



“Going Mobile”-increasing the reach of parent-mediated intervention for toddlers with ASD via group-based and virtual delivery

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Abstract

Evidence supports early intervention for toddlers with ASD, but barriers to access remain, including system costs, workforce constraints, and a range of family socio-demographic factors. An urgent need exists for innovative models that maximize resource efficiency and promote widespread timely access. We examined uptake and outcomes from 82 families participating in a parent-mediated intervention comprising group-based learning and individual coaching, delivered either in-person ($n=45$) or virtually ($n=37$). Parents from diverse linguistic, ethnic, and educational backgrounds gained intervention skills and toddlers evidenced significant social-communication gains. Few differences emerged across socio-demographic factors or delivery conditions. Findings highlight the feasibility, acceptability, and promise of group-based learning when combined with individual coaching, with added potential to increase program reach via virtual delivery.

Keywords Autism · ASD · Toddlers · Early intervention · Parent-mediated · Parent group · Virtual delivery

Introduction

Recent advances demonstrating the efficacy of very early intervention for toddlers with autism spectrum disorder (ASD) focus on approaches delivered in naturalistic settings, integrating developmental science with applied behaviour analytic techniques (i.e., naturalistic developmental behavioral interventions (NDBIs); Schreibman et al., 2015; Sandbank et al., 2020). However, significant barriers exist to accessing many intervention services, such as high costs of intensive therapist-delivered programs,

and constraints associated with low system capacity and urban-rural workforce distributions, which lead to reduced access, long wait times, and the exclusion of families living in rural and remote areas (Penner et al., 2018; Trembath et al., 2019). Other family socio-demographic factors, such as parental language barriers and limited availability (due to parents' work schedules and other children's care needs) significantly limit many families' access to intervention. Recent service closures due to COVID-19 containment measures have further restricted access to intervention for young children with ASD (Jeste et al., 2020; Manning et al., 2020; Wagner et al., 2021). There is thus an urgent need to develop and evaluate innovative delivery models that are more resource efficient than traditional approaches, and that can be readily accessed when the first signs of ASD emerge. Promising innovations include (1) involving parents as mediators of the intervention, (2) optimizing existing workforce capacity by developing group-based instructional approaches, and (3) increasing reach via virtual delivery methods.

Recent reviews highlight the promise of parent-mediated interventions for young children with emerging autism (French & Kennedy, 2018), particularly those that employ active coaching (Sone et al., 2021). Parent-mediated programs are particularly relevant in the toddler years when

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foundational interactions are established with primary caregivers and may present unique opportunities for earlier access to care. High quality evidence from randomized control trials (RCTs) points to the efficacy of parent-mediated programs in well-controlled research settings, yielding developmental gains for toddlers in core domains such as communication, social attention/orienting, joint engagement, affect sharing, and play (Kasari et al., 2010; Wetherby et al., 2014; Kasari et al., 2015; Brian et al., 2017; Schertz et al., 2018). Positive parent-level effects have also been reported, such as increased responsiveness or synchrony (e.g., Green et al., 2010; Siller et al., 2013; Kasari et al., 2014; Watson et al., 2017), increased parental self-reflection (Siller et al., 2018), feelings of self-efficacy and empowerment (Brian et al., 2017), and at least in some studies, reduced parenting stress (e.g., Rollins et al., 2019; Turner-Brown et al., 2019).

The issue of parenting stress warrants particular attention in the context of parent-mediated interventions for toddlers. First, stress may already be elevated during what is, for many families, a particularly challenging time as they identify their child's developmental differences or receive a diagnosis (Brian et al., 2018). Moreover, many families with toddlers also have other young children who need attention and caregiving, leading to parents having to balance multiple competing demands. Given that parent-mediated approaches typically entail parents learning a new set of techniques, it could be predicted that stress might *increase*, at least in the short-term, as demands increase. Ideally, such stress would decrease as parents master the new skills and their feelings of self-efficacy increase, and as child-level gains emerge. Finally, elevated levels of parent stress have been shown to negatively affect the efficacy of parent-mediated interventions (presumably due to interference with parents' learning; Stadnick et al., 2015). Taken together, program developers must be sensitive to parenting stress, both from the perspective of how stress might affect parents' learning, but also with respect to parents' overall mental wellness and coping (Barroso et al., 2018). A few studies have directly examined the impact of parent-mediated toddler programs on parenting stress, with equivocal findings. For example, parenting stress decreased in some studies (Rollins et al., 2019; Turner-Brown et al., 2019), but remained stable in others when compared to controls for whom stress either increased (Estes et al., 2014), decreased (Kasari et al., 2015), or remained stable (Brian et al., 2017). Despite some promising findings, the issue of parenting stress remains to be understood fully within the context of parent-mediated interventions and should be considered a clinical priority when supporting families.

Families may also benefit from access to group-based learning opportunities in the context of parent-mediated

interventions for toddlers. Group-based teaching has been used widely in general parenting programs (e.g., Maz-zucchelli & Sanders, 2011) and has the potential to optimize resource efficiency. Such efficiencies may allow for increased access to timely care for toddlers with emerging ASD. Evidence demonstrates that parents can learn early ASD-focused intervention techniques in a group format, but child-level outcomes vary. For example, Gengoux et al. (2015) showed that parents successfully learned intervention techniques (i.e., they attained implementation fidelity) in a 24-week group learning format. Moreover, parents reported gains in their children's communication skills that exceeded those in a psychoeducational comparison condition. Barber et al. (2020) also reported language and social communication gains for toddlers and preschoolers with ASD following a 12-week small-group parent-mediated intervention, based on both parent and clinician report. Conversely, Wetherby et al. (2014) reported preferential outcomes for toddlers in a 9-month parent-mediated intervention that was individually taught (vs. group-based), although some gains were observed for both modalities. However, parents' strategy use was not measured so it remains unknown whether parents' skill acquisition was superior in one modality. Despite mixed results in the context of parent-mediated programs for toddlers with ASD, group-based approaches stand apart as being more efficient than individual models (e.g., by optimizing workforce capacity and reducing costs), and thus present the opportunity to increase service availability. Beyond increased efficiencies, group-based learning has the potential to add unique therapeutic value (Biggs et al., 2020; Borek et al., 2019). Therapeutic benefits may emanate from encouragement or concrete strategies provided by group facilitators and/or may be associated with social support from peers (i.e., other parents who are experiencing similar life events). The positive influence of social support on parenting stress has been demonstrated in parents of children with ASD, with evidence suggesting that perceived support may play a key role in mitigating parenting stress and fostering empowerment (Robinson & Weiss, 2020). Thus, group-based learning has the potential to reduce parenting stress in ways that may not be seen in other learning contexts.

Motivated to increase the reach of intervention, a few studies have examined the efficacy of virtual parent-training methods (e.g., see Parsons et al., 2017, for a review of therapist- and self-directed approaches for children with ASD, and Tan-MacNeill et al., 2021, for a review of exclusively self (i.e., parent)-directed on-line programs across different neurodevelopmental conditions). Parsons et al. (2017) identified seven studies of virtual parent-training for children with ASD, only one of which focused on the toddler age range in a very small sample ($n=8$; Vismara et al., 2013; since expanded, see Vismara et al., 2018). Despite

limitations associated with design and sampling across studies, the review concluded that virtual training in parent-mediated intervention may mitigate barriers associated with access to more traditional services, with potential benefits to children with ASD and their families. As demonstrated for in-person programs (Sone et al., 2021), live coaching has been identified as a core feature for fostering parent engagement and skill acquisition in virtual care (i.e., compared to exclusively self-directed on-line learning; as demonstrated by Ingersoll & Berger, 2015). Vismara et al. (2018) also demonstrated the efficacy of two-way videoconferencing as a means of enhancing parents' use of intervention strategies, but child-level outcomes did not differ when compared to a community control condition. In response to the COVID-19 pandemic and associated isolation measures, parents of children with a range of neurodevelopmental disorders have expressed an interest in accessing virtual (i.e., telehealth) services, particularly those that integrate a one-to-one component (Jeste et al., 2020), such as that afforded by individual coaching sessions delivered via two-way videoconferencing. A recent review identified a rapid increase in virtual interventions for general mental health conditions in response to COVID-19, highlighting the need for further study. With respect to group-based virtual interventions, the review concluded that the evidence is scant, but there is promise of feasibility and "roughly comparable outcomes between in-person and tele-group treatments" (Markowitz et al., 2021).

To address the pressing need for innovative, efficient, and scalable intervention approaches for toddlers with ASD, we adapted an existing in-person parent-mediated program (the Social ABCs) to incorporate group-based learning, for both in-person and virtual delivery. The original model is a 12-week parent-mediated NDBI for toddlers with confirmed or suspected ASD, supported by RCT evidence of efficacy (Brian, Smith, et al., 2017). Through live coaching and supported by a Parent Manual, parents are taught play- and routines-based strategies to foster their children's social engagement and communication skills (e.g., directed, intentional vocal communication and shared positive affect). The program uses active, moment-by-moment, supportive coaching (Sone et al., 2021) to help parents identify and capitalize on child motivation (e.g., Koegel & Koegel, 2006), to foster positive engagement, and to build developmentally informed routines that set the occasion for meaningful language opportunities.

In the original model, parents are individually taught content and coached in their homes over a 12-week period. The original Social ABCs has been demonstrated to yield positive outcomes for both toddlers and their parents including increased positive affect-sharing and social communication in toddlers, and parental skill acquisition and feelings

of empowerment (Brian, Smith et al., 2017). This model differs from many approaches by using manualized active parent-coaching strategies that are easily translated to virtual delivery. For example, the program intentionally *avoids* the use of 'modelling' (i.e., demonstrating strategies to the parent by working directly with the child), a technique used in other prominent parent-mediated programs (e.g., Rogers et al., 2012; Wetherby et al., 2018). This was motivated by a commitment to support parents in developing their own 'style', to promote positive parent-child interaction, and to foster parental empowerment. This unique coaching stance, shown in our previous work to successfully promote parents' skill acquisition and self-efficacy, makes the Social ABCs ideally suited to virtual delivery.

The program was modified from the original in two phases. First, we abbreviated the duration to 6 (rather than 12) weeks and developed a group-based approach to delivering the instructional components of the program. This adaptation (referred to as Group-Based Social ABCs) was motivated by efforts to increase efficiency of program delivery to improve access. Modifications entailed group-based learning, rather than individual teaching for program content (i.e., parents gathered with group facilitators to learn program content and engage in facilitated discussion). Group sessions were facilitated by two group leaders, at least one of whom was also the Coach assigned to the families in that group. Facilitation included encouraging all participants to ask questions, generate ideas, discuss strategies that had been working well for them, and to plan for integration of strategies into the families' daily lives. When parents raised personal reflections associated with their diagnostic journey, developmental concerns, frustrations with the service system, etc., those conversations were also addressed in the moment to the extent that they were deemed relevant to the group and appropriate for facilitators to comment on (e.g., facilitators were not able to comment on whether they felt that a particular child warranted a diagnosis). If discussion started to dominate the time allotted for the session, or stray too far from the session material, families were encouraged to bring those questions to the doctor or psychologist who was involved in their child's care, to allow adequate time for coverage of the planned session material. Group-based learning was bolstered by nine individual coaching sessions that took place in the clinic (rather than in the home per the original model).

The second phase of modifications was spurred by COVID-19 isolation measures and an appreciation for the potential scalability of virtual care. This entailed adapting the group-based model for virtual delivery, with in-home individual coaching sessions and group learning sessions, all delivered over a virtual platform (*Virtual Group-Based Social ABCs*). For the virtual adaptation, engagement in

group learning sessions was fostered as described above, with the addition of encouraging parents to keep their cameras turned on as much as possible, permitting some parents to turn them off periodically to respect the privacy of other family members in the home.

This paper describes the feasibility, acceptability, and promise of both adaptations of the original Social ABCs model (i.e., *Group-Based Social ABCs* and *Virtual Group-Based Social ABCs*). The main objective was to explore whether there were any differences between in-person and virtual delivery of the group-based program in terms of outcomes, feasibility, or acceptability. We explored family socio-demographic factors related to feasibility, acceptability, and program adherence, as well as parent- and child-level changes during treatment. We hypothesized that parents would find the in-person group-based model feasible and acceptable and would report child-level communication gains. We predicted that the virtual model would also be feasible and acceptable to families, but we anticipated lower levels of satisfaction and attenuated parent-reported child-level gains. We examined various socio-demographic factors to explore enrollment into the in-person versus virtual models. However, given the exploratory nature of those investigations, we did not generate specific hypotheses.

Method

Participants and setting

Inclusion criteria. Eligibility was based on referral for an ASD diagnostic assessment, clinician impression of signs indicative of ASD, or a confirmed diagnosis of ASD by a qualified professional (Developmental Paediatrician [DP] or Psychologist) at the study site (an academic pediatric hospital identified as a regional “diagnostic hub”), or by one of two community providers (one DP and one Psychologist) with formal hospital affiliations. Toddlers were between 12 and 36 months of age at enrollment, with no other diagnosed neurological condition, nor significant sensory impairments; walking was not an eligibility criterion, but toddlers had to be able to move sufficiently to explore their environment and move toward a preferred item or activity. Participation required parents’ comprehension of spoken English for the live coaching, and sufficient written English comprehension to understand the Parent Manual (written at a grade 4 level, with concepts shared verbally and through images), and to complete parent questionnaires. Parents also indicated a willingness to be video-recorded for data acquisition and cross-site consistency checks. For the in-person group-based model, all sessions took place at the hospital clinic, whereas all sessions for the virtual group-based model took place in

families’ homes, with Coaches connecting with them over the internet. During the 6-week intervention phase, families were asked not to participate in other parent-mediated interventions, and to limit behavioural, speech and language, or occupational therapies, or other interventions to no more than one hour/week each.

Compliance with ethical standards

Disclosure of potential conflicts of interest Co-authors Brian and Bryson co-developed the Social ABCs intervention. Neither party receives any royalties from its use, but we recognize the potential for reputational bias associated with positive study findings.

Research involving human participants - Informed consent. Families were recruited directly through the assessment clinic at Holland Bloorview Kids Rehabilitation Hospital or through affiliated clinicians and were consented per approved Research Ethics Board protocols. Parents provided informed consent for themselves and on behalf of their toddlers.

Procedure

This is a single-blind, quasi-experimental, pre-post, sequential group design study.

The intervention. The intervention involved one of two modified versions of the Social ABCs program, as described below. A total of 21 group cycles was completed (11 in-person and 10 virtual), each composed of 3–5 families and at least 2 Coaches / group facilitators. All in-person group cycles were completed (March 2018 – February 2020) before the virtual cycles occurred (April 2020 – December 2020). All Coaches had achieved $\geq 80\%$ coaching fidelity during their training but this was not re-evaluated in the course of the program. However, because parents provide the intervention, parents’ fidelity of implementing the techniques with their toddlers (and not the Coaches’ fidelity in coaching parents) is the more relevant metric of intervention fidelity.

Group-Based Social ABCs (adaptation 1). The group-based model is abbreviated compared to the original model (6 rather than 12 weeks) and entails small group sessions for delivery of didactic content, supported by a Parent Manual and presentation slides. Group facilitation is a key component of this model, wherein parents are encouraged to share ideas, discuss challenges, and ask questions. In this study, groups of 3 to 5 families met weekly, over 6 weeks, in the clinic, for approximately 90 min, to learn session content,

and to discuss / share examples from individual coaching sessions, which took place between didactic sessions. Coaching sessions (approximately 60 min each) also took place in the clinic, with a tapering schedule (2 visits in each of weeks 1–3; 1 visit in each of weeks 4–6), interspersed between weekly group didactic sessions.

Virtual Group-Based Social ABCs (VG-Social ABCs; adaptation 2). The VG-Social ABCs model was a modification of the group-based model with two differences: all of the interactions (group sessions and individual coaching) took place virtually, over Zoom for Healthcare; families and toddlers were in their homes for all sessions. The schedule and length of sessions was identical to that of the in-person group-based model.

Data collection and measures. Video-recorded parent-child free play interactions and parent questionnaires (described below) were collected at two time-points: Baseline (BL) and following the 6-week intervention (Post).

Video-coded variables. Ten-minute, parent-child free play interactions were video-recorded at both time-points. For all parent-child interaction videos, parents were instructed to “play with your child as you typically play” and were reminded that “we want to see both of you on the screen as much as possible”. No coaching occurred during the data collection videos, in order to observe parents’ independent use of the strategies. Videos were recorded by the Coach assigned to the family (with occasional exceptions when staff were ill). Video coding was conducted by blinded research staff with established inter-rater reliability who were not involved in the didactic or coaching sessions. Consistent with standard practice in the field (Sone et al., 2021) and our previous work (Brian et al., 2016; Brian, Smith et al., 2017), video coding was used to measure two key indices: (1) *Parent implementation fidelity* (percent correct use of 10 antecedent and consequence strategies; described in Brian, Drmic et al., 2022); and (2) *toddler vocal responsiveness* (% of child vocal responses to parent-provided language opportunities; i.e., “model prompts”), which has been shown to be linked to real-world outcomes including later language and cognitive abilities (Warlaumont et al., 2014).

Parent-report measures. All parent-report questionnaires were completed on paper response forms that were mailed to families in self-addressed, stamped return envelopes prior to beginning the intervention. In some cases, families in the in-person condition were provided with copies directly at the clinic, as needed (i.e., if time for mail-outs was insufficient to ensure families received the forms before starting). At baseline, parents completed a *Family Profile (Intake) Form*, developed for our previous work (Brian, Smith et al., 2017), which yielded information about their toddler’s age and diagnostic status, family structure (e.g., marital status, whether the toddler has a sibling with ASD,

languages spoken at home), and parents’ educational attainment, ethnicity, and occupation. Additional parent-report questionnaires were collected at both time-points to explore toddlers’ language skills (inventory), ASD symptoms, and parents’ sense of parenting efficacy and parenting stress. Finally, parents completed a satisfaction questionnaire at the end of the program.

MacArthur-Bates Communicative Development Inventory (CDI; Fenson et al., 1993). Information about toddlers’ language skills was collected from parents pre- and post-intervention, using the CDI Words and Gestures form (Part I). The CDI measures vocabulary comprehension (words understood) and production (words understood and used) based on an inventory of 396 words. The CDI is designed for the 8- to 18-month age range but has been used effectively with preschoolers with ASD beyond age 3 (Charman et al., 2003). Percentile scores are not available beyond age 18 months, so we used raw scores (cf. Charman et al., 2003; Mitchell et al., 2006; Iverson et al., 2018).

Autism Parent Screen for Infants (APSI; Bryson et al., 2006). The APSI is a 26-item forced-choice questionnaire designed to measure parent-reported ASD symptoms in 6- to 24-month-olds. The APSI has excellent internal consistency (Cronbach’s $\alpha=0.92$) at 24 months in a sample of toddlers at elevated familial likelihood of ASD who received an ASD diagnosis at 36 months of age (Sacrey et al., 2018). A higher score indicates more (or higher intensity) ASD symptoms. Raw total score was used for analyses to compare pre- versus post-intervention parent-reported ASD symptoms; because we used the tool beyond the validated age-range, cut-off scores were not used to predict or validate diagnostic outcomes.

Parenting Stress Index (PSI-4 Short Form; PSI-SF-4; Abidin, 2012) was used pre- and post-intervention. This is a 36-item parent-reported scale designed to measure stress associated with parenting, with acceptable test-retest reliability ($r=.68-0.85$) and good internal consistency for Total Stress (Cronbach’s $\alpha=0.91$) for the original version, and good agreement between versions ($r=.97-.99$; Abidin, 2012). The PSI-SF-4 is written at a grade 5 reading level and yields a Total Stress score (ranging from 36 to 180), derived from three subscale scores (each ranging from 12 to 60): Parental Distress (PD), Parent-Child Dysfunctional Interaction (P-CDI), and Difficult Child (DC). Clinical cut-offs (associated with raw domain scores ≥ 85 th percentile) are as follows: PD (≥ 33), P-CDI (≥ 26), DC (≥ 33), and Total Stress (≥ 86). This scale has been used with respect to parenting children with ASD with caveats regarding interpretation of the P-CDI and DC scales (Zaidman-Zait et al., 2010).

Self-efficacy. To examine parents’ perceived self-efficacy at both time-points, we used a 21-item, 5-point Likert scale

(0: “Never” to 5: “Very Often”) questionnaire (the Self-Efficacy Form) adapted from the Family Empowerment Scale (Koren et al., 2000) and the Early Intervention Parenting Self-Efficacy Scale (Guimond et al., 2008) and used in our previous related work (Brian, Smith et al., 2017).

Satisfaction. Following the 6-week program, parents completed a 12-item questionnaire, developed by our group (and used in previous work; Brian, Smith et al., 2017), to assess acceptability of the intervention, with 7 questions rated on a 5-point Likert scale (1: “Not at all” to 5: “Extremely” helpful) and tallied for a total satisfaction score (possible range: 7 to 35). Questions are related to the “helpfulness” of core aspects of the intervention (e.g., the Parent Manual itself, discussion of the Manual content, live coaching), the Coaches’ responsiveness to parent questions or concerns, perceived impact of the program on children’s language and smiling, and a global rating of the overall training experience. Parents were also asked to indicate their satisfaction with the length of the program, the number and length of visits (0 – too short; 1 – just right, 2 – too long). Open-ended comments were also invited regarding what parents found most helpful and how to improve the experience. No formal psychometrics are available for this measure.

Analyses and hypotheses

All analyses were conducted using IBM-SPSS Statistics (version 25).

Feasibility and program acceptability. We examined feasibility (attendance, completion of questionnaires) and acceptability (satisfaction) of the different model adaptations in two ways. First, we examined indices of feasibility and acceptability across conditions (in-person vs. virtual). We then explored program enrollment across family socio-demographic factors (e.g., marital status, use of English in the home, parents’ educational attainment) and sample characteristics (e.g., diagnostic status of toddlers). We used Chi-squared (χ^2) or Fisher’s exact tests to compare categorical variables, and ANOVA for continuous variables. We predicted that attendance would be higher for the virtual model, but that satisfaction would be higher for the in-person model. We did not generate specific hypotheses related to family socio-demographic factors or sample characteristics.

Change made during intervention. Repeated measures analyses of variance (ANOVAs) were used to examine main effects and condition by time interactions for all primary and secondary outcomes. For significant tests, we report effect size (η_p^2), interpreted as small (0.01 – 0.059), medium (0.06 – 0.139), or large (0.14 or greater), per Cohen (1992).

Primary outcomes. Primary outcomes were parent implementation fidelity and toddler vocal responsivity (both blind-coded from video); to reduce the risk of type 1 error,

we used the Bonferroni correction (critical $p = .05/2 = 0.025$) for primary analyses. We hypothesized that parent fidelity would increase significantly in both conditions, that parents would achieve fidelity of 75% on average (as recommended by Stahmer & Gist, 2001), and that toddlers would evidence significant gains in responsivity. We hypothesized that there would be a condition by time interaction, whereby the in-person condition would yield greater gains than the virtual delivery condition for both primary outcomes.

Secondary outcomes. As secondary outcomes, we explored changes across five parent-reported indices (toddler ASD symptoms, word inventory – use and comprehension—, and parenting stress and self-efficacy). To account for multiple tests, we used the Bonferroni correction to reduce the risk of type 1 error (critical $p = .05/5 = 0.01$) for secondary outcomes. Again, we anticipated pre-post gains in all measures, but expected a condition by time interaction, whereby effects would be smaller for virtual delivery.

Exploratory outcomes. Finally, we used one-way ANOVAs to explore the influence of family factors (coded categorically; e.g., marital status, use of English in the home, parents’ educational attainment) on parental gains in implementation fidelity, collapsed across conditions. For these ANOVAs, implementation fidelity (change over time) was the within-subjects factor, with each of the categorical socio-demographic variables in turn as the between-groups factor. We anticipated that analyses would yield informative predictors of parents’ acquisition of implementation strategies. Due to the exploratory nature of these analyses, no corrections were made for multiple testing; in some cases, sub-groups were collapsed for ease of interpretation or to result in more balanced distributions.

Results

Normality assumptions

Examination of skewness and kurtosis indicated normality of distributions for all continuous variables (i.e., skew $\leq |1.70|$; kurtosis $\leq |1.69|$), with the exception of parent satisfaction (kurtosis = 2.74), wherein half of the families who completed the form (50.80%) provided a rating of ≥ 33 out of a possible 35, and no satisfaction scores were below 23. Due to high kurtosis, we used a non-parametric test (Mann-Whitney U) for this variable.

Sample description

A total of 82 primary caregivers (parents and one grandmother) and their toddlers (65 boys, 17 girls; mean age = 30.5 months; range 18–36 months) participated across the two

models. All but 3 families were recruited through a clinical assessment service dedicated to the diagnostic assessment of children referred for possible ASD, at Holland Bloorview Kids Rehab, a large paediatric rehabilitation hospital identified as a diagnostic “hub”, in Toronto, Ontario, Canada; thus all toddlers had either an ASD diagnosis or an elevated likelihood of ASD. Forty-five families received the in-person group model, and 37 received the virtual group program. Table 1 reports data on child characteristics (e.g., age, birth-assigned sex), parent ethnicity, educational attainment, marital status, and use of English and other languages at home, collected from the *Family Profile (Intake) Form*. In response to a question asking parents to list all the languages spoken in their homes, 27 languages were reported across these family homes (see Fig. 1).

Diagnoses of toddlers. Parents were asked to indicate any relevant diagnostic information about their toddlers on the *Family Profile (Intake) Form*. These data were available for 72 of the 82 participating toddlers (i.e., 10 forms were missing or the relevant item was left blank). For these 72 participants, 48 (66.7%) were reported to have a confirmed diagnosis of ASD made by a qualified professional at Holland Bloorview Kids Rehab or by affiliated community clinicians (in 3 cases) and 3 toddlers had “other” diagnoses (e.g., global developmental delay). In the remaining 21 cases, parents reported that their diagnostic assessment appointment had not been completed so a diagnosis had not yet been confirmed (e.g., they were awaiting a final assessment appointment or formal feedback regarding a diagnosis).

Feasibility and acceptability

Program delivery mode. Two significant differences with respect to program adherence emerged across delivery conditions. First, although overall χ^2 was non-significant when examining the absolute number of coaching sessions attended ($p=.12$), there was a pattern wherein parents in the virtual condition were more likely to attend a “high” proportion (defined as $>80\%$) of coaching sessions (i.e., 8 or 9) compared to those in the in-person model (97.2% vs. 79.5%, respectively), Fisher’s exact $p=.02$; note however that 93.2% of in-person families attended 7 or more sessions (i.e., $>75\%$). Conversely, parents in the in-person condition completed their questionnaires at a significantly higher rate (93.3%) than those in the virtual condition (56.8%), $p<.001$. Parent-reported satisfaction was high and did not differ across conditions (both means >32 out of a possible 35; Mann-Whitney $U=367.00$, $p=.065$).

Socio-demographic factors and sample characteristics. Family socio-demographic factors did not differ across in-person and virtual program delivery for any of the indices collected (see Table 1). Parent marital status approached a

significant difference ($p=.06$), such that marginally more parents self-identified as married or common-law partners in the virtual (88.0%) than the in-person (68.2%) condition. Toddlers’ diagnostic status differed significantly across delivery modes ($p=.04$), whereby there was a greater proportion of confirmed (vs. in-progress) diagnoses for the virtual (85%) than the in-person (62%) condition.

Parent and toddler changes made during intervention

Primary outcomes (video-coded variables). All videos with two available time-points were blind coded ($n=150$, across 75 parent-child dyads; 91.5% of the sample); 15% ($n=22$) were double-coded to establish inter-rater reliability. Intra-class correlations (ICC; using a two-way random effect model, with absolute agreement) were excellent for both Fidelity (ICC = 0.98; 95% CI: 0.95 – 0.99) and Responsivity (ICC = 0.99; 95% CI: 0.97 – 0.99).

Table 2 shows mean (SD) parent implementation Fidelity and toddler Responsivity at both time-points, by treatment condition. For Fidelity, a significant main effect of time emerged; $F(1,73)=225.46$, $p<.001$, with a large effect size ($\eta_p^2=0.75$). The main effect of condition ($F(1,73)=3.88$, $p=.053$, $\eta_p^2=0.052$), and the condition by time interaction ($F(1,73)=3.89$; $p=.052$, $\eta_p^2=0.051$) both failed to reach significance, and had small effect sizes. Similarly for Responsivity, there was a significant main effect of time; $F(1,72)=130.35$, $p<.001$, with a large effect size ($\eta_p^2=0.64$), but no significant main effect of condition ($F(1,72)=2.34$, $p=.13$, $\eta_p^2=0.03$) or condition by time interaction ($F(1,72)=2.82$, $p=.10$, $\eta_p^2=0.04$). None of the non-significant findings met criteria for significance based on standard ($p=.05$) or corrected p values (0.025), and effect sizes were small.

Secondary outcomes (parent questionnaires). Table 3 presents mean scores (SD) and significance tests for all parent-rated questionnaires across time and condition. For all measures, a significant main effect of time was seen (with consistent improvement from pre- to post-intervention), but no significant main effect of condition or time by condition interactions emerged.

A significant main effect of time emerged for total parenting stress; $F(1,56)=12.33$, $p=.001$, with a large effect ($\eta_p^2=0.18$). The condition ($F(1,56)=3.99$, $p=.051$) and time by condition interaction effects ($F(1,56)=3.73$, $p=.058$) both approached uncorrected significance, both with medium effect sizes ($\eta_p^2=0.07$ and 0.06, respectively), but these trends did not survive error correction. Examination of means reveals a pattern wherein parents in the in-person condition reported less stress overall; this group also reported a somewhat greater decrease in parenting stress

during the intervention period ($M=85.34$ vs. 75.38 , for baseline and post-intervention, respectively) compared to those in the virtual condition ($M=92.84$ vs. 89.95 , respectively); see Table 3.

Exploratory outcomes. Separate one-way ANOVAs did not yield significant effects for change in parent implementation fidelity based on any of the following between-subjects participant or family factors: which parent was coached (mother or father; the 1 grandmother was excluded; $F(1,71)=0.01, p=.92$); marital status (married/common law vs. single or separated; $F(1,62)=1.72, p=.19$), frequency of English used in the home (rarely, sometimes, always; $F(2,62)=0.98, p=.38$), number of languages spoken in the home (1–4; $F(3,60)=0.25, p=.86$), parents' ethnicity (collapsed into BIPOC or white/Caucasian; $F(1,65)=0.03, p=.87$), occupation (employed/ self-employed vs. homemaker/unemployed/ student; $F(1,63)=0.30, p=.58$), educational attainment (high school, college/ trade, or university / graduate or professional school; $F(2,62)=0.46, p=.63$), or the number of coaching sessions attended (note that all those with videos had attended ≥ 5 sessions; $F(4,68)=0.51, p=.73$); the same held when session attendance was divided into high (8–9 sessions) versus low (4–7 sessions) attendance; $F(1,71)=0.92, p=.34$.

Discussion

In the current study, we examined the acceptability, feasibility, and preliminary outcomes associated with participation in group-based learning, combined with individual coaching, of a parent-mediated intervention for toddlers with suspected or confirmed ASD. The main objective was to examine outcomes and identify any potential differences between in-person and virtual delivery of the group-based program in terms of uptake or change during treatment.

The group-based Social ABCs model attracted a diverse range of families, regardless of whether provided in person or virtually, with no systematic enrollment differences based on parental ethnicity, education, employment, or English proficiency. Across conditions, parents represented an ethnically and linguistically diverse sample, with almost three-quarters self-identifying as BIPOC (i.e., Black, Indigenous, or People of Colour), over half speaking more than one language, and only half reporting “always” speaking English at home. Across the sample, 27 languages were spoken by participating families, further highlighting this diversity. Parents also represented a range of educational backgrounds, with 20% not having completed schooling beyond high school, and just over half were employed (including working from home during the pandemic); nearly one-quarter were separated or single parents. The only characteristic

that differed significantly across groups was the higher proportion of children's confirmed diagnoses of ASD in the virtual model. Given the uncontrolled cohort effect (i.e., virtual group was only available during the pandemic, starting during a temporary interruption in diagnostic assessment services), we interpret this as a spurious finding—that is, for the virtual condition, the increased time from initial assessment appointment to intervention initiation made it more likely that a diagnosis could be confirmed before the program began. Perhaps most important was the finding that none of the socio-demographic factors or sample characteristics was associated with parents' ability to learn and deliver the intervention with fidelity. This underscores the feasibility of the model, across a diverse range of families, and its potential to be embedded into clinical pathways.

As predicted, there were subtle differences in rate of attendance at coaching sessions. Namely, families in the virtual group were more likely to attend a high proportion of sessions (i.e., $>80\%$) than in-person families. It thus appears that attendance might be somewhat optimized in the virtual model. This may be due to a variety of factors such as families not needing to leave their homes, navigate transportation, or make extended child-care arrangements, and because rescheduling was easier for virtual care. Moreover, because the program took place during the pandemic, parents may have had more availability to attend sessions due to work-from-home orders or being laid off from employment during the pandemic. However, the clinical significance of this difference is unclear. First, the large majority ($>85\%$) of families attended at least 8 of 9 coaching sessions, and almost all families (95%) attended at least 7 sessions. Moreover, a high rate of attendance ($\geq 80\%$) was not associated with increased parent implementation fidelity, although these findings must be interpreted cautiously given the very small number of families attending fewer than 7 or 8 sessions. Overall, findings suggest that both versions of the group-based model are feasible for families, with the vast majority being able to attend at least three-quarters of the coaching sessions, whether delivered in-person or virtually. High attendance rates at coaching sessions may have been facilitated by a coaching protocol that allowed for family rescheduling (within specific parameters), but is also a strong indicator of families' commitment to supporting their young children's development when given the opportunity.

One other factor associated with adherence also differed significantly across conditions, with the opposite pattern. Namely, parents in the virtual condition completed questionnaires at a significantly lower rate than those in the in-person condition. This is not surprising given the nature of contact with Coaches / facilitators, such that families were able to easily hand the questionnaires to research staff at the centre. For the virtual groups, we continued to rely on paper

Table 1 Toddler characteristics, family socio-demographics, and program adherence across conditions

Variable	In-person group <i>n</i> = 45 (% of available data)	Virtual group <i>n</i> = 37 (% of available data)	Significance test, <i>p</i>
Mean (SD) age of toddler; range	30.62 months (4.15) Range: 21–36 months	30.34 months (4.02) Range: 18–36 months	$F(1,80)=0.098$, $p=.76$
Sex of toddler (m:f)	39:6 (86.7% male)	26:11 (70.3% male)	$\chi^2(1, N=82)=3.32$, $p=.07$
Diagnostic status of toddler	Confirmed diagnosis (26 ASD, 2 other): 28 (62.2%) No confirmed diagnosis yet: 17 (37.8%) Missing: 0	Confirmed diagnosis (22 ASD, 1 other): 23 (85.2%) No confirmed diagnosis yet: 4 (14.8%) Missing: 10	$\chi^2(1, N=72)=4.307$, $p=.04$
Sibling with ASD (y:n)	7:33 (17.5% sibling with ASD)	5:20 (20.0% sibling with ASD)	Fisher's Exact ($N=65$), $p=.52$
Marital status of parents; number (%)	Married/ common-law: 30 (68.2%) Single/ separated: 14 (41.2%)	Married/ common-law: 22 (88.0%) Single/ separated: 3 (12.0%)	$\chi^2(1, N=70)=3.66$, $p=.06$
Languages spoken at home; number (%)	One language: 23 (52.3%) More than one language (two: 16; three: 3; four: 2): 21 (47.7%)	One language: 11 (42.3%) More than one language (two: 11; three: 4; 15 (57.7%))	$\chi^2(1, N=70)=0.65$, $p=.42$
English spoken at home (frequency)	Always: 32 (71.1%) Sometimes (8), rarely or never (5): 13 (28.9%)	Always: 19 (73.1%) Sometimes (5), rarely or never (2): 7 (26.9%)	$\chi^2(1, N=70)=0.03$, $p=.86$
Which caregiver was coached	Mother: 37 (82.2%) Father: 7 (15.6%) Grandmother: 1 (2.2%); excluded from χ^2 analysis	Mother: 31 (86.1%) Father: 5 (13.9%) Grandmother: 0	$\chi^2(1, N=80)=0.06$, $p=.80$
Ethnicity of coached parent	Asian: 3 (6.7%) South-East Asian: 4 (8.9%) South Asian: 6 (13.3%) Black/ Caribbean: 8 (17.8%) White/ Caucasian: 13 (28.9%) First Nation: 1 (2.2%) Hispanic: 4 (8.9%) Middle Eastern: 3 (6.7%) Mixed: 3 (6.7%)	Asian: 5 (17.8%) South-East Asian: 1 (3.6%) South Asian: 7 (25%) Black/ Caribbean: 2 (7.1%) White/ Caucasian: 6 (21.4%) First Nation: 0 Hispanic: 4 (14.3%) Middle Eastern: 0 Mixed: 3 (10.7%)	$\chi^2(1, N=73)=0.50$, $p=.48^a$
Educational attainment of coached parent	High school (partial or full): 10 (23.8%) College/ Trade school: 16 (38.1%) University (9)/ Graduate or professional school (7): 16 (38.1%)	High school (partial or full): 4 (14.3%) College/ Trade school: 8 (28.6%) University (11)/ Graduate or professional school (5): 16(57.1%)	$\chi^2(1, N=70)=2.54$, $p=.28$
Coached parent employment status	Unemployed: 2 (4.5%) Home-maker: 15 (34.1%) Employed: 26 (59.1%) Student: 1 (2.3%)	Unemployed: 0 Home-maker: 9 (34.6%) Employed: 15 (57.7%) Student: 2 (7.7%)	$\chi^2(1, N=70)=0.01$, $p=.91^b$
Questionnaires completed (y:n)	42:3 (93.3% completed)	21:16 (56.8% completed)	$\chi^2(1, N=82)=15.26$, $p<.001$
Number of coaching sessions attended	9 sessions (all): 31 (70.4%) 8 sessions: 4 (9.1%) 7 sessions: 6 (13.6%) 4–6 sessions: 3 (6.8%)	9 sessions (all): 30 (83.3%) 8 sessions: 4 (12.1%) 7 sessions: 0 4–6 sessions: 1 (3.0%)	Fisher's Exact Test ($N=80$); $p=.02^c$

Note: ^a χ^2 test for parent ethnicity collapsed participants across non-white groups to allow for a 2-group comparison. ^b χ^2 test for parent occupation collapsed across categories (employed/ self-employed vs. home-maker/ unemployed/ student) for a 2-group comparison. ^cFisher's Exact test for number of coaching sessions collapsed across two categories (4–7 sessions vs. 8–9 sessions) for a 2-group comparison.

versions of questionnaires. Although these were mailed to families with pre-stamped, return-addressed envelopes, the burden of leaving the house to get to a mailbox (during the COVID-19 pandemic, when children were not at school and many out-of-home activities were restricted) may have been a substantive barrier. This highlights the importance of

adopting on-line methods for data collection in future studies of virtually delivered interventions. Across conditions, parents reported high satisfaction with the program.

As predicted, significant gains emerged for both parent implementation Fidelity and toddler Responsivity, across conditions, both with very large effects. Contrary

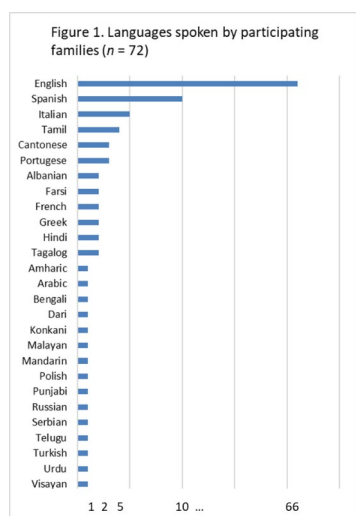


Fig. 1 Languages spoken at home as reported by participating families

to predictions, no differences emerged between in-person and virtual delivery for either of these primary video-coded outcomes, suggesting that virtual delivery did not impede parents' and toddlers' positive response to the program. In contrast to the original model (which involved more sessions of individual, in-person teaching and coaching in the family's home), parents in both group-based conditions approached but did not achieve the targeted implementation fidelity of 75% on average. Nonetheless, fidelity for both groups was around 70% overall at the end point, they experienced significant gains in fidelity, and reported significant improvements in feelings of self-efficacy, with large effect sizes, regardless of condition.

Toddlers' gains (amount of change) on the video-coded measure of Responsivity were generally consistent with outcomes from the original model, with average gains of approximately 40 percentage points when collapsed across

Table 2 Video-coded primary and secondary outcomes across time and condition: Parent implementation fidelity and toddler vocal responsivity

Variable	In-person group (n = 40)	Virtual group (n = 35)	Main effect of time ^{a,b}	Time by condition interaction ^{a,b}
Parent Fidelity (mean %, SD)	BL: 34.58 (16.52) Post: 69.53 (16.56)	BL: 44.40 (13.62) Post: 71.23 (14.61)	$F(1,73)=225.46$, $p < .001$, $\eta^2 p = 0.75$	$F(1,73)=3.89$, $p = .052$ (N.S.), $\eta^2 p = 0.05$
Toddler Responsivity (mean %, SD)	BL: 9.43 (15.05) Post: 54.76 (28.37)	BL: 9.36 (15.28) Post: 43.07 (26.37)	$F(1,72)=130.35$, $p < .001$, $\eta^2 p = 0.64$	$F(1,72)=2.82$, $p = .10$ (N.S.), $\eta^2 p = 0.04$

Note: BL = baseline; Post = Post-intervention; SD = standard deviation; N.S. = non-significant. Main effects of condition were both non-significant and are not reported here as they were not part of the hypothesized analyses. ^aBonferroni correction (critical $p = .05/2 = 0.025$) was used to reduce risk of Type I error. ^bEffect size, reported as $\eta^2 p$, is interpreted as small (0.01-0.059), medium (0.06-0.139), or large (≥ 0.14).

Table 3 Parent-reported toddler and parenting outcomes

Variable	In-person group (n = 41)	Virtual group (n = 25)	Main effect of time ^{a,b}	Time x condition interaction ^{a,b}
Toddler APSI Total Score (mean, SD)	BL: 18.88 (9.73) Post: 16.73 (9.40)	BL: 21.76 (9.29) Post: 17.72 (9.03)	$F(1,64)=18.29$, $p < .001$, $\eta^2 p = 0.22$	$F(1,64)=1.71$, $p = .20$ N.S.
Toddler Words Understood (CDI; mean, SD)	BL: 185.05 (115.07) Post: 232.85 (124.08)	BL: 215.61 (125.25) Post: 248.13 (117.87)	$F(1,62)=42.75$, $p < .001$, $\eta^2 p = 0.41$	$F(1,62)=1.55$, $p = .22$ N.S.
Toddler Words Spoken (CDI; mean, SD)	BL: 105.74 (117.19) Post: 143.57 (137.22)	BL: 151.61 (130.66) Post: 175.96 (141.41)	$F(1,63)=32.03$, $p < .001$, $\eta^2 p = 0.34$	$F(1,63)=1.51$, $p = .22$ N.S.
Parenting Stress (PSI-SF-4 Total Score)	BL: 85.58 (19.75) Post: 76.10 (18.11)	BL: 92.84 (22.58) Post: 89.95 (25.62)	$F(1,56)=12.33$, $p = .001$, $\eta^2 p = 0.18$ Main effect of condition: $F=3.99$, $p = .051$ N.S. (trend) $\eta^2 p = 0.07$	$F(1,56)=3.73$, $p = .058$ N.S. (trend) $\eta^2 p = 0.06$
Parenting Efficacy	BL: 59.55 (8.91) Post: 63.59 (9.03)	BL: 61.33 (8.04) Post: 64.62 (10.20)	$F(1,59)=10.92$, $p = .002$, $\eta^2 p = 0.16$	$F(1,59)=0.12$, $p = .74$ N.S.

Note: BL = baseline; Post = Post-intervention; SD = standard deviation; N.S. = non-significant. Main effect of condition is only reported when a trend approaches significance (i.e., only for PSI Total). ^aBonferroni correction (critical $p = .05/5 = 0.01$) was used to reduce risk of Type I error. ^bEffect size, reported as $\eta^2 p$, is interpreted as small (0.01-0.059), medium (0.06-0.139), or large (≥ 0.14).

conditions. Although not compared directly to previous findings, this gain is broadly in line with an average increase of 45 percentage points for toddlers in the original RCT (Brian, Smith et al., 2017). The slight attenuation of gains in Responsivity for the group-based (vs. original) model is not surprising given the abbreviated duration of the intervention, but demonstrates significant learning even over the six-week time frame. In addition to the video-coded measures, parent-reported outcomes also revealed significant gains in toddlers' use and understanding of words and reduced ASD symptoms, with no differences across in-person and virtual conditions. These findings converge to highlight the potential of group-based learning for parent-mediated interventions, with respect to both parent learning and child developmental gains, and the added promise of virtual delivery to allow for increased reach. Group-based learning also allows families to meet and share experiences with other parents in a supportive and facilitated environment, which may add therapeutic benefit (Biggs et al., 2020; Borek et al., 2019) and reduce parenting stress (e.g., Boyd, 2002; Robinson & Weiss, 2020).

The pattern of findings that emerged with respect to parenting stress revealed a statistically significant decrease in total stress over time (collapsed across conditions) with a small effect size. Specifically, participation in either group-based learning model was associated with decreased parenting stress over time. Although not compared directly, this stands in contrast to findings from the original Social ABCs model (Brian, Smith et al., 2017), in which parenting stress did not significantly decrease over time. That parenting stress was reduced in the group model, despite families receiving less individual support than in the original model, points to the important role of facilitated peer support (e.g., Borek et al., 2019), which may have increased parents' sense of social support. Previous studies have demonstrated the positive impact of perceived social support on parents' stress, highlighting the benefits of connecting with other parents of children with disabilities (Boyd, 2002) or feeling like "part of a group" (Robinson & Weiss, 2020; p. 4) of like-minded people. The notion of the "right support" has been identified as a key factor in parental adjustment to a child's diagnosis, wherein "connections with people who are intimately familiar and comfortable with autism... offer understanding and reassurance that calms the sense of overwhelming...with which many parents grapple" (Drumm, 2019, p. 113). Examination of means, motivated by the trend toward a condition by time interaction, reveals a somewhat larger reduction in parenting stress for the in-person group model. It is not clear whether this was due to a true difference between the in-person and virtual program, or whether other factors interfered with stress reduction for the virtual condition. Specifically, participation in

the virtual condition was confounded by the COVID-19 pandemic, which is associated with known stressors (Manning et al., 2020). Although baseline stress levels did not differ significantly across conditions, it bears noting that parents in the in-person groups began the program with Total stress scores just below the clinical range on average (decreasing to well below clinical cut-offs), whereas parents in the virtual group (during COVID-19) began well within the clinical range on average. Although the pandemic may not fully explain our findings, the stress parents experienced may have been less amenable to change in comparison to the cohort who participated in the in-person condition, which took place before the pandemic began. Nonetheless, this finding points to the potential therapeutic benefit of the group-based learning environment, driven perhaps by the feeling of being supported by peers (i.e., "the experience of being understood and validated by others who get what they are going through"; Drumm, 2019, p. 128), which may be particularly salient during in-person interactions. These putative associations were not formally examined in the current study, nor do we know the impact of other factors such as group size (i.e., larger groups may not yield similar effects), warranting further exploration in future research.

Strengths and Limitations

Strengths of the current study include recruitment of a relatively large, ethnically and linguistically diverse sample through a clinical diagnostic assessment service, blinded video coding with inter-rater reliability, and the inclusion of both objective (video-coded) and parent-reported outcomes. Limitations include factors related to study design, including non-random assignment to conditions, sequential enrollment into in-person vs. virtual delivery, and the complete overlap of the virtual model with the global pandemic, leading to potential cohort effects (e.g., different stressors and priorities, reduced access to competing services, increased parent availability due to work-from-home practices associated with isolation measures). We also acknowledge a high rate of missing parent-reported data from the virtual condition. With just over half of the questionnaire data returned by parents in the virtual group, findings for this condition must be interpreted with caution, and may not be representative of all parents in this group. Limitations associated with measurement include the lack of direct clinical assessment, no independent confirmation of diagnostic status (though almost all diagnoses came from a centre with recognized expertise in ASD assessment), and constraints associated with some of our parent measures. Specifically, we did not adapt the Satisfaction survey for the group-based model so we are unable to obtain information about parents'

satisfaction with specific adaptations to the program; we have not established the psychometric properties of our measure of parent efficacy, which was adapted from established measures and used in our previous work; and our use of the APSI beyond the validated age range (although we examined raw scores, i.e., changes in parent-reported ASD symptoms, rather than applying a cut-off score to establish risk status). Finally, with regard to interpretation of parenting stress, the current design does not allow us to determine whether the attenuated reduction in stress for the virtual group can be explained by the virtual nature of the interactions *per se* (i.e., in-person interaction may be the “active ingredient”), or whether confounding historical variables (i.e., the global pandemic) may have interfered with this effect for the virtual group. Given the negative impact that parenting stress can have on mental wellness and coping (Weiss, 2002), as well as its potential to interfere with learning (Stadnick et al., 2015), this is a key avenue for future research. This work represents a first step in demonstrating the efficacy of group-based learning for parent-mediated intervention with toddlers who are showing early signs of ASD or have recently been diagnosed. Stronger empirical tests of efficacy and effectiveness are needed.

Conclusions and implications

This paper demonstrates the feasibility and acceptability of group-based learning, combined with individual coaching, as a promising adaptation of an evidence-based parent-mediated intervention for toddlers with confirmed or probable ASD, with similar outcomes across in-person and virtual delivery modalities. The feasibility and efficacy of Social ABCs across a range of culturally diverse families with varied educational backgrounds and English language proficiency indicates that the program may be a good fit for community delivery, with potential to be embedded into diagnostic assessment pathways. That the program capitalizes on children’s unique relationships with their parents and encourages parents to develop their own style when using the Social ABCs strategies suggests that it is sufficiently accessible to families from a range of backgrounds. Achieving on average approximately 70% fidelity of parental implementation in six weeks further supports this notion. Having two group-based models with similarly strong effects means that more families can be accommodated based on the families’ availability, needs, preferences, or on the suitability of a particular model, with potential to enhance health equity. Gains made in response to short-term early intervention have potential to set children on an accelerated developmental trajectory (Landa, 2018), but we do acknowledge that brief programs such as this are unlikely

to be sufficient for most children with ASD, and important parenting considerations (i.e., competing personal, professional, and family demands, stress and well-being) must not be overlooked. Nonetheless, findings highlight the promise of group-based learning and virtual delivery models for increasing timely access to very early supports at the first sign of concern for toddlers with ASD.

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1007/s10803-022-05554-7>.

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