

Teaching Community Service Providers to Support Caregiver PECS Use: An Evaluation of the
PECSperts Facilitator Training Model

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Applied Disability Studies

Submitted in partial fulfilment of the requirements for the degree of

Master of Arts in Applied Disability Studies, specialization in Applied Behaviour Analysis

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Abstract

Research examining how to train facilitators to implement the Picture Exchange Communication System (PECS) with caregivers and children is scarce. This research gap presents a barrier to offering PECS as a community service. Currently, there is some empirical research supporting the effectiveness of behaviour skills training (BST) and pyramidal training to train facilitators to implement behavioural interventions. Building on this foundation, the present study used a quasi-experimental, non-randomized group design to explore the effectiveness of a manualized BST training model (i.e., the *PECSperts Facilitator Training Package*) within a pyramidal training approach. Sixteen community facilitators participated in the study. Participants who immediately received training demonstrated a significant increase in treatment integrity from pre- to post-training assessments. These results maintained during the five week follow up period and generalized to the participants' clinical practice with families in the community. Participants who did not immediately receive training, did not demonstrate an increase in treatment integrity from pre- to post-training assessments. Later, the training procedures were replicated with the participants who did not initially receive training. After participation in the *PECSperts Facilitator Training*, these participants' treatment integrity scores also significantly increased. Participants rated the training positively on a social validity questionnaire. The results provide preliminary evidence for the use of the *PECSperts Facilitator Training* as an effective training model for training facilitators to teach caregivers to implement PECS with their autistic children. Results of this study have implications for increasing community capacity and access to facilitator PECS training.

Key words: autism spectrum disorder, behaviour skills training, pyramidal training, caregiver coaching, Picture Exchange Communication System

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Teaching Community Service Providers to Support Caregiver PECS Use: An Evaluation of the PECSperts Facilitator Training Model

A central symptom of autism spectrum disorder (ASD) is a delay or difficulty in developing functional communication skills (American Psychiatric Association, 2013).¹ Communication difficulties appear differently across individuals and may include difficulty in social situations, initiating and maintaining interactions, understanding nonverbal communication cues, and developing speech. In instances where speech is delayed or absent, augmentative and alternative communication (AAC) systems are often recommended (Alzrayer, 2020; Walker & Snell, 2013). One commonly used AAC is the Picture Exchange Communication System (PECS) developed by Frost and Bondy in 1984. The PECS protocol is based on Skinner's analysis of verbal behaviour (Skinner, 1957) and uses teaching strategies drawn from the science of behaviour analysis. PECS is composed of six phases and is designed to be used by children, adolescents and adults. The protocol progresses from simple picture exchanges using single pictures with no requirement for picture discrimination (Phase I), to developing persistence as a communicator (Phase II), to discriminating between different types of pictures (preferred vs. non-preferred, Phase IIIa; preferred vs. preferred, Phase IIIb), to creating sentences (Phase IV), to more complex skills, such as commenting, and responding to other people's questions using multi-picture sentences (Phases V and VI; Bondy & Frost, 2001).

Since 1990, numerous research studies have examined the implementation of PECS. These studies provide empirical support that indicates PECS is effective in facilitating the

¹Re: terminology in this paper is meant to be inclusive and we acknowledge different individuals identify with different terms, including but not limited to person first language and diagnosis first language. For example: children on the autism spectrum and autistic child.

development of communication for individuals on the autism spectrum and other developmental disabilities (e.g., Anderson et al., 2007; Carr & Felce, 2007; Cagliani et al., 2017; Ganz et al., 2008). Various studies, including experimental and single case research, have concluded that PECS has a positive effect on the development of functional communication skills (Anderson et al., 2007; Greenberg et al., 2012; Koudys et al., 2022), play skills (Carr & Felce, 2007), social communicative behaviour (Anderson et al., 2007), speech (Carr & Felce, 2007; Carson et al., 2012), and the amelioration of maladaptive or problem behaviour (Anderson et al., 2007; Chai & Lieberman-Betz, 2016; Frea et al., 2001).

Overall, the results from several meta-analyses indicate study participants can readily learn to functionally communicate with PECS (e.g., Ganz et al., 2012; Preston & Carter, 2009) and PECS use is correlated with an increase in functional communication and a reduction in the occurrence of problem behaviour. Problem behaviours appear differently across individuals and may include aggressive, self-injurious or tantrum behaviours (Battaglia & McDonald, 2015). In addition to these meta-analyses, several comprehensive reviews have been conducted to identify intervention approaches that meet criteria to be considered evidence based (e.g., National Professional Development Center on Autism Spectrum Disorders, 2010). According to these reviews, PECS is considered an evidence-based practice for helping autistic individuals develop functional communication (Hume et al., 2021; Ontario Scientific Expert Taskforce for the Treatment of Autism Spectrum Disorders, 2017; Wong et al., 2015).

Caregiver PECS Training

Caregivers are the primary communicative partners of many PECS users. Communicative partners function as the “listener” in the interactive communication exchange with the child during a PECS trial (Bondy & Frost, 2001). As the primary communication partner, caregivers

will have the most opportunities—in both number and variety—to facilitate communication opportunities for their autistic children through PECS. It is also the caregivers who will ensure the continued use of PECS (Chai & Lieberman-Betz, 2016; Olivatti et al., 2021). Family support and caregiver training is crucial for the success of behaviour support systems for children as caregivers are largely responsible for the creation and maintenance of children's daily routines and learning environments (Licona et al., 2022; Mahoney & Wiggers, 2007). Similarly, caregiver training and engagement in AAC use is integral to the development and maintenance of a functional communication system (Granlund et al., 2008). As PECS is a complex, multi-phase communication system, focused training is required for caregivers to implement the system effectively (Ganz et al., 2012). For this reason, several studies have examined a behavioural skills training (BST) model to train caregivers to implement various phases of PECS training with their children (Chaabane et al., 2009; Rosales et al., 2009; Treszl et al., 2022). Behaviour skills training is a teaching model which includes the following four-step teaching structure: instructions, modelling, rehearsal, and performance feedback (Dib & Sturmey, 2012; Sarokoff & Sturmey, 2004). Behaviour skills training has been used to help caregivers learn how to implement PECS and other behavioural interventions with their children, including: increasing food selections, implementing guidance compliance, and supporting discrete-trial teaching (Slane & Lieberman-Betz, 2021).

Specific to caregiver PECS training, Chaabane et al. (2009) used BST to teach two parents to accurately implement PECS with their autistic children. The results of the multiple baseline design study demonstrated that the parents' PECS skills generalised and their children, after being taught PECS, were able to exchange novel pictures. Another changing criterion design study, involving three parents, demonstrated BST was successful in teaching parents to

support their autistic children's PECS skill use (Park et al., 2011). Child PECS skills were shown to maintain during follow-up assessments. Alsayedhassan et al. (2020) used a multiple baseline and changing criterion design to explore the effectiveness of a BST package to train two parents to implement PECS with their autistic children. Parents achieved high treatment integrity after training and demonstrated skill maintenance and generalisation. Furthermore, the children attained independent PECS requesting skills.

Relatedly, in the first published study exploring the use of telehealth to train caregivers to implement PECS, Treszl et al. (2022) used a multiple baseline design across skills to explore the use of BST and general case training (GCT). Together, BST and GCT were used to support one parent implementing PECS with their autistic child at home. Telehealth is the electronic distribution of health services to support a broader community that might have otherwise gone without (Luxton, 2013). Telehealth may involve a variety of modalities including telephone, online through the use of synchronous videoconferencing, asynchronous webinars, Web-based systems, store-and-forward call center services, email, and remote monitoring (Luxton, 2013). Behavioural services delivered via telehealth have equivalent attendance rates and may increase service access for clients in comparison with face-to-face treatment (Cao et al., 2023; Walton et al., 2023). Wacker et al. (2013) demonstrated that caregivers can be coached through the implementation of behavioural interventions with their autistic children via telehealth consultation. Pollard et al. (2021) demonstrated that for clients with autism telehealth behavioural services was able to support the same amount of treatment hours and either maintained or increased client responding for all behavioural targets. Furthermore, Treszl et al. (2022) results indicate that a telehealth training method was associated with improved parent PECS treatment fidelity in the training session, but mixed results were observed for the

generalisation of skills such as error correction to the natural environment. The researcher hypothesised that this variability was due to a lack of practice opportunities for the parent because of the child's high level of PECS accuracy. Overall, the results of these studies indicate that BST—and potentially telehealth—are beneficial for parent PECS skill development.

Caregiver Coaching

In addition to using BST to support caregivers, there is also a body of evidence supporting the use of coaching to help caregivers implement behavioural procedures with their children (e.g., Gerow et al., 2021a; Gerow et al., 2021b). Caregiver coaching, which involves prompting and providing feedback to caregivers while they implement procedures with their child (e.g., Gerow et al., 2021a), ensures additional support is provided to caregivers beyond the training model. This additional support is important because this caregiver population—and training models that are directed towards them—need to be approached with careful consideration given the vulnerability of this population who often report lower quality of life, higher stress levels, feelings of isolation, and poorer psychosocial outcomes (Funke, 2019).

Several approaches to facilitate caregiver–child coaching sessions are described in the literature. Boutain et al. (2020) used a nonconcurrent multiple baseline design to evaluate the impact of a telehealth caregiver training, involving BST and coaching, across three caregiver–child dyads. Their training package improved the fidelity of three caregivers in teaching their autistic children, while increasing child independence in targeted self-care skills. A social validity survey reported high levels of parent satisfaction with the training model and child skill outcomes. Another study, involving seven caregiver–child dyads, coached caregivers to perform brief functional analyses (FA) for their autistic child's challenging behaviours over telehealth (Gerow et al., 2021b). The researchers used a reversal design in which four or five conditions of

the brief FA were presented in randomised order. Similar to Boutain et al. (2020), caregiver coaching involved the therapist providing corrective feedback for incorrect or missed steps and praise for correct steps while the parent implemented FA procedures with their child. Results indicate that a telehealth coaching model may be an effective approach to teach parents to implement FA procedures and support function-based interventions. Social validity ratings of the procedure were positive (Gerow et al., 2021b). A subsequent multiple baseline across skills study examined the outcomes of caregiver coaching through telehealth and found positive results (Gerow et al., 2021a). During coaching sessions, parents worked directly with their child, while therapists described how to implement procedures and provided specific verbal prompts. When four caregivers were coached through telehealth to teach their child with a diagnosis of autism spectrum disorder daily living skills, the researchers found high levels of caregiver fidelity and child accuracy. The conclusions of these studies suggest that caregiver coaching, when combined with BST and telehealth technology, may help caregivers effectively implement behavioural assessments and interventions with their autistic children.

Training Facilitators to Implement PECS

For facilitators (community service providers) to teach caregivers how to use PECS with their children, they must first learn to implement PECS properly. Facilitators have reported a lack of community training opportunities as a barrier to offering this service (Alsayedhassan et al., 2020). Further, results from a survey exploring facilitators' perceptions of PECS recommended the development of programs for training personnel to implement AAC systems (Alsayedhassan et al., 2021). An increase in research exploring community training approaches would support and perhaps increase the use of AAC systems in naturalistic, clinical settings across communities (Ganz et al., 2013). Currently very little is known about PECS facilitator

training in naturalistic contexts and even less attention has been given to specific training issues (Ganz et al., 2013). Despite the current lack of community facilitator training opportunities, a number of studies exist that have examined different approaches to train facilitators to implement PECS with their clients (e.g., Barnes et al., 2011; Hill et al., 2014; Homlitas et al., 2014; Howlin et al., 2007; Ganz et al., 2013; Koudys et al., 2022; Magiati & Howlin, 2003). In these studies, examining PECS facilitator training, there are some notable positive results from a few different approaches for training facilitators to teach and implement PECS.

In 2003, a pilot study investigated the skill development of 34 autistic students in a randomised control study. The teachers at the schools of these learners were trained to use PECS through a workshop (conducted by the creators of PECS, Pyramid Educational Consultants) and ongoing consultation (Magiati & Howlin, 2003). Outcomes reported highly favourable teacher experiences following participation; however, the teachers identified implementation challenges, including time restrictions, and difficulty accommodating a variety of child needs and PECS levels in the same classroom which contained 34 children. Two major limitations of this study are that teacher PECS fidelity was not recorded after the training and the specific approaches they used to train the consultants during the six days were not reported. Monthly consultation was provided by the PECS consultants, but no data were collected to ensure the continuation of accurate teaching on the part of the teachers (Magiati & Howlin, 2003). Further, this study did not report on the teachers' PECS skill maintenance and generalisation.

Additional research explored the outcomes of training three direct care staff to use PECS with three adults on the autism spectrum. The direct care staff were trained using only verbal instruction and video modelling. The results showed that workshops and instructional videos produced minimal skill development when pre- to post-test scores were compared (Barnes et al.,

2011). An error analysis of the direct care staff's accuracy results indicated that more training on steps with common errors may have boosted their PECS skills and overall scores. The authors suggested that to train participants to mastery in these tricky steps in the PECS protocol would require training using BST, which notably also includes performance feedback (Barnes et al., 2011).

In a study using a multiple probe design, with generalisation probes, Ganz et al. (2013) explored PECS implementation fidelity outcomes after training three therapists to use PECS in real life contexts. Therapists were trained using a multi-component training model that involved a group workshop, individual instructional coaching, and optional booster sessions. The group practised Phases I to IV and received feedback on their practice trials. Generalization of PECS teaching skills was evaluated five weeks after the training during sessions involving three autistic children in a classroom. Outcomes indicated that the training package produced high treatment fidelity in the training context, but the therapists did not reliably demonstrate skill generalisation to novel environments. Therapists provided fewer PECS opportunities in the new environments and did not consistently ensure the child's PECS binder was readily available. The authors concluded didactic training through group workshops was insufficient to support a facilitator's accuracy in PECS during maintenance and generalisation. They further suggested individualised training and practice might have a positive impact on the promotion of generalisation.

Howlin et al. (2007) examined teacher training involving six teachers in a group design study. The teachers were trained in three groups (immediate treatment, delayed treatment, and control). The training consisted of a two-day PECS workshop, and six half-day consultations over five months. In the half-day consultations, the expert trainers recommended strategies, observed practice, and provided feedback to the teachers on their PECS implementation. Student

PECS communication and teacher fidelity were initially found to increase; however, the effects of treatment decreased once the intervention was removed (Howlin et al., 2007). The researchers recommended an extension of their PECS training and consultation package to determine if this could positively impact maintenance results. One limitation of this study was that teacher's practice opportunities varied due to time and personnel constraints.

Another facilitator training study used a multiple baseline across participants design to explore the outcomes of a PECS training with three pre-service teachers (Hill et al., 2014). The pre-service teachers were trained in six, 3-hour, BST sessions. In these BST sessions, the protocols were reviewed, various difficult PECS scenarios modelled, and opportunities for guided practice and feedback provided. Outcomes revealed an increase in communication, in an extended school year setting, for graduate level pre-service teachers. This training method achieved teacher fidelity according to a fidelity checklist (Hill et al., 2014). Follow-up probes were conducted to determine whether students benefitted from the pre-service teachers' training; results indicated that two child participants were independently using PECS (the third student could not participate in follow-up for personal reasons). The teachers' PECS teaching accuracy following the training was not reported.

An evaluation of the effectiveness of a BST model to teach PECS was conducted using a multiple baseline across participants design (Homlitas et al., 2014). Researchers trained three teachers, working with nine autistic children, at a therapeutic centre. Results indicated that the teachers-maintained accuracy in communication exchanges for PECS Phase I to IIIa in the natural environment. The BST training model enabled staff to reach a 90% criterion and maintain this level of accuracy in follow-up probes (Homlitas et al., 2014).

Finally, Koudys et. al. (2022) used a pre-post design to examine the effectiveness of PECS training, in a community setting. Facilitators were trained by attending a PECS overview session, data collection training, and individualised coaching. The training sessions involved the components of BST: didactic instruction, video review, role play, and direct skills coaching. Results demonstrated that BST may be used to teach PECS in naturalistic settings and improve student communication, despite imperfect implementation on the part of facilitators (Koudys et. al., 2022).

Considering both the caregiver training and facilitator training literature related to PECS, BST training models have been effective in training both populations to implement PECS with autistic children. Further, as illustrated by Ganz et al. (2013) didactic training alone, appears insufficient to attain a satisfactory level of fidelity. Relatedly, Barnes et al. (2011) concluded that performance feedback is particularly important for ensuring success. Although this literature is encouraging and provides guidance regarding how best to train parents and facilitators to implement PECS, to my knowledge there are no published studies that examine how to train facilitators to train caregivers to implement PECS with their children.

Pyramidal Training

Although little is known about training facilitators to train and coach caregivers to use PECS with their children, there is evidence that facilitators can be effectively trained to conduct BST to train other facilitators to implement behaviour-change procedures (i.e., pyramidal training; Parsons et al., 2012). In a study involving 10 facilitators in an adult education program, a BST pyramidal training approach was used to train other facilitators to implement behavioural interventions. A multiple baseline design across behaviours (e.g., most-to-least prompting, manual signing) was used. Results demonstrated that all participants improved their BST

implementation during training. Later, these skills were also effectively used on the job by participants in order to train other facilitators. The participants also reported that the intervention was acceptable and they would recommend it to their colleagues (Parsons et al., 2012). The authors further noted that a BST, pyramidal training approach can reduce the time required to train facilitators and may facilitate the dissemination of behavioural interventions. The results of this study demonstrate that pyramidal training can be used to effectively train facilitators to train others to implement behavioural interventions.

Similarly, in a multiple baseline study, Pence et al. (2012) examined the effectiveness of pyramidal training using roleplay, practise and feedback to train teachers to implement preference assessments. Three senior facilitators taught five special education teachers to implement multiple preference assessments with children (Pence et al., 2012). After the first round of training, the initial eight teachers taught 18 more teachers. All teachers demonstrated 90% accuracy in one to two sessions of training and strong generalisation results with students, in the teacher's classrooms or clinics. The authors concluded that the pyramidal training approach may be efficient and effective for propagating the use of behaviour-analytic procedures throughout the professional community (Pence et al., 2012).

As PECS is a behavioural intervention, it is plausible that a similar training procedure could be used to train facilitators to train caregivers to implement PECS. Pyramidal training might likewise increase the number the community-based facilitators and caregivers who are trained, potentially addressing the training dissemination barriers in the community and the current gaps in the literature (Alsayedhassan et al., 2020; Hill et al., 2014; Magiati & Howlin, 2003; Safi et al., 2022). Given the significant gaps in the literature related to training facilitators to support caregivers in implementing PECS with their autistic children, the purpose of this pilot

study is to examine the use of a BST package (i.e., the *PECSperts Facilitator Training Package*) to teach community facilitators to support caregivers PECS implementation.

My research questions are as follows:

- a. Is the *PECSpert Facilitator Training Package* effective in teaching community-based facilitators to implement online training sessions and caregiver–child coaching sessions with acceptable treatment integrity (TI)?
- b. Does the *PECSperts Facilitator Training Package* promote skill maintenance and generalisation to the facilitator’s natural environment with caregivers and children?
- c. What are the participants’ perceptions of the effectiveness and appropriateness of the training?

Methods

Participants

Participants were 16 community service providers who deliver services to children on the autism spectrum and who are employed by agencies that are involved in a multi-site, community-engaged pilot project, called *PECSperts*. The involved partner agencies provide a variety of services (e.g., speech-language pathology, mental health services, occupational therapy, applied behaviour analysis [ABA] services, and developmental services) for various child and adolescent populations, including children with neurodevelopmental disorders. Although the larger *PECSperts* project also explored child and caregiver outcomes following caregiver–mediated PECS training, this research study was specifically designed to evaluate the effectiveness of the *PECSperts Facilitator Training Package*. The partnering community agencies received an information brochure containing information about the purpose of PECS

and the basic purpose and goals of the *PECSperts Facilitator Training Package*, which is to teach facilitators to conduct online training sessions and caregiver–child coaching sessions. The brochure was distributed through relevant service provider information channels, including service provider email distribution lists and internal servers. Participant inclusion criteria were as follows:

- a) minimum one-year experience working with people with developmental disabilities (e.g., ASD, developmental disability),
- b) willing to complete a vulnerable sector screening,
- c) willing and available to participate in required facilitator training and assessment activities,
- d) willing and available to conduct online training sessions and online and in-person caregiver–child coaching sessions.

All participants demonstrated proficiency in reading, writing, understanding, and speaking in English. As well, all participants had experience working with people with intellectual disabilities and/or individuals on the autism spectrum and their caregivers. They included a combination of professionals working under the supervision of Board Certified Behaviour Analysts (BCBA), including Registered Behaviour Technicians (RBT) and autism therapists. Service providers from other related fields, including speech-language pathology and children’s mental health services, were also included. All participants were female between the ages of 26 and 60. Participants were divided into two groups: an immediate training group (ITG; $n = 7$) and a waitlist comparison group (WCG; $n = 9$). The ITG participants were assessed in pre- and post-training and participated in the *PECSperts Facilitator Training* in the spring of 2023 and the WCG participated in the assessments in the spring of 2023 but did not participate in the

*PECS*pers Facilitator Training until the fall of 2023. Further demographic details are presented in Table 1. All participants provided written, informed consent to participate.

Table 1

Demographic Characteristics of Participants in the ITG and WCG Groups

| Characteristic | Category | ITG | | WCG | |
|-----------------------------------|-----------------------------------|-----|------|-----|------|
| | | n | % | n | % |
| Age (years) | >18 and ≤ 25 | 2 | 28.6 | 0 | 0 |
| | >26 and ≤35 | 4 | 57.1 | 7 | 77.8 |
| | 35 or above | 1 | 14.3 | 2 | 22.2 |
| Ethnicity | African American | 1 | 14.3 | 0 | 0 |
| | White | 5 | 71.4 | 8 | 77.8 |
| | Filipino | 1 | 14.3 | 1 | 0 |
| | Other* | 0 | 0 | 0 | 11.1 |
| Highest Education Achieved | College | 1 | 14.3 | 1 | 11.1 |
| | Bachelor's | 5 | 71.4 | 7 | 77.8 |
| | Masters | 1 | 1.3 | 1 | 11.1 |
| Occupation | Autism Therapist | 7 | 100 | 3 | 33 |
| | Drug & Alcohol Counsellor | 0 | 0 | 1 | 11.1 |
| | Mental Health Therapist | 0 | 0 | 2 | 22.2 |
| | Communication Disorders Assistant | 0 | 0 | 3 | 33.3 |
| | | | | | |
| | | | | | |
| Years experience: ID | 0-5 | 3 | 42.8 | 7 | 77.8 |
| | 6-10 | 1 | 14.3 | 1 | 11.1 |
| | 11-15 | 2 | 28.6 | 1 | 11.1 |
| | 16-20 | 1 | 14.3 | 0 | 0 |
| Years experience: AAC | 0-5 | 4 | 57.1 | 8 | 88.8 |
| | 6-10 | 2 | 28.6 | 0 | 0 |
| | 11-15 | 1 | 14.3 | 1 | 11.1 |
| Years experience: PECS | 0-5 | 4 | 57.1 | 8 | 88.8 |
| | 6-10 | 2 | 28.6 | 0 | 0 |
| | 11-15 | 1 | 14.3 | 1 | 11.1 |

Note. ID = intellectual disability; AAC = alternative and augmentative communication.

As shown in Table 1, the participants in the ITG were all female with a group average age of 32.7 years old (range 23–58). Five participants in the ITG identified as White. One participant identified as Black and one identified as “other”. In terms of education, one had obtained a college diploma, five had obtained a Bachelor's degree, and one had obtained a Master's degree. All participants in the ITG worked in the field of ABA. On average, participants in this group had 8.93 years of experience working with individuals with intellectual disabilities (range 2–19). The ITG participants' group average was 6.07 years of experience working with AAC systems (range 0.5–14). Finally, all the ITG participants had prior experience implementing PECS. The group average was 6.41 years' experience implementing PECS (range 0.5–14). Most ($n = 4$) participants reported they had been trained through PECS Level One. One facilitator in this group indicated she was trained through clinical supervision and two facilitators did not report receiving any formal training.

As shown in Table 1, the participants in the WCG were also all female with a group average age of 29.88 years old (range 26–41). Eight participants in the WCG identified as White. One participant identified as Filipino. In terms of education, one had obtained a college diploma, seven had obtained a Bachelor's degree, and one had obtained a Master's degree. In terms of field of practise, three participants in the WCG worked in the field of ABA, three worked as communication disorders assistants, two worked in mental health services, and one worked as a drug and alcohol counsellor. On average, participants in this group had 5.33 years of experience working with individuals with intellectual disabilities (range 1–15). The WCG participants' group average was 4 years of experience working with AAC systems (range 0–15). Finally, two-thirds of the WCG participants had implemented PECS previously. On average this group had 3 years' experience implementing PECS (range 0–13). From the WCG, almost half ($n = 4$) of

participants reported they had been trained using PECS Level One. Most of the remaining participants reported they had no PECS training ($n = 5$). One participant in this group reported she received informal training from a Speech and Language Pathologist and had been directed to resources from the PECS website.

Settings and Equipment

This study took place through a combination of in-person and online settings. All online activities were conducted synchronously. First, the online video conferencing platform, Zoom was used to conduct the first portion of the *PECSperts Facilitator Training Package: PECS Level One Training* by Pyramid Educational Consultants of Canada. Participants logged-in to the training on Zoom from a location of their choosing (e.g., hospital/clinical offices, child service centres, and homes). All other online activities were conducted using the online videoconferencing platform, BlueJeans, which features high-quality video, screen sharing and breakout room capabilities, and video recording features. BlueJeans can be accessed anywhere with an internet network, through a link and password. This platform meets established security criteria for protecting health information using encryption, in-meeting and administration security features, and secure data storage features (BlueJeans, 2020). All online training activities were conducted synchronously. Online assessments, and training and follow-up sessions were recorded using the BlueJeans video recording feature.

In-person activities were conducted at the community service agencies. The 3-day BST training took place at the lead non-profit agency in a room large enough for 20 people with tables, chairs, an overhead projector, and the resources required to conduct PECS trials (i.e., toys, activities, edibles, corresponding pictures, PECS binders). Follow-up sessions with caregiver–child dyads and facilitator booster sessions were conducted at involved community

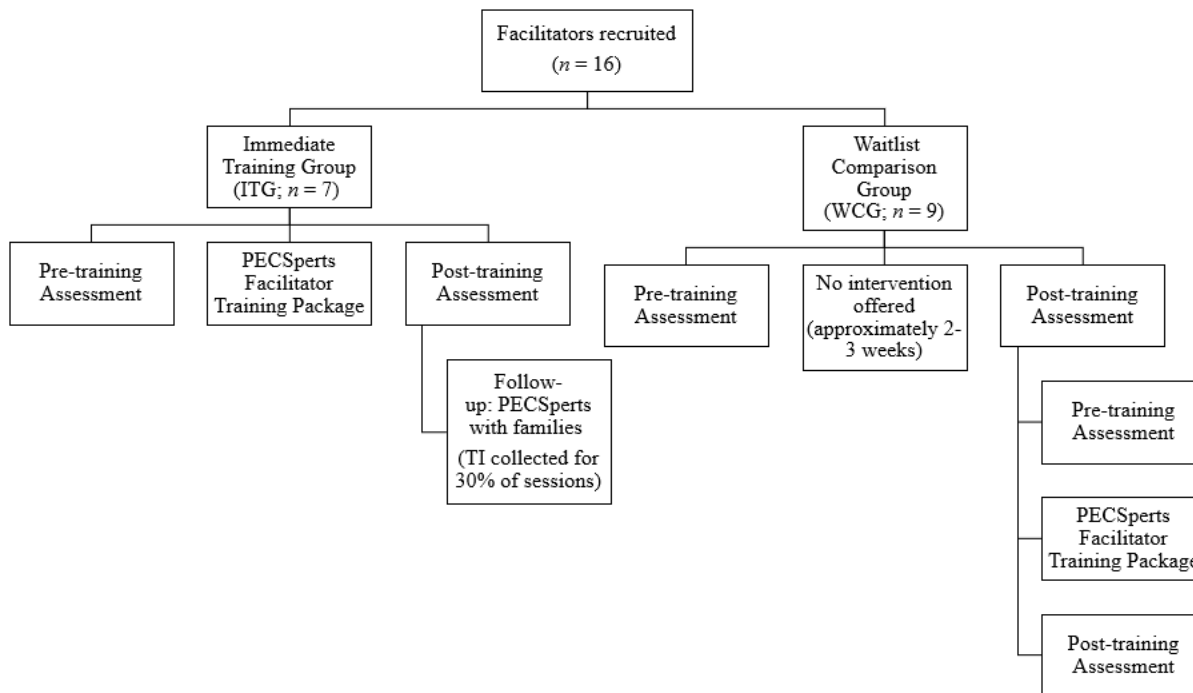
service agencies in smaller rooms also equipped with recording devices (i.e., iPads), computers with training videos, and the resources required to conduct PECS trials. In-person assessments, and training and follow-up sessions were recorded using iPads and tripods. Videos were uploaded to a secure, cloud-based Sync folder and deleted off iPads.

Materials

Materials included standard 3-ring, PECS binders that were 26cm x 23cm in size. Each binder had two to three PECS insert pages (21cm x 17cm in size). Velcro™ pieces lined the front cover of the binder and the page inserts. A hanging sentence strip with Velcro™ was located on the front bottom edge of the binder. Each binder included a variety of pictures. Each picture showed an image of typical preferred, non-preferred or neutral items, activities, and places. For example, toys (e.g., cars, balls, stuffed animals), food (e.g., crackers, candy, fruit, drinks), activities (e.g., swing, trampoline, tickles), and non-preferred items like tissues and pens. The laminated pictures were 4cm x 4cm, printed in colour and had the names of the items clearly marked. Smaller pieces of Velcro™ were attached to the back side of the pictures.

Research Design

We used a quasi-experimental design with non-random group assignment. Participants were assigned to groups based on their reported availability and work schedules to a summer or fall cohort of *PECSperts*, as shown in Figure 1. The summer cohort immediately received *PECSperts* and formed the ITG. The fall cohort was asked to participate as part of the WCG (i.e., participate in pre- and post-assessments in advance of receiving training). The ITG also participated in a follow-up phase to assess skill maintenance and generalisation. The WCG later participated in *PECSperts Facilitator Training* to provide the opportunity for the replication of treatment effects.

Figure 1*Non-randomised Group Assignment Diagram*

Note. TI = treatment integrity.

This design was practical for a community, real-world pilot study and suitable for a professional development setting (Pocock & Elbourne, 2000). Due to the scheduling difficulties associated with involving service community service providers as participants, a true randomised experiment would not have been feasible. Furthermore, empirical evidence suggests nonrandomised studies may yield sufficiently similar results to randomised group design counterparts (Benson & Hartz, 2000; Concato et al., 2000; Ioannidis et al., 2001; McKee et al., 1999; Pocock & Elbourne, 2000). We obtained ethical approval for the research project through Brock University's Research Ethics Board and relevant ethics approval processes of involved community agencies.

Response Measurement and Dependent Variables

Treatment integrity (TI) is “the extent to which the independent variable is implemented as planned” (Cooper et al., 2020, pg. 226). The dependent variables were the participant’s *Online Training Treatment Integrity* (henceforth, called Online TI) and *Coaching Treatment Integrity* (henceforth, called Coaching TI). Online TI is defined as the extent to which the *PECSperts Caregiver Training* online training sessions were implemented as planned. Coaching TI is defined as the extent to which the *PECSperts Caregiver Training* caregiver–child coaching sessions were implemented as planned. Both Online and Coaching TI were measured by calculating the percentage of correctly implemented steps for online training sessions and online or in-person caregiver–child coaching sessions using *Facilitator Treatment Integrity Checklists* (i.e., Online Training Treatment Integrity [Appendix A]; Caregiver–Child Coaching Treatment Integrity [Appendix B]). The checklists were designed to evaluate participants’ completion of the required training and coaching components, including all steps of BST (i.e., instructions, modelling, participant practice, and performance feedback; Parsons et al., 2012). Each item on the checklist was scored by a trained coder. Coders included trained graduate students completing a Master of Applied Disability Studies with a specialisation in ABA and BCBA’s at the Masters and Doctoral level. A correct score indicated the step was performed as described. An incorrect score indicated the step was not performed as described or was omitted. A ‘not applicable’ score indicated the participant did not need to perform the step (e.g., if the caregiver did not make any errors and the participant did not need to administer corrective feedback). To determine Online and Coaching TI scores, the total checklist steps scored correctly were divided by the total number of correct and incorrect steps and multiplied by 100 (Homlitas et al., 2014).

Pre- and post-training, Online and Coaching TI were measured for both ITG and WCG participants during online training assessments and online or in-person caregiver–child coaching

assessments. These assessments were conducted with confederates, playing the role of caregivers and children. Data were collected from video recordings. During follow-up, Online and Coaching TI was measured for the ITG during live observation of online training and caregiver–child coaching sessions with participating caregivers and children. Follow-up probes were conducted while the facilitators implemented the *PECSperts Caregiver Training Package* with caregiver–child dyads over approximately a 5-week period following training. Follow-up probes allowed us to evaluate participants’ skill generalisation to the natural environment with caregivers and children, as well as their skill maintenance over time (Pennington et al., 2019). When the WCG received the *PECSperts Facilitator Training*, Online and Coaching TI was calculated pre- and post-training as described earlier.

Interobserver Agreement (IOA)

Trained graduate students completed the *Facilitator Treatment Integrity Checklist* for 33% of randomly selected pre- and post-training assessments, and for 30% of semi-randomly selected follow-up sessions. These follow-up sessions were selected using a random number generator; however, attempts were made to observe a variety of phases across both online training sessions and caregiver–child coaching sessions and across all facilitators as they worked with one or two families. For this reason, strict randomization was not possible. Of the 30% of follow-up sessions, 10 were online training sessions (41.67% of the total number of online training follow-up sessions) and five were caregiver–child coaching sessions (20.83% of the total number of caregiver–child coaching sessions). For both Online and Coaching TI, IOA was calculated through trial-by-trial comparison, also called point-by-point agreement (Cooper et al., 2020; Ledford & Gast, 2018). In trial-by-trial comparison, the score of one observer is compared to the score of another observer for the same trial or item (Ledford & Gast, 2018). Agreements

occur when both observers score the trial (item) in the same way (i.e., both score the trial correct, both score the trial incorrect, or both score the trial n/a). A disagreement occurs when the observers score the trial (item) in different ways (i.e., one observer scores a trial correct and the other scores the trial incorrect, one observer scores the trial N/A and the other scores the trial incorrect, etc.). Disagreements were resolved by consensus; coders rewatched the videos containing disagreements and reviewed the participant's behaviour and the relevant scoring conventions and came to an agreement on the correct score for the item (Ledford & Gast, 2018). Interobserver agreement was calculated by dividing the total number of trials (items) agreed by the sum of the total number of trials (items) agreed and disagreed. The resulting number was multiplied by 100 to determine the percentage agreement (Cooper et al., 2020, pg. 117; Ledford & Gast, 2018, pg. 122).

The mean IOA score, across 33% of assessments, for pre-training online training sessions was 98.2% agreement (range 97–100); the mean IOA score, across 33% of assessments, for post-training online training sessions was 98% agreement (range 96–100). The mean IOA score, across 33% of assessments, for pre-training caregiver–child coaching sessions was 91.2% agreement (range 75.7–97); the mean IOA score, across 33% of assessments, for post-training caregiver–child coaching sessions was 89.8% agreement (range 71.4–100). The mean IOA score, across 30% of follow-up sessions, for both types of sessions was 93.2% agreement (range 85.1–100). At replication, the mean IOA score, across 33% of assessments, for pre-training online training sessions was 91.4% agreement (range 90.1–92.6); the mean IOA score, across 33% of assessments, for post-training online training sessions was 96% agreement (range 95–97). At replication, the mean IOA score, across 33% of assessments, for pre-training caregiver–child coaching sessions was 85.75% agreement (range 74–97.5); the mean IOA score, across 33% of

assessments, for post-training caregiver–child coaching sessions was 93.65% agreement (range 93–94.3).

Independent Variable

The independent variable was the *PECSperts Facilitator Training Package*. The *PECSperts Facilitator Training Package* was designed to train participants to conduct online training sessions, as well as caregiver–child coaching sessions. It included the PECS Level One Training which is a two-day intensive workshop offered by Pyramid Educational Consultants of Canada. The PECS Level One Training focuses on teaching PECS, as an evidence-based practice, including its protocol and theory for caregivers and facilitators (Pyramid Educational Consultants, 2023).

The second portion of the *PECSperts Facilitator Training Package* was a 3-day online and in-person BST training. The training was facilitated by PECS training leaders, including a clinical psychologist who is also a BCBA-D and a master's level BCBA, both of whom have attended PECS Level One and Two training and have extensive experience implementing and supervising PECS use with children with neurodevelopmental disorders. The training used BST to teach participants to use BST to teach caregivers to implement PECS with their child (i.e., pyramidal training; Parsons et al., 2012). The training was designed to teach participants to facilitate the online training sessions and the caregiver–child coaching sessions. The 3-day training involved (a) an instructional portion (i.e., rationale, written and vocal instructions for each PECS phase and for the *PECSperts* online training sessions and the caregiver–child coaching sessions); (b) modelling (i.e., video and live models of each PECS phase and the online training sessions and the caregiver–child coaching sessions); (c) opportunities for participants to practise using PECS and conduct online training sessions and caregiver–child coaching sessions

with confederates; and (d) opportunities for participants to receive performance feedback on their PECS use, and their *PECSperts* training and coaching skills.

Procedural Fidelity

Procedural fidelity involves the objective measurement of the researcher's adherence to experimental procedures (Strain et al., 2021). Procedural fidelity increases confidence that results are due to the training and not unplanned variables (Cooper et al., 2020, pg. 226). To evaluate whether the PECS training leaders implemented the independent variable as designed, procedural fidelity data were collected using *Procedural Fidelity Checklists* (Appendix C). The *Procedural Fidelity Checklists* were designed to evaluate whether the required components of BST (as described above) were completed to train the participants to conduct online training sessions and caregiver-child coaching sessions. Procedural fidelity was scored for 50% of facilitator training sessions. Graduate students scored the delivery of the *PECSperts Facilitator Training Package*. The procedural fidelity score was 100% across all three days of training.

Social Validity

Social validity as a concept refers to the "(1) social significance of treatment or intervention goals, (2) social acceptability of treatment or intervention procedures, and (3) social importance of effects resulting from treatment or intervention" (Common & Lane, 2017, pg. 74; Wolf, 1978). Social validity is essential to this research because the *PECSperts Facilitator Training Package* will only be adopted in the community if participants feel it is effective, realistic, and adequately assists in skill development (Snodgrass et. al., 2018; Wolf, 1978). Social validity was explored through a revised version of the Treatment Acceptability Rating Form-Revised (TARF-R; Reimers & Wacker, 1988) which was created to measure the social significance of behavioural interventions and the behaviours they manipulate. The revised

TARF-R was used to assess the social importance and acceptability of the *PECSperts Facilitator Training Package* as reported by ITG participants. Social validity was gathered from this participant group as they implemented the *PECSperts Caregiver Training Package* with caregiver–child dyads and were best positioned to speak to the significance of the treatment goals, acceptability of the training procedures, and the importance of the effects with both them and caregivers and children. The social validity questionnaire contains 22 questions which covered: prior PECS knowledge, the acceptability, reasonableness, and effectiveness of the *PECSperts Facilitator Training Package*, and participant ratings of the social importance of the training. Each item was scored on a Likert-type rating scale from 1 (e.g., *not reasonable at all, very reasonable*) to 5 (e.g., *very acceptable, very reasonable*). Space for additional comments was provided at the end of the form. Scores of four or five indicated that the participant had a positive perception of the training. Several questions were reverse scored, meaning scores of four or five on these questions indicated the participant was dissatisfied, perceived disadvantages, or experienced undesirable side effects with the training.

Procedures

Recruitment

Recruitment flyers were sent to the seven community service agencies involved in the *PECSperts* project. The seven community partners disseminated the information and encouraged facilitators from their agencies that fit the inclusion criteria to contact the research team.

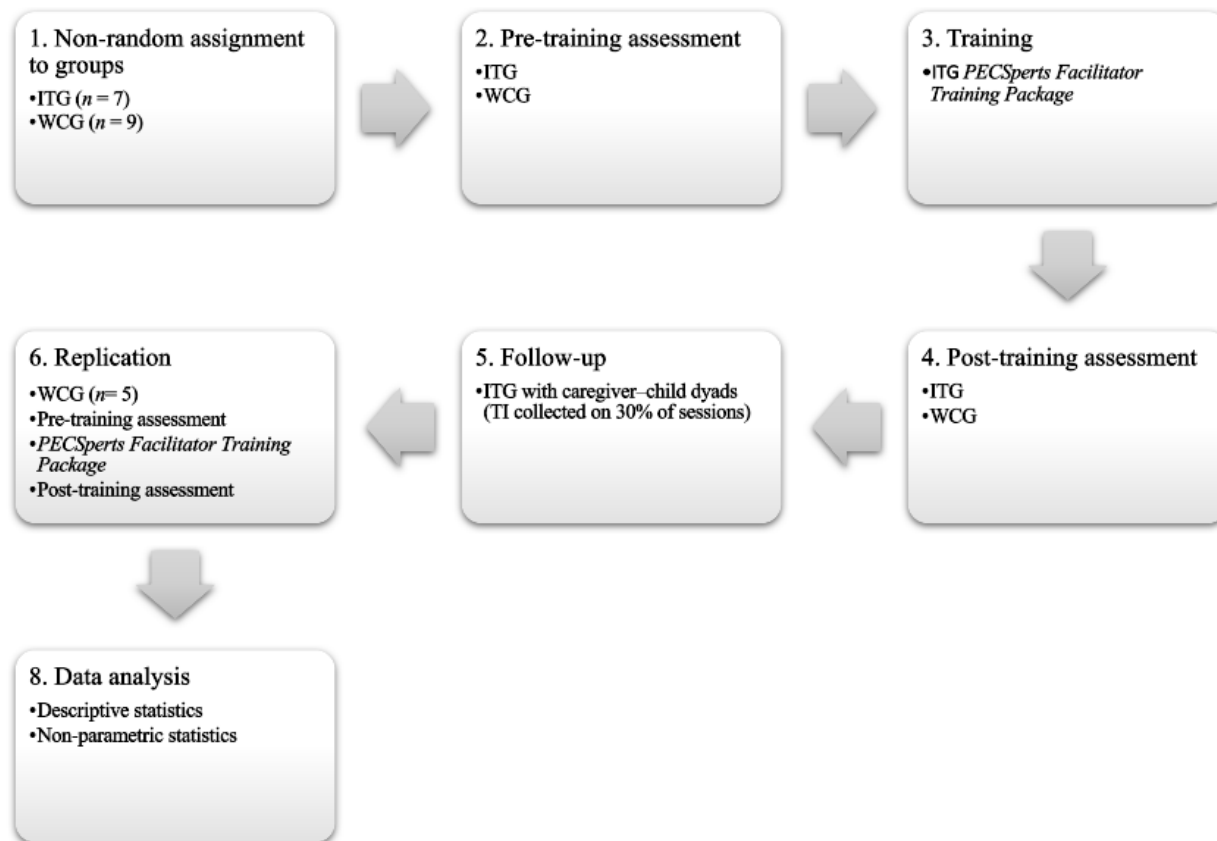
Informed, written consent was obtained from all the participants who met the inclusion criteria.

Pre-training Assessment

Before participating in the *PECSports Facilitator Training*, all members of the ITG and WCG participated in Online and Coaching TI assessments. All participants also completed a brief demographic form. Figure 2 displays the research methodology.

Figure 2

Research Methodology of a Quasi-experimental Non-randomised Group Design



Note. TI = treatment integrity.

Online Treatment Integrity. Prior to the pre-training assessment, participants received the PECS Phase I caregiver training handout (Appendix D), as well as a PECS communication book, pictures, and an array of reinforcers. At the beginning of the assessment, participants were instructed that they may use the available resources to train the caregiver in PECS Phase I. They were informed that the confederate parent had a PECS communication book, pictures, and an array of reinforcers they could use during the training. The participants were informed that they

had a maximum of one hour and that they could use whatever approaches they felt were most appropriate to train the caregiver. To enhance consistency across the assessments, confederate parents had a script of behaviours to engage in during the training, depending on the approaches used by the facilitators.

Coaching Treatment Integrity. Prior to the pre-training assessment, participants received the PECS Phase IIIa caregiver training handout (Appendix E), as well as a PECS communication book, pictures, and an array of reinforcers. Further, the assessment rooms were equipped with additional reinforcers and pictures that could be used during the assessment. A trained graduate student or PECS training leader conducted the pre-training assessment with the assistance of a confederate parent and a confederate child (i.e., two graduate students). At the beginning of the pre-training assessment, the participant was instructed that they could use the available resources to coach the caregiver and child in the use of PECS Phase IIIa. They were informed that the parent confederate had a PECS communication book, pictures, and an array of reinforcers they could use during the training. The participant was also informed that they had a maximum of 30 minutes and that they could use whatever approaches they felt would be most appropriate to coach the caregiver and child. To enhance consistency across the assessments, parent and child confederates had a script of behaviours to engage in during the training, depending on the approaches used by the facilitators. The caregiver–child coaching pre-training assessments were conducted in-person at community partner sites.

Facilitator training: ITG

The *PECSperts Facilitator Training* began with PECS Level One training offered by Pyramid Educational Consultants of Canada. The training involved an instructional portion, demonstrations, and opportunities for participants to practise. Following the PECS Level One

training, participants attended the 3-day online and in-person BST. The agenda for the 3-day training is appended (Appendix F). On Day One, participants reviewed the required teaching procedures for PECS Phases I to IV. The rationale and instructions for teaching each phase were provided using phase specific caregiver PECS hand-outs (e.g., Appendices D & E). Participants then practised teaching each phase of PECS to a confederate child (i.e., a graduate student) and were given performance feedback. Practice and feedback continued, during the initially scheduled training days or during scheduled booster session, until each participant implemented PECS with >85% accuracy. Participants' performance was evaluated using the *Caregiver Treatment Integrity Checklist* (Appendix G). Day One ended with an orientation to the online training resources (e.g., caregiver training handouts, Appendices D & E; *Caregiver Treatment Integrity Checklist*, Appendix G; online lesson plans, Appendix H; PECS overview and scenario videos. (Note: for brevity only Phase I lesson plans, hand-outs, and data sheets are appended). A rationale and instructions for the use of the resources were provided. Next, a PECS training leader modelled how to facilitate an online training session.

On Day Two, participants practised implementing online training sessions with confederate caregivers. Performance feedback, including positive feedback for correct implementation and corrective feedback for areas of improvement, was provided to participants. On Day Three, the PECS training leaders oriented the participants to the *PECSperts* caregiver–child coaching resources (e.g., coaching lesson plans, Appendix I and other resources listed above). They then modelled a caregiver–child coaching session using confederate caregivers and children. Participants then practised implementing caregiver–child coaching sessions, with confederate caregivers and children, and received positive and corrective feedback on their performance.

Overall, participants practised implementing two online training sessions with a confederate at different PECS phases (e.g., Phases I and IIIa) and two caregiver–child coaching sessions with a confederate at different PECS phases (e.g., Phases II and IIIb). Participants were required to obtain 85% TI while practising implementing online training sessions and caregiver–child coaching sessions across PECS phases. If a participant did not reach this expected standard for TI, 90-minute booster session(s) were scheduled to practice and receive feedback until they obtained 85% TI on both types of sessions. Of the ITG participants, a total of six booster sessions were required across all participants and PECS phases.

On both days, PECS training leaders conducted the training according to the following steps: (a) orient participants to the *PECSperts* training resources, (b) provide instructions on how to use the resources and a rationale for the approaches, (c) model how to conduct the online training sessions and the caregiver–child coaching sessions (including showing PECS overview videos and scenario videos), (d) provide opportunities for participants to practise conducting online training sessions and caregiver–child coaching sessions with confederates, and (e) provide performance feedback to participants on their PECS training and coaching skills. Participants were supported to achieve >85% Online TI and Coaching TI (either in-person during the training or in later booster sessions). During this time, participants in the WCG were not offered any form of training.

Post-training Assessment

Within two weeks of completing the *PECSperts Facilitator Training*, each participant's Online and Coaching TI was evaluated using procedures identical to those used at pre-training, with the exception that at post-training ITG participants received access to all *PECSperts*

training resources (i.e., lesson plans, overview and scenario videos, etc). Finally, participants were asked to complete the social validity questionnaire.

Follow-up: ITG

After completing the *PECSperts Facilitator Training*, achieving 85% or greater Online and Coaching TI, and the post-training assessments, participants implemented *PECSperts* sessions with caregivers and children with neurodevelopmental disorders as part of the larger community project. While working with these families, follow-up probes were conducted to evaluate maintenance and generalisation of the skills from the training environment with confederate caregivers and children to the natural environment with actual caregivers and children. This portion of the study was approximately five weeks long, as each participant implemented one online training session with caregivers and one online or in-person caregiver–child coaching session per week (unless unforeseen circumstances required rescheduling). The participants trained and coached Phase I in week one, Phase II in week two, Phase IIIa in week three, Phase IIIb in week four, and Phase IV in week five. Following each observed session, participants received their score from the *Facilitator Treatment Integrity Checklist* and received a combination of corrective feedback and praise as required. Once facilitators completed the five-week training with caregiver–child dyads, they completed the social validity questionnaire.

Replication: WCG

The WCG participants received the same training (the *PECSperts Facilitator Training Package*) with the same procedures (described above) approximately four months later. They also worked with caregivers following training and post-training assessments; however, probes of these sessions are not reported as part of this study.

Pre-training Assessment. The exact same procedures and resources that were described above for the pre-training assessment with the ITG were used during the replication with the WCG. These assessments re-evaluated the Online and Coaching TI for the WCG participants before they received the *PECSperts Facilitator Training*. One participant's pre-training assessment data was lost, so the data from her post-training assessment were used.

Facilitator Training: WCG. Training was offered to the WCG participants at replication using the same procedures, resources, facilities, and training leaders as described for the ITG. The WCG participants attended the PECS Level One training by Pyramid Educational Consultants of Canada and the 3-day in-person and online training, using BST, led by the PECS training leaders. The same agenda was used (Appendix F). Of the WCG participants, a total of 12 booster sessions were required across all participants and PECS phases.

Post-training Assessment. Within two weeks of completing *the PECSperts Facilitator Training*, each WCG participant's Online and Coaching TI was evaluated using procedures identical to those used at pre-training, with the exception that at post-training WCG participants received access to all *PECSperts* training resources (i.e., lesson plans, overview and scenario videos, etc).

Data Analysis

Descriptive statistics (i.e., *M*, range) and graphical depictions of TI were analysed for both groups at pre- and post-training and for the ITG at follow-up. Further, continuous score data from participants (e.g., TI scores) was compared pre- to post-training using nonparametric Wilcoxon sign-rank tests (Field, 2018). Key variables were compared across groups (ITG, WCG) using Mann-Whitney U tests (Field, 2018) to examine group differences. Effect sizes quantify the difference between the means of groups. Effect size was calculated using Pearson's

r formula. Pearson's r is categorized by range, based on its size: r values that are between 0.10-0.30 represent a small effect; r values that are 0.30-0.50 represent a medium effect; r values that are greater than 0.50 represent a large effect (Field, 2018, pg. 117).

Results

The first research question asked, “Is the *PECSpert Facilitator Training Package* effective in teaching community-based facilitators to implement online training sessions and caregiver–child coaching sessions with acceptable TI?”. To answer this question, descriptive and non-parametric statistics were used to analyze the Online and Coaching TI of the ITG and WCG during pre- and post-training assessments. Results are presented separately for Online TI and Coaching TI.

Facilitator Treatment Integrity

Online Training

Visual analysis and descriptive statistics were used to analyze facilitator Online TI from pre- and post-training assessments, as shown in Table 2 and Figure 3. Pre-training, both the ITG and WCG performed below established standards for TI (i.e., ITG, training $M = 18.6\%$, range 0–39.3; WCG, training $M = 12.5\%$, range 1.5–26.7). Post-training, the ITG performed above established standards for TI, while the WCG again performed below established standards for TI (i.e., ITG, training $M = 93.8\%$, range 87.9–100; WCG, training $M = 15.1\%$, range 0–41.6).

Table 2

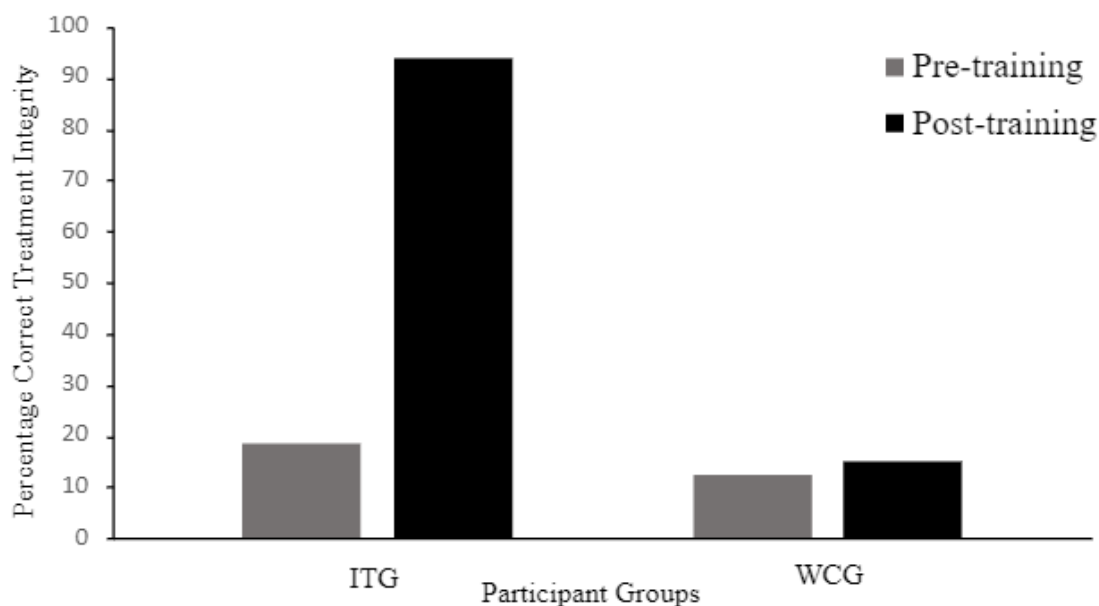
Descriptive Statistics for Pre- and Post-training Online and Coaching TI for ITG and WCG Participants

| Timepoint | Immediate Training Group (ITG) | | | Waitlist Comparison Group (WCG) | | |
|---------------------------------|--------------------------------|--------------------|---------------------|---------------------------------|--------------------|--------------------|
| | <i>n</i> | Online TI (%) | Coaching TI (%) | <i>n</i> | Online TI (%) | Coaching TI (%) |
| Pre <i>M (range)</i> | 7 | 18.6 (0–39.3) | 29 (20.7–50) | 9 | 12.5 (1.5–26.7) | 16 (0–30.3) |
| Post <i>M (range)</i> | 7 | 93.8 (87.9–100) | 88.6 (73.9–95.5) | 9 | 15.1 (0–41.6) | 21.6 (1.7–45.8) |

Note. Descriptive statistics were calculated from the pre- and post-assessments in which the ITG participated in the *PECsperts Facilitator Training* and the WCG did not.

Figure 3

Group Average Pre- and Post-training Online TI



Note. ITG, $n = 7$. WCG, $n = 9$.

To further answer the first research question, a Wilcoxon sign-rank test was used to examine within group differences pre- to post-training for Online TI. For ITG participants,

Online TI scores were significantly higher at post-training ($Mdn = 91.5\%$) than at pre-training ($Mdn = 21\%$), $T = 28$, $p = 0.018$, $r = -0.63$, demonstrating a large effect size. For WCG participants, Online TI scores were not significantly different at post-training ($Mdn = 8.90\%$) than at pre-training ($Mdn = 8.60\%$), $T = 30.5$, $p = 0.34$, $r = -0.22$. Finally, a Mann-Whitney U test examined the differences across the ITG and WCG groups at pre-training. Online TI scores in ITG participants ($Mdn = 21\%$) did not differ significantly from WCG participants' scores ($Mdn = 8.60\%$) at pre-training, $U = 24$, $z = -0.79$, $p = 0.47$, $r = -0.20$. However, at post-training, ITG participants' Online TI scores ($Mdn = 91.5\%$) were significantly higher than those of the WCG participants ($Mdn = 8.90\%$), $U = 0.00$, $z = -3.34$, $p = <.001$, $r = -0.83$, representing a large effect size.

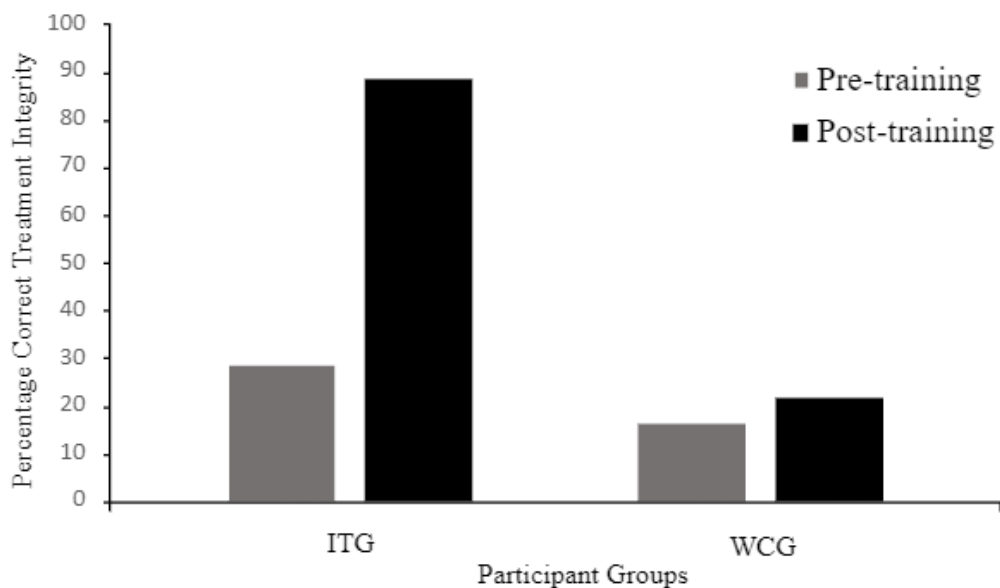
WCG Replication Data. Over the course of the study, a total of four participants withdrew from the WCG for the following reasons: one participant withdrew after auditing the training for management purposes, one participant left on maternity leave, one participant left due to a change in position, and one participant did not complete post-training as she was on leave from her work position. Therefore, analyses of the WCG replication data were conducted using a total of five participants. Descriptive and non-parametric statistics were used to explore pre- to post-training results for the WCG's Online TI after they participated in the training. Pre-training, the WCG performed below established standards for Online TI ($M = 21.54\%$, range 8.9–32.3). Post-training, the WCG performed above the established standards for Online TI ($M = 90.3\%$, range 82.4–100). A Wilcoxon sign-rank test was used to examine within group differences pre- to post-training for Online TI at replication. For WCG participants, Online TI scores were significantly higher at post-training ($Mdn = 87.1\%$) than at pre-training ($Mdn = 22.4\%$), $T = 15$, $p = 0.04$, $r = -.64$, representing a large effect size.

Caregiver–Child Coaching

Coaching TI pre- and post-training was examined using visual analysis and descriptive statistics, as shown in Table 2 and Figure 4. Pre-training, both the ITG and WCG groups performed below established standards for Coaching TI (i.e., ITG, coaching $M = 29\%$, range 20.7–50; WCG, coaching $M = 16\%$, range 0–30.3). Post-training, the ITG performed above established standards for Coaching TI, while the WCG again performed below established standards for Coaching TI, as shown in Figure 4 (i.e., ITG, coaching $M = 88.6\%$, range 73.9–95.5; WCG, coaching $M = 21.6\%$, range 1.7–45.8).

Figure 4

Group Average Pre- and Post-training Coaching TI



Note. ITG, $n=7$. WCG $n=8$.

To further answer our first research question, a Wilcoxon sign-rank test was used to examine the within group differences pre- to post-training. For ITG participants, Coaching TI scores were significantly higher at post-training ($Mdn = 91.10\%$) than at pre-training ($Mdn = 23.70\%$), $T = 28$, $p = 0.018$, $r = -0.63$, demonstrating a large effect size. For WCG participants,

Coaching TI scores were also significantly higher at post-training ($Mdn = 24.75\%$) than at pre-training ($Mdn = 18.60\%$), $T = 32$, $p = 0.05$, $r = -0.46$, representing a medium effect size.

Although, this is a statistically significant increase, this post-training score remained well below the expected standards for TI.

Next, a Mann-Whitney U test was used to examine the differences in Coaching TI across groups at pre-training and then again at post-training. At pre-training, Coaching TI scores in the ITG participants ($Mdn = 23.70\%$) did not differ significantly from WCG participants' scores ($Mdn = 18.60\%$), $U = 0.50$, $z = -1.32$, $p = 0.25$, $r = 0.33$. At post-training, Coaching TI scores in the ITG participants ($Mdn = 91.10\%$) differed significantly from WCG participants' scores ($Mdn = 24.75\%$), $U = .000$, $z = -3.34$, $p = <.001$, $r = -0.84$. This across groups difference demonstrated a significant improvement, with a large effect size, in the ITG participants Coaching TI following the *PECSperts Facilitator Training*.

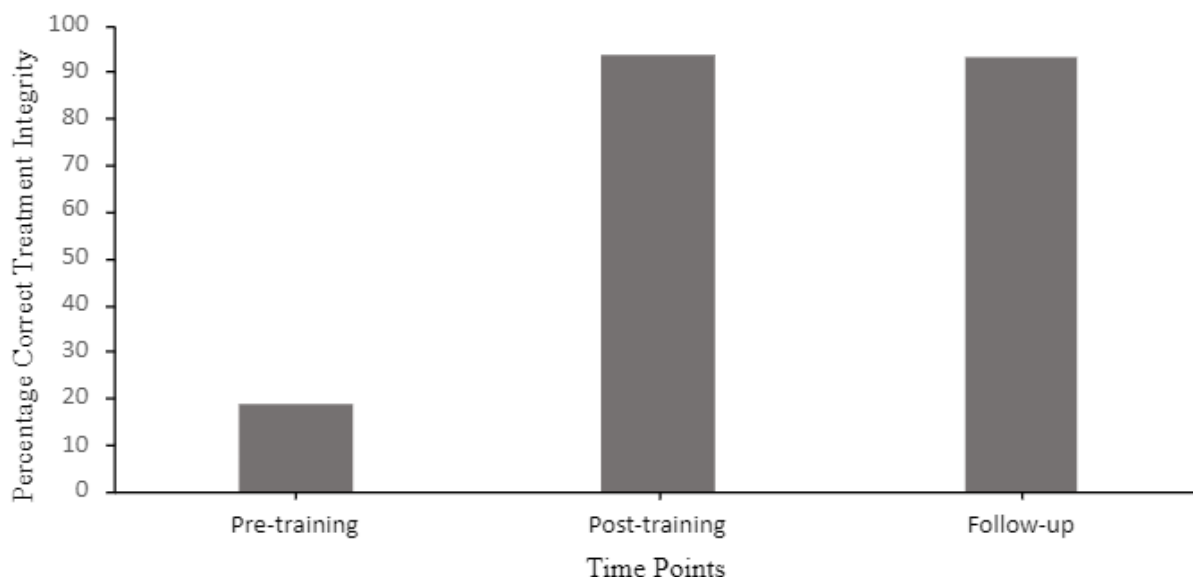
WCG Replication Data. Descriptive and non-parametric statistics were used to explore pre- to post- training Coaching TI for the WCG. Pre-training, the WCG performed below established standards for Coaching TI ($M = 24.54\%$, range 10.9–44). Post-training, the WCG performed above the established standards for Coaching TI ($M = 90.5\%$, range 82.5–100). A Wilcoxon sign-rank test was used to examine within group differences pre- to post-training for Coaching TI at replication. For WCG participants, Coaching TI scores were significantly higher at post-training ($Mdn = 88.40\%$) than at pre-training ($Mdn = 22.00\%$), $T = 10$, $p = 0.04$, $r = 1.17$. This pre- to post-training difference demonstrated a significant improvement, with large effect size, in the WCG participants' Online TI, during the replication.

ITG Follow-up: Online and Coaching TI

The second research question asked, “Does the *PECSperts Facilitator Training Package* promote skill maintenance and generalisation to the facilitator’s natural environment with caregivers and children?” To answer this, visual analysis and descriptive statistics were used to analyze the ITG’s Online and Coaching TI while implementing the *PECSperts Caregiver Training* with caregivers and children (as opposed to confederate caregivers and children who were involved in the pre- and post-assessments and in the *PECSperts* facilitator training sessions). Online TI was examined using descriptive statistics, as shown in Figure 5 and Table 3. The ITG mean for Online TI remained above the expected standards at follow-up (i.e., training $M = 92.9\%$, range 84.5–98.9).

Figure 5

Mean ITG Online TI at Pre-, Post-training and Follow-up

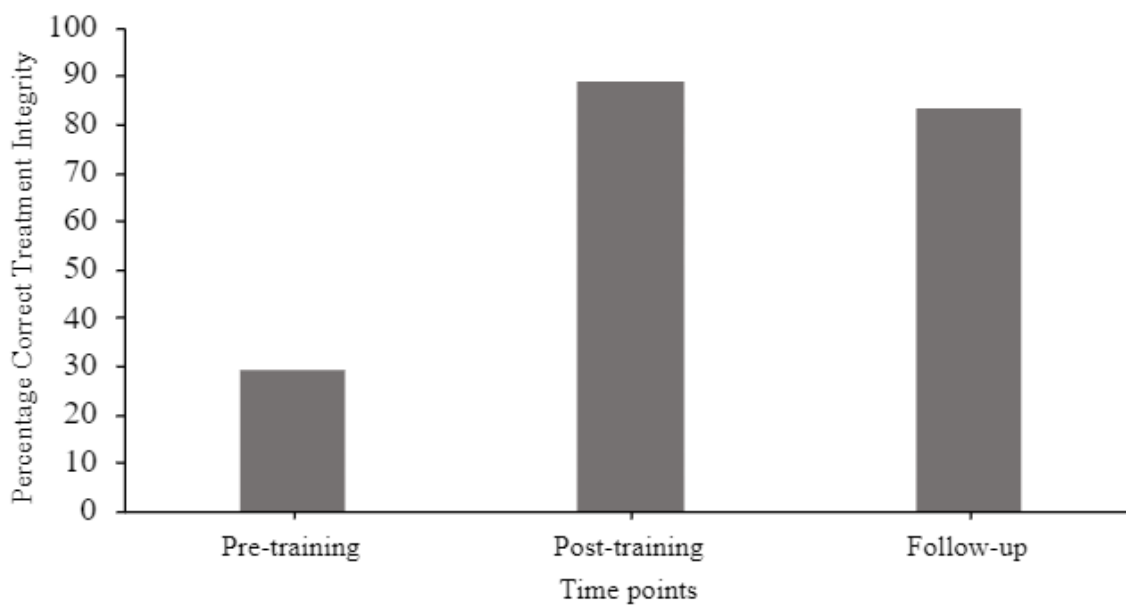


Note. ITG, $n = 7$ across pre-, post-training and follow-up timepoints.

Coaching TI at follow-up was examined using visual analysis and descriptive statistics, as shown in Figure 6 and Table 3. The ITG Coaching TI mean remained above the expected standards at follow-up (i.e., coaching $M = 83.3\%$, range 68.2–95.7).

Figure 6

Mean ITG Coaching TI at Pre-, Post-training, and Follow-up



Note. ITG, $n=7$ across pre-, post-training and follow-up timepoints.

Follow-up descriptive statistics for the ITG indicate that Online and Coaching TI means generally remained within accepted standards for TI, as shown in Table 3.

Table 3

Online and Coaching TI Scores for the ITG During Follow-up

| Participants | Online TI (M, range) | Coaching TI (M, range) |
|---------------|----------------------|------------------------|
| P1 | 84.5% (69–93.6) | 77.3% (63.8–86) |
| P2 | 96.5% (93.1–100) | 85.6% (69–96.6) |
| P3 | 89.5% (77.59–96) | 87% (74–93.9) |
| P4 | 92.1% (80–100) | 79.6% (54.29–91) |
| P5 | 91.1% (87.18–95.19) | 89.7% (86–93.4) |
| P6 | 97.5% (95–100) | 68.2% (48.6–87.8) |
| P7 | 98.9% (96.29–100) | 95.7% (92.7–100) |
| Group Average | | |

| | | |
|------------|-------------------|-------------------|
| (M, range) | 92.9% (84.5–98.9) | 83.3% (68.2–95.7) |
|------------|-------------------|-------------------|

Note. P=participant.

Social Validity

The final research question asked, “What are the participants’ perceptions of the effectiveness and appropriateness of the *PECSperts Facilitator Training Package?*”. To answer this question, the ITG participants’ responses to the social validity questionnaire were examined, as shown in Table 4.

Table 4

Mean Social Validity Scores from the ITG

| Question | Mean | Range |
|---|------|-------|
| PECS knowledge and implementation ability | | |
| How clear was your understanding of PECS before you participated in <i>PECSperts</i> ? | 3.28 | 2 – 4 |
| How clear was your understanding of PECS following the PECS Level One training offered by Pyramid Educational Consultants, Inc? | 4.42 | 4 – 5 |
| How well did you think you could implement PECS following the PECS Level One training? | 3.85 | 2 – 5 |
| How clear was your understanding of PECS following the hands-on coaching (behavioural skills training)? | 4.85 | 4 – 5 |
| How well did you think you could implement PECS following the hands-on coaching (behavioural skills training)? | 4.85 | 4 – 5 |
| How well did you think you could teach parents to implement PECS following the hands-on coaching (behavioural skills training)? | 4.28 | 3 – 5 |
| How well did you think you could teach parents to implement PECS following your delivery of <i>PECSperts</i> ? | 4.71 | 4 – 5 |
| Acceptability | | |
| How much did you like the procedures used in PECS? | 4.42 | 4 – 5 |

| | | |
|---|-------|--------|
| OVERALL, how acceptable did you find the PECS training and coaching that you received? | 4.57 | 3 – 5 |
| How much did you like the procedures used to train parents to teach their child PECS? | 4.28 | 2 – 5 |
| How acceptable did you find the <i>PECSperts</i> parent training for your assigned participants? | 4.14 | 3 – 5 |
| How acceptable did you find the PECS parent-child coaching for your assigned participant? | 4.14 | 3 – 5 |
| Reasonableness | | |
| Given your assigned participants' needs, how reasonable did you find the online PECS parent training? | 4.14 | 2 – 5 |
| Given your assigned participant's needs, how reasonable did you find the PECS parent-child coaching? | 4.14 | 2 – 5 |
| Effectiveness | | |
| How likely is this treatment to make ongoing improvements in your assigned participant's (caregivers) PECS training skills? | 3.71 | 3 – 4 |
| How effective did you think the online PECS parent training was for your assigned participant? | 4.14 | 3 – 5 |
| Participants ratings of social importance | | |
| To what extent did you think there were disadvantages in training parents to implement PECS in an online format?* | 2.71* | 2 – 4 |
| To what extent did you think there were disadvantages to the PECS caregiver-child coaching?* | 1.71* | 1 – 3 |
| How much discomfort do you think your assigned participant experienced during <i>PECSperts</i> ? * | 2.71* | 2 – 4* |
| To what extent did undesirable side-effects result from the <i>PECSperts</i> model (for caregivers/ children)? * | 2.41* | 1 – 4* |
| How willing would you be to recommend PECS in the future? | 4.85 | 4 – 5 |
| How willing would you be to recommend <i>PECSperts</i> in the future? | 4.57 | 3 – 5 |

Note. The social validity questionnaire was completed immediately after ITG participants completed follow-up sessions with caregivers. Items denoted by * are reverse scored.

The social validity questionnaire evaluated the ITG participants' perceptions of various aspects of the training, including prior PECS knowledge, the acceptability, reasonableness, and effectiveness of the training, and ratings of the social importance of the training. Overall, participants indicated they found the training highly acceptable, reasonable, and effective. The ITG participants indicated they felt PECS Level One gave them a clear understanding of PECS procedures but were not as confident in their ability to implement PECS after this training (Table 4). Their confidence increased after they attended the 3-day BST training. Relatedly, the facilitators rated themselves as being confident in training caregivers after attending the *PECSperts* 3-day BST and this increased further after they implemented the training with caregivers and children during follow-up. The ITG participants also indicated they would be very willing to recommend PECS and *PECSperts* in the future.

In the social validity questionnaire's open-ended questions, participants indicated that they and their clients found the training effective and rewarding. One participant said that "parents seemed genuinely grateful for the training." Only a few participants reported difficulties related to scheduling difficulties and barriers that arose using the online format. However, the majority of the participants' comments reported that their confidence increased with feedback and that they appreciated collaboration with supervisors to mitigate barriers. Another ITG participant indicated she "loved the hands-on experience that families receive from *PECSperts* during the caregiver-child coaching." Most participants did not share additional suggestions related to their experience; however, one participant mentioned that she thought "additional

guidance for administrative steps” would have been helpful. Overall, the open-ended questions further indicated ITG participants found the training beneficial.

Discussion

This pilot study was designed to explore the effectiveness of a pyramidal approach to teach community facilitators to support caregivers to implement PECS with their autistic children. Facilitators were trained using the *PECSperts Facilitator Training Package*. The first research question asked, “Is the *PECSpert Facilitator Training Package* effective in teaching community-based facilitators to implement online training sessions and caregiver–child coaching sessions with acceptable TI?”. Following participation in the *PECSpert Facilitator Training*, ITG participants Online TI significantly increased with large effect size. These results indicate that facilitators learned to effectively implement online training sessions with confederates acting as caregivers. Importantly, post-training, there was no significant improvement in Online TI for the WCG. Further, although there was no significant difference in the group mean Online TI scores for the ITG and the WCG pre-training, there was a significant difference in the group mean Online TI scores for the ITG and the WCG post-training. Similarly, there was a large, significant increase in the ITG participant's Coaching TI, after participation in the *PECSperts Facilitator Training Package*. These results indicate that following training ITG participants were able to effectively implement caregiver–child coaching sessions with confederates, playing the roles of caregivers and children.

In terms of the WCG, a significant improvement was reported in Coaching TI, despite not receiving the training. Although these results are unexpected, they may be better understood in relation to the small sample size. Within a small sample, there is an increased risk of skew from higher data points impacting the effect size, test statistics, and p-values (Field, 2018, pg. 277).

The WCG's statistical improvement should be interpreted with caution due to potential inflation from a few participants' high score in post-training assessment. Overall, all participants remained well below accepted standards for TI (i.e., > 50%) with a group average of only 24.75%. Visual analysis, descriptive statistics and raw data results indicate that following training WCG participants were still not able to accurately implement caregiver-child coaching sessions with confederates, despite the significant statistical result. Importantly there was no significant difference in the group mean Coaching TI scores for the ITG and the WCG pre-training and there was a significant difference in the group mean Coaching TI scores for the ITG and the WCG post-training, with a large effect size. These results suggest that, although there may have been some improvement in the WCG's Coaching TI, despite the lack of training, when compared to the improvements made by the ITG, this improvement was not statistically significant. Together, these results are consistent with the results from Parsons et al. (2012) and Pence et al. (2012) showing that facilitators may be effectively trained using BST to use BST to train others to implement behaviour-change procedures. These results provide evidence for the effectiveness of the *PECSperts Facilitator Training Package*.

Notably, caregiver-child coaching sessions had slightly lower post-training TI scores than online training sessions. This may be due to the nature of these sessions. Online training sessions involve only the facilitators and caregivers and are generally more structured. In contrast, during the caregiver-child coaching sessions, the child is present with the caregiver. It seems reasonable that attending to both the child's and the caregiver's behaviour is more difficult than attending solely to caregiver behaviour. Nonetheless, research suggests that family engagement is important for child PECS success (Olivatti et al., 2021). Therefore, PECS caregiver coaching with their autistic children present is important as it simulates socially valid,

target learning situations (McCoy & McNaughton, 2018; Olivatti et al., 2021). Future studies could examine how to help facilitators prepare for unexpected interruptions or barriers that may arise in caregiver–child coaching sessions and that could potentially impact the facilitator’s Coaching TI.

Further support for the effectiveness of the *PECSperts Facilitator Training Package* can be found in the replication of the positive effect of the training with the WCG. Results demonstrated that the WCG’s Online and Coaching TI remained well below accepted standards for TI during both pre- to post-assessments (i.e., when they did not receive the *PECSperts Facilitator Training*). However, when the WCG participants received training, their TI scores significantly increased, with a large effect size, providing further evidence for the effectiveness of the *PECSperts Facilitator Training Package*.

The second research question asked, “Does the *PECSperts Facilitator Training Package* promote skill maintenance and generalisation to the facilitator’s natural environment with caregivers and children?”. Encouragingly, the results show that ITG participants’ Online and Coaching TI maintained at high levels outside the initial training environment, while facilitators interacted with caregivers and children. This is a noteworthy result because currently, there is very little research reporting on the generalization and maintenance of facilitator PECS skills (Ganz et al., 2013; McCoy & McNaughton, 2018). The research that does exist on generalization and maintenance, indicates that treatment fidelity did not generalize to novel environments (Ganz et al., 2013) or that targets are not generalized to socially valid situations (i.e., generalization did not occur in situations with caregivers instead of confederates; McCoy & McNaughton, 2018). The results of this pilot study demonstrate participants’ PECS training and coaching skills generalized from the training environment, while working with confederates, to

the natural work environment, while interacting with caregivers and children. Furthermore, these skills were maintained at high levels during the five-week implementation of the *PECS* *parts Caregiver Training*. These results further suggest that the pyramidal training model is effective in facilitating generalization and maintenance of skills. This is important because generalization and maintenance promote the dissemination and continuation of skills in the presence of similar stimuli, including skills related to the implementation of behavioural interventions (Blough, 1975; Lazareva, 2012). Prior to this research, there were no previous studies examining the use of a pyramidal training model to disseminate PECS training to caregivers and children, nor evidence to support a PECS facilitator training model with good generalization and maintenance. It is important to note that these positive outcomes were achieved with ongoing support during follow-up (i.e., 30% of sessions were supervised). Future research should explore the amount and nature of ongoing support that is required to maintain acceptable levels of facilitator TI.

The third research question asked, “What are the participants’ perceptions of the effectiveness and appropriateness of the training?”. Social validity questionnaires contained predominantly positive feedback. Participants generally found the training acceptable and effective. Social validity demonstrates that a study considered and uses consumer driven approaches and methodologies. Furthermore, positive social validity results increase the likelihood that the research study will be accepted in the greater community, in both publication and in practise (Hawkins, 1991; Winett et al., 1991). The predominantly positive results from the social validity questionnaires in this project provide preliminary support for the acceptability and feasibility of the use of this training model in the community (Cooper et al., 2020).

This study was designed to address the lack of research exploring how to train facilitators to train caregivers to implement PECS. There is evidence to suggest that BST can be used to effectively train caregivers to implement PECS with their autistic children (e.g., Chaabane et al., 2009; Treszl et al., 2022). However, within the BST literature, there are no studies examining a structured model to train facilitators to teach caregivers to implement PECS with their children. Without community support and training for facilitators to implement PECS with caregivers, there is a significant barrier to the dissemination of PECS services to families (Alsayedhassan et al., 2020). The development of the *PECSperts Facilitator Training Package* and the outcomes of this pilot study, which demonstrated the effectiveness and efficiency of this training model, address this research gap and the potential barriers to service provision. The results, therefore, have important implications for the dissemination of evidence-based communication training with children on the spectrum and their caregivers. By training more facilitators to train caregivers, an increase in caregiver involvement in supporting their child's PECS use will likely also occur. Increased involvement of caregivers will empower caregivers to support their children through the use of behavioural interventions like PECS (Licona et al., 2022).

The *PECSperts Facilitator Training Package* involves 37 hours of training. Results of this study suggest that within this timeframe, facilitators can generally be trained to implement PECS caregiver training and coaching with good TI. Given the complexity of the PECS protocol, and the need for facilitators to learn how to implement both online training sessions and caregiver-child coaching sessions, this seems like a reasonable duration. It is hoped that this model may feasibly be used in the community to help to reduce barriers to implementation in the community. However, the results also suggest that additional practice and feedback may be warranted as participants in both groups did not meet the expected standard for TI in the time

allotted in the training agenda. Participants in the ITG required six additional 90-minute boosters. Participants in the WCG required 12 additional 90-minute boosters. It is important to note for future replications of this training that booster sessions did not include verbal instructions and modeling. Booster sessions only included the practice and feedback components of BST. For this reason, future studies should examine including more practice and feedback in the training agenda. This pilot study did not conduct a component analysis to determine which elements were most effective in increasing participants' TI; however, the increase in participants TI following additional practice and feedback during booster sessions suggests that more time dedicated to these components might adequately boost participants' TI.

Strengths and Limitations

The results of the present study should be interpreted in the context of the study's methodological strengths and limitations. The use of a quasi-experimental design and a waitlist comparison group strengthened the rigour and believability of the results. The clear replication of the training effect increases confidence that the change to the dependent variable was due to the application of the independent variable (Ledford & Gast, 2018).

Furthermore, procedural fidelity scores were very high. This increases confidence that the results were due to the application of the independent variable as described and not to unplanned variables (Cooper et al., 2020, pg. 226). Additionally, high procedural fidelity increases internal and external validity of a study. Procedural fidelity measurement ensures that the results are caused by the intervention and not external factors (Ledford & Gast, 2018). Furthermore, internal validity measures enable future researchers to confidentially replicate these findings in other experimental studies and potentially in applied practice (Borrelli et al., 2005).

The community setting of this research is another significant strength. This study was completed in the community with facilitators of varying levels of experience working with individuals with ID, using AAC systems, and implementing PECS. The setting of this research is important because it demonstrates that high TI scores may be achieved and maintained by facilitators in socially valid settings (i.e., in their community service centres) (McCoy & McNaughton, 2018). The primary goal of the *PECSperts Facilitator Training Package* is to effectively train community facilitators to support the caregivers in their region to support their autistic children. The setting of this research clearly demonstrates that this training model is effective in training facilitators in a community setting with this client population. Furthermore, community-based research involves community stakeholders in the research process and design, empowering them to work towards a solution to their own community problems (Collins et al., 2018). This research reflects the values and goals of community-based facilitators in the Hamilton-Niagara region.

Finally, due to the varied level of experience in this sample, results from these participants demonstrate that the *PECSperts* model may be applicable in the broader professional community of facilitators implementing PECS with clients. Demographically, the ITG participants had more prior experience working with this clientele and more experience using PECS or AAC systems than the WCG. However, these differences did not appear to significantly affect the change in pre- to post-training TI; nor did the demographic differences appear to impact the participants' perceptions of the training. However, this demographic difference may explain why the WCG required double the number of additional booster sessions to reach the expected standards of TI. Future research should be conducted to explore whether additional

practice and performance feedback is required to better support facilitators with limited experience working with individuals with ID and using AAC systems and PECS.

Finally, an important strength of this study was the inclusion of generalization data. Participants in the ITG were able to use their new skills to train and coach caregivers and children in novel environments. The follow-up data were collected in novel settings with caregivers and autistic children over approximately five weeks following training. Generalization of the post-training results indicates that the behaviour change extends to novel, socially valid environments (McCoy & McNaughton, 2018). High TI scores were not limited to the training environment, suggesting a robust training effect (Ledford & Gast, 2018). As previously mentioned, generalization also illustrates that the target behaviours persist in the presence of new but similar stimuli, over time (Blough, 1975; Lazareva, 2012). Furthermore, the results maintained over a five-week period. Overall, the results contribute meaningfully to the existing literature as this is the first study to explore a structured training package to train facilitators to support caregivers to implement PECS with their autistic children. Furthermore, it includes generalization and maintenance data which are often overlooked.

One limitation to consider of this study is its small sample size. These results cannot be generalized to all facilitators because this sample may not accurately or completely represent the entire population of community-based professionals using PECS with caregivers. Furthermore, the small sample size may have impacted some statistical analyses, as high scores in the WCG group may have inflated some results (Field, 2018). Relatedly, the two groups were not equivalent in terms of nature of work experience and PECS or AAC experience more specifically. Future research should examine the replicability of this training model with a larger sample size. Another limitation is that this study did not use a true randomized design, as the

participants were assigned based on availability and work schedules. Without true randomization, there is a greater potential for bias and confounds in the results. Bias and confounding variables limit the ability of non-randomized studies to demonstrate causal effects (Ledford & Gast, 2018). Future studies should examine the results of a true randomized research study using the *PECSperts Facilitator Training Package* to examine the effects of this training on facilitator TI. Perhaps the most significant limitation of the present study is the lack of reporting on caregiver and child PECS outcomes which is ostensibly the most important outcome of pyramidal training. Future research should explicitly report on these outcomes.

Conclusion

The purpose of this pilot study was to address the gaps in the literature related to training facilitators to support caregivers as they implement PECS with their child on the autism spectrum. Our research questions asked whether the *PECSperts Facilitator Training Package* was effective in training facilitators to support caregivers as they implemented PECS with their autistic child and the extent to which the package supported the generalization and maintenance of the facilitators' skills. Finally, our last research question examined the perceptions of the participant facilitators on this training through social validity questionnaires. The results provide emerging support for the use of the *PECSperts Facilitator Training Package* to support high facilitator TI in supporting caregivers as they implement PECS with their autistic children. Overall, results indicated participants' skills generalized to the natural environment and maintained over time. Finally, social validity questionnaires demonstrated that the participants generally perceived the training to be very effective and appropriate. For clinical purposes, *PECSperts* appears to be an effective facilitator training approach. As high social

validity was demonstrated, the *PECSperts* training package may be feasible for use in the community which could increase community capacity and access to PECS training.

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| | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 5. Mediator shows the target phase overview video | | | | | | | | | | | | | |
| 6. Mediator asks the parents if they have any questions and clarifies/replays the video if necessary | | | | | | | | | | | | | |
| 7. Mediator informs the parents that it's time to practice and ensures the parent has the required PECS training materials. | | | | | | | | | | | | | |
| Total +'s Part A | | | | | | | | | | | | | |
| B. Practice & Performance Feedback (5-7 per parent) | | | | | | | | | | | | | |
| 8. Mediator shows a video displaying a scenario | | | | | | | | | | | | | |
| 9. Mediator instructs the parent to show OR tell how he/she would respond to the scenario | | | | | | | | | | | | | |
| 10. Mediator provides praise for correct actions | | | | | | | | | | | | | |

| | | | | | | | | | | | |
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| 11. Mediator provides corrective feedback as required | | | | | | | | | | | |
| 12.If corrective feedback was given, the mediator instructs the parent to practice again, until the parent trainee demonstrates the correct behaviour | | | | | | | | | | | |
| 13.Mediator provides feedback for the additional practice trial(s) | | | | | | | | | | | |
| 14. Mediator records data on parent performance | | | | | | | | | | | |
| Total +'s | | | | | | | | | | | |
| Total +'s Part B | | | | | | | | | | | |
| Percent Correct Procedural Integrity (Total +'s A & B / total steps A & B X 100) | | | | | | | | | | | |

For use when conducting target phase probes:

| | |
|---------------------------------|--------------|
| <i>C. Probes (3 per parent)</i> | Target Phase |
|---------------------------------|--------------|

| | | | | | | |
|--|--|--|--|--|--|--|
| 1. Mediator places one parent into the lifesize waiting room | | | | | | |
| 2. Mediator shows the first part of the scenario video (STOP at “What should you do?”) | | | | | | |
| 3. Mediator instructs the parent to show OR tell how he/she would respond to the scenario | | | | | | |
| 4. Mediator does not provide corrective feedback or praise | | | | | | |
| 5. Mediator records data on parent performance | | | | | | |
| Total +’s | | | | | | |
| Percent Correct Procedural Integrity (Total +’s / total steps A & B X 100) | | | | | | |

| | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <p>5. Mediator asks the parent if he/she has any questions and clarifies if so</p> | | | | | | | | | | | | | |
| <p>6. Mediator models 2 trials of the appropriate phase with child</p> | | | | | | | | | | | | | |
| <p>7. Mediator describes procedure as they model</p> | | | | | | | | | | | | | |
| <p>8. Mediator informs the parents that it's time to practice and ensures the parent has the required PECS training materials.</p> | | | | | | | | | | | | | |
| <p>Total +'s Part A</p> | | | | | | | | | | | | | |
| <p style="text-align: center;">B. Practice & Performance Feedback (10 trials during training)</p> | | | | | | | | | | | | | |
| <p>9. Mediator instructs the parent to show them how they would implement the current phase with their child</p> | | | | | | | | | | | | | |
| <p>10. Mediator instructs parent to indicate if they would like back up prompter support for a trial</p> | | | | | | | | | | | | | |

| | | |
|---|--|--|
| Percent Correct Procedural Integrity (Total +'s A & B / total steps A & B X 100) | | |
|---|--|--|

For use when conducting target phase probes:

| <i>C. Probes:</i> | Target Phase | | |
|---|--------------|--|--|
| 1. Mediator asks parent to implement a trial at the current phase | | | |
| 2. Mediator describes the role they want the parent to take (Ph 1 only, 2CP 1 BP) | | | |
| 3. Mediator does not provide corrective feedback or praise | | | |
| 4. Mediator records data on parent performance | | | |
| Total +'s | | | |
| Percent Correct Procedural Integrity (Total +'s / total steps A + B + C X 100) | | | |

Appendix C

Procedural Fidelity Checklist - PECSperts Facilitator Training

PECS IMPLEMENTATION

| | |
|---|---|
| Sr PECS Trainers Initials: _____ Date: _____ | |
| Primary Coder initials: _____ | |
| IOA: Y/N | Secondary Coder |
| Initials: _____ | |
| Phase 1 | <i>Correct = +;</i> <i>Incorrect = -</i> |
| Provides written instructions (Phase 1 PECS Data Sheet) and brief verbal instructions | |
| Models one correct & one incorrect trial Phase 1 | |
| Instructs facilitators to practice Phase 1 & provides performance feedback | |
| Collects data on facilitators' performance | |
| Phase 2 | |
| Provides written instructions (Phase 2 PECS Data Sheet) and brief verbal instructions | |
| Models one correct & one incorrect trial Phase 2 | |
| Instructs facilitators to practice Phase 2 & provides performance feedback | |
| Collects data on facilitators' performance | |

| | |
|--|--|
| Phase 3a | |
| Provides written instructions (Phase 3a PECS Data Sheet) and brief verbal instructions | |
| Models one correct & one incorrect trial Phase 3a | |
| Instructs facilitators to practice phase 3a & provides performance feedback | |
| Collects data on facilitators' performance | |
| Phase 3b | |
| Provides written instructions (Phase 3b PECS Data Sheet) and brief verbal instructions | |
| Models one correct & one incorrect trial Phase 3b | |
| Instructs facilitators to practice phase 3b & provides performance feedback | |
| Collects data on facilitators' performance | |
| Phase 4 | |
| Provides written instructions (Phase 4 PECS Data Sheet) and brief verbal instructions | |
| Models one correct & one incorrect trial Phase 4 | |
| Instructs facilitators to practice phase 4 & provides performance feedback | |
| Collects data on facilitators' performance | |

PECS ONLINE CAREGIVER TRAINING

| | |
|---|---|
| Sr PECS Trainers Initials: _____ Date: _____ | |
| Primary Coder initials: _____ | |
| IOA: Y/N | Secondary Coder |
| Initials: _____ | |
| Introduction to Online Caregiver Training | <i>Correct = +;</i> <i>Incorrect = -</i> |
| Orients participants to the <i>PECSperts</i> online training resources (i.e., lesson plan, scenario list, parent handout, data sheet, scenario videos) | |
| Provides rationale for the training approach | |
| Models an online training session | |
| Phase 1 | |
| Instructs facilitators to practice Phase 1 online caregiver training & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 2 | |
| Instructs facilitators to practice Phase 2 online caregiver training & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 3a | |

| | |
|---|--|
| Instructs facilitators to practice Phase 3a online caregiver training & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 3b | |
| Instructs facilitators to practice Phase 3b online caregiver training & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 4 | |
| Instructs facilitators to practice Phase 4 online caregiver training & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |

PECS CAREGIVER–CHILD COACHING

| | |
|--|---|
| Sr PECS Trainers Initials: _____ Date: _____ | |
| Primary Coder initials: _____ | |
| IOA: Y/N | Secondary Coder |
| Initials: _____ | |
| Introduction to Online Caregiver Training | <i>Correct = +;</i> <i>Incorrect = -</i> |
| Orients participants to the <i>PECS</i> parts caregiver–child coaching resources (i.e., lesson plan, scenario list, parent handout, data sheet) | |
| Provides rationale for the coaching approach | |

| | |
|--|--|
| Models coaching session | |
| Phase 1 | |
| Instructs facilitators to practice Phase 1 caregiver–child coaching & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 2 | |
| Instructs facilitators to practice Phase 2 caregiver–child coaching & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 3a | |
| Instructs facilitators to practice Phase 3a caregiver–child coaching & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 3b | |
| Instructs facilitators to practice Phase 3b caregiver–child coaching & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |
| Phase 4 | |
| Instructs facilitators to practice Phase 4 caregiver–child coaching & provides performance feedback | |
| Collects data on facilitator treatment fidelity | |

Appendix D

PECS Phase I Caregiver Training Handout

PHASE 1

“HOW” TO COMMUNICATE

Overview: Phase 1 focuses on teaching your child HOW to communicate. We want your child to learn that they need to approach another person and engage in an action, in this case giving a picture, to get what they need or want. Phase 1 is similar to early communication skills that develop in typical children when they are very young. Before children can say words, they learn that their actions (e.g. crying, babbling) can result in a specific desired outcome (e.g., being fed or picked up) if they direct that action to a specific individual (e.g., a parent).

In Phase 1, your child does not need to choose the correct picture, you will be setting up the picture so that your child is only focusing on learning how to pick-up, reach and release the picture. You should always have a second person, a back-prompter, available when teaching your child Phase 1 PECS. Having a second person is important when teaching Phase 1, as the second person helps teach your child to initiate (or go first) when communicating. We will teach you how to be the communicative partner and the back-prompter.

| Communication Partner | |
|--|---|
| 1. Arranges the environment effectively | <ul style="list-style-type: none"> - Multiple possible preferred items and/or activities available - Attempts to maintain control of items/activities |
| 2. Identifies child's current preference | <ul style="list-style-type: none"> - Looks to see what items or activities the child is interested in - Gives a "freebie" of the item to confirm child is interested |
| 3. Sets up communication opportunity | <ul style="list-style-type: none"> - Picture in front of child - Positioned across from the child with the item in their control |
| 4. Silently entices | <ul style="list-style-type: none"> - Shows the child the preferred item or activity - Does not verbally entice the child |
| 5. Uses open hand effectively | <ul style="list-style-type: none"> - Opens hand to receive picture only after the child has initiated towards the item or the picture |
| Responds to a Correct Exchange | |
| 6. Accepts the picture | <ul style="list-style-type: none"> - Receives picture in open hand |
| 7. Delivers the reinforcer in a ½ second | <ul style="list-style-type: none"> - Delivers the item or activity to the child immediately |
| 8. Vocally labels the item | <ul style="list-style-type: none"> - Vocal labels the item - May or may not deliver praise, but only after the vocal model |
| Responds to an Error by Restarting the Trial | |
| 9. Places the picture back down in front of the child | <ul style="list-style-type: none"> - Places the picture back down in front of the child |
| 10. Silently re-entices | <ul style="list-style-type: none"> - Shows the child the preferred item or activity - Does not verbally entice the child |
| Back-Prompter | |
| 11. Waits for child to initiate | Prompts child only after the child has demonstrated initiation |
| 12. Physically prompts pick up, reach, and release | <ul style="list-style-type: none"> - Uses a physical prompt (e.g., full, partial, at hand, wrist, elbow, etc.) to teach the pick-up, reach, and release |
| 13. Fades prompts over trials | <ul style="list-style-type: none"> - Demonstrates fading of prompts over successive trials (i.e., across 5-trials the force of the physical prompt or position of the physical prompt has visibly reduced) |
| 14. Provides no social interaction to the child | |

Appendix E

PECS Phase IIIa Caregiver Training Handout

PHASE 3A

SIMPLE DISCRIMINATION

Overview: Phase 3 focuses on teaching the child to discriminate or choose the picture that represents the item or activity he or she wants. Phase 3A teaches the child to discriminate between 2 pictures, one of something that is highly preferred, in other words something they really want versus a picture of something that is not preferred, a distractor. We start by teaching the child to choose between a highly preferred picture versus distractor picture because we want to start teaching the child to be accurate with their choices. If we started with two pictures of things they liked, then they might be happy if we gave them either item, but we wouldn't know which one they meant to ask for. Phase 3A teaches your child that the picture that they exchange has a meaning and making the wrong choice won't get you what you want.

| Communication Partner | |
|--|--|
| 1. Arranges the environment effectively | <ul style="list-style-type: none"> - Multiple possible preferred items and/or activities available and minimum one distractor item - Attempts to maintain control of items/activities |
| 2. Identifies child's current preference | <ul style="list-style-type: none"> - Looks to see what items or activities the child is interested in - Gives a "freebie" of the item to confirm child is interested |
| 3. Sets up communication opportunity | <ul style="list-style-type: none"> - Picture of high-preferred and distractor picture on the front cover of the child's communication book - Across from the child with both items in their control |
| 4. Silently entices | <ul style="list-style-type: none"> - Shows the child the preferred item and the distractor item - Does not verbally entice the child |
| Responds to a Correct Exchange | |
| 5. Socially reinforces as soon as the child touches the correct picture | <ul style="list-style-type: none"> - Provides verbal praise within ½-second following the child touching the correct picture |
| 6. Accepts the picture | <ul style="list-style-type: none"> - Receives picture in their hand |
| 7. Delivers the reinforcer in a ½ second | <ul style="list-style-type: none"> - Delivers the item or activity to the child immediately |
| 8. Vocally labels the item | <ul style="list-style-type: none"> - May or may not deliver praise, but only after the vocal model |
| 9. Moves both pictures to new locations on the front of the communication book | |
| Responds to an error by conducting the 4-step error correction | |
| 10. Remains silent and accepts the distractor picture | <ul style="list-style-type: none"> - Accepts the distractor picture but does not make any vocal utterance as the child picks up the distractor picture; does not use social reinforcement or disapproval (e.g., do not say "no" or something similar) |
| 11. Delivers and vocally labels the distractor item within ½ second of the exchange | <ul style="list-style-type: none"> - Delivers the distractor item to the child immediately - Vocally labels the distractor item |
| 12. Returns the distractor picture to the same general location on the cover of the communication book | |
| 13. Models correct picture | <ul style="list-style-type: none"> - Points at the correct picture |
| 14. If child does not initiate exchanging the correct picture, uses a physical prompt to help the child practice the exchange | <ul style="list-style-type: none"> - If child does not grasp the correct picture within 2-seconds following the model, a physical prompt is used |
| 15. Accepts the correct picture | <ul style="list-style-type: none"> - Receives correct picture in their open hand |
| 16. Vocally labels, but does not deliver the item | |
| 17. Returns picture to same general location on the cover of the communication book | |
| 18. Distracts the child | <ul style="list-style-type: none"> - Does something to distract the child (e.g., flips over communication book, asks child to complete a short, known task) |
| 19. Silently re-entices (repeats the trial) | <ul style="list-style-type: none"> - Shows the child the preferred item and the distractor item - Does not verbally entice the child |

Appendix F

AGENDA PECSperts Facilitators Training Package - 2023

Day One (at Bethesda)

- Review teaching procedures for phases I to IV
- Evaluate participants ability to accurately implement phases I to IV of PECS
- 9-10 Phase I
- 10-11 Phase II
- 11-12 Phase IIIa
- 12-12:30 Lunch
- 12:30-1:30 Phase IIIb
- 1:30-2:30 Phase IV
- 2:30-2:45 Break
- 2:45-3:30 orient participants to the *PECSperts* online training resources, and provide vocal instructions and rationale for the training approach
- 3:30-4:30 model an online training using Phase I
- 4:30-5:00 training tips (rapport, prompting, shaping, reinforcement, error correction, practice vs. describe, preference assessments, etc)

Day Two (online)

- 9-10:15 ½ group practice training Phase I
- Break
- 10:30-12 ½ group practice training Phase II

- 12:00-12:30 lunch
- 12:30-2:00 ½ group practice training Phase IIIa
- Break
- 2:15-3:45 ½ group practice training Phase IIIb
- Break
- 4:00-5:00 all group practice training Phase IV (*split into smaller groups*)

Day Three (at Bethesda)

- 9-9:20 orient participants to the *PECSperts* caregiver–child coaching resources, and provide vocal instructions and rationale for coaching Phase 2
- 9:20-9:45 model caregiver–child coaching for Phase II
- 9:45-10:45 ½ group practice coaching Phase I
- 10:45-11 Break
- 11-12 ½ group practice coaching Phase II
- 12-12:30 Lunch
- 12:30-1:30 ½ group practice coaching Phase IIIa
- 1:30-2:30 ½ group practice coaching Phase IIIb
- 2:30-2:45 Break
- 2:45-3:45 all group practice coaching Phase IV (*split into smaller groups*)
- 3:45-4 Break
- 4:00-5:00 data collection practice (3 trials phases I, II, IIIa, IIIb, IV)

NOTE: ensure participants who practiced online training one phase, practice a different phase in coaching

| Skills | | Probe Trial | | |
|---|---|-------------|---|---|
| | | 1 | 2 | 3 |
| Communication Partner | | | | |
| 1. | Arranges the environment effectively for Phase 1 <ul style="list-style-type: none"> Multiple possible preferred items and/or activities available Environment is generally clear of other easily accessible putative reinforcers NOTE: this item focuses on having possible reinforcers for the purpose of identifying reinforcers and creating the communication opportunity, parents should have reasonable control of the reinforcers for the purposes of identifying child's current preference, but items can be more available than when the communication opportunity starts in #3 NOTE: Issues with too many pictures, pictures set up improperly, improper use of binder are scored under item #3 NOTE: Pictures can be in the environment at this time, but shouldn't be used to assess preferences/placed out with the items | | | |
| 2. | Identifies child's current preference <ul style="list-style-type: none"> Looks to see what items or activities the child is interested in May give a "freebie" of the item to confirm child is interested NOTE: if parent engages in behaviours attempting to identify child's preferences, but child doesn't co-operate, parent may still be scored "+" if they were making reasonable attempts; however, if child shows interest in other items/activities, doesn't show interest in offered items, and the parent doesn't adjust their strategy/change up the offered items, they may be scored "-" | | | |
| 3. | Sets up communication opportunity at Phase 1 <ul style="list-style-type: none"> Single picture in front of child (NOTE: if more than one picture score "x"; if not picture of putative reinforcer score "x"; if binder used score "x") Positioned across from the child with the item in their control | | | |
| 4. | Silently entices <ul style="list-style-type: none"> Shows the child the preferred item or activity Does not verbally entice the child | | | |
| 5. | Uses open hand effectively <ul style="list-style-type: none"> Opens hand to receive picture only after the child has initiated towards the item or the picture NOTE: If child reaches for item/toward pics (even if they grab or parents give without exchange, this item should be scored) | | | |
| Uses Back Prompter Effectively | | | | |
| 6. | Uses back prompter effectively <ul style="list-style-type: none"> Waits for the back prompter to prompt the child to pick-up, reach, release when child reaches for the item or picture Requests back prompter assistance to prompt the child to pick-up, reach, release NOTE: if the parent uses physical or gestural prompts to assist the child to pick-up, reach or release the picture score as incorrect. | | | |
| Responds to a Correct Exchange | | | | |
| 7. | Accepts the picture <ul style="list-style-type: none"> Receives picture in open hand | | | |
| 8. | Delivers the reinforcer in a ½ second <ul style="list-style-type: none"> Delivers the item or activity to the child immediately | | | |
| 9. | Vocally labels the item <ul style="list-style-type: none"> May or may not deliver praise, but only after the vocal model | | | |
| Responds to an Error by Restarting the Trial | | | | |
| 10. | Places the picture back down in front of the child | | | |
| 11. | Silently re-entices <ul style="list-style-type: none"> Shows the child the preferred item or activity Does not verbally entice the child | | | |
| Back-Prompter | | | | |
| 12. | Waits for child to initiate <ul style="list-style-type: none"> Prompts child only after the child has demonstrated initiation | | | |

| | | | | |
|-----|---|--|--|--|
| 13. | Physically prompts pick up, reach, and release | | | |
| | <ul style="list-style-type: none"> Uses a physical prompt (e.g., full, partial, at hand, wrist, elbow, etc) to teach the pick-up, reach, and release | | | |
| 14. | Fades prompts over trials | | | |
| | <ul style="list-style-type: none"> Demonstrates fading over trials (i.e., across 5-trials the force of the physical prompt or position of the physical prompt has visibly reduced) | | | |
| 15. | Provides no social interaction to the child | | | |
| | Total Correct | | | |
| | Percent Correct | | | |
| | CHILD PERFORMANCE (Independent = "+", Prompted = "P", Refusal = "-") | | | |

Appendix H

Online Lesson: Phase 1

---REDACTED---

Appendix I

Caregiver–Child Coaching Lesson Plan: Phase 1

---REDACTED---