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ORIGINAL PAPER

Intercontinental Telehealth to Train Japanese Interventionists in Incidental Teaching for Children with Autism

Leslie Neely[1] · Ee Rea Hong[2] · Sawako Kawamini[3] · Ileana Umana[4] · Isanely Kurz[1]

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Abstract

Intercontinental telehealth may be a solution for the dissemination of evidence-based practices in underserved countries. The purpose of this study was to evaluate the use of intercontinental telehealth to train interventionists in incidental teaching. The training package consisted of written and verbal instructions and videoconferencing with delayed video-feedback. Five adults and two children participated in this study. One adult was in the United States (host site), and the remaining participants were in Japan. The adult located at the host site first taught one of the participants (termed "coach") the incidental teaching and coaching procedures. The coach then trained the three subsequent interventionists in the incidental teaching procedures. All three interventionists improved their implementation of incidental teaching and reached the preset criterion. We also evaluated the distal outcomes on child mands with one child emitting increased mands in response to interventionists' improved implementation fidelity of incidental teaching and one child demonstrating no change.

Keywords Telehealth · Videoconferencing · Autism · Incidental teaching · Applied behavior analysis

✉ Leslie Neely
leslie.neely@utsa.edu

[1] Department of Educational Psychology, The University of Texas at San Antonio, San Antonio, TX 78207, USA

[2] Baekseok University, Cheonan, South Korea

[3] University of Tsukuba, Tsukuba, Japan

[4] Texas A&M University, College Station, USA

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impairments in social-communication skills and engagement in restricted and repetitive behavior or interests (Copeland 2018). Social and preverbal behaviors are typically present in most children by 18 months of age (Johnson 2008), due to the importance of these behavior signs, the concerns of many parents of children with ASD begin with delays in the development of social and communicative behaviors. The development of social and communicative behaviors is important, given empirical evidence linking these areas of development with detrimental outcomes. Social and communication deficits in children with ASD are associated with a higher likelihood of adverse child outcomes, such as poor academic performance, employment failure, peer rejection, social isolation, and mental health issues (e.g., depression, anxiety) (Eaves and Ho 2008).

Many studies have shown that naturalistic developmental behavioral interventions (NDBIs) lead to improvements in social-communication for children with ASD (Eikeseth and Klintwall 2014; Feldman and Matos 2013; Gianoumis et al. 2012; Shukla-Mehta et al. 2010). A defining feature of NDBIs is the idea that children learn best when they engage in child-led activities (Yurovsky et al. 2013). In turn, when implementing NDBI techniques, natural change agents learn how to maintain or enhance children's motivation and capitalize on activity engagement to build child skills (Schreibman et al. 2015). Given the complexity and variation of social, emotional, and behavioral characteristics within each child with ASD, there is no single NDBI protocol that can be applied across all children on the autism spectrum. Therefore, it is important to have trained professionals who can confidently adapt and modify the underpinning principles of NDBI techniques to work with those children with ASD. Unfortunately, as with many local areas in and outside of the US, shortage of qualified professionals in the autism field has always been a challenge to families who need help in educating their children with ASD (Powers 2010; Wang and Michaels 2009).

One solution to addressing the shortage of trained professionals is through telehealth. Telehealth encompasses the use of communications technology (e.g., computers, cell phones, tablets, and/or video conferencing) for the delivery of services when the client and therapist are located in different geographic locations (Peterson et al. 2017). The use of telehealth for service delivery has been evaluated extensively in other professions, including the medical (Kelly et al. 2016), psychological (Rees and Maclaine 2015), and speech therapy fields (Sutherland et al. 2018). Recently, researchers in the field of autism have used telehealth to train service providers on communication topics such as functional communication training (Tsami et al. 2019; Wacker et al. 2013a, b, c) and incidental teaching (Neely et al. 2016). They have found improved implementation fidelity for interventionists (Neely et al. 2018) and improved behaviors for the recipients of the interventions (Ferguson et al. 2019). In addition, preliminary evidence suggests that telehealth may be more cost and time-efficient (Lindgren et al. 2016).

Recently, telehealth researchers have begun to investigate the possibility of intercontinental telehealth (or telehealth across continents; Bakaria et al., 2017). For example, Barkaia et al. (2017) investigated the use of telehealth to train therapists in echoic and mand training for three children with ASD. The coach, located in the United States (host country), trained three interventionists located in Georgia-Sakartvelo (receiving site). The coach spoke both Georgian and English. All telehealth sessions were conducted live, and the coach provided both didactic training and immediate performance feedback. Improvements were noted for all of the therapists with mixed effects on child communication goals. Overall, this study provided initial evidence for the use of intercontinental telehealth to reach underserved countries.

Furthermore, a recent study of Tsami et al. (2019) replicated Wacker et al. (2013a, b) studies to undertake a further investigation of the efficacy and acceptability of parent training via telehealth. The researchers located in the United States (host site) worked with 12 children with ASD and their parents located across the globe. The children and caregivers resided in rural and urban areas across seven countries (receiving sites), including Greece, Turkey, Saudi, Costa Rica, Mexico, Ukraine, and Russia. Two behavior therapists, located in the United States, trained the parents to implement a functional analysis and functional communication training. Each parent met with the therapist and an interpreter, and all training sessions were conducted live. In each training session, the parents received both didactic instructions and immediate performance feedback. Results indicated that all parents were able to implement the training procedures with high fidelity, and their children showed a decrease in problem behaviors while increasing communication skills.

The Bakaria et al. (2017) and Tsami et al. (2019) articles are notable steps towards the investigation of intercontinental telehealth to teach communication skills to individuals with autism. However, there are several modifications that warrant further study. First, while synchronous training may be ideal, scheduling of simultaneous sessions may be a particular barrier to intercontinental telehealth. Considering the case of Japan, should a coach in the United States aim to conduct synchronous supervision during a 1 p.m. Japan Standard Time therapy session, the coach would need to be available at 11 p.m. Central Standard Time (the day before). As that might preclude training, one solution might be the use of delayed video-based feedback. Telehealth researchers have utilized delayed video-based feedback to teach interventionists to implement incidental teaching (Neely et al. 2016, 2018) and delayed performance feedback to teach reciprocal imitation training (Wainer and Ingersoll 2015). Preliminary results indicate improvements for interventionists' implementation fidelity with positive results for child outcomes.

In addition to the time difference, intercontinental telehealth may present cultural and language barriers. One solution is to identify a culturally and linguistically matched therapist in the host country, as was implemented by Barkaia et al. (2017). Alternatively, the culturally and linguistically matched therapist may be located in the receiving country with the ability to communicate in both the host and the receiving country's language. Lastly, a culturally and linguistically matched translator may be located in a third location and translate between the host and receiving

country via telehealth technologies. Since it is unknown which solution is most efficient and effective, additional research is warranted.

The purpose of this study is to extend the telehealth literature base to investigate the effectiveness of intercontinental telehealth. In particular, this study aimed to evaluate the effect of intercontinental telehealth (using delayed video-based feedback and a culturally and linguistically matched therapist in the receiving country) on interventionist implementation of incidental teaching. The experimenters chose to teach incidental teaching as it is an evidence-based intervention for children with ASD and has been previously investigated by telehealth researchers (e.g., Neely et al. 2018). Based on results from previous studies, we hypothesize the telehealth training will improve interventionist implementation fidelity and improve the consistency (e.g., decrease variability) of communication opportunities offered per session. We also hypothesize the improved fidelity of implementation and consistency of communication trials will result in increased child mands per session. This study also aims to extend intercontinental telehealth to a novel location, Japan.

Methods

Participants

Five adults and two children participated in this study. One adult was located at the host site in the mainland United States, and the other four adults and the two children were located in Japan. The trainer, located on the mainland United States, worked with one adult in Japan (termed "coach"). The trainer was a Board Certified Behavior Analyst—Doctoral level with 7 years of experience implementing incidental teaching for children with ASD at the time of the study. She also had 3 years of experience training others using telehealth technologies. The trainer spoke English with the coach and did not speak Japanese.

The coach was located in Japan and received training in incidental teaching from the trainer. At the time of the study, the coach was a doctoral student studying special education in mainland Japan. She had a total of 4 years of experience implementing behavioral therapy and spoke fluent Japanese and English. She spoke Japanese with the interventionists.

The coach worked with three interventionists from a community-based autism clinic in Japan. Interventionist one ("I1") was a 24-year-old Chinese female. She had 2 years of experience working with children with ASD. Interventionist two ("I2") was a 25-year-old Chinese female. She had 3 years of experience working with children with ASD. Interventionist 3 ("I3") was a 33-year-old Korean female. She had 2 years of experience working with children with ASD. All interventionists were pursuing their master's degree in special education. They had not completed behavioral specific coursework prior to this study. All of the interventionists spoke Japanese with the coach and child participants.

Each interventionist was assigned a child to work with for this study. The children were eligible for this study if they met the following criteria (a) had an ASD diagnosis (b) were receiving services through the community-based clinic in Japan, and

(c) their caregivers provided written, informed consent translated into Japanese for them to participate (as approved by the host university Institutional Review Board). Two children participated in this study. Each child had a communication goal (i.e., manding goal) that could be targeted as part of this study. All services were provided in Japanese. Taro was a 4-year-old male who produced some sounds but did not imitate any sounds or actions. He worked with the coach and I1 throughout the study. Ken was a 9-year-old male who used simple one two sentences (e.g., go school), but didn't consistently mand for preferred items. Ken worked with I2 and I3 throughout the study. Prior to beginning any study procedures, all participants provided informed, written consent translated into Japanese. The caregivers signed the consent for the children.

Setting and Materials

All study sessions occurred at the community-based clinic for children with disabilities in Japan. The clinic was 7 m × 7 m with equipment such as a trampoline, large exercise ball, a swing, tables, and climbing equipment. The clinic had a wall of windows with a view of the cityscape and carpeted floors. Each session was 5-mins and occurred once (coach) or twice (interventionists) a week. There were two adults and one child in the clinic at a time.

Technology Equipment

The host site in the USA connected with the receiving site in Japan using four different communication technologies. The team shared documents and videos using Dropbox® with added Sookasa® application. Dropbox® is an online cloud-based file storage and sharing system. The Sookasa® add-on application encrypts the files stored in Dropbox®. The host site conducted inter-continental videoconference sessions via Vsee® and recorded them for data collection purposes using Camtasia® studio v8. Vsee® is utilized for HIPAA secure videoconferencing and allows for real-time chat, text and file transfer. Camtasia® studio v8 is a software suite with a tool that allows for capturing and recording screen video and audio sessions. These technologies were chosen as they allowed for encryption of confidential information and transmission of data between the host and receiving country.

The interventionists in Japan used a video recorder with built-in microphone (specifications not available) to record all of their sessions. The interventionists shared the videos with the coach in Japan and the host country (USA) by uploading the videos to the designated Dropbox folder. The coach also provided feedback and training to the interventionists via VSee® and recorded the training sessions with Camtasia® studio v8 for data collection purposes.

Dependent Variables and Data Collection

The trainer (located in the USA) and a second research team member (located in Japan), independently coded each video. During each 5-min session, the raters

collected data on both the coach/interventionist and child behavior. Observers recorded data on two topographies of coach/interventionists' behavior (a) number of communication opportunities ("trials") presented by the interventionist and (b) percentage of incidental teaching steps completed correctly. We defined a trial as a child initiation towards a pre-planned environmental arrangement. Pre-planned environmental arrangements included blocking access to an item (e.g., placing a toy in a clear childproof container), pausing an ongoing game (e.g., stopping a swinging game), or sabotaging a routine (e.g., locking a door that is typically unlocked). The researchers defined child initiations on an individual level, but the initiations included spontaneous verbal initiations and physical initiations (e.g., pointing). The coach/interventionists could offer multiple trials within the 5 min session. The observers recorded the total number of trials offered for each session.

For each trial, observers evaluated the interventionist implementation fidelity using an incidental teaching fidelity rubric adapted from Neely et al. (2018). The lead researcher calculated implementation fidelity for the session by dividing the total number of procedural steps completed correctly by the total number of procedural steps and multiplying by 100. Because multiple trials could occur within a 5 min session, the lead researcher averaged the percentages of steps implemented correctly per trial to obtain an overall percentage of steps implemented correctly within each session.

Although it was not the main variable of interest, observers also recorded child mands during the 5-min session. During the pre-assessment phase, prior to beginning the study, the trainer worked with the coach to identify an appropriate mand for each participant. Target mands included a gestural response for Taro (similar to clapping) and two-word mands for Ken (e.g., "Kashite Kudasai [貸してください]"). Observers recorded both independently and prompted mands.

Interobserver Agreement

The raters collected interobserver agreement (IOA) data for all three measures (i.e., implementation fidelity, number of trials, and child mands) for a minimum of 20% of sessions, within each condition, for each participant (e.g., 20% of baseline for I1, 20% of intervention for I1, 20% of baseline for I2, etc.). The trainer calculated IOA by dividing the total number of agreements by the sum of agreements and disagreements. This number was multiplied by 100 to obtain a percentage. IOA was 100% for the number of trials, 100% for the frequency of child mands, and 99% (range 90–100%) for percentage of incidental steps preformed correctly. Although the trainer did not speak Japanese, she was able to code the videos with a high level of reliability with the second rater (who did speak Japanese).

Treatment Integrity

The raters also collected treatment integrity data for the trainer and coach's adherence to the coaching procedures for 100% of sessions (calculated as the percentage of steps implemented correctly). Treatment integrity was 100% for the trainer and coach. Reliability on treatment integrity was 100% for all fidelity data collected.

Experimental Phases and Design

We conducted this experiment in three distinct phases. First, the trainer taught the coach via telehealth to implement incidental teaching until she reached the pre-set performance criterion. The trainer then taught the coach the training procedures. In the final phase, the coach prepared the interventionists to implement incidental teaching. We used a concurrent multiple baseline design across interventionists to evaluate the effects of the telehealth training.

Procedures

Phase One

In phase one, the trainer taught the coach via telehealth to implement incidental teaching. All telehealth meetings between the trainer and coach occurred between 7 and 8 p.m. Central Standard Time (host country) which equated to 9–10 a.m. Japan Standard Time the next day (receiving country). During the first telehealth meeting, the trainer provided verbal and written instructions regarding incidental teaching (PowerPoint® lecture and incidental teaching fidelity rubric). After the first telehealth training, the coach implemented incidental teaching in her therapy session later that same day. The coach videotaped her 5 min incidental teaching session and uploaded to the Dropbox® with Sookasa® add-on folder. The coach and trainer then met the following day via telehealth. Right before the meeting, the coach and trainer independently viewed the video-taped session and scored the video according to the incidental teaching fidelity rubric. The trainer started the video conference feedback by providing an overall positive statement concerning the coach's performance. The trainer and coach then reviewed their ratings for each step of the incidental teaching fidelity rubric. The trainer provided descriptive praise for steps completed correctly and neutral corrective feedback for steps completed incorrectly. The coach then implemented another therapy session with her client, uploaded the video to the trainer, and scheduled a second videoconferencing coaching session for the following day with the training. A videoconferencing coaching session was conducted in between each therapy session. The videoconferencing sessions continued until the coach implemented the procedures for incidental teaching with greater than 90% fidelity for three sessions and a minimum of three sessions to meet minimum quality standards for single-case research (Kratochwill et al. 2010). The coach reached the pre-set performance criterion in four sessions. The total intervention phase lasted less than a month".

While the coach was being trained in the incidental teaching procedures, the interventionists collected baseline videos. Each interventionist was instructed to video themselves with their child teaching them the target mand. No other feedback was provided by the coach (or trainer) during this phase. The interventionists were instructed to upload the video to the Dropbox® with Sookasa® folder.

Phase Two

Once the coach met the preset performance criterion, the trainer video-conferenced with the coach to teach the training procedures. Before the meeting, the trainer and coach each watched one baseline video session of the interventionists with their respective child participant. During the meeting, the trainer provided verbal and written instructions on how to conduct the training for the interventionists. The trainer also provided the procedural checklists for coaching sessions, study schedule, and information on environmental arrangement. The coach was able to ask any questions. This meeting lasted just over an hour.

Phase Three

Prior to phase three, the coach translated all the training materials into Japanese. The research team also employed an independent translator to verify the accuracy of the translations. The coach then taught three interventionists to implement the incidental teaching procedures using the same training procedures as Phase 1. Explicitly, the coach met with each interventionist individually via telehealth. The coach met with the therapists via telehealth as their schedule did not permit them to be present together during therapy sessions. During the first telehealth meeting, the coach provided verbal and written instructions regarding incidental teaching (PowerPoint® lecture and incidental teaching fidelity rubric). After the first telehealth training, the interventionist implemented incidental teaching in her therapy session later that same day. The interventionist videotaped her 5 min incidental teaching session and uploaded to the Dropbox® with Sookasa® add-on folder. The coach and interventionist then met via telehealth right before the next therapy session. Before the telehealth meeting, the coach and trainer independently viewed the video-taped session and scored the video according to the incidental teaching fidelity rubric. The coach started the video conference feedback by providing an overall positive statement concerning the interventionist's performance. The coach and interventionist then reviewed their ratings for each step of the incidental teaching fidelity rubric. The coach provided descriptive praise for steps completed correctly and neutral corrective feedback for steps completed incorrectly. The videoconferencing sessions continued until the interventionists implemented the procedures for incidental teaching with greater than 90% fidelity, a minimum of three sessions to meet minimum quality standards for single-case research (Kratochwill et al. 2010), and until the data demonstrated stability using visual analysis of the time series data. The total intervention phase lasted two (I2) to 3 weeks (I1 and I3).

Results

Coach

The coach's implementation fidelity is depicted by the line graph in Fig. 1 and corresponds to the left y-axis. During baseline, the coach implemented incidental

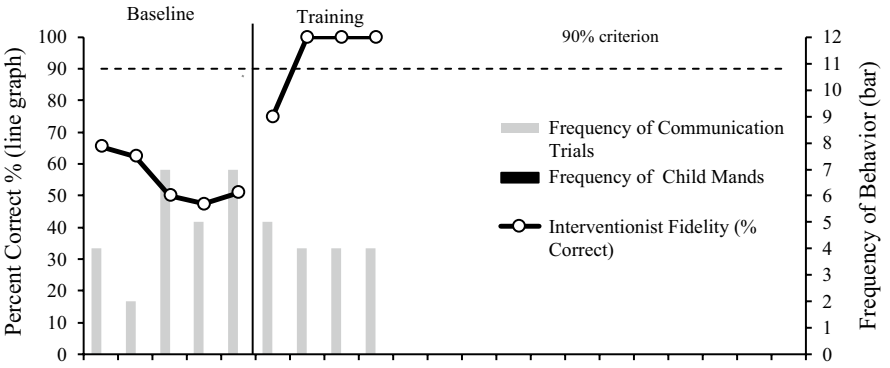

Fig. 1 Coach's percentage correct in implementing incidental teaching (line graph corresponding to left axis), frequency of communication opportunities offered (grey line graph corresponding to right axis), and frequency of child communication (black line graph corresponding to right axis)

teaching with an average of 55.3% fidelity (range 47.5–65.6%). After introduction of the training phase, the coach reached the pre-set 90% criterion within two sessions and maintained 100% fidelity for the remainder of the training session. The frequency of communication trials offered by the coach is depicted by grey bars in Fig. 1. The frequency of communication trials corresponds to the right *y*-axis. During baseline, the coach offered an average of five communication trials per session (range 2–7 trials/session). During the intervention phase, the coach offered an average of 4.25 communication trials per session (range 4–5 trials/session). The total intervention phase lasted less than a month.

Interventionists

Interventionists' implementation fidelity is depicted by the line graph in Fig. 2 and corresponds to the left y-axis. During baseline, I1 implemented incidental teaching with an average of 62.7% fidelity (range 42.8–77.8%). I2 implemented incidental teaching with an average 50.6% fidelity (range 23.5–70.6%) and I3 implemented incidental teaching with an average of 58.6% fidelity (range 0–71%).

After introduction of the training phase, I1 demonstrated variability in implementation fidelity but reached the pre-set 90% criterion within two sessions. I1 averaged 87.4% implementation fidelity (range 66.7–100%) during the training phase and her fidelity stabilized above the 90% criterion for the final three sessions. For I2, the introduction of the training resulted in immediate and stable responding with I2 immediately reaching 100% implementation fidelity and maintaining that fidelity for four consecutive sessions. I3 also improved implementation fidelity during the training phase averaging 82% implementation fidelity (range 60–100%). She reached the fidelity criterion in three sessions. The total intervention phase lasted two (I2) to 3 weeks (I1 and I3).

The frequency of communication trials offered by the interventionist is depicted by grey bars in Fig. 2. The frequency of communication trials corresponds to the

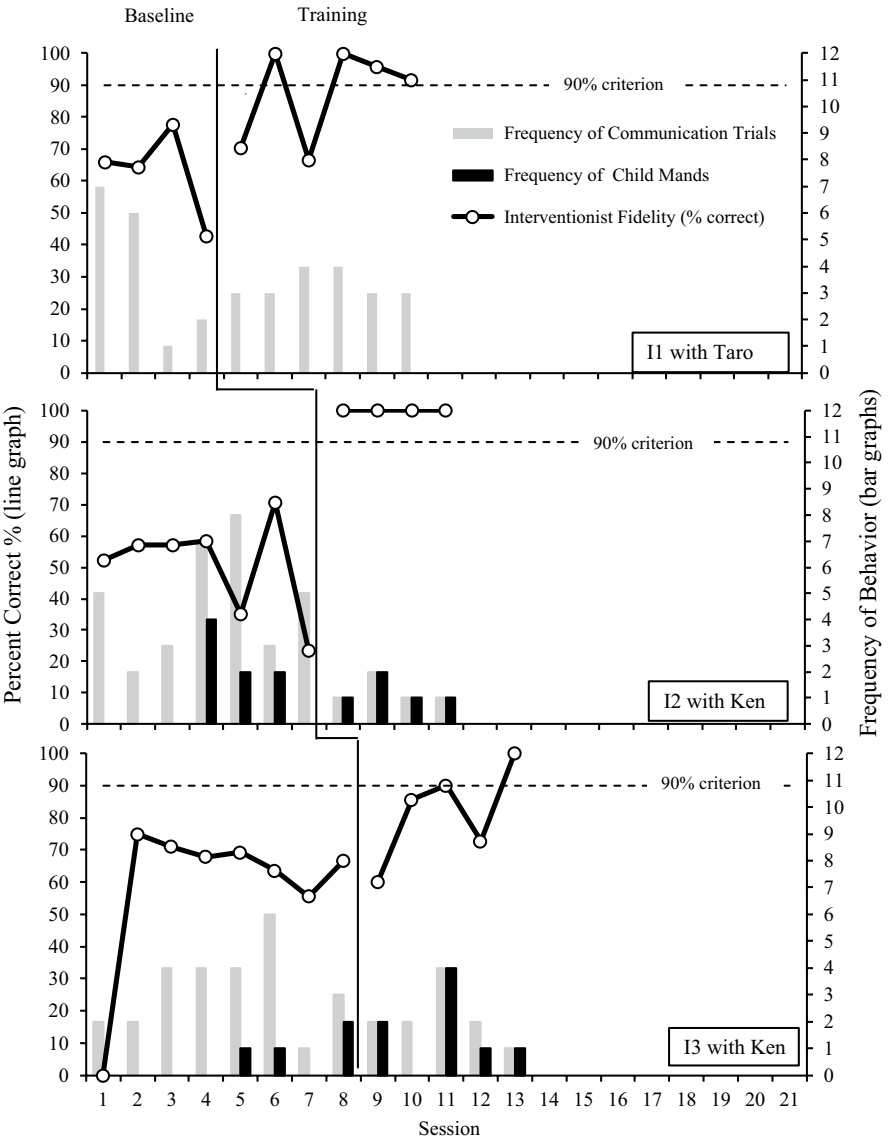

Fig. 2 Interventionists' percentage correct in implementing incidental teaching (line graph corresponding to left axis), frequency of communication opportunities offered (grey line graph corresponding to right axis), and frequency of child communication (black line graph corresponding to right axis)

right y-axis. During baseline, I1 offered an average of four communication trials per session (range 1-7 trials/session). I2 offered an average of 4.71 communication trials (range 2-8 trials/session), and I3 offered an average of 3.25 communication trials (range 1-6 trials/session). Once they began training, I1 offered an average of 3.3 communication trials per session (range 3–4 trials/session). I2 offered an average of

1.25 communication trials per session (range 1–2 trials/session), and I3 offered an average of 2.2 communication trials per sessions (range 1–4 trials/session).

Child Mands

The frequency of child mands is depicted by black bars in Figs. 1 and 2 with the data corresponding to the right y-axis. Taro worked with the coach and I1 and never emitted any of the target mands in either baseline or intervention. Ken worked with both I2 and I3. During baseline with I2, Ken emitted an average of 1.1 mands/session (range 0–4 mands/session). During intervention with I2, Ken emitted an average of 1.25 mands/session (range 1–2 mands/session). Ken also responded to a higher percentage of communication trials in intervention (100% of trials/session) versus the baseline (21% of trials/session; range 0–67% of trials/session). During baseline with I3, Ken emitted an average of 0.5 mands/session (range 0–2 mands/session). During intervention with I3, Ken emitted an average of 1.6 mands/session (range 0–4 mands/session). Ken also responded to a higher percentage of communication trials/session during intervention (70% of trials/session; range 0–100% trials/session) versus baseline (13% of trials/session; range 0–67% of trials/session).

Discussion

Intercontinental telehealth may be an option for the dissemination of incidental teaching to underserved countries. The purpose of this study was to evaluate the effects of intercontinental telehealth training on interventionist's implementation of incidental teaching for children with autism. The training initiated in the host country, the United States, while the interventionists conducted incidental teaching sessions in Japan. A training package consisting of verbal and written instructions, videoconferencing, and delayed video-based feedback was effective in improving coach and interventionist implementation fidelity for all three participating interventionists. There were mixed results for the two participating children with one child demonstrating improved manding and the other demonstrating no effects. Overall, the effects of the telehealth training are promising and warrant future investigation.

The first purpose was to evaluate the effects of the telehealth training on interventionist fidelity of implementing incidental teaching. The telehealth training was associated with improved implementation fidelity for the coach and all three interventionists. These results are consistent with previous studies demonstrating improved implementation fidelity when interventionists are trained via telehealth (Ferguson et al. 2019). This study also adds to the growing literature base highlighting the utility of video-based feedback in providing performance feedback when synchronous training is not available (Neely et al. 2016, 2018).

We also hypothesized that telehealth training would improve interventionist consistency of providing communication trials within a session. These results were realized with the coach and interventionists reducing the variability in the communication trials offered per session. While these results were consistent

with some studies focused on improving fidelity of incidental teaching (e.g., Neely et al. 2016, 2018), they contradict other studies documenting an increase in the number of communication trials (e.g., Huskens et al. 2012). This discrepancy could be attributed to a number of reasons. Most notable, it could be that the 20 s reinforcement schedule reduced the overall number of opportunities offered as the interventionists were instructed to present zero contingencies during the reinforcement period. In addition, it could be that focusing on fidelity of incidental teaching and following the child's lead, as opposed to a focus on increasing communication opportunities, may have reduced the overall communication opportunities. To note, the percentage of trials with communication for Ken actually increased in correspondence with the improved fidelity and reduced communication trials. Regardless, future research might investigate the impact of focusing on fidelity and dosage of communication trials on child communication.

The second purpose of this study was to evaluate distal outcomes of improved interventionist implementation fidelity on child mands. It was hypothesized that improved implementation fidelity would be associated with increased child mands. While this was the case for Ken, this was not the case for Taro. When considering the implications, it is possible that Taro might be sensitive to a reinforcement parameter not captured by the incidental teaching procedure. For example, it is possible he was differentially sensitive to contingency of reinforcement rather than immediacy of reinforcement. Since the incidental teaching essentially provides a 10 s delay to reinforcement if there is no response from the child or immediate reinforcement contingent upon vocalization, this approach might be most appropriate for those children sensitive to immediacy of reinforcement as they will receive access to the reinforcer regardless of responding. However, some children might require mand training which only provides reinforcement contingent upon the target response. Alternatively, it is possible that the study duration was too short for Taro to demonstrate independence of his mand or a different mand-modality might be necessary to reach independence. Conversely, Ken demonstrated increased mands corresponding to improved implementation fidelity. In addition, Ken responded with increased accuracy as the treatment fidelity increased. Ken's results add to the evidence supporting incidental teaching as an evidence-based intervention for teaching communication to children with ASD while Taro's results suggest other communication interventions might be indicated for some children.

A novel aspect of this study is the extension of telehealth to intercontinental training. This study replicates and extends previous findings by Barkaia et al. (2017). It demonstrates the effectiveness of intercontinental telehealth to train interventionists to teach communication to children with ASD. This study also extended the international telehealth literature by using delayed video-based feedback (rather than synchronous feedback) and employing a bilingual coach in the receiving country to serve as the trainer for the interventionists. The identification of a trainer in the host country may be particularly useful as the trainer can serve as a cultural broker (a termed coined by anthropologists to identify a person who acts as an intermediary between individuals from different cultures for the purpose of producing change; Jezewski 1990).

Limitations and Suggestions for Future Research

There are some notable limitations of this study. First, while our primary purpose was to evaluate intercontinental telehealth on interventionist behaviors, the ultimate evaluation of effects should be on the level of the client receiving therapy. To note, we did demonstrate improvements for one child, but the second child did not demonstrate improvements. In addition, we only included two children in this study. Since our level of experimental control was not on the child level, we decided to allow I2 and I3 to work with the same child. This introduced some possible confounds. For example, it is possible that Ken's improvements with I2 generalized to I3 and facilitated improvements in I3's implementation fidelity. In fact, the last session of baseline for I3 did demonstrate the highest level of mands for Ken during baseline. However, as the telehealth training begins for I3, Ken's manding increases in variability and only reaches consistency in relation to improvements in I3's implementation fidelity. Therefore, there is an obvious need to continue this work with a focus on client outcomes.

As with other telehealth studies, the research team did experience some technological difficulties (Lee et al. 2015). For example, experimenters did have to restart the videoconference during sessions to re-establish the connection. However, these difficulties were easily remedied with preventative and responsive procedures established prior to the start of the study. For example, 2 h prior to each session with the coach, the trainer emailed to confirm the appointment. The coach and trainer also had their email open in the event they needed to communicate any technical difficulties. The trainer also had back up technology pre-identified in the event there was a need to switch technologies (this ended up not being necessary). These strategies were communicated to the coach at the onset of the study and facilitated easy reconciliation of barriers.

Another notable limitation was the inclusion of a highly educated coach. The coach was not only a doctoral student at the time of this study, she was trilingual and spoke English, Japanese, and Korean fluently. She also was training in applied behavior analysis at the time of the study and had previous behavior analytic coursework. This level of expertise might not be available in other countries and future research should aim to replicate with underserved communities without access to highly trained coaches.

Another notable limitation was the lack of language diversity in the host country as the trainer was monolingual and did not speak Japanese. While this was not a barrier in this study, practioners and future researchers might consider different models to address this issue. For example, a translator at the host site might facilitate communication between the host and receiving sites. Alternatively, the translator could be located at the receiving site or could join the telehealth session from a third site. The host site might also identify a bi-lingual expert to facilitate the telehealth sessions.

Unlike other studies, the experimenters did not collect any measure of social validity. In addition, while the experimenters did collect data regarding the length of the intervention phase, they did not collect data regarding the total duration of the videoconferencing sessions. While this was definitely short-sighted, this

unfortunately leaves the reader to question whether the coach and interventionists were agreeable to the telehealth training and if the total duration of training is feasible in practice. Future research should not only replicate this study and extend to address limitations, but should collect a measure of social validity to support the use of intercontinental telehealth and the total duration of training.

Conclusion

This study adds to the limited literature base supporting the use of intercontinental telehealth to disseminate ASD communication intervention to underserved countries. The interventionists in this study all improved their implementation of incidental teaching in a relatively short time frame. The use of a cultural broker to serve a coach may also be a viable solution to facilitate the transfer of interventions across cultures and languages. Future research is indicated to continue the investigation into intercontinental telehealth for ASD.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This article complies with all ethical requirements and was approved by The University of Texas at San Antonio Institutional Review Board #16-216.

References

Barkaia, A., Stokes, T. F., & Mikiashvili, T. (2017). Intercontinental telehealth coaching of therapists to improve verbalizations by children with autism. *Journal of Applied Behavior Analysis, 50,* 582–589. https://doi.org/10.1002/jaba.391.

Copeland, J. N. (2018). What Is Autism Spectrum Disorder? Retrieved March 30, 2020, from https://www.psychiatry.org/patients-families/autism/what-is-autism-spectrum-disorder.

Eaves, L. C., & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders, 38,* 739–747. https://doi.org/10.1007/s10803-007-0441-x.

Eikeseth, S., & Klintwall, L. (2014). Educational interventions for young children with autism spectrum disorders. In V. Patel, V. Preedy, & C. Martin (Eds.), *Comprehensive guide to autism* (pp. 2101–2123). Berlin: Springer. https://doi.org/10.1007/978-1-4614-4788-7_128.

Feldman, E. K., & Matos, R. (2013). Training paraprofessionals to facilitate social interactions between children with autism and their typically developing peers. *Journal of Positive Behavior Interventions, 15,* 169–179. https://doi.org/10.1177/1098300712457421.

Ferguson, J., Craig, E. A., & Dounavi, K. (2019). Telehealth as a model for providing behaviour analytic interventions to individuals with Autism Spectrum Disorder: A systematic review. *Journal of Autism and Developmental Disorders, 49,* 582–616. https://doi.org/10.1007/s10803-018-3724-5.

Gianoumis, S., Seiverling, L., & Sturmey, P. (2012). The effects of behavior skills training on correct teacher implementation of natural language paradigm teaching skills and child behavior. *Behavioral Interventions, 27,* 57–74. https://doi.org/10.1002/bin.1334.

Huskens, B., Reijers, H., & Didden, R. (2012). Staff training effective in increasing learning opportunities for school-aged children with autism spectrum disorders. *Developmental Neurorehabilitation, 15*(6), 435–447. https://doi.org/10.3109/17518423.2012.705910.

Jezewski, M. A. (1990). Culture brokering in migrant farmworker health care. *Western Journal of Nursing Research, 12,* 497–513. https://doi.org/10.1177/019394599001200406.

Johnson, C. P. (2008). Recognition of autism before age 2 years. *Pediatrics in Review, 29,* 86. https://doi.org/10.1542/pir.29-3-86.

Kelly, J. T., Reidlinger, D. P., Hoffmann, T. C., & Campbell, K. L. (2016). Telehealth methods to deliver dietary interventions in adults with chronic disease: A systematic review and meta-analysis. *American Journal of Clinical Nutrition, 104,* 1693–1702. https://doi.org/10.3945/ajcn.116.136333.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). Single-case designs technical documentation. Retrieved March 30, 2020, from What Works Clearinghouse https://ies.ed.gov/ncee/wwc/Docs/ReferenceResources/wwc_scd.pdf

Lee, J. F., Schieltz, K. M., Suess, A. N., Wacker, D. P., Romani, P. W., Lindgren, S. D., et al. (2015). Guidelines for developing telehealth services and troubleshooting problems with telehealth technology when coaching parents to conduct functional analyses and functional communication training in their homes. *Behavior Analysis in Practice, 8,* 190–200. https://doi.org/10.1007/s40617-014-0031-2.

Lindgren, S., Wacker, D., Suess, A., Schieltz, K., Pelzel, K., Kopelman, T., et al. (2016). Telehealth and autism: Treating challenging behavior at lower cost. *Pediatrics, 137,* S167–S175. https://doi.org/10.1542/peds.2015-2851O.

Neely, L., Rispoli, M., Boles, M., Morin, K., Gregori, E., Ninci, J., et al. (2018). Interventionist acquisition of incidental teaching using pyramidal training via telehealth. *Behavior Modification*. https://doi.org/10.1177/0145445518781770.

Neely, L., Rispoli, M., Gerow, S., & Hong, E. R. (2016). Preparing interventionists via telepractice in incidental teaching for children with autism. *Journal of Behavioral Education, 25,* 393–416. https://doi.org/10.1007/s10864-016-9250-7.

Peterson, K. M., Piazza, C. C., Luczynski, K. C., & Fisher, W. W. (2017). Virtual-care delivery of applied-behavior-analysis services to children with autism spectrum disorder and related conditions. *Behavior Analysis: Research and Practice, 17,* 286–297. https://doi.org/10.1037/bar0000030.

Powers, M. D. (2010). *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment*. New York: Guilford Press.

Rees, C. S., & Maclaine, E. (2015). A systematic review of videoconference-delivered psychological treatment for anxiety disorders. *Australian Psychologist, 50,* 259–264. https://doi.org/10.1111/ap.12122.

Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G. G., et al. (2015). Naturalistic developmental behavioral interventions: Empirically validated treatments for autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45,* 2411–2428. https://doi.org/10.1007/s10803-015-2407-8.

Shukla-Mehta, S., Miller, T., & Callahan, K. J. (2010). Evaluating the effectiveness of video instruction on social and communication skills training for children with autism spectrum disorders: A review of the literature. *Focus on Autism and Other Developmental Disabilities, 25,* 23–36. https://doi.org/10.1177/1088357609352901.

Sutherland, R., Trembath, D., & Roberts, J. (2018). Telehealth and autism: A systematic search and review of the literature. *International Journal of Speech-Language Pathology, 20,* 324–336. https://doi.org/10.1080/17549507.2018.1465123.

Tsami, L., Lerman, D., & Toper-Korkmaz, O. (2019). Effectiveness and acceptability of parent training via telehealth among families around the world. *Journal of Applied Behavior Analysis, 52,* 1113–1129. https://doi.org/10.1002/jaba.645.

Wacker, D. P., Lee, J. F., Padilla Dalmau, Y. C., Kopelman, T. G., Lindgren, S. D., Kuhle, J., et al. (2013a). Conducting functional communication training via telehealth to reduce the problem behavior of young children with autism. *Journal of Developmental and Physical Disabilities, 25*(1), 35–48. https://doi.org/10.1007/s10882-012-9314-0.

Wacker, D. P., Lee, J. F., Padilla Dalmau, Y. C., Kopelman, T. G., Lindgren, S. D., Kuhle, J., et al. (2013b). Conducting functional communication training via telehealth to reduce the problem behavior of young children with autism. *Journal of Developmental and Physical Disabilities, 25,* 35–48. https://doi.org/10.1007/s10882-012-9314-0.

Wacker, D. P., Lee, J. F., Padilla Dalmau, Y. C., Kopelman, T. G., Lindgren, S. D., Kuhle, J., et al. (2013c). Conducting functional analyses of problem behavior via telehealth. *Journal of Applied Behavior Analysis, 46,* 31–46. https://doi.org/10.1002/jaba.29.

Wainer, A. L., & Ingersoll, B. R. (2015). Increasing access to an ASD imitation intervention via a telehealth parent training program. *Journal of Autism and Developmental Disorders, 45,* 3877–3890. https://doi.org/10.1007/s10803-014-2186-7.

Wang, P., & Michaels, C. A. (2009). Chinese families of children with severe disabilities: Family needs and available support. *Research and Practice for Persons with Severe Disabilities, 34,* 21–32. https://doi.org/10.2511/rpsd.34.2.21.

Yurovsky, D., Boyer, T. W., Smith, L. B., & Yu, C. (2013). Probabilistic cue combination: Less is more. *Developmental Science, 16,* 149–158. https://doi.org/10.1111/desc.12011.