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Effectiveness of Sesame Workshop's Little Children, Big Challenges: A digital media SEL intervention for preschool classrooms

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Abstract

This cluster-randomized pre-post comparison study examined the effects of using Sesame Workshop's Little Children, Big Challenges: General Resilience (LCBC) digital media toolkit in preschool classrooms over a 12-week period. Participants included 157 preschool teachers and 766 preschool children from 159 preschool classrooms in 38 Head Start centers, 7 Military Child Development Centers, 2 community-based preschool agencies, and a public school district. Children's social-emotional skills, behaviors, and relationship qualities were measured using a combination of direct testing of children and teacher behavioral ratings. Hierarchical linear modeling accounted for classroom-level nested data and the results indicated that LCBC increased emotion vocabulary, attachment, initiative, self-control, emotion regulation, and adaptability. The LCBC intervention also significantly reduced teacher conflict, attention problems, and emotion control problems. Additionally, the teacher survey indicated that the intervention was appealing to teachers and students. Reasons for nonsignificant effects on teacher closeness, social problem solving, and social skills are discussed.

KEYWORDS

digital media/technology, head start, military child development centers, preschool children, SEL, Sesame Street, social-emotional

1 | INTRODUCTION

Preschools play an important role in promoting social-emotional competencies that are associated with greater academic outcomes and well-being in children (Eisenberg, 2006; Guerra & Bradshaw, 2008; Masten & Coatsworth, 1998; Weissberg & Greenberg, 1998). There are a number of social-emotional learning (SEL) interventions that have been found to be effective in promoting social-emotional skills in schools, but no studies of the effectiveness of a digital media-based SEL intervention in preschool classrooms. Given that children are increasingly more competent at using technology even before they enter preschool, and that PreK-12 schools are integrating technology into classrooms, research on SEL interventions that incorporate digital media is important and timely (National Association for the Education of Young Children & Fred Rogers Center, 2012). Additionally, the need for digital media-based resources became even more urgent during the COVID-19 pandemic in view of the increase in the mental health needs of children and virtual schooling during this time. The purpose of this study is to determine the effectiveness of a freely available online digital media-based SEL toolkit in preschool classrooms.

2 | SOCIAL-EMOTIONAL LEARNING

SEL is the process of acquiring the ability to recognize and manage emotions, develop empathy, establish and maintain positive relationships, handle interpersonal conflicts with social problem-solving skills, make good decisions, and set and achieve positive goals (Collaborative for Academic Social and Emotional Learning, 2012). The importance of SEL in preschools is shown by its link to lowering teacher-child conflicts, increasing levels of classroom engagement, enhancing academic outcomes, and supporting well-being in children (Eisenberg, 2006; Guerra & Bradshaw, 2008; Masten & Coatsworth, 1998; Morris et al., 2013; Raver, 2002; Weissberg & Greenberg, 1998). The preschool classroom can play a vital role in promoting these social-emotional skills in young children as well as their cognitive and academic development.

SEL curriculums integrate a competence promotion framework for reducing risk factors and fostering protective mechanisms for positive adjustment (Benson, 2006; Catalano et al., 2002; Guerra & Bradshaw, 2008; Weissberg et al., 2003). As young children gain social-emotional competence, they are better able to respond adaptively and avoid negative responses to challenges met in their daily lives. A substantial body of research has documented several social-emotional skills as being associated with positive behavioral outcomes in young children. Some examples include the ability to regulate emotions (Eisenberg & Fabes, 1992; Graziano et al., 2007; Gross, 1998; Oades-Sese et al., 2011; Safdar et al., 2009), increase social competence (Blair, 2002; Luthar & Zigler, 1991; Oades-Sese et al., 2011; Raver & Zigler, 1997; Reynolds & Kamphaus, 2004), and develop effective problem-solving skills (Crick & Dodge, 1994; Denham et al., 2014). Social-emotional skills have been found to help strengthen social environmental factors, such as attachment to sensitive and responsive caregivers and supportive teacher-child interactions, which are likewise protective and foster the well-being of children (Morris et al., 2013; Werner & Smith, 1989).

Research has indicated that SEL programs incorporated in preschools are effective at teaching social-emotional skills and reducing problem behaviors. These programs include Incredible Years, Preschool Paths, and Tools of the Mind-Play (Morris et al., 2014), and the Head Start Research-based Developmentally Informed (REDI) intervention (Bierman et al., 2008). Findings from a recent meta-analysis (Murano et al., 2020) showed that preschool SEL interventions were effective in building social-emotional skills and reducing problem behaviors in 15,498 preschool children, with greater effectiveness in preschoolers without problems, smaller effects for children with behavioral problems, and no difference across socioeconomic groups in terms of the responses to the intervention. The researchers concluded that four components were essential for an intervention to succeed. It needed to be sequenced, active, focused, and explicit. That is, the intervention should involve a step-by-step process during which the children are engaged and active participants in the learning process, teachers are intentional in preparing

and supporting children as they practice the social-emotional activities, and the concepts and skills being taught are explicit. Given that classroom instruction in SEL that is systematic and explicit has been found to be effective with preschool children, initial research on digital media indicates it could be a promising addition to other instructional approaches.

3 | USE OF EDUCATIONAL DIGITAL MEDIA IN PRESCHOOLS

Digital media are created, viewed, modified, distributed, and saved in electronic devices such as computers, laptops, smartphones, smartboards, tablets/iPads, and television. Videos or images, video games, websites, social media, MP3, electronics documents, and e-books are commonly used types of media. It has been recommended that when implementing digital media in preschool settings, sound pedagogical practices involve intentional questioning that fosters children's critical thinking skills, encouraging teacher-student dialogue, promoting self-regulatory and at- tentional skills, using play, and practicing problem-solving skills (National Research Council, 2001). When used appropriately, digital content offers educators additional options for accommodating preschool children who need differentiated instruction, such as for children who are English language learners or have special needs, and reinforcing the content across multiple contexts (Lee & Tu, 2016). Furthermore, digital media have helped in improving preschool children's motivation in ways that help them attend to and engage with educational materials (Lin, 2012; Verdugo & Belmonte, 2007; Yang & Wu, 2012).

Research on the use of digital media in early childhood education is still in its infancy. This is related in part to the debate about the appropriateness of using digital media for children under the age of five, the need for adequate professional development in utilizing digital media in the classroom, and teachers' attitudes and beliefs about these new resources (Billington, 2016; Johnston et al., 2018; Lindahl & Folkesson, 2012; Vidal-Hall et al., 2020). Furthermore, educators have found it challenging to integrate digital technologies into preschool classrooms in particular (Prestridge, 2017).

Although a majority of studies of classroom interventions that utilize digital media have focused on children in grades K through 12 (e.g., Blackwell et al., 2013; Lee et al., 2013), a few studies have examined its usage in preschool classrooms. Digital media was found to be effective in increasing science knowledge among 161 low- income 3-year olds, which also included English language learners and children with special needs (Lee & Tu, 2016). A small qualitative study of three 4-year-old children demonstrated how using iPads increased the prosocial behavior of sharing among the students (Ralph, 2018). A naturalistic classroom-based intervention of one teacher found that changing a teacher's skeptical beliefs about using digital media in early childhood education led to her ability to develop effective strategies to integrate digital media in her classroom (Vidal-Hall et al., 2020). In addition, digital storytelling was found to be more effective than traditional storytelling in increasing conceptual develop- ment among 146 preschool children in Turkey as a result of increased child motivation and focus as well as the format of combining video clips, music, drama, and visual images afforded by digital media (Kocaman-Karoglu, 2015). Overall, digital media has been found to strengthen young children's ability to transfer knowledge by combining art, drama, music, and movement with visual images (Sawyer & Willis, 2011).

Similar to the limited use of digital media technologies, preschool educational practices have not tended to make use of public television programming (Wartella et al., 2010). Beginning a decade ago, researchers showed interest in exploring supplementing preschool curriculums with media developed for public television. For example, researchers used content from Between the Lions (an educational program focused on phonics instruction) as a curriculum-supplement involving teacher training. They found positive results for both teachers' practices and early literacy outcomes (Linebarger, 2009; Prince et al., 2002). Video content from Sesame Street was also used suc- cessfully as part of a multimedia vocabulary intervention (Neuman et al., 2010). Penuel et al. (2012) conducted a study involving 80 preschool classrooms in New York and San Francisco using content from public education television as part of its digital media-rich supplement to literacy instruction. The authors integrated video content

from Sesame Street, Between the Lions, and SuperWhy! with online games and other teacher-led activities that did not involve digital media. Results indicated a positive impact on children's ability to learn the alphabet, the sounds of letters, and story and print concepts.

During 2020, the need for digital media became more urgent as instruction expanded to e-learning and online schooling during the COVID-19 pandemic. As a result, educators and parents have sought digital materials for educating preschool children via online platforms such as Google classroom and Zoom. Similarly, mental health professionals needed digital media materials to keep children engaged and motivated during teletherapy sessions. Digital media created by Sesame Workshop addresses the need for digital materials in the preschool classroom.

4 | SESAME WORKSHOP'S SESAME STREET MULTIMEDIA EDUCATIONAL MATERIALS

Sesame Workshop has been developing digital media programs for integration into classrooms since 1970 (Cole & Lee, 2016). These programs have been shown to be associated with gains in prosocial development (Zielinska & Chambers, 1995) and school readiness skills, including vocabulary, letters of the alphabet, early literacy, numeracy, and sorting and classification abilities (Ball & Bogatz, 1970; Rice et al., 1990; Wright et al., 2001). The Sesame Workshop digital media programs have also been found to correlate with high school science grades (Anderson et al., 2001).

More recently, Sesame Workshop produced a digital media educational toolkit, *Little Children, Big Challenges: General Resilience* (LCBC; Sesame Workshop, 2013), to foster social-emotional skills. The toolkit provides teachers with resources and video clips that enable them to take an interactive, multisensory, integrated pedagogical approach to help children cope with and understand challenging situations in the classroom and at home. To date, there has been no research on the effectiveness of this toolkit on improving SEL of preschool children.

5 | PURPOSE OF THE CURRENT STUDY

The purpose of this intervention study is to examine the usability and SEL outcomes of Sesame Workshop's LCBC toolkit in the classroom. Our hypotheses about the intervention were as follows:

1. The LCBC intervention will expand children's emotion vocabulary.
2. The LCBC intervention will improve children's social problem-solving skills.
3. The LCBC intervention will result in improved child initiative, self-control, adaptability, social skills, emotion regulation, attention problems, emotion control problems, withdrawal/depression, and lability/negativity.
4. The LCBC intervention will result in improved teacher–child relationships (greater closeness, less conflict, less aggression, and stronger attachment).
5. The teachers will find the LCBC intervention appealing, useful, and easy to implement.

6 | METHOD

6.1 | Design

A quasi-experimental cluster-randomized, pretest-posttest design was used to identify the unique effects of the LCBC toolkit by comparing it to Sesame Workshop's Healthy Habits for Life digital media toolkit for preschool classrooms (HH, Sesame Workshop, 2007). The HH toolkit was selected for the comparison group because it is

similar in format and structure, yet differs in that it focuses on developing children's healthy habits involving food choices and physical activity. Participating preschools were randomly assigned to implement either the LCBC toolkit (SEL intervention condition) or HH toolkit (comparison condition). Comparing the effects of the two Sesame Workshop multimedia toolkits enabled a strong test of the unique effects of the LCBC toolkit because teachers and children in both experimental conditions were exposed to similar training and experiences. This included teacher training on how to use digital media in the classroom, and exposure to Sesame Street characters, songs, classroom discussions, and hands-on activities. Comparing two different interventions controlled for aspects of attention, contact time with research staff, social support, follow-up times, and related factors since both the intervention and comparison conditions received the same treatment (Lindquist et al., 2007; Street & Luoma, 2002). Additionally, both toolkits were presented to teachers and parents as ways to increase the well-being or the general resilience of children. This means they could not determine from the forms they completed which specific outcomes were expected in the study. To further protect against response and expectation bias, preschool teachers and child evaluators were blind to which interventions were primarily under investigation in this study.

Before starting the study, a power analysis was conducted to determine the appropriate sample size for the Hierarchical Linear Model (HLM). Calculations indicated that we would need 700 preschool children from 140 classrooms within 35 schools to be able to detect a minimum effect size of .25. Sample size calculations were based on power analysis using Optimal Design (Raudenbush et al., 2011) with a specified power of .80 and alpha level of .05. The actual sample sizes were above these minimum requirements, indicating adequate statistical power for tests of the intervention effect.

6.2 | Setting and participants

Data were collected at 62 preschool sites in San Diego, CA, most of which were Head Start centers (61%, 38 schools). The remaining preschools were either public (15%, 9 schools), community-based (13%, 8 schools), or Military Child Development Centers (11%, 7 schools). Though 8 of the schools only had 1 classroom, other schools contributed between 2 and 4 classrooms, amounting to a total of 159 class groups involved in the study. Most of the classrooms (83.4%) were identified by teachers as multi-age rooms with 8.9% (N = 14) of the teachers reporting that the class was only same-age children. More than half (68.2%, N = 107) of teachers reported their classrooms dual-language, and 13.4% (N = 21) of teachers classified their classroom as English-only. The Creative Curriculum for Preschool was the core curriculum in the majority (70%) of classrooms.

Within each classroom, five to seven children were randomly selected from the class list to be assessed on the study outcomes after obtaining parental consent. Child participants met the following criteria: (a) between the ages of 2.9 and 5, (b) no prior exposure to either of the Sesame toolkits used in the study, (c) no language or speech impairment or other diagnosed disability, and (d) not referred for an evaluation for special services. Criteria *c* and *d* were included to control for language impairment as an extraneous variable and because the purpose of this initial study was to understand the effects of the SEL intervention on preschool children with normative memory and receptive/expressive language skills. All 3245 preschool children, regardless of disability status, in participating classrooms were involved in Sesame Street classroom activities.

Demographic information was collected from parents. Child ages ranged from 35 to 65 months, with an average age of 52.4 months (SD = 6.36). Data were collected from 354 boys (46.2%) and 412 girls (53.8%). Overall, the child participant sample was 49.6% Latino, 16.7% Biracial, 11.0% White, 7.6% African American, and 3.8% Asian. The remaining 11.4% were other or unknown ethnicities.

There were 157 teachers involved in the study. Two teachers had separate morning and afternoon sessions with different groups of children that were both part of 159 classrooms in the study. The teachers were 98.1% female (3 teachers were male). The majority of teachers (62.4%) were Latino, and the others were White (15.3%), African American (9.6%), Asian (9.6%), American Indian (1.3%), and Persian (1.3%). One teacher (0.6%) reported a

mixed ethnicity. The average teacher age was 41.58 years (SD = 10.0), and the average number of years teaching was 11.9 (SD = 7.5). Few of the teachers (1.9%) had earned a graduate degree, 40.8% had earned a bachelor's degree, 56.6% had earned an associate degree or some college credits, and 1 teacher did not have postsecondary education.

6.3 | Materials

The LCBC intervention and HH comparison condition had similar formats. Both toolkits included: (a) a Sesame Street DVD that features Muppet characters in different challenging situations and song clips; (b) a teacher educator guide with 60 mini-lessons and activities to be used daily for 12 weeks; and (c) an online toolkit version to accommodate a variety of technologies that could be used in the classroom (e.g., Smartboard, iPad, and computer).

6.4 | Intervention and comparison instruction

6.4.1 | Intervention instruction: *Little Children, Big Challenges: General Resilience Toolkit*

This multimedia educator's toolkit was designed to build social-emotional skills in preschool children by developing the key protective factors of teacher-child relationships, attachment relationships, emotion vocabulary, emotion regulation, social skills, social problem-solving skills, and adaptability. The toolkit had an English version and a Spanish version and both were made available to teachers. During the first 5 weeks of the exploring feelings unit, the children learned key vocabulary words and messages through movement and chants (Day 1 of each week); engaged in hands-on art activities, games, and stories to explore feelings (Day 2); applied emotion words to everyday routines (Day 3); viewed and interacted with Sesame Street videos to practice identifying feelings with the characters (Day 4); and reviewed concepts and shared their feelings with others throughout the day (Day 5). During Weeks 6–10 of the problem-solving unit, the children learned key vocabulary and emotion-related messages through movement and chants (Day 1 of each week); brainstormed solutions to a problem that a Sesame character had (Day 2); engaged in hands-on activities to explore problem-solving strategies (Day 3); watched and interacted with a Sesame Street video to see the plan used by a character to solve a problem (Day 4); and reviewed concepts learned and applied them to everyday routines (Day 5). During Weeks 11–12, activities involved reviewing the words and skills learned in the previous weeks.

6.4.2 | Comparison instruction: Healthy habits for life toolkit

The HH toolkit was developed by Sesame Workshop as a teaching resource to improve healthy food choices and increase the physical activity of preschool children. The toolkit had an English version and a Spanish version and both were made available to teachers. A multistate program evaluation of the HH toolkit showed that preschool children increased their interest in nutrition and exercise and talked more about these healthy habits after completing the toolkit (Andrews et al., 2009).

Classroom activities focused on body movements and physical activities (Weeks 1–3); nutritious food, healthy choices, and other movement activities (Weeks 4–6); integration of healthy food choices and physical activities (Weeks 7–9); and reviewing and celebrating what was learned throughout previous weeks (Weeks 10–12). During each week, the children learned a poem related to physical activity or healthy foods (Day 1 of the week), viewed or danced to a Sesame Street video (Day 2), participated in a hands-on activity (Day 3), played an outdoor game (Day 4), and participated in a circle time activity (Day 5).

6.5 | Measures

Outcome measures are organized according to domains corresponding to our hypotheses: (a) social-emotional learning, (b) positive behaviors, (c) problem behaviors, (d) relationship outcomes, and (e) teacher perceptions.

Socio-emotional learning was measured with direct assessments of children before and after the intervention. This included the Challenging Situations Test (CST, Denham et al., 2014). Scores equaled the number of times a sad or socially competent response was chosen by the child when presented with six scenarios. Also, an emotion vocabulary test was administered to determine if the children learned the specific words taught during the toolkit activities. All child assessments used in the study were available in English and Spanish. A certified professional translator provided Spanish translations and back translations on all assessments before using them in the study.

Positive behaviors, problem behaviors and relationships were measured by standardized teacher rating scales for individual children. The rating scale measures that were used for each hypothesis are presented in Table 1 along with information about the nature of each instrument, its observed reliability, and score interpretation. The test battery included scales from the following instruments: Devereux Early Childhood Assessment-Clinical Scale (DECA-C, LeBuffe & Naglieri, 2002), Emotion Regulation Checklist (ERC, Shields & Cicchetti, 1997), Behavior Assessment System for Children, 2nd Edition (BASC-2, Reynolds & Kamphaus, 2004), and Student–teacher Relationship Scale (STRS, Pianta, 2001).

Teacher perceptions were measured through a post-intervention questionnaire. The questionnaire asked about classroom practices, their thoughts about the usefulness and appeal of the toolkit, and perceptions of the toolkit's impact on the children.

6.6 | Procedure

6.6.1 | Pretesting of children

Between November of 2013 and January of 2014, the children were individually tested by trained bilingual (English/Spanish) or monolingual (English) evaluators who administered the Challenging Situations Test and assessment of emotion vocabulary knowledge in the child's most proficient language, as indicated by the teacher. When the child demonstrated a lack of proficiency in the language that was specified by the teacher, the child was assessed bilingually to best assess their skills; 33% of the children were tested in Spanish. Evaluators were blind to which experimental condition the child was assigned.

6.6.2 | Pretest teacher questionnaire and ratings of child behaviors and relationships

Teachers completed a paper-based questionnaire that assessed teacher and classroom practices and included behavioral rating scales for each of the participating children. Researchers directly collected the rating scales from teachers. The pretest phase of the study was conducted before teachers were randomly assigned to conditions and trained on their respective toolkit.

6.6.3 | Assignment to intervention and comparison conditions

Participating schools were randomly assigned to comparison or intervention conditions. We chose random assignment of schools to avoid the risk of contamination of information across classrooms within schools. Random assignment was conducted separately for Military Child Development Centers because of a difference in timing of

TABLE 1 Teacher rating scale outcome measures psychometric information

Subscale[Test]	Items	Scale	α	Description
Initiative [DECA-C]	11	5-point	.88	T-scores indicate a child's ability to use independent thought and action to meet his/her needs
Self-Control [DECA-C]	8	5-point	.88	T-scores indicate ability to experience feelings and express them in words and actions appropriately
Emotion Regulation [ERC]	8	4-point	.71	T-scores indicate child's ability to show adaptive regulation, situationally appropriate affective displays, empathy, and emotional self-awareness
Adaptability [BASC-2]	7	4-point	.85	T-scores indicate the child's ability to recover quickly after a setback and adapt to changes in routine, a shift from one task to another, and to share toys with other children
Social Skills [BASC-2]	6	4-point	.89	T-scores indicate a child's ability to show interpersonal aspects of social adaptation such as complimenting others, encouraging others, and offering assistance
Attention Problems [DECA-C]	7	5-point	.92	T-scores indicate difficulties in focusing on a task and ignoring competing stimuli
Emotion Control Problems [DECA-C]	8	5-point	.92	T-scores indicate a child's difficulty in controlling the overt expression of negative emotions such as have temper tantrums, and become easily upset, frustrated, or cry
Lability/negativity [ERC]	15	4-point	.87	T-scores indicate a child's tendency to show a lack of flexibility, mood lability, and dysregulated negative effect
Withdrawal/depression [DECA-C]	9	5-point	.82	T-scores indicate social withdrawal, self-absorption, and feelings of sadness
Teacher Closeness [STRS]	11	5-point	.73	T-scores indicate the degree to which a teacher experiences affection, warmth, and open communication with a particular student
Attachment [DECA-C]	8	5-point	.83	T-scores indicate child's mutual strong long-lasting relationships with parents or teachers
Teacher Conflict [STRS]	12	5-point	.87	T-scores indicate the degree to which the teacher perceives the relationship with a student as negative and conflictual
Aggression [DECA-C]	7	5-point	.88	T-scores indicate hostile or destructive acts directed at others or things

Abbreviations: BASC-2, Behavior Assessment System for Children Edition (Reynolds & Kamphaus 2004); DECA-C, Devereux Early Childhood Assessment Clinical Form (LeBuffe & Naglieri 2002); ERC, Emotion Regulation Checklist (Shields & Cicchetti 1997); STRS, Student Teacher Relationship Scale (Pianta, 2001).

the implementation described below. Given the existing sample size differences within schools, this resulted in 33 schools (53%) in the SEL intervention condition and 29 schools (47%) in the HH comparison condition. Table 2 shows the child demographics of each condition by school type.

6.6.4 | Teacher training

The training for teachers was developed for this study and included reviewing the Sesame Street classroom supplemental activities, practicing the implementation of activities, creating teacher materials that would be used in the classroom with the children, discussing how to incorporate the materials within their current curriculum, and resolving possible challenges to implementation.

All teachers attended a 6-hour training workshop on how to use and incorporate their assigned toolkit into their curriculum. Teachers were blind to whether they were in the control or the intervention group, but intervention teachers were trained in Little Children, Big Challenges: General Resilience and comparison teachers were trained in Healthy Habits for Life. Teachers were compensated $180 for attending the training associated with the study; except, in accordance with military regulations, Military Child Development Center teachers were not compensated for the training.

Teacher training began soon after the pretests were completed. Training occurred in January for nonmilitary preschools and in February for Military Child Development Centers. The delay in training teachers in the Military Child Development Centers was due to the more rigorous approval process for the military schools and was exacerbated by the government shutdown and layoffs in the fall of 2013. Teachers actively participated with the toolkit materials by watching video mini-clips, engaging in hands-on arts and craft activities, and participating in group discussions about classroom implementation. The training was evaluated by teachers according to the following criteria: organization of the trainer, usefulness of the content, clarity and effectiveness of the trainer, and the effectiveness of the visual materials. On a scale of 1 to 5, with 1 indicating poor and 5 indicating excellent,

TABLE 2 Child participants for comparison (HH) and intervention (SEL) conditions overall and by school type

	Overall		Community preschool		Head start		Military		Public preschool	
	HH	SEL	HH	SEL	HH	SEL	HH	SEL	HH	SEL
Age in months										
M (SD)	51.92 (6.4)	52.87 (6.3)	51.2 (7.4)	52.1 (6.7)	52.4 (6.1)	53.1 (5.8)	48.7 (7.1)	52.2 (8.1)	53.2 (4.9)	53.8 (5.3)
N	345	421	56	54	207	276	38	63	44	28
Female (%)	54.8	53.0	55.4	53.7	53.6	53.3	50.0	49.2	63.6	57.1
Latino (%)	46.4	52.3	60.7	90.7	48.3	51.8	10.5	14.3	50.0	67.9
Biracial (%)	16.5	16.9	16.1	3.7	15.5	17.8	29.0	25.4	11.4	14.3
Caucasian (%)	9.3	12.4	3.6	1.9	10.1	8.7	18.4	41.3	4.55	3.57
Black (%)	7.3	7.8	0.0	0.0	9.2	10.5	13.2	6.4	2.3	0.0
Unknown (%)	15.4	8.1	19.6	3.7	12.6	7.6	21.1	12.7	18.2	10.7
Asian (%)	5.2	2.6	0.0	0.0	4.4	3.6	7.9	0.0	13.6	3.6

Note: HH, Healthy Habits for Life Comparison; SEL, LCBC intervention.

intervention teachers ($M = 4.94$, $SD = .24$; $N = 112$) and comparison teachers ($M = 4.77$, $SD = .53$; $N = 99$) rated the training as excellent.

6.6.5 | Implementation

Most (91.8%) of the teachers utilized the English version of their assigned toolkit. Some teachers used both versions over the course of the intervention (4.1%) and some (4.1%) used only the Spanish version of the toolkit materials. Classroom activities were implemented daily for 10–15 min for 10 weeks at the Military Child Development Centers and 12 weeks in the other preschools. The delay in teacher training for Military Child Development Centers resulted in different implementation windows for those sites compared to the others. Specifically, other sites began integrating the Sesame Street toolkits in February and continued for 12 weeks through May 2014. The teachers in the Military Child Development Centers began in March and implemented the toolkit for only 10 weeks. The last 2 weeks of the toolkit were missed by the intervention and comparison Military Child Development Centers. However, since the last 2 weeks focus on reviewing concepts and vocabulary that were learned during the prior 10 weeks, we kept these sites in the data set given that the students were exposed to all content of the toolkits.

6.6.6 | Fidelity checks

During the implementation of the toolkit activities, research assistants conducted two fidelity checkpoints. The first checkpoint was in the second week and the second was between the sixth and eighth week for both conditions. Nearly all ($N = 153$, 97%) classrooms were observed once. In most instances ($N = 106$, 69%), the intervention activities were directly observed during the check; however, other times ($N = 47$, 31%) the observers rated other evidence available in the classroom, such as physical evidence of children's work, as well as children and teachers using the vocabulary and skills that were taught in the toolkit. For both types of evidence, the observers completed a rating scale that converted to fidelity and implementation scores by summing relevant items. No significant differences between the SEL intervention and HH comparison condition were found for fidelity ($t = 1.41$, $df = 104$, $p = .16$) or implementation ($t = 0.48$, $df = 103$, $p = .64$).

6.6.7 | Posttesting of children

Posttesting occurred after 12 weeks of implementation or 10 weeks for the Military Child Development Centers. Each child was posttested by the evaluators to assess emotion knowledge and social problem-solving skills. Of the 766 initial child participants, 99.5% were assessed at posttest. Attrition was attributed to transferring schools or being absent.

6.6.8 | Post-intervention teacher questionnaire

The researcher-developed teacher questionnaire was administered when the intervention ended. Of the 151 teachers that submitted a pre-intervention questionnaire, 146 (96.7%) submitted the post-intervention questionnaire. The teachers completed the DECA-C, ERC, BASC-2, and STRS teacher rating scales for each participating child in their classroom. After submitting posttest measures, the teachers received a $100 honorarium, except for the Military Child Development Center teachers.

6.7 | Data analysis

Hierarchical Linear Models were used to capture the nesting of observations in this cluster-randomized study. Separate HLM models were posed for each of the outcome measures to enable evaluation of the effect of the intervention on each outcome. We ran separate HLM models for each outcome for this initial effectiveness study to understand the effects of the intervention on distinct outcomes. For all outcomes, level one of the model captures scores for each student, and there is a single predictor variable, time, which was coded as 0 for initial baseline measurement (pretest) and 1 for the final assessment after the intervention (posttest). The school-level variable condition was coded as either 0 for the comparison intervention or 1 for the SEL intervention. The child's age variable was the grand-mean centered child age in months, where 0 is the average child age in months. Visual inspection of the distribution of child ages confirmed that the variable is normally distributed. There were nine children (1.1%) with missing birthdate information, and these children were dropped from the analysis. The child's gender variable was coded as 0 for male students and 1 for female students; complete data were obtained for gender. The school type variable captured differences across the four different types of schools included in the study: public preschools, Head Start centers, Military Child Development Centers, and community preschools. Head Start was selected as the reference group for this variable because it comprised the largest portion of the sample. Equation (1) shows the fixed and random parameters that were estimated.

$$
\begin{aligned}
Y_{itj} = &\ \gamma_{000} + \gamma_{100}(Time) + \gamma_{010}(Gender) + \gamma_{020}(Age) + \gamma_{030a-c}(School\_Type) \\
&+ \gamma_{001}(Condition) + \gamma_{110}(Time{*}Condition) + \gamma_{120}(Time{*}Gender) + \gamma_{130}(Time{*}Age) \\
&+ \gamma_{140a-c}(Time{*}School\_Type) + u_{00j} + r_{0ij} + e_{tij} + u_{10j} + r_{1ij}.
\end{aligned}
\tag{1}
$$

Parameters for the model are interpreted as follows: Y_{ijt} is the outcome score for student i, in classroom j, at time t; γ_{000} is the grand mean, the overall average pretest score; γ_{100} is the overall slope coefficient for Time, the non-randomly varying average change; γ_{010} captures the difference on average pretest scores for girls compared to boys; γ_{020} captures the amount of difference for every 1 month a child is older; γ_{030a-c} is the difference in pretest scores for public (γ_{030a}), MCDC (γ_{030b}), and community preschools (γ_{030c}) compared to Head Start centers; γ_{001} is the difference between control and intervention pretest means, note: this effect should be zero due to randomization; γ_{110} is the primary test of the intervention effect, it shows the difference in change over time across intervention and control classrooms; γ_{110} shows how change from pre to post differed for girls compared to boys; γ_{120} shows whether or not change over time differed for older children; γ_{130a-c} shows how change over time was different for public preschools (γ_{130a}), MCDC (γ_{130b}), and community preschools (γ_{130c}) compared to Head Start centers; u_{00j} is the random variance between classrooms at pretest; r_{0ij} is the variability within classrooms (between students) at pretest; e_{tij} is the within-student variance in scores from pre to post; u_{10j} is the random variance in classroom average change; r_{1ij} is the random student-level slope variability (within classrooms), capturing how differences in student characteristics affect the amount of pre-post change on SEL outcomes.

6.7.1 | Estimation

HLM models were analyzed using SAS/STAT® 15.1 software (SAS Institute Inc., 2018). Distributions of the outcome measures were all normal, except for the CST, which was positively skewed (it is essentially a count variable) and accordingly was analyzed with a generalized linear mixed model using SAS PROC GLIMMIX. Final models were run using PROC MIXED with Restricted Maximum Likelihood Estimation (REML). However, model comparisons involving fixed effects were examined using Full Maximum Likelihood Estimation (FIML) because REML models cannot be compared unless they differ only in random effects (Peugh, 2010). Cases that were missing pre- or post-outcome measures were included as this is an advantage of using HLM models to increase statistical power and reduce biased estimates and inflated Type I and Type II error (Bryk & Raudenbush, 1992).

6.7.2 | Model selection

Random effects were only included if model fit indices supported the more complex model. The random effects for slopes and intercepts were tested before determining which fixed effects to retain in the model according to the two-stage model building procedure (Raudenbush & Bryk, 2002). Decisions to retain random or fixed effects were made through formal comparisons of model-fit. These decisions were primarily determined by the log-likelihood ratio test (Raudenbush & Bryk, 2002) comparing the more complex model to a model with one of the effects constrained to zero. If the results of the chi-square test were significant ($p < .05$), the more complex model was championed. If the results of the test were borderline, AIC and BIC information criteria statistics were also considered. Specifically, differences in AIC and BIC statistics were computed for the two models, and the more complex model was retained if both indices strongly supported it. Strong support was defined as the more complex model being at least six points lower on the information criteria index (McCoach & Black, 2008; Raftery, 1995).

6.7.3 | Interpretation of model

Once the final model was determined for each outcome, we interpreted parameter estimates to see if scores differed across conditions, ages, genders, and school types in expected ways. We expected no difference on average scores across conditions at pretest due to randomization. We expected that SEL outcomes may be higher in older female students but did not expect the rate of change over time to be different across ages or genders. The hypotheses about the unique impact of the LCBC intervention on SEL, child behaviors, and relationships was addressed by determining the magnitude and significance of the condition-by-time parameter (γ_{110}). The null hypothesis was that average change over time would be the same across the randomly assigned conditions, indicating no difference in outcomes of the two interventions. Rejecting this null hypothesis is support for the unique effect of the SEL intervention on the outcomes. We computed a standardized mean difference (d-metric) effect size for the condition-by-time effect by dividing the condition-by-time parameter by the pooled within-group standard deviation (Feingold, 2013). This value is interpreted as the mean difference between the intervention and comparison condition at posttest after controlling for pretest and other variables in the model.

If the condition-by-time parameter was significant, we would identify the nature of the interaction by describing the pre-post change for each condition. We used LS means in SAS to estimate the group means and requested simple effect tests using SLICE command. We used Cohen's d mean difference effect sizes, but this time computed by dividing the difference of the estimated cell means by the pooled standard deviation at pretest to describe the magnitude and direction of change in each condition.

7 | RESULTS

7.1 | Descriptive statistics

Pretest data were collected from 766 children, of which complete data were obtained from 76% on all outcomes, 93% for the DECA-C scales, and 98% for the direct assessments (i.e., CST and emotion vocabulary test). Posttest data were collected from 765 children, of which complete data were obtained from 77% for the teacher rating scales and 95% for the direct assessments. No cases were removed because of extreme values. Table 3 shows the correlations among the positive behaviors and problem behavior measures, and these were as theoretically expected in that positive behaviors were negatively correlated with problem behaviors and positively correlated with each other. The strongest correlation was $r = .79$, and for the most part, correlations were moderate, supporting our view that the dependent variables are interrelated, but each captures a distinct social-emotional outcome. Table 4

TABLE 3 Intercorrelations of outcome measures at pretest for overall sample

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Emotion vocabulary														
2	Social problem-solving	**.08**													
3	Initiative	**.21**	.05												
4	Self-control	.07	.03	**.52**											
5	Emotion regulation	**.16**	.05	**.52**	**.41**										
6	Adaptability	**.08**	.03	**.56**	**.64**	**.53**									
7	Social skills	**.13**	.03	**.61**	**.48**	**.54**	**.53**								
8	Attention problems	**−.14**	.08	**−.31**	**−.59**	**−.27**	**−.35**	**−.39**							
9	Emotion control problems	.06	.04	**−.22**	**−.58**	**−.26**	**−.41**	**−.25**	**.64**						
10	Withdrawal/depression	**−.10**	.06	**−.43**	**−.38**	**−.58**	**−.39**	**−.46**	**.45**	**.45**					
11	Lability/negativity	−.02	.00	**−.22**	**−.64**	**−.38**	**−.44**	**−.30**	**.67**	**.72**	**.42**				
12	Teacher closeness	**.17**	.03	**.43**	**.43**	**.51**	**.43**	**.40**	**−.25**	−.14	**−.36**	**−.29**			
13	Attachment	**.10**	.00	**.65**	**.64**	**.52**	**.56**	**.58**	**−.30**	**−.21**	**−.42**	**−.29**	**.57**		
14	Teacher conflict	.01	.04	**−.20**	**−.57**	**−.32**	**−.38**	**−.27**	**.57**	**.68**	**.37**	**.79**	**−.28**	**−.29**	
15	Aggression	−.04	.06	**−.19**	**−.60**	**−.24**	**−.34**	**−.33**	**.74**	**.67**	**.43**	**.70**	**−.26**	**−.32**	**.63**

Note: Boldface coefficients are significantly different from zero ($p < .05$) for H_0: $r = 0$.

shows the means and standard deviations for the outcomes of each condition at both observation points. The percentage of pretest scores with a matching posttest score was greater than 83% for all scales. Matched pairs were available for 90% or more of the direct child assessments, BASC and DECA-C measures.

7.2 | HLM

The intraclass correlation coefficients at the classroom level were all greater than .18, confirming the need for a hierarchical model. Slopes were non-randomly varying according to the factors in the model because random effects for slopes (u_{10j} and r_{1ij}) were not supported. For all outcomes, we utilized an intercepts-only 2-level model with three random effects (r_{0ij}, u_{00j}, and e_{tij}) corresponding to a model in which pre-post scores are nested within students and students are nested within classes. Table 5 shows fixed-effect parameter estimates for the fixed effects covariates in the HLM model.

TABLE 4 Descriptive statistics at pretest and posttest by condition

| | Comparison | | | | | | SEL intervention | | | | | |
| | Pretest | | | Posttest | | | Pretest | | | Posttest | | |
	N	M	S	N	M	S	N	M	S	N	M	S
Emotion vocabulary	340	.16	.10	349	.20	.09	411	.18	.10	381	.33	.19
Social problem-solving	341	.71	1.06	352	.91	1.30	418	.66	.98	400	1.01	1.22
Initiative	335	53.3	10.0	355	55.8	10.3	395	52.5	9.3	397	57.4	9.5
Self-control	327	57.1	10.6	347	58.2	11.1	394	55.7	10.0	396	59.1	10.5
Emotion regulation	325	25.6	3.5	318	26.4	3.4	394	26.0	3.6	368	27.2	3.6
Adaptability	328	50.7	8.7	347	51.3	9.5	395	50.4	8.4	397	52.5	8.1
Social skills	328	54.5	9.5	348	58.5	9.7	396	55.3	9.3	397	58.5	10.1
Attention problems	328	43.4	11.3	347	42.7	10.9	392	43.9	11.4	395	42.5	11.3
Emotion control problems	334	39.8	10.6	355	39.8	10.0	397	41.0	10.6	397	40.5	10.7
Withdrawal/depression	336	44.6	10.3	355	43.0	10.0	395	43.2	10.4	397	41.9	10.3
Lability/negativity	309	24.4	7.1	330	23.7	6.4	378	24.6	6.5	383	23.3	6.6
Teacher closeness	339	45.4	5.7	351	46.4	5.7	412	45.5	5.8	400	46.3	6.0
Attachment	327	52.6	9.8	347	53.5	10.6	392	52.1	9.6	396	55.2	10.1
Teacher conflict	339	17.3	6.8	353	17.5	6.8	412	18.0	7.1	400	17.3	6.3
Aggression	327	40.5	9.9	347	39.9	9.5	392	41.2	9.8	396	41.2	9.9

7.2.1 | Age, gender, and school types

Child age (γ_{020}) was a significant predictor of pretest scores for all outcomes except social problem-solving skills and adaptability, such that older children exhibited more positive behaviors, fewer negative behaviors, and better relationship indicators than younger children. Older children also made significantly greater gains over time with respect to initiative, social skills, emotional vocabulary, social problem solving, and teacher closeness.

Pretest scores differed across girls and boys (γ_{010}) for the outcomes except for social problem-solving skills and withdrawal/depression. Girls exhibited greater positive behaviors, fewer problem behaviors, and better relationships at pretest. Being a girl was also associated with greater increases in teacher closeness and emotion vocabulary.

Results showed a few differences across school types. Classrooms in the public schools were the most similar to the Head Start schools, which we identified as the reference group, because the only difference at pretest was slightly lower social skills. Community-based preschools were also similar to the reference group at pretest except that their gain on social skills tended to be lower and scores on attention problems and aggression tended to be higher. The biggest difference was between school types, with children in Military Child Development Centers scoring higher in problem behaviors except for withdrawal/depression and more teacher conflict and aggression. Additionally, children in Military Child Development Centers had smaller gains on average in positive behaviors and positive relationship indicators than the reference group across conditions. In contrast, gains were similar across public, community, and Head Start preschools, with a few differences noted in Table 4.

TABLE 5 HLM model results: Parameter estimates for covariates

| | School type | | | | | | Gender | | Age | |
| | Community | | Military | | Public | | (Female) | | (months) | |
	γ_{030a}	γ_{130a}	γ_{030b}	γ_{130b}	γ_{030c}	γ_{130c}	γ_{010}	γ_{110}	γ_{020}	γ_{120}
Emotion vocabulary	−0.02	0.02	0.03	**0.15**	-<0.01	0.02	**0.03**	**0.03**	**<0.01**	**<0.01**
Social problem-solving	−0.09	**0.43**	**0.38**	0.25	0.16	−0.02	0.09	0.20	<0.01	**0.05**
Initiative	0.99	−1.30	0.38	**−3.36**	−1.07	2.09	**3.10**	−0.82	**0.52**	**−0.13**
Self-control	0.29	−1.20	−2.58	**−2.42**	−0.97	**3.11**	**2.86**	−0.24	**0.25**	0.05
Emotion regulation	0.50	**−1.08**	0.64	**−1.40**	0.73	−0.08	**0.82**	−0.19	**0.11**	−0.04
Adaptability	0.26	−0.77	−1.50	−1.08	−1.69	1.78	**1.98**	−0.21	0.07	0.03
Social skills	−2.97	**−2.27**	0.04	**−2.38**	**−3.53**	2.31	**2.81**	0.04	**0.17**	**−0.12**
Attention problems	**3.80**	0.34	**5.02**	0.02	0.79	−1.75	**−3.68**	0.01	**−0.33**	0.02
Emotion control problem	0.77	0.08	**6.57**	−1.22	−0.53	**−1.83**	**−2.42**	0.59	**−0.18**	−0.04
Withdrawal/depression	0.13	**3.12**	2.42	1.56	−1.56	−0.22	−1.04	−0.14	**−0.24**	0.08
Lability/negativity	0.73	<0.01	**2.35**	0.58	−1.51	−0.19	**−2.11**	0.04	**−0.09**	−0.01
Teacher closeness	−0.79	−0.38	0.06	**−2.38**	1.67	0.71	**0.92**	0.79	**0.16**	**<0.01**
Attachment	−1.01	−1.00	0.79	**−4.38**	−2.59	**2.60**	**2.57**	−0.61	**0.21**	−0.02
Teacher conflict	1.02	−0.06	**2.95**	−0.44	−0.91	−0.94	**−1.28**	**−0.19**	**−0.10**	0.01
Aggression	**2.86**	0.11	**5.46**	−1.09	0.63	−1.36	**−2.28**	0.03	**−0.11**	0.07

7.2.2 | Differential effects across conditions

Table 6 shows the results of the F-tests for the condition-by-time interactions for each outcome, which provides evidence of the SEL intervention effects. Exact *p*-values are reported and show that the SEL intervention had a significant effect for 10 of the 15 outcomes when using conventional alpha of $p < .05$. The condition-by-time was above .05 for social problem-solving skills and social skills scores; surprisingly, there was similar statistically significant growth in both conditions. Additionally, the effect of the SEL intervention was not significant for withdrawal/depression, teacher closeness, and aggression. However, for these three outcomes, the change in means was nonsignificant in the comparison HH condition and significant in the expected direction in the SEL condition. In other words, the hypothesized pattern of means was observed, but the effect size was smaller than expected, meaning that a Type II error could have occurred.

The effect sizes computed on the *d*-metric indicate the difference in the change scores from the two conditions in standard deviation units. According to Cohen's benchmarks of effect sizes, around .2 are considered small, those closer to .5 are considered medium, and .8 and above are considered large. Effect sizes for each outcome are shown in Table 6. Except for emotion vocabulary, the effect sizes for this study would be classified as small effects, corresponding to roughly a quarter of a standard deviation of difference in change on average (absolute values ranged from .14 to .29).

TABLE 6 HLM model results: Intervention effects

	Condition × Time					Comparison	SEL
	Df_d	F	p	b	d	Δ_{M2-M1}	Δ_{M2-M1}
Emotion vocabulary	776	101.4	<.001	**.10**	.88	**0.07**[a]	**0.17**[a]
Social problem-solving	798	0.2	.653	.047	.14	**0.32**[a]	**0.36**[a]
Initiative	794	16.1	<.001	**2.66**	.28	**1.93**[a]	**4.59**[a]
Self-control	763	18.1	<.001	**3.02**	.29	0.60	**3.62**[a]
Emotion regulation	754	4.96	.026	**0.59**	.17	0.42	**1.01**[a]
Adaptability	789	9.64	.002	**1.93**	.23	0.29	**2.22**[a]
Social skills	785	0.91	.341	**0.66**	.07	**2.65**[a]	**3.32**[a]
Attention problems	740	10.81	.001	**−2.13**	−.19	−0.26	**−2.40**[a]
Emotion control problems	762	9.39	.002	**−1.99**	−.19	0.48	**−1.51**[b]
Withdrawal/depression	787	2.44	.118	−1.13	−.17	−0.28	**−1.43**[c]
Lability/negativity	705	7.74	.006	**−1.08**	−.14	−0.10	**−1.18**[a]
Teacher closeness	817	0.16	.691	0.16	.03	0.62	**0.78**[c]
Attachment	800	13.23	<.001	**2.73**	.28	0.17	**2.90**[a]
Teacher conflict	775	12.16	<.001	**−1.51**	−.22	0.52	**−1.00**[b]
Aggression	749	3.49	.062	−1.10	−.11	0.19	**−1.00**[c]

[a]Bold indicates statistical significance H_0: = 0 for p < .001.

[b]Bold indicates statistical significance H_0: = 0 for p < .01.

[c]Bold indicates statistical significance H_0: = 0 for p ≤ .05.
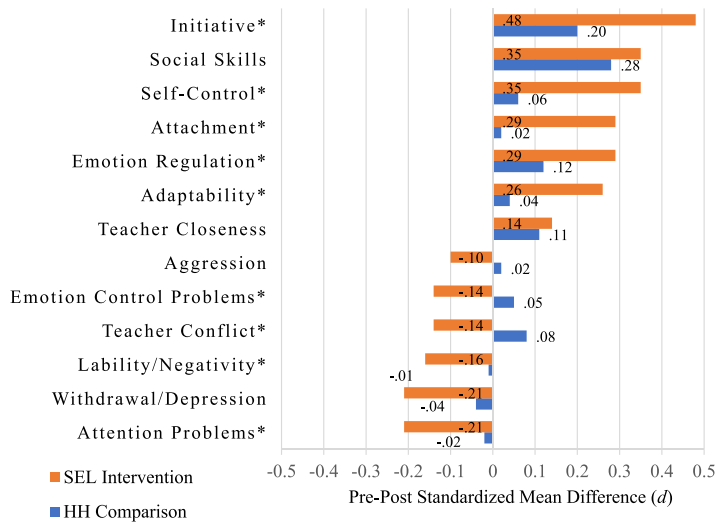
FIGURE 1 Pre–post mean difference effect sizes (d) for the social-emotional learning (SEL) intervention and comparison conditions. Asterisks indicate significant differences between conditions. Outcomes sorted by size of effect in SEL condition. HH comparison values for emotion vocabulary and social problem-solving skills (not shown due to scale range) were d = .61 and d = .94, respectively. SEL intervention values for these assessments were d = 1.48 and d = 1.05, respectively [Color figure can be viewed at wileyonlinelibrary.com]

7.3 | Examination of statistically significant condition-by-time interactions

To determine the nature of the significant intervention interaction effects, the standardized pre-post difference effect sizes were computed and compared for each condition. Positive *d* values would indicate that scores increased from pre- to post- and negative *d* values would reflect score decreases. Figure 1 depicts the comparisons by plotting the *d* effect sizes for each condition. The following is a summary of the results.

7.3.1 | Social-emotional learning outcomes

The positive gains in emotion vocabulary knowledge were large (*d* = 1.48) in the SEL intervention condition and medium-sized in the comparison HH condition (*d* = .61). The evidence supports the first hypothesis because the SEL intervention resulted in greater learning of emotion vocabulary. For the second hypothesis, the effect of the SEL intervention on improving social problem-solving skills was not significant.

7.3.2 | Behavioral outcomes

The SEL intervention was associated with greater increases in positive behaviors for all outcomes with significant interaction effects. Initiative increased a medium amount in the SEL intervention condition (*d* = .48) compared to a small effect (*d* = .20) in the comparison HH condition. Self-control had the next biggest effect in the SEL condition (*d* = .35) and a very small effect in the comparison HH condition (*d* = .06). In the SEL condition, adaptability and emotion regulation both increased a small significant amount (*d* = .26 and *d* = .29, respectively) compared to non-significant changes in the comparison HH condition. Overall, the SEL intervention increased the children's ability to engage in positive behaviors and, specifically, initiative, self-control, emotion regulation, and adaptability.

For each problem behavior, the SEL intervention was associated with small but significant declines whereas change from pretest to posttest was nonsignificant and tiny (*d* < .10) in the comparison HH condition. Overall, these results support the third hypothesis as the SEL intervention improved child behavior.

7.3.3 | Teacher–student relationship outcomes

In the SEL intervention condition, attachment increased a moderate amount (*d* = .29), whereas there was no significant gain in attachment (*d* = .02) in the comparison HH condition. Teacher conflict decreased a small significant amount in the SEL intervention condition (*d* = −.14) and increased a very small nonsignificant amount in the comparison HH condition (*d* = .08). Taken together, the relationship outcome results provide support for the SEL intervention as effective in improving relationships, supporting the fourth hypothesis.

7.4 | Post-Intervention survey of teachers

To address our fifth hypothesis, we examined teacher responses to the post-intervention survey and compared them across SEL intervention and comparison HH conditions. The survey results describe teacher characteristics and consistently supported our hypothesis that teachers would find the toolkit to be appealing, useful, and easy to implement.

7.4.1 | Teacher characteristics

Results showed that teacher characteristics were not different across conditions, including teacher ethnicity ($\chi2$ = 5.2, df = 6, p = .52), teacher education level (χ^2 = .09, df = 1, p = .76), teacher age (t = .52, df = 141, p = .60), years of experience teaching preschool (t = .49, df = 151, p = .63), and months in current teaching position (t = 1.57, df = 149, p = .12). Across conditions, the teachers were equally well satisfied with their existing social-emotional curriculum (t = −1.09, df = 134, p = .28) and before the study had about the same previous experience with implementing social-emotional curricula (t = .28, df = 116, p = .77).

7.4.2 | Digital media use

We examined the teachers' reported utilization of the toolkit components across conditions. All but two teachers who responded to this question reported using the Educator's Guide. No significant difference across conditions was found in the proportion of teachers using the digital media DVD (χ^2 = .96, p = .33). Overall, 96% (N = 140) of teachers used the digital media DVD. Additionally, the intervention conditions were not different in terms of how many of the teachers used the available online resources (χ^2 = .75, p = .39). Overall, 62% of teachers used online resources. It may be that this lower usage was because they were provided the printed materials.

7.4.3 | Overall quality ratings

The post-intervention survey asked teachers to rate several aspects of the quality of the toolkits. Figure 2 displays the average agreement rating and shows that the two toolkits were comparable in quality. The average ratings were not different across conditions (p > .16) except that the HH Comparison was viewed as slightly more "boring" (t = 1.95, df = 143, p = .053) and SEL had a higher rating for "excellent" (t = −2.22, df = 142, p = .03). The positive
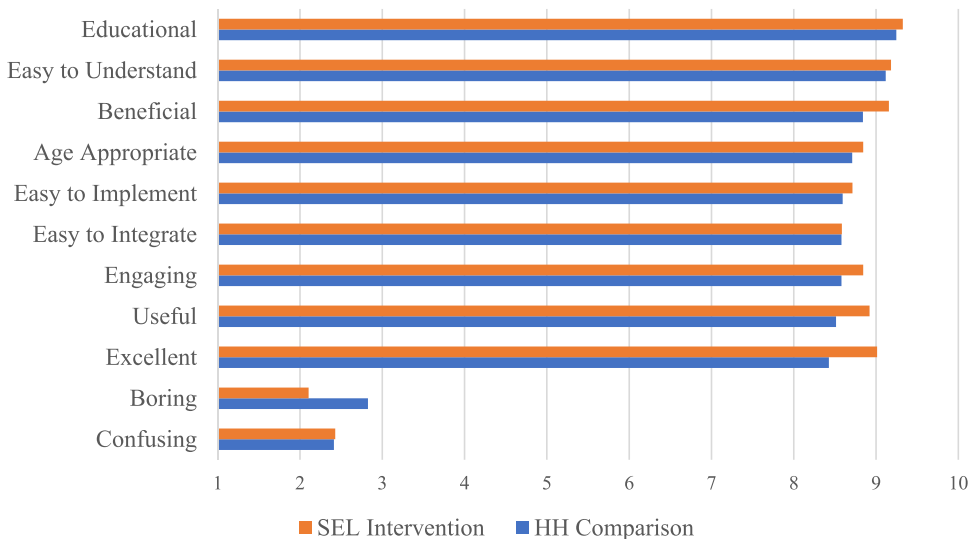

FIGURE 2 Ratings of intervention qualities by teachers post-intervention (N = 146). Ratings were on a scale with 10 indicating strong agreement and 1 indicating strong disagreement [Color figure can be viewed at wileyonlinelibrary.com]

descriptors (excellent, easy to integrate, easy to implement, engaging, educational, age appropriate, beneficial, easy to understand, and useful) were strongly endorsed with averages above 7 on a scale of 1 = "strong disagreement" to 10 = "strong agreement." Teachers disagreed with the negative descriptors of the toolkit (boring, confusing) and the average rating was below 3 on the 10-point agreement scale.

7.4.4 | Toolkit appeal

Results showed no difference across conditions on average ratings of how much teachers and children liked the toolkits. On a scale of 1 to 10, with 10 as "liked a lot," the average rating in the SEL condition was 8.8 (SD = 1.6), which was not different (t = −.80, df = 143, p = .42) than the average in the comparison HH condition (M = 8.6, SD = 1.4). Teachers rated the appeal of each toolkit component separately using a scale of 1 = "not at all appealing" to 5 = "extremely appealing." The appeal ratings were not different across conditions for the online resources and training webinar. However, the DVDs were rated as more appealing (t = −2.54, df = 144, p = .012) in the SEL intervention condition, where the average rating was 4.43 (SD = .98) compared to 3.94 (SD = 1.33) in the comparison HH condition. The educator's guide was rated slightly higher (t = −2.50, df = 142, p = .014) for the SEL intervention condition, where the average rating was 4.00 (SD = 1.18) compared to 3.43 (SD = 1.57) for the comparison HH condition. Both toolkits were reported to be well liked by the children, with the average rating in the SEL condition being 9.2 (SD = 1.5), which was not different (t = −.84, df = 139, p = .40) than the average in the comparison HH condition (M = 9.0, SD = 1.6).

7.4.5 | Usefulness

In both conditions, the teachers rated the toolkit components on a scale of 1 = "not useful" to 5 = "very useful." The teachers in both conditions rated the videos, songs, and educator's guide as useful (M > 4.17). The video clips were rated as more useful in the SEL intervention condition than in the comparison HH condition (t = 2.10, df = 141, p = .037). The ratings were not different for the educator's guide (t = −1.76, df = 142, p = .08), songs (t = 1.74, df = 143, p = .08), and online resources (t = −0.76, df = 140, p = .45). Notably, the online resources were rated less useful than the other components in both conditions, with means of 2.16 (SD = 2.12) and 2.43 (SD = 2.11), because teachers were also provided with hardcopies of the materials. The toolkits were perceived as helpful or very helpful and ratings were equal with 4.25 (SD = .70) in both conditions (t = −0.03, df = 139, p = .98).

7.4.6 | Perceived impact

Regarding the transfer of skills to the home, results showed that 86.7% of teachers in the SEL intervention condition reported hearing from parents that children showed better social-emotional skills at home. In the comparison HH condition, only 59.1% of teachers reported this kind of parent feedback ($\chi2$ = 13.8, df = 1, p < .001). Findings further indicated significant differences between conditions ($\chi2$ = 24.2, df = 1, p < .001), with 96.0% of teachers in the SEL intervention condition believing that the toolkit increased how much the children talked about emotions and feelings outside of Sesame Street time compared to 62.9% in the comparison HH condition.

When asked how much it increased constructive problem solving, a significant difference in conditions was found (t = −3.68, df = 125, p < .001), with the teachers in the SEL intervention condition providing higher average ratings of 1.99 (SD = .75) on a 3-point scale compared to 1.41 (SD = 1.0) in the comparison HH condition. When asked how much of an overall impact the toolkit would have on children's ability to handle challenges in everyday life, 100% of teachers in both conditions indicated that the toolkit would have at least some impact. On average, the

rating for the amount of impact was 3.96 ($SD = .74$) in the SEL intervention condition and 3.81 ($SD = .81$) in the comparison HH condition; however, this difference was not statistically significant ($t = -1.17$, $df = 136$, $p = .24$). Teachers also reported feeling that the toolkit would have an impact on how much they will include resilience-building activities in their classrooms in the future; there was a significant difference ($t = -2.30$, $df = 133$, $p = .02$) in ratings across conditions, with higher ratings for the SEL intervention condition ($M = 4.16$, $SD = .74$) and lower for the comparison HH condition ($M = 3.82$, $SD = 1.0$).

8 | DISCUSSION

The findings show the potential benefits of using Sesame Workshop's LCBC digital media toolkit for teaching SEL skills and improving preschool children's social-emotional behavioral outcomes. Observed benefits of the intervention include improved initiation, self-control, attachment, emotion regulation, and adaptability. Additional benefits were decreased attention problems, emotional dysregulation, and teacher–student conflict. The intervention was not only beneficial, but also reported to be useful and appealing. The post-intervention survey showed that nearly all the teachers used the video clips and found that the materials were appealing and liked by the children. Overall, this initial empirical evidence of the effectiveness of the LCBC toolkit as a classroom digital-media SEL intervention is promising, especially since these findings represent stand-alone intervention effects without additional benefits of intervention support systems (e.g., teacher mentoring, coaching, and follow-up meetings).

8.1 | Comparison of LCBC and other SEL interventions

The LCBC digital media intervention effect sizes were compared with those reported by other well-known SEL interventions. The What Works Clearinghouse (2015) intervention report indicated that Head Start, by itself, had no discernible effect on children's social-emotional development. However, the Head Start Classroom-based Approaches and Resources for Emotion and Social Skill promotion (CARES) programs provided consistent evidence of effectiveness for three social-emotional enhancements implemented in Head Start (Morris et al., 2014). These programs included Incredible Years, Preschool Paths, and Tools of the Mind-Play. We also compared LCBC to the Head Start REDI intervention (Bierman et al., 2008) that focused on social-emotional competencies.

LCBC had a larger effect size ($d = .88$) on Emotion Vocabulary compared to the other SEL programs measures of emotional knowledge ($d = .12$ to $.29$). This may be because the vocabulary measure focused on the specific emotion words learned through the LCBC intervention; LCBC focused on teaching children to identify emotions demonstrated by facial expressions and body language and also directly taught the corresponding vocabulary word. Although children had no prior experience with the photos of facial expressions that were used in the measure, children in the SEL condition demonstrated competence at discerning happy, thrilled, ecstatic, sad, disappointed, miserable, mad, frustrated, and furious, as well as their nuances. Emotion knowledge had the largest effect that was obtained for the LCBC intervention. The effect sizes for the behavioral teacher rating scale outcomes were much smaller ($d = .17$ to $.29$) compared to the vocabulary outcomes. This is not surprising because direct child measurement tasks have been found to have higher effect sizes compared to observer or teacher and parent ratings (Murano et al., 2020).

The second largest effects of the intervention (see Table 6) were for the increases in positive behaviors. These increases were in preschool children's initiative ($d = .28$), self-control ($d = .29$), attachment ($d = .28$), and adaptability ($d = .23$). Measuring positive behavioral outcomes was one of the strengths of this study, as these were not measured in previous SEL interventions. Positive behaviors are an expected outgrowth of children's increased ability to identify and have words for emotions. Also, implementing strategies such as Breathe, Think, Do allow

children to recover from upsets and disappointments. All of these skills undergird better social relations and attachment.

The effect size for emotion regulation ($d = .17$) was slightly lower than other positive behaviors. Nonetheless, the results here are consistent with research that has found that greater language skills are associated with greater emotion regulation (Eisenberg et al., 2005; Oades-Sese et al., 2011). As shown in prior research, children who have a better linguistic understanding of emotions are better able to use effective regulatory strategies in any given social context; conversely, children with poor regulatory skills are also likely to have poor language skills. This association is most likely bidirectional in nature in that well-regulated children are likely to engage in language-rich conversations with teachers and peers, offering frequent practice and reinforcement of both skills.

The effect sizes were slightly smaller with problem behaviors than seen with the positive behaviors. Teacher conflict decreased ($d = -.22$), another bidirectional impact, as consistent responsiveness from teachers promotes secure attachment, which enhances communication abilities in children (Murray & Yingling, 2000; Van Ijzendoorn et al., 1995). LCBC had a small impact on reducing preschool children's emotion control problems and dysregulation ($d = -.14$ to $-.19$). This is more than has been seen with other SEL programs: Incredible Years ($d = -.06$), Preschool Paths ($d = -.04$), and Tools of the Mind-Play ($d = .02$), which had no significant impact. LCBC also had an impact on preschool children's attention problems and attention ($d = -.19$) and this effect is comparable to Head Start REDI ($d = -.10$). A recent SEL meta-analysis reported effects as large as $g = .32$ for attention problems (Murano et al., 2020). The large effect size was due to interventions that also involved parents and, thus, would be expected to have greater effects.

Although nonsignificant in this study, the effect size we observed for social problem-solving skills ($d = .14$) was also comparable to previous research of Incredible Years ($d = .14$) and Preschool Paths ($d = .17$). Tools of the Mind-Play had a negligible impact ($d = .04$) on this skill. The Head Start REDI program had the largest, most practically significant impact compared to other SEL interventions ($d = .21$ to $.35$). When compared to Head Start REDI, LCBC's smaller effect size on social problem-solving skills may be due to differences in the length of the intervention, age range of the children, and nature of social situations presented in the video clips. LCBC was a short-term intervention compared to the year-long Head Start REDI program. Learning and applying social problem-solving skills may require more time to develop and practice. Also, the problems or solutions presented in the CST differed in the situations presented in LCBC, potentially lowering the effects. For example, LCBC focused on saying goodbye during the first day at school, taking turns, joining a playgroup already in progress, sharing, and dealing with frustration when learning a new skill.

8.2 | Utility and appeal of the digital media toolkit

Results of the post-intervention survey showed that teachers had a very positive reaction to the toolkit materials and activities. This strong teacher response may be because teachers were familiar with Sesame Street characters from their own childhoods. Children also may have found LCBC appealing because most are exposed to Sesame Street characters well before entering preschool. Pedagogically, this allows for an easy transition of these characters as familiar playmates from the home into a school setting. In this sense, the Sesame Street characters constitute what we called a "virtual transitional object," which is a psychological use of an object within a digital space between environments. The meaningful social-emotional relationships established between the media characters and children, referred to as parasocial relationships, have been shown to facilitate better learning (Gola et al., 2013; Hoffner, 1996).

Technology was limited or lacking in a few of the schools that participated in the project. Schools were proactive in gaining access to technology. However, two classrooms implemented without using the digital media components, which was unfortunate because one of the inherent features of digital media technologies is the diversity of formats in which content can be shared, allowing educators to better accommodate children with

different learning needs. Nevertheless, technology use was not a significant limitation of the study as nearly all teachers were able to implement the toolkits by using their smartboards, iPads, computers, laptops, or television sets. Given that the video clips were brief, the teachers were amenable to implementing them in the classroom and rated the video clips for both toolkits as highly appealing.

9 | LIMITATIONS AND FUTURE DIRECTIONS

Contrary to our expectations, the effects of LCBC on social problem-solving skills and social skills were not significantly different from those found in the comparison group. Both toolkits demonstrated positive growth in social skills, with LCBC (d = .35) having only slightly more growth than HH (d = .28). Similarly, growth in social problem-solving skills was observed in both conditions, with LCBC (d = 1.05) and HH (d = .94) having similar effect sizes. There may be an overlap between the LCBC and HH toolkits in terms of fostering positive interaction among peers. For example, the Social Skills measure evaluates behaviors such as helping others, using table manners, complimenting others, and saying please/thank you. The increase in the HH condition could have occurred because engaging in the toolkit activities fostered positive social interactions in the classroom, even though this was not part of the goals of the toolkit. Alternatively, it could be that the increase seen in both conditions captured typical developmental growth in preschool. Comparisons with a pure control group, that had no special treatment program, would allow us to estimate the normal developmental growth on these constructs and compare that to growth seen in the conditions implementing a toolkit. Unfortunately, we did not include a pure control group in our study as our participating schools were not amenable to having classrooms receive no training and intervention and it was most imperative to include a comparison condition that would hold constant the influence of Sesame Street program due to the likely effects of the digital media, engaging characters, classroom activities, teacher training, and attention from researchers. The effect sizes in this study only show the impact of the intervention above and beyond the more generally positive effects of using an engaging media-rich curriculum. Certainly, the inclusion of a third group of classrooms without any intervention would have been ideal.

Considering the number of outcomes examined in this study, seeing statistically significant results by chance would not be unexpected. However, the majority of the effects were significant using the most conservative alpha level of $p < .001$, somewhat reducing concerns about Type I error. The exceptions to this were Emotion Regulation (p = .026) and lability/negativity (p = .006). It is encouraging that these two ERC subscales showed a change in the hypothesized direction, and corresponding DECA scales (Self-Control and Emotion Control Problems) showed significant effects as well. However, we recommend replication research to confirm our conclusions from this study. Specifically, given that the current study identified numerous outcomes of the LCBC intervention, future research could use multilevel structural equation modeling to account for measurement error and examine the relationships between variables of interest, including testing the program theory of change or exploring moderation and mediation in outcomes.

The delayed timing of including MCDC was a limitation of the study. Going through the IRB-related approval process was extensive and lengthy due to U. S. Department of Defense regulations. Government furloughs and shutdown during the time of the study significantly contributed to the delay of their participation. It was a year-long process, which resulted in a shortened intervention application of 10 weeks instead of the anticipated 12 weeks. Furthermore, it would have been beneficial to measure classroom quality with an observation tool, but it was not feasible given the budget and time constraints.

Emotion vocabulary measures for the emotion words of interest to our study were not available. Accordingly, we developed our own measure to assess whether children learned the intended emotion vocabulary through recall and identification. Thus, the large effect sizes may be due to our assessment of the same words that were used during the intervention as opposed to using a broader, standardized measure of emotion vocabulary. Alternatively,

results from the CST may not have adequately captured the social problem-solving skills that children gained through the LCBC intervention because of limitations in instrument alignment to intervention outcomes.

The results of this initial study of the LCBC intervention are encouraging and warrant continued research. Several avenues for future research are clear. First, a longitudinal study examining how effects persist over time would further illuminate the benefits of using this toolkit. Also, the inclusion of at least a third time point in a future study would enable a better understanding of the nature of change in these social-emotional outcomes.

Second, given our survey data indicated that 86.7% of teachers heard from parents that improvements were observed at home, there is an opportunity for future research to examine how much the effects can be augmented by adding a parent component to the intervention. This additional intervention component would reinforce learning and could magnify intervention effects substantially. Findings from a meta-analysis on preschool SEL programs suggest that parental involvement is key to strengthening universal SEL interventions in that larger effect sizes were found in reducing problem behaviors (g = .32) in 15,498 preschool children for SEL interventions that also had parent training components in social-emotional skills (Hedges's g = .34) (Murano et al., 2020). Similarly, although findings have been mixed, adding a teacher-coaching/mentoring component and follow-up meetings to future studies may be beneficial to improving the fidelity of the implementation and potential longer-term effects (Bierman et al., 2008; Penuel et al., 2012).

A third area for future research would be to examine the impacts of the intervention on specific populations. A limitation of this study is that we did not include students with disabilities in our evaluation and thus our results may not generalize to all students and a future study is needed to targeting children with disabilities. We were able to include in our current study English/Spanish bilingual children, trained bilingual evaluators, and bilingual measures. This is a strength of this study because the study was representative of the linguistically diverse children in the preschools. Previous studies with this population (Oades-Sese et al., 2011) have found that over 60% of young English language learners are not proficient in either language during the preschool years. To ensure accurate assessment of the children's performance, we evaluated children in the language in which they were most comfortable and proficient, or bilingually when it was not clear. Future research could explore differences in intervention outcomes for English language learners and bilingual children. This study included military preschools that are an understudied setting. This is the first study that implemented and examined an SEL intervention in Military Child Development Centers. Given the small sample, future studies should examine the effects of LCBC on children in this setting, given the unique challenges experienced by military school staff, children, and families.

10 | CONCLUSION

SEL has been found to be critical for supporting early and later academic success and mental health (Eisenberg, 2006; Guerra & Bradshaw, 2008). Better academic learning and improved interpersonal relationships with teachers and peers result in enhanced early school experiences (e.g., student engagement, better grades, participation, and reduced behavioral problems). Positive behaviors elicit consistent responsiveness from teachers, which promotes secure attachment, enhancing communication and language abilities in children (Murray & Yingling, 2000; Van Ijzendoorn et al., 1995).

The present study adds to the evidence that SEL can be intentionally engendered in the preschool classroom through the teaching of emotional vocabulary, deep-breathing, and social problem-solving skills. In addition, the study exhibits the potential of digital media-based interventions for engaging children in preschool classrooms. The LCBC SEL intervention implemented known SEL pedagogical strategies but seemed to have somewhat stronger effects than previously studied interventions, perhaps because of the parasocial relationships with Sesame Street characters that were shared by teachers and children and facilitated this social-emotional learning. In this sense, the results of the study suggest that other interventions that capitalize on parasocial relationships from children's digital media could augment other types of learning in preschool classrooms. We believe that both the positive reaction to

the Sesame characters and the evidence-based active components of the intervention contributed to the strong evidence of effectiveness observed in this study. Another reason for the effectiveness is the appeal and ease of implementation of the short-term intervention. Since it was sequenced, active, focused, and explicit, teachers could implement without coaching or further training. As a result of good implementation, a strong theoretical foundation, and parasocial relationships, the LCBC intervenion was found to be a viable option for reducing conflicts and problem behaviors in the preschool classroom while teaching emotion vocabulary and positive behaviors.

Digital media-based SEL interventions are particularly important during unprecedented stressful life events, such as the COVID-19 pandemic or natural disasters. Fostering social-emotional skills in young children helps bolster their resilience, which is especially needed during these times of adversity. Furthermore, as a result of the rapid and unexpected application of technology during the pandemic for which many educators were unprepared, it is clear that research and development of digital media-based interventions are much needed. LCBC is an effective SEL digital media toolkit that can be adapted to be implemented virtually since all the materials are available digitally. Teachers, school psychologists, counselors, and parents can access the media and materials free online on the Sesame Workshop website.

AUTHOR NOTE

The findings and conclusions presented in this manuscript are those of the authors and do not necessarily represent the views of Sesame Workshop. The funder was not involved in any aspect of the collection, management, analysis, or interpretation of data; or in the preparation, review, or approval of the manuscript.

ETHICAL STATEMENT

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The Rutgers RWJ Medical School Institutional Review Board (IRB) and the Department of Defense Human Research Protection Office (HRPO) approved all study procedures. Informed consent was obtained from all schools and individual participants included in this study.

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