Prevention Science
https://doi.org/10.1007/s11121-024-01696-5

Comparing the Implementation Context for Early Intervention Services Before and During the COVID-19 Pandemic

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Accepted: 3 June 2024

Abstract
The COVID-19 pandemic not only led to drastic changes in the implementation context for early intervention and early childhood special education services in 2020, but has had an enduring effect on the organizations, educators, families, and children with developmental delays and disorders. Through secondary data analysis, characteristics of toddlers with autism being served in a publicly funded center-based early intervention program as well as the characteristics of their educators are examined, comparing those who were enrolled in (a) two randomized trials conducted prior to the pandemic and (b) one ongoing randomized trial that launched in return to in-person educational services after the pandemic shutdown. Significant demographic differences are found for toddlers, where the current study includes more girls ($p = 0.002$), who are younger ($p < .001$) than the prior studies. Further, toddlers enrolled in the current trial are entering with significantly younger receptive ($p < .001$) and expressive language age-equivalent scores ($p < .001$) than toddlers from the prior studies. In addition, significant differences are also found for teaching assistants (TAs), who are younger ($p < .001$), less experienced supporting children with autism ($p < .001$), have spent less time in this position ($p < .001$), and who are still working toward college degrees ($p < .001$) than TAs in the prior studies. Implications of these changes for both intervention strategies to support the strengths and needs of the toddlers (e.g., reduce frequency of TA-child pairing changes to build rapport, increase time in adult–child JASPER before adding peers) as well as implementation strategies (e.g., increase foundational content, TA teaming) to support the training and retention of the TAs are discussed. Clinical Trials Registry number: NCT04283045.

Keywords Implementation context · Implementation strategies · Early intervention · Toddlers · Educators · Autism

Implementation context can be conceptualized as both a place and a dynamic process (May et al., 2016). As a place, the circumstances and characteristics of the context can be mapped. Considering context as a process acknowledges the ongoing evolution of dynamic factors within which a practice of interest will need to function over time. The implementation context is not only the backdrop for implementation, but the context interacts with, influences, and modifies the implementation of the practice and perhaps the practice itself (Pfadenhauer et al., 2017). In the case of early intervention classroom-based programming for young children with autism, specialized interventions take place in the context of public health and public education systems. Implementers can include families, allied health professionals (e.g., speech language pathologists), special educators, and paraprofessional assistants (e.g., instructional assistants, registered behavior therapists). It has been demonstrated that teaching assistants (e.g., Shire et al., 2017, 2020) and childcare workers (e.g., Brian et al., 2017; Feuerstein & Landa, 2020; Gulsrud et al., 2019) can deliver specialized interventions for toddlers with autism with quality when provided with technical assistance including workshops followed by coaching to support implementation.

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Published online: 11 June 2024

The COVID-19 pandemic led to radical changes in early intervention services with the initial shutdown of in-person programming in March 2020 followed by a slow return of children and personnel in small numbers to socially distanced in-person services. To date, center-based early intervention agencies continue to build back to levels that may or may not resemble classrooms prior to the pandemic. There is significant concern for an enduring impact on children's physical, psychological, developmental, and behavioral health due to the lack of access to classroom settings (Irwin et al., 2022). Considering children with developmental delays and differences, specifically, children with autism who often show delays in the development of social communication and social-emotional skills, limited access to early intervention services may amplify the children's needs as they return to public schools. If children are now entering classrooms with different needs, then it is critical to understand these needs and adjust our educational practices to meet the children where they are.

In addition, we must also acknowledge that educators who took on the stress and burden of an immediate shift to online services encountered both professional challenges in the move to a remote environment as well as personal challenges to navigate the shutdown (Gomez et al., 2022), leading to poorer mental health, coping, and teaching (Baker et al., 2021). Further, educators were asked to return to uncertain and challenging conditions when restarting in-person public early intervention services. These conditions have been linked to burn out including anxiety from multiple sources including catching COVID-19, limited guidance in the returning to in-person teaching practices, and communication with parents (Pressley, 2021).

Organizations must flex and adapt over time to the needs of the community to remain relevant in their mission (Nilsen & Bernhardsson, 2019). In addition to differences in needs the children may bring to the context, the Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009) provides a taxonomy of constructs that may be influential to the implementation context from a variety of theories. CFIR includes 5 domains of constructs including intervention characteristics, outer setting, inner setting, characteristics of individuals, and process. Facilitators and barriers (i.e., determinants) across these domains may have shifted in the pandemic. For example, characteristics of the individuals (e.g., knowledge and beliefs, self-efficacy, readiness for change) may interact with other inner setting determinants such as networks and communications as well as the implementation climate (e.g., relative priority given the demands of health and safety policies and children's needs). To meet these changing needs, implementation strategies to support educators' professional development and high-quality delivery of specialized interventions may be needed. Implementation strategies that have been adopted prior to the pandemic may or may not fit the new and changing context of both young autistic children and the educators who serve them.

The Current Study

This study explores the implementation context of a classroom-based public EI provider serving families in the New York City (NYC) Burroughs of the Bronx and Manhattan, including the communities of Harlem and the financial district in Lower Manhattan. Communities in NYC were hit hard by the COVID-19 pandemic. Early rates of hospitalization in NYC demonstrated the highest rates of death were found amongst minorities and those living in poverty in the Bronx (Abrams et al., 2022). The context for implementation of specialized interventions for children with autism was an evolving process from March 2020 through the Fall of 2023.

The partnership between the public early intervention organization and the research team preceded the pandemic including the development and completion of two randomized trials that focused on the effectiveness and implementation of Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER: Kasari et al., 2021), a comprehensive social communication intervention for young children with autism. JASPER has demonstrated efficacy across a range of contexts including implementation by clinicians (e.g., Kasari et al., 2006), public preschool educators in classrooms (e.g., Chang et al., 2016; Panganiban et al., 2022), and caregivers at home (e.g., Kasari et al., 2014) with gains for children in social communication, play skills, and social engagement. The two trials of focus in this study were conducted in 2014–2016 (see "Methods" for details) and first examined the effectiveness of JASPER delivered by teaching assistants (TAs) one-on-one with autistic toddlers compared to the center's usual programming. TAs randomized to JASPER classrooms learned to deliver the intervention with high quality and toddlers receiving JASPER showed significant gains over peers in programming as usual in initiations of joint attention, time jointly engaged with their TA, and play skills (Shire et al., 2017). The second trial focused on an adaptation of JASPER to include a peer called JasPEER compared to one-on-one JASPER. TAs randomized to JasPEER classrooms showed significant gains in their strategy use to support peer-to-peer engagement, social communication, and play. Toddlers in both interventions demonstrated significant gains in social communication and play skills over the course of the intervention. Toddlers with greater receptive language and play skills at the levels of combination and pre-symbolic play were most likely to demonstrate peer engagement (Shire et al., 2020).

The partnership has continued into an ongoing randomized trial that was about to launch enrollment in March

2020. The trial was paused due to the pandemic shutdown. The center resumed in person services with a few children in fall 2020 with the first participants enrolling in the study in January 2021. Given this longstanding partnership, the team has the unique opportunity to engage in secondary data analysis to examine the characteristics of the toddlers, educators, and the classrooms prior to the pandemic in comparison to the characteristics of those who engaged in the reopening to classroom service during the pandemic up through the current day. This exploration of the characteristics of the implementation context prior to and after the pandemic shutdown has the potential to shed light on changes that have taken place and inform next steps in implementation strategies to support implementation outcomes for educators and intervention effectiveness for the toddlers they serve. Therefore, the objectives of this secondary analysis are:

- **Objective 1.** To examine the baseline developmental level and demographic characteristics of toddlers who enrolled in studies prior to the pandemic (2014–2016) and those who enrolled in 2021 to 2023.
- **Objective 2.** To examine the demographic characteristics of educators (teaching assistants and group leaders) who enrolled in studies prior to the pandemic and those who enrolled in 2021 to 2023.
- **Objective 3.** To describe changes in the research design of the trial developed and launched in 2019 to adjust to pandemic protocols for a return to in-person classroom services in 2021.

Methods

Research Designs and Interventions

Prior studies The team has partnered to conduct two randomized trials between 2014 and 2016. The first trial included randomization of classrooms to immediate JASPER or to continue the standard social group as usual (Shire et al., 2017). The second trial built on this first trial by responding to the educators' interest to support peer-to-peer play interactions. This trial included the randomization of classrooms to either a peer play adaptation of the JASPER intervention referred to as "JasPEER" or to continue with one-to-one JASPER as the waitlist control before also learning JasPEER (Shire et al., 2020). In both trials, the intervention was provided for 10 weeks in classrooms randomized to JASPER (study 1) or JasPEER (study 2). This was followed by training for staff in the waitlisted classrooms in the intervention and then delivery of the intervention in the waitlisted classrooms. An initial 5-day training was provided by the research team at the start of each study, followed by weekly feedback for each TA based on 10-min videos submitted to the research team. At week 5, a second 5-day training was provided followed again by weekly video feedback. A local on-site JASPER supervisor was also trained in the experimental interventions to provide coaching and troubleshooting support on a day-to-day basis. Both trials examined the effectiveness of the interventions on children's outcomes including time jointly engaged, play skills, and social communication skills as well as implementation outcomes including the TAs' implementation fidelity.

Current study A Sequential Multiple Assignment Randomized Trial (SMART: Murphy, 2005) design is applied in the current study to examine children's initial response to first-stage intervention as well as whether and how best to augment that initial intervention for children demonstrating a slower response. After entry assessments, each child is randomized with equal probability to early response assessment at either 6 weeks or 12 weeks to examine the timing of assessment of early response. This early response assessment is used to determine whether children are considered fast or slow responders to JASPER intervention. It was planned that for the remaining 12–18 weeks, children responding early to the intervention would then split their hour of JASPER intervention into 30 min of one-on-one TA-child JASPER and 30 min of JasPEER (JASPER including another child peer). Children responding slowly to the initial intervention were to be randomized to continue JASPER or to add a strategy referred to as "structured teaching" to their JASPER sessions. Structured Teaching refers to direct instruction of specific target skills that were identified for each child. These targets were selected from the social communication (e.g., pointing to share- joint attention) and play skills (e.g., extending a brush to a doll, a pre-symbolic level play action) domains following published developmental hierarchies (e.g., Mundy et al. 2003; Lifter et al., 1993). Repeated trials of instruction where the adult can provide support to help the child demonstrate the skill are provided until the child can demonstrate the skill on their own. These trials occur at the beginning of the JASPER session and are intended to help the child practice the skill with repetition before using the skill in the more challenging context of dynamic social play in the remainder of their JASPER session.

Participants

Toddlers with Autism

All toddlers enrolled in the center-based early intervention program were eligible to enroll in research. As per the NYC EI program guide, eligible toddlers are a minimum 24 months of age and demonstrate a delay of at least two standard deviations in one functional domain (cognition,

communication, physical, adaptive, or social-emotional) or lesser delays in more than one domain. Children at the partner center-based program are also diagnosed with autism by a psychologist. Toddlers age out of the service at 36 months of age; the average length of service at the center is 6–9 months.

Prior studies Across the two prior randomized trials, 113 children were enrolled in each of the two studies for a total of 226 children (CONSORT diagrams can be found in Shire et al., 2017, 2020). Children did not overlap between the two studies as the studies were conducted in separate academic years.

Current study Enrollment in the current study is ongoing. To date, 136 children have been enrolled in the study.

Educators

Across all studies, educators included one on-site JASPER supervisor, a group leader (GL) who is the assigned lead for each classroom, and teaching assistants (TAs) who are paired one-on-one to support the toddlers.

Prior studies The on-site JASPER supervisor held a master's degree in school psychology and supported both school sites. A total of 18 GLs (14 serving both study years) were enrolled across the two school years as well as 66 TAs (59 serving both study years). CONSORT diagrams can be found in Shire et al. (2017) and Shire et al. (2020).

Current study The on-site JASPER supervisor holds a master's degree in social work and is currently supporting both school sites. A total of 131 TAs have been enrolled over three school years.

Setting

Toddler classrooms prior to the shutdown Prior to COVID-19 including the prior trials, toddlers attended a 2-h long classroom session 5 times a week with 8–10 toddlers per classroom with sessions running in the morning and afternoon. Each child was paired with a TA who supported multiple sessions per day and a supervising GL led the classroom. Further details about the agency pre-pandemic can be found in published work focused on the prior trials (e.g., Shire et al., 2017, 2020).

Changes in the setting during the shutdown During the pandemic shutdown, EI services were paused and then shifted to entirely remote instruction. GLs shifted to provide caregiver coaching and individual family visits via remote platforms such as Zoom to those families who wished to engage in remote services. Given the significant change in the service delivery model and inability to provide the interventions designed for the randomized trial, the trial was placed on pause until the center returned to in-person classroom instruction.

Modifications to Procedures in the Return to In-Person Services

Changes in the classroom setting The return to in-person service in the classroom after the pandemic shutdown followed guidance provided by the New York State Department of Health and the New York City Department of Health and Mental Hygiene. For example, limited enrollment (maximum 6 children per classroom) was permitted to allow for social distancing 10/21/20–9/1/21. During this time, specific materials were assigned to each child and disinfected regularly, and the TA and child pairing were held consistent to avoid mixing interaction partners. Quarantine procedures were applied to the classrooms. If an individual tested positive for COVID-19, the classroom was shutdown for 14 days from the last date of exposure. The classroom quarantine restrictions then shifted to individual quarantine where individuals who present as symptomatic must produce a negative COVID-19 test or stay home. When a child has a positive test, the child must stay home for 10 days. When an adult has a positive test, the adult may return after 5 days and wear a mask. This individual quarantine protocol continues through the current fall of 2023.

Modifications to the research design Given the need for social distancing, no mixing across classrooms, and a small number of responders due to limited classroom enrollment the stage two strategy to add the JasPEER approach where two toddlers would be supported to play together was no longer viable. Therefore, JasPEER was removed from the study design. Early responders were assigned to continue JASPER for 60 min per day rather than receive 30 min of JasPEER and 30 min of individual JASPER.

For slower responders, the Structured Teaching strategy as designed required the ongoing supervision of Board Certified Behavior Analysts (BCBAs) who led Applied Behavior Analytic (ABA) classrooms services for the center. Given that the BCBAs supervised a different set of classrooms at the school and that staff could not mix amongst classrooms due to health and safety protocols, the team needed a strategy that allowed for the JASPER supervisor and GLs to train and supervise the TAs in the JASPER classrooms. Therefore, the team shifted from Structured Teaching to a strategy called JASPER + . The JASPER + intervention follows the same premise of Structured Teaching, to provide direct instruction of specific target skills across the developmental domains of focus (social communication, play skills) that

were identified for each child. However, JASPER + shifts the context of direct instruction to adapted books (e.g., simplified text with picture icons, laminated materials for matching, 3D toy items) and songs with objects (e.g., laminated pictures, puppets, 3D toy items that match the song). The natural structure of books and songs allows for repeated opportunities to elicit specific target skills (e.g., to point to share an animal on the page, point and use words to request the matching laminated frog that is out of reach while singing little green frog). Therefore, JASPER + facilitated the same teaching principle as Structured Teaching by offering repeated opportunities to learn the skill with adult support before engaging in JASPER play where the child would have the opportunity to generalize the target skills to the context of dynamic social play.

Measures

Baseline demographic surveys for families of the toddlers and the educators (TAs and GLs) as well as a standardized measure of children's receptive and expressive language are examined in the current study. The larger trial includes additional measures of children's social communication, social engagement, and play skills.

Demographic survey: children Caregivers are asked to complete a brief demographic form providing information about their toddler (e.g., birthdate, diagnosis, race/ethnicity, service history) and information about the family (e.g., language spoken in the home, caregivers' education, and caregivers' employment status).

Demographic survey: educators Educators are also asked to complete a brief survey to share information about their personal (e.g., race/ethnicity) and professional background (e.g., education, time in position, autism-specific training).

Mullen Scales of Early Learning-Expressive and Receptive Language Subscales (MSEL: Mullen, 1995) The MSEL is a standardized measure of development. The receptive and expressive subscales were administered by graduate students in school psychology (past studies) and trained school site staff (current study: e.g., experienced TAs and GLs). Given floor effects in standardized *T*-scores, age-equivalent scores are presented.

Statistical Analyses

Descriptive statistics are provided for child and educator characteristics from the prior studies and the current study. Bivariate tests (2 sample *t*-tests, the Wilcoxon rank sum tests, chi-square tests, and Fisher's exact tests) were utilized to compare the differences in demographic characteristics of children and educators between prior and current studies.

Results

Children's Characteristics

Children's demographic characteristics including age, gender, and race/ethnicity as well as receptive and expressive language skills are described in Table 1. Children who enrolled in the two prior randomized trials (Shire et al., 2017, 2020) are combined as "prior" studies while

Table 1 Baseline child characteristics in prior and current studies

	Prior ($n=226$)	Current ($n=133$)	p-value
Age (months): mean (SD)	32.01 (3.13)	29.76 (3.32)	$p<0.001$
Gender: *n* (%)			$p=0.002$
Female	49 (21.68%)	44 (33.08%)	
Male	177 (78.32%)	89 (66.92%)	
Race/ethnicity: *n* (%)			$p<0.001$
Asian	3 (1.33%)	6 (4.51%)	
Black	51 (22.57%)	41 (30.83%)	
Hispanic	141 (62.39%)	55 (41.35%)	
Mixed Race	18 (7.96%)	7 (5.26%)	
Other	0 (0%)	7 (5.26%)	
White	10 (4.42%)	14 (10.53%)	
Did not disclose	3 (1.33%)	3 (2.26%)	
MSEL Language age equivalent scores (months)			
Receptive language: mean (SD)	16.82 (10.36)	11.07 (8.28)	$p<0.001$
Expressive language: mean (SD)	17.56 (9.38)	11.07 (7.44)	$p<0.001$

children enrolled in the current SMART design trial are described under the "current" study.

Children's age Children entered the prior studies on average at 32.01 months of age (SD = 3.13 months). Children are entering the current study on average at 29.76 months of age (SD = 3.32 months). Children in the current study are significantly younger than children in the prior studies ($t(266.84) = -6.3$, $p < 0.001$).

Children's gender Of the 226 children enrolled in the prior studies, $n = 49$ (21.65%) were girls and 177 (78.32%) were boys. The current study includes 44 (33.08%) girls and 89 (66.92%) boys. The distribution of gender is significantly different between the prior and current studies ($\chi^2_1 = 5.09$, $p = 0.02$). Given that there has been a significant focus on the strengths and needs of girls to inform diagnostic protocol for autism during the study period (review: Wood-Downie et al. 2021), it is encouraging to see an increase in the representation of girls within the CURRENT study sample.

Children's race/ethnicity The racial/ethnic distribution of children between the prior and current studies is significantly different ($\chi^2_6 = 30.27$, $p < 0.001$). Overall, in the prior studies, 62.39% identified their children as Hispanic and 22.57% as Black while in the current study, 41.35% of families identified their child as Hispanic and 30.83% as Black. Further, the proportion of children identified as White, Asian, and Other race is greater in the current study than prior studies while the proportion of children identified as Mixed race was greater in the prior studies. The center relocated from the Bronx school site that was included in the prior studies to a location in Lower Manhattan for the current study. Given that the communities being served have changed, it follows that the racial/ethnic demographics of the children and families has also changed.

Children's MSEL Expressive and Receptive Language Overall, children are entering the current study developmentally younger than children in the prior studies. On average, children in the current study are demonstrating age-equivalent receptive language scores of 11.07 months (SD = 8.28 months) compared to 16.82 months (SD = 10.36 months) in the prior studies ($t(324.48) = -5.73$, $p < 0.001$). A similar trend is found in expressive language where children in the current study demonstrate mean age-equivalent scores of 11.07 months (SD = 7.44 months), compared to 17.56 months (SD = 9.38 months) in the prior studies ($t(325.79) = -7.17$, $p < 0.001$).

Educator Characteristics

Educators' age While GLs do not significantly differ in age between the prior and current study (W = 77.5, p = 0.368), TAs in the current study (M = 25.3 years, SD = 5.51 years) are significantly younger (W = 1735.5, $p < 0.001$) than TAs in the prior studies (M = 30.33 years, SD = 9.04 years). Details for educator characteristics by study and by role (GL or TA) can be found in Table 2.

Educators' race/ethnicity Self-reported race/ethnicity was not significantly different between educators in the prior studies compared to the current study for either GLs ($p = 0.732$) or TAs ($p = 0.375$).

Educators' highest completed level of education GLs did not significantly differ in their highest level of education (graduate/professional) between the prior and current study ($p = 0.239$). However, TAs entered the studies with significantly different levels of education ($\chi^2_1 = 98.30$, $p < 0.001$). Forty-eight percent of TAs participating in the prior studies entered with a college degree, another 26% with some college, and 12% with a graduate or professional degree. In contrast, no TAs in the current study report having obtained a college degree while 32% report some college and 5% a professional degree. TAs in the current study primarily (43%) report vocational schooling and 11% report graduation from high school. Details are provided in Table 2.

Educators' time in current position While GLs do not show significant differences in the time in their position between the prior and current studies, there are significant differences for TAs (W = 1213.5, $p < 0.001$). On average, TAs had spent 2.8 years (SD = 2.13 years) in their position when beginning participation in the prior studies while in the current study, TAs have spent an average of 1.04 years in their position (SD = 1.81 years). Across 2.5 years in the current study, of 131 TAs, 5 who entered in year 1 remain in their positions while 126/131 have left (94%).

Educators' experience with autism Examined as binary variable (yes previous experience or no previous experience), all but one GL enrolled in the current study reported previous experience supporting children with autism with no significant differences between prior and current studies ($p = 0.483$). However, in prior studies, 43 (86%) of TAs reported experience supporting children with autism, while significantly fewer TAs ($n = 55$, 46%) in the current study report experience serving children with autism ($\chi^2_1 = 21.71$, $p < 0.001$).

Table 2 Baseline TA and GL characteristics in prior and current studies

	GL			TA		
	Prior	Current	*p*-value	Prior	Current	*p*-value
Age (years): mean (SD)	33.77 (8.59)	30.07 (4.42)	0.368	30.33 (9.04)	25.3 (5.51)	$p < .001$
Race/ethnicity: *n* (%)			0.732			0.375
Asian	2 (11%)	1 (7%)		1 (2%)	7 (5%)	
Black	2 (11%)	0 (0%)		15 (23%)	38 (28%)	
Hispanic	4 (22%)	3 (20%)		41 (62%)	66 (49%)	
Other	0 (0%)	0 (0%)		1 (2%)	4 (3%)	
White	7 (39%)	9 (60%)		2 (3%)	11 (8%)	
Did not disclose	3 (17%)	2 (13%)		6 (9%)	10 (7%)	
Experience with autism: *n* (%)			0.483			$p < .001$
Yes	15 (100%)	13 (93%)		43 (86%)	55 (46%)	
No	0 (0%)	1 (7%)		7 (14%)	65 (54%)	
Time in current position (years): mean (SD)	1.74 (1.19)	1.56 (2.02)	0.234	2.8 (2.13)	1.04 (1.81)	$p < .001$
Education level: *n* (%)			0.239			$p < .001$
Some high school	0 (0%)	0 (0%)		0 (0%)	1 (1%)	
High school graduate	0 (0%)	0 (0%)		3 (5%)	15 (11%)	
Some college	0 (0%)	0 (0%)		17 (26%)	44 (32%)	
College graduate	2 (11%)	0 (0%)		32 (48%)	0 (0%)	
Vocational school	0 (0%)	0 (0%)		1 (2%)	59 (43%)	
Graduate/professional	14 (78%)	15 (100%)		8 (12%)	7 (5%)	
Do not disclose	2 (11%)	0 (0%)		5 (8%)	10 (7%)	

Discussion

The implementation context includes a dynamic set of characteristics within which complex interventions live in real-world educational settings. The uniquely extreme context of the COVID-19 pandemic led to radical disruptions to early intervention services and research beginning in March 2020. For the team's current trial, the research design had been developed and the educator training had taken place prior to the shutdown with initial participant enrollment scheduled for spring 2020. However, as was the case for many funded trials, participant enrollment was put on pause until the reopening of in-person early intervention services. By examining the characteristics of educators and children in studies completed prior to the pandemic, the profiles of children and the training needs of educators have changed. To better meet these needs, we explore both considerations for (a) intervention strategies to support the toddlers and (b) implementation strategies to support the educators.

Considerations for Intervention Strategies with Children

The baseline data of children enrolling in the current study demonstrate that the children are entering the center both chronologically and developmentally younger (evidenced by receptive and expressive language scores) than the children enrolled in the prior studies. Children in the current study are about 2.25 months younger in chronological age, yet over 5.5 months younger in receptive language age and 6 months younger in expressive language age. Central to not only JASPER but high-quality special education is to meet children where they are developmentally. To support children's regulation and engagement in the classroom, it may be necessary to place a greater focus on the TA's implementation of basic classroom and relational strategies that can support fun and creative interactions with the children while also developing a clear and consistent classroom structure and routine. By establishing the daily routine, this may support more successful daily classroom experiences for both the children and for the TAs. This intervention strategy for the toddlers is tied closely to also thinking about TA's professional development. TA's intervention implementation may be influenced by the timing and sequence of content that the TAs engage with. Given that TAs in the CURRENT study are newer to their positions and less experienced in special education, spending more focused time on mastering foundational classroom strategies for children's engagement and regulation may also create the base for the adults to then learn the specialized interventions.

Learning losses attributed to the pandemic given the limited opportunities for young children to engage in the daily experiences in their communities are a significant concern across developmental domains including social and language

skills (e.g., Irwin et al., 2022). Given the earlier stage of language development for the toddlers in our CURRENT study, this sparks the question of how best to introduce specialized interventions. The center's programming includes both a one-on-one adult–child intervention (JASPER) as well as adaptation of the intervention that includes a peer to target social connections with peers (JasPEER). Based on our prior study exploring JasPEER (Shire et al., 2020), post hoc analyses demonstrated that toddlers with greater receptive language (> 12 months), combination play skill diversity (≥ 3 types), and some pre-symbolic play diversity (≥ 2 types) were more successful entering into periods of joint engagement with their peers during interactions that were not supported by adults. Given the need to support these early regulatory, play, and communication skills, the toddlers in the CURRENT study may need more time in one-on-one educator-child JASPER to develop the foundational skills needed to then engage in the peer-to-peer JasPEER intervention successfully. Further, these needs may also necessitate broader use of the JASPER + intervention to provide more opportunity for repeated structured opportunities to learn foundational skills that can then be used in dynamic social play settings.

Additional child level differences toddlers in the CURRENT and PRIOR studies included a larger portion of girls and a shift in the racial/ethnic makeup of the sample of toddlers in the CURRENT study. We do not believe these differences are specific to the pandemic but rather other changes in the outer and inner settings. First, specific to child gender, given the increased scientific focus on understanding the strengths and needs of girls and women on the autism spectrum, it is encouraging to see that more girls are receiving this early diagnosis (at or before 2 years) and thus being referred to the center for service. Second, the organization was required to lease new spaces for one of the classroom sites twice over the course of the CURRENT study, thereby moving a school site from the Bronx, first to Inwood, and then to Financial District allowing enrollment across Lower Manhattan. Our sample demographics align with this shift increasing the proportion of Black, Asian, and White toddlers compared to the PRIOR studies.

Considerations for Implementation Strategies

Retention of TAs in the program has radically changed since the completion of the initial two randomized trials. Prior to the pandemic, the rate of educator turnover in the center was considerably lower, with 89.39% of TAs and 77.78% of GLs who engaged in the first trial (academic year 2014–2015), continuing at the center in the second trial (academic year 2015–2016). Framed by CFIR, there are factors specific to the post-shutdown return to in-person services that may have impacted educator retention. For example, when examining available resources and readiness for implementation, in EI services, educator pay is directly linked to the hours of direct service the TA provides to a child. During the shutdown, remote services were provided by GLs and TAs who did not have the necessary credentials to provide these services were not able to be retrained. Therefore, in the return to in-person services, TAs needed to be rehired. With limited enrollment due to social distancing and no contact being allowed across classrooms, this led to a maximum of 6 children per classroom who were each allocated a single TA. Some TAs opted not to return to in-person work due to the continued risks of COVID-19. To date, the demand to hire TAs remains high and ongoing. Given that TA pay is tied to child contact hours, a child must be registered to hire a TA. This requirement is a barrier that continues to impact the leadership's ability to hire and train TAs prior to children's arrival. Given the large number of new hires and ongoing high rate of replacement of educators as well as the greater regulatory and developmental needs of the toddlers, the ability to develop the foundation of expertise needed to layer in specialized interventions is an ongoing challenge.

In response to the high rate of newly hired TAs as well as the early developmental level of the children, the supervisory staff has instituted an implementation strategy to increase the time a TA and toddler are paired before TAs are rotated amongst children. Previously, TA-child pairings were rotated monthly. TAs are now paired with the same toddler for an extended period (at least 2 months) to allow more time for relationship building as well as give the TA time to build an understanding of the child's individual goals, strengths, needs, and temperament. This extended time also gives new TAs more time to establish foundational strategies and begin to apply the more specialized interventions with one child before they are asked to generalize those skills to the unique strengths and needs of another toddler. Retaining this implementation strategy may support staff retention by better meeting new TAs where they are in their professional development.

Reflecting on the pre-pandemic trials, the consistency in staffing across the two school years allowed for the development of foundational knowledge in the JASPER intervention such that, adding new components, such as jasPEER was possible. Given the ongoing collaboration between the center and the researchers, the initial design of the current study included both the JASPER and jasPEER intervention models in a sequence where children showing early response to the JASPER intervention then added jasPEER to generalize their skills with peers. However, given the social distancing requirements and limited enrollment after the pandemic, the research design needed to change. Planning forward now that it is possible to deliver jasPEER again, there are significant considerations for implementation strategies to deliver both specialized interventions with high quality. Of

CFIR identified intervention characteristics, intervention complexity is a significant consideration for the specialized interventions. The short duration of staff employment and limited initial training time provide little time for educators to develop foundation skills prior to working toward fidelity of implementation of specialized interventions. Given that prior JASPER intervention data demonstrates an association between adults' implementation of the intervention and children's spontaneous communication outcomes (e.g., Shire et al., 2018), it is critical to consider the new context for intervention implementation and how implementation strategies may need to shift to meet the educators where they are. Demographic data indicates that significantly fewer TAs are now entering with experience with children with autism. In addition, they are newer to their roles, and still working toward relevant degrees. Therefore, there may be a greater need to build foundational classroom skills (e.g., basics of child development, childcare, relationship building, communication strategies, classroom routines) prior to the introduction of specialized intervention components. For example, focusing on core skills for classroom functioning such as understanding the classroom schedule and timing of activities, using developmentally appropriate visuals to support clear expectations, and implementing clear and consistent classroom transitions can help reduce the need for repeated individual instruction from the GL and provide consistent structure, repetition, and routine for the toddlers. Breaking down this content with explicit learning goals for the TAs may support TA's self-directed learning and GL's coaching supports.

To date, coaching (local and remote) has been the primary implementation strategy to support the adults' learning and provide access to knowledge and information (a core component of CFIR's readiness for implementation). Although coaching may be supportive for some, others may prefer the opportunity to gain foundational knowledge through peer or self-study before adding coaching. Further, the intensive time commitment of the coaching strategy that can only be delivered by a small number of practitioners (e.g., program supervisor, GLs) limits the feasibility of applying coaching for all educators, at all times. Given that TAs are paid for hours where they are serving children, systematically creating space for very brief periods of adult learning during the classroom day may help build the foundational knowledge necessary to support basic strategies. For example, teaming TAs could create the opportunity for two adults to be familiar with two children in the class allowing for brief task shifting. Snack is a time in the classroom day when many children are attending to the activity and many need less adult support. By having one TA support the pair of children, this may free the TA partner to engage in brief modular content (5–10 min) developed by the team on needed topics. This systematized teaming strategy may support connections amongst TAs as well as increase the capacity of the classroom team to support toddlers when their assigned TA is absent, thereby addressing stressors that may impact TA retention. Further, coaching supports may then be tied to this content or allow for the development of a knowledge base to then provide coaching as a next step in the TA's learning. Methods to personalize the coaching implementation strategy may be one path to better match individual learning styles and spread out the allocation of coaching resources over time.

Limitations and Future Directions

The prior randomized trials were completed in 2014–2016 leaving a gap in time between the start of the 2020 shutdown and the end of the studies. Therefore, it is unknown if there were changes to the implementation context in that time. However, anecdotal feedback from center leadership indicates that the increase in staff turnover has radically increased since the pandemic. Further work to explore additional aspects of the inner setting including the networks and communications and culture, as well as components of the outer settings such as gaining information family needs and resources, may provide additional critical information to understand the current implementation context and inform implementation strategies.

The current trial includes additional measures and assessment data that can be explored to further understand children's development. Examination of additional measures from the current trial may help to understand if other critical domains of early learning such as social engagement also look different compared to children enrolled in the past trials. As the team continues to enroll children into the current trial, it will also be possible to explore whether incoming toddlers who were born in fall of 2021 and who did not experience the social and environmental constraints of the pandemic shutdown may have similar or different developmental profiles to the children enrolled to date. Therefore, we will continue to monitor children's baseline skills and characteristics to determine if the toddlers present similarly or differently to the children in our current study sample. In addition, a larger scale examination of enrollment within public EI programs could help explore differences pre and post COVID-19.

Conclusions

The COVID-19 pandemic has led to numerous changes to the implementation context for center-based early intervention programming for toddlers who are on autism spectrum. These changes necessitate that we re-examine characteristics of the inner and outer setting to understand

the strengths and needs of the educators who have returned to and who are entering the field as well as those of the children who we serve.

Funding The initial trials were funded by Autism Speaks (PI: Kasari; Grant # 5666) and a FAR Fund grant to NYCIT. The current study CAIT is funded by NICHD (PI: Kasari; Grant # 1R01HD098248-01). The current trial is registered at clinicaltrials.gov (NCT04283045).

Data Availability Data from this study will be accessible via the National Database for Autism Reseach (NDAR).

Declarations

Ethical Approval All three trials represented in this paper were approved by the Institutional Review Board at the University of California Los Angeles.

Consent to Participate The studies were performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Educators including the On-Site JASPER coordinator, GLs, and TAs signed paper consent documents. Caregivers of the toddlers also signed consent documents.

Conflict of Interest Authors SS and CK are authors of the JASPER intervention manual.

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