the *conventional* ACEs ("ACEs-C") as well as

additional indicators of adversity ("ACEs-E": e.g., bullying/harassment at school, discrimination/treated badly due to identity, violence in neighborhood – or school neighborhood) represents a significant advancement. Although it is too early to draw firm conclusions about differential impacts of these different categories of ACEs, the current findings demonstrate the potential importance of more inclusive measurement of ACEs. Findings also suggest the potential for differential effects of different ACEs or categories of ACEs. Where appropriate and feasible, future research may consider examining associations between specific ACEs and outcomes.

One particular methodological challenge of the current study is the reporting of ACEs during early childhood, when they are unfolding; this may have led to under-estimation of children's ACEs. Future research may examine the added benefit of asking teachers to also report children's ACEs. Researchers in at least one study have employed teacher reports of children's ACEs (Blodgett & Lanigan, 2018). Systematic analysis of consistencies and inconsistencies between parents and teachers (and at later ages, youth) as reporters of ACEs is an important direction for future research.

Other study limitations include a relatively small sample of children, with limited racial, ethnic, and linguistic diversity. Future studies conducted in geographic locations with teachers and families with more diverse identities and experiences is of paramount importance. This is especially the case when examining effects of adversities such as discrimination and historical trauma. Longitudinal studies that examine how early adversities affect young children's developing representations of themselves, others, and institutions akin to schools as they engage with ECE programs before entering formal school, is an important future direction for research to support children from varying backgrounds. Future research should also examine young children's developmental assets and protective factors that may buffer negative effects of ACEs on their development through the transition into kindergarten. Findings from the current study point to social skills, and positive engagement with peers and teachers as potentially important factors to consider, along with other factors identified in previous research, such as high quality teaching and caregiving (Magnuson et al., 2007; Peisner-Feinberg et al., 2001).

Conclusions and implications

Findings from the current study suggest that young children who have experienced more adversity by the time they are ages 3–5 years exhibit more negative engagement (less behavioral control, more conflict with peers and teachers) in their early child care and preschool programs, while accounting for socio-economic disadvantage and other factors. This was a consistent finding, regardless of whether ACEs-C and E were considered together or separately; additional effects of the *extended* ACEs index on self-regulation, engagement with tasks, and math were also detected and should be further studied.

These findings, coupled with recent evidence of increased suspensions and expulsions among children with more ACEs (Zeng et al., 2019) suggest the need for preventive interventions before children enter elementary school. Strategies may include both direct intervention with children, such as games focused on self-regulation (e.g., Red Light Purple Light; McClelland et al., 2019), and/or stress management, as well as professional supports for teachers focused on trauma and resilience (e.g., Lipscomb, Hatfield, Lewis, Goka-Dubose, & Fisher, 2019). Investigations of the effectiveness of such interventions on outcomes for both teachers and children will be important to advancing science at the intersection of early learning, adversity, and resilience. Findings from the current study are also suggestive that young children impacted by ACEs show strengths in their social skills and positive engagement with teachers. Future research should examine these potential developmental assets as protective factors to strengthening resilience among young children impacted by a range of early adversities.

Declaration of Competing Interest

none.

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