Preliminary Practice Recommendations for Telehealth Direct Applied Behavior Analysis Services with Children with Autism

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Abstract
This article provides preliminary practice recommendations for telehealth direct applied behavior analysis (ABA) services for children with autism. In the face of COVID-19, there is an immediate need for discussion on how to implement various ABA procedures via telehealth for ABA practitioners. Alongside emerging scientific evidence on the effectiveness of telehealth direct service as well as various service-related guidelines, we provide preliminary practice recommendations that are based on the existing literature on in-person and telehealth ABA procedures. We also discuss these recommendations with case studies of two boys with autism. Social validity measures indicated that families were satisfied with telehealth direct services. Even after the COVID-19 pandemic has resolved itself, telehealth direct ABA service will still be a valuable option for remote and international locations where direct ABA service is limited, and thus, practice recommendations continue to be relevant for all practitioners that use telehealth direct service.

Keywords Applied behavior analysis · Autism · Case study · COVID-19 pandemic · Practice recommendation · Telehealth

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Introduction

Telehealth direct applied behavior analysis (ABA) service is defined as an ABA service provided “… face-to-face via synchronous videoconferencing to implement the treatment protocols and data collection procedures with the patient in the treatment setting” (Council for Autism Service Providers [CASP], 2020, p 28). Given the need for telehealth direct ABA service due to the COVID-19 pandemic, a growing number of studies began demonstrating its effectiveness. Pollard et al. (2021) and Nohelty, Bradford et al. (2021) reported the overall effectiveness of telehealth direct ABA services with children with autism. Cihon et al. (2021), Ferguson et al. (2020), and Pellegrino and DiGennaro Reed (2020) demonstrated the effectiveness of several ABA procedures in telehealth direct service with children and adults with disabilities. Furthermore, CASP (2020) provided an overall service structure of telehealth ABA service and Rodriguez (2020) provided guidelines on how to transition from in-person to telehealth service. In addition, Nohelty, Hirschfeld, and Miyake (2021) presented the Telehealth Therapy Treatment Integrity Measure (TTTIM) to evaluate performance integrity of ABA practitioners during telehealth direct therapy.

Efforts to evaluate the effectiveness of ABA service such as above are important as Lerman et al. (2020) noted that ABA practitioners’ skills needed for telehealth services greatly differ from ones needed for in-person services showing that skills learned in an in-person context did not automatically generalize to telehealth. Thus, discussing practical issues and providing preliminary recommendations for telehealth direct ABA services is useful for clinicians to deliver better quality services. To the best of our knowledge, no articles have discussed practical issues and challenges that might arise in the implementation of telehealth direct ABA services and how to resolve them. Thus, the purpose of this article is to provide (a) preliminary practice recommendations for ABA practitioners on implementing direct telehealth practice based on the existing literature both on in-person and telehealth ABA procedures and (b) discuss the application of these recommendations using the case studies of two boys with autism. These recommendations are important as various aspects of telehealth direct ABA treatment differ in comparison with in-person treatment (Nohelty, Hirschfeld, and Miyake 2021).

In the following sections, we briefly describe ABA service models and introduce the case studies of two boys with autism and discuss the client suitability of each of these boys as well as the technology used for telehealth. Then, we provide preliminary practice recommendations for telehealth direct ABA services and discuss applications of recommendations through each case study (see Table 1 for summary). In addition, we share findings of the social validity questionnaire that families of these two boys completed as well as the limitations of present article.
| Topic                        | Recommendations                                                                 | Future research topics                                                                 |
|------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Caregiver support            | Determine which telehealth model suits the family the best                       | Studies on comparisons of the effectiveness of different telehealth models are needed      |
|                              | Explain the extent of caregiver involvement in service                            |                                                                                          |
|                              | Build rapport with caregivers                                                    | Studies on how to develop and maintain rapport with caregivers via telehealth are needed  |
| Rapport building             | Develop and maintain rapport with the client using activities and items deliverable via telehealth throughout the course of service | Studies on how to establish and maintain rapport with a client via telehealth as well as to measure it are needed |
| Preference assessments and reinforcers | Find reinforcing items and activities that can be delivered via telehealth          | Studies on the effectiveness of preference assessments via telehealth are needed         |
|                              | Conduct preference assessments initially and throughout the course of the service to identify potential reinforcers | Studies on motivating operation on the effectiveness of reinforcers in telehealth are needed |
|                              | Consider asking caregivers to deliver reinforcers in-person                       | Studies on the factors affecting the effectiveness of telehealth-delivered social reinforcers are needed |
|                              | Organize physical environment to remove possible distractors during telehealth sessions |                                                                                          |
| Session frequency and session length | Determine session frequency and length (treatment dosage) based on treatment dosage in in-person service, client characteristics, reinforcer availability, rapport, and frequency of short breaks | Parametric studies on treatment dosage difference in telehealth direct ABA service are needed |
| Topic                      | Recommendations                                                                 | Future research topics                                                                 |
|----------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Program adaptation         | Determine which skill acquisition programs need modifications                     | Studies on how to modify skill acquisition programs from in-person to telehealth are needed |
|                            | Consider adaptations of materials, target responses, prompts, and procedures      | Studies on how acquired skills generalize from telehealth to in-person are needed         |
|                            | Plan for skill generalization from telehealth to natural environment              |                                                                                        |
|                            | Modify measurement methods for telehealth                                       |                                                                                        |
|                            | Consider caregiver-implemented telehealth model to implement some programs       | Studies on the validity of curricular assessment tools in telehealth are needed           |
|                            |                                                                                  | Studies on how to implement programs for functional living skills and/or community participation and social skills via telehealth are needed |
| Topic                        | Recommendations                                                                                                                                                                                                 | Future research topics                                                                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Behavior management          | Assess whether challenging behavior might interfere with direct telehealth service before the beginning of the telehealth service implementation as well as during the course of service. Decide with caregiver whether it is safe to continue telehealth service if new challenging behavior emerges. Conduct a functional behavior assessment, develop a behavior intervention plan, and train caregivers on it. | Studies on prevalence of types and severity of challenging behaviors in telehealth are needed. Development of caregiver training on behavior management during telehealth direct service are needed. |
| Technological issues         | Do the best to secure a reliable internet connection, software, and hardware throughout the course of telehealth service. Develop a plan for technological issues that might arise during service and interfere with program implementations. Provide training and support for technology-related issues to caregivers. | Studies on how technological issues influence the quality and outcome of telehealth ABA service are needed.                                                                 |
| Topic                      | Recommendations                                                                 | Future research topics                                                                 |
|---------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Social validity           | Development of social validity instruments for the families who receive telehealth direct ABA service is needed | Studies on the long-term effect of providing ABA service via telehealth on practitioners’ health are needed |
|                           | Have a regular meeting with caregivers to discuss telehealth service             |                                                                                        |
|                           | Include caregivers in decision making on all aspects of telehealth direct ABA service such as program development and implementation, treatment dosage, and reinforcers |                                                                                        |
ABA Service Models

In the current practice, there are two modalities of delivering ABA services: (a) in-person and (b) telehealth. In-person service refers to delivering treatment face-to-face while both service provider(s) and client are in the same location. Telehealth service refers to the use of technology to deliver remote treatment when at least one of the party members is not in the same location. Currently, there is no unanimous agreement about terminology pertaining to different telehealth service variations in ABA. For example, CASP (2020) suggested the following models: telehealth direct service (a technician delivers treatment to a client via real-time videoconferencing), partial telehealth model (a technician or caregiver delivers treatment in-person while supervised by a clinician via telehealth), caregiver-implemented service (a caregiver is trained by a clinician via telehealth to deliver ABA treatment protocols on their own in-person; also referred to as parent-coaching model, Wacker et al., 2013), and caregiver training and consultation (a clinician meets with a parent to discuss general issues). Furthermore, Pollard et al. (2021) and Nohelty, Bradford et al. (2021) separated telehealth direct ABA service into three different models: (a) the technician-delivered telehealth service model, (b) the caregiver-assisted telehealth model, and (c) the caregiver-implemented telehealth model. In the technician-delivered telehealth service model, a practitioner is the one who provides all the instructions, prompts, reinforcers, and data collection without caregiver support. In the caregiver-assisted telehealth model, the practitioner delivers the instruction but the caregiver assists the practitioner when needed (e.g., with prompts, delivering reinforcers, implementing the behavior intervention plan). In the caregiver-implemented telehealth model, the caregiver delivers all components of intervention in-person while the practitioner provides guidance remotely. In this article, we discuss the practical issues and recommendations primarily for the technician-delivered telehealth service model (Pollard et al., 2021), though in some sections, we also address the caregiver-assisted telehealth model as these two models are interconnected in many steps of telehealth direct service in practice.

Case Introduction

We present case studies of two boys, Rob and Kelly, who sought telehealth service with the first author at the time the COVID-19 pandemic began. They were chosen as case studies because their programs were different yet representative cases in ABA service. We initially reached out to three families and obtained consent from two. The caregivers of these two boys gave their informed written consent for us to share information in the form of a case study before writing this article. We also obtained the consents from the families after the families read the finalized article before submitting it to the journal. Caregivers were informed in written form about the aim of the study and about the information discussed in this article.
Rob

Rob was an Asian American male with a diagnosis of autism. He was six years and nine months old at the time he transitioned to telehealth services in April 2020. Rob’s skills fell around Level 3 on the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) at the time of transition. Rob could use simple sentences with two to three words to mand and tact objects, actions, and activities. Rob engaged in simple intraverbals, such as fill-in animal sounds and songs and fill-in feature, function, or class sentences. Rob required adult supervision to engage in daily independent activities such as bathing and toileting.

Until April 2020, Rob had been receiving insurance-based in-person ABA service at home by a Registered Behavior Technician (RBT) two days a week for a total of three hours and Board Certified Behavior Analyst-Doctoral Level (BCBA-D) supervision (from the first author) for 1.5 h weekly for a duration of two years (though the amount of service varied across time, it had been three hours a week in the last eight months before April 2020). A typical in-person session consisted of programs based on the VB-MAPP and took place in the family’s apartment and in community settings such as a park. Rob’s mother had been participating in ABA service at home such that she practiced discrete-trial training and an implementation of a behavior intervention plan. Even when she was not taking an active role in an ABA session, she was required to be in the same house or accompanying a team in a community outing.

Rob’s family’s health insurance allowed only a BCBA/BCBA-D to conduct telehealth practice so the first author started providing telehealth direct sessions instead of the RBT when transitioned to telehealth. Telehealth service was provided from April 2020 to April 2021 and no in-person sessions were conducted during that period.

Kelly

Kelly was a seven-year and three-month-old Asian American male with autism, whose language and independence skills were equivalent to his typically developing peers. He was referred to ABA services due to having challenging behaviors and deficits in social skills. Before the pandemic, the authors had been providing sole BCBA/BCBA-D direct in-person service with Kelly for one and a half years. When the pandemic was declared, Kelly’s programs consisted of social interaction programs with peers in community settings, largely derived from the Socially Savvy: An Assessment and Curriculum Guide for Young Children (SS; Ellis & Almeida, 2014). Before the pandemic, in-person sessions occurred two times a week for two hours each. A typical in-person session consisted of a social skills program with Kelly’s peers at his house or in a community setting such as a park or mall. His peers were similar-age boys from his family friends and at least one of them was always present during in-person sessions. Kelly’s father and mother had been participating in sessions and learned to implement a visual schedule, reinforcement, and a behavior intervention plan. Even when Kelly’s parents were not taking an active part in his session, at least one of them was in the house or accompanying a team in a community setting. During the pandemic, telehealth direct sessions occurred at a similar rate, but only one of the peers was available to
participate. Telehealth service was provided from April 2020 to September 2020, and no in-person sessions were conducted during this period, nor was there any in-person contact between Kelly and his peers.

Client Suitability for Telehealth Direct Services

In order to provide successful ABA therapy, the client suitability for telehealth direct services was first assessed (Baumes et al., 2020; CASP, 2020; Rodriguez, 2020). Both Rodriguez (2020) and CASP (2020) discussed clients’ prerequisite skills for telehealth direct services. Factors such as attending, prompting, following directions, sitting in front of the computer, reinforcers, and problem behavior are considered as well as the availability of caregivers and their skills. In addition, Baumes et al. discussed ethical considerations for telehealth services, such as client interest in telehealth, client’s culture, technology knowledge and equipment, and safety. Both Rob’s and Kelly’s families were interested in receiving telehealth direct services, and they had the necessary equipment and possessed the necessary technology-related knowledge.

Rob had basic attending skills such as sitting and working at a desk with a dense reinforcement schedule, following an adult’s simple verbal and gestural instructions and prompts, scanning 2D stimuli such as pictures on a computer monitor, and reading simple sentences and sight words. He also had tangible and social reinforcers readily available at home such as different types of toys and board games. In addition, Rob’s challenging behavior did not occur for the last six months (November 2019 to April 2020) before transition to telehealth direct service. It is important to mention that in the past, the ABA team worked on decreasing challenging behaviors to zero such as escape-maintained screaming and tangible-maintained hitting and crying. His mother had been participating in ABA sessions regularly for the past two years and her implementation fidelity of prompting procedures, delivering reinforcers, and providing instruction was at 100% before transitioning to telehealth service. Based on prerequisite skills, absence of challenging behaviors, the availability of reinforcers, and the caregiver’s skills and availability, telehealth seemed to be a viable option for Rob. In addition, the mother reported that Rob responded well to his school’s tele-education.

Kelly had prerequisite skills suggested by Rodriguez (2020) and CASP (2020) such as following instructions, and sitting independently at a computer for more than 10 min. He also had a variety of reinforcers readily available at home. He was competent in using a computer and its software with a minimum level of parental support such that Kelly only needed parental support when a difficult technical issue arose (e.g., internet interruption and equipment failure). His parents were also available at all times for support both for technological and behavior management. Kelly’s challenging behaviors, such as tangible-maintained tantrums and hitting objects and people, had occurred three times in sessions during the last six months (November 2019 to April 2020) before the transition to telehealth.
Technology Used for Telehealth Direct ABA Sessions

For both boys, the first author used a free version of the Cisco WebEx software as a videoconferencing application. During the COVID-19 pandemic, the U.S. Department of Health and Human Services (2020) allowed the use of the free versions of the videoconferencing applications and popular applications such as Apple FaceTime, Facebook Messenger video chat, Skype, etc. (see recommendations for Health Insurance Portability and Accountability Act secure software, Baumes et al., 2020; Romani & Schieltz, 2017). Cisco WebEx allows multi-person video conference, sharing screens, and text communication among other functions. The first author used an HP laptop computer with a built-in microphone and speakers. Rob’s family used a Lenovo laptop computer and Apple iPhone, both of which had a microphone and a speaker embedded. Kelly’s family used an Apple iPad, MacBook Pro laptop computer, and an iMac desktop computer, all of which had a microphone and a speaker embedded.

Practice Recommendations

Caregiver Support—Practice Recommendation

The demand for caregiver involvement in telehealth direct service is equally likely as in in-person service if not more. Thus, it is recommended that ABA practitioners discuss the role of the caregiver in telehealth direct service before the start of the service and then continue the discussions with them regularly throughout the course of telehealth service. In addition to caregivers setting up the telehealth equipment for each session, some factors to consider are whether the caregivers are motivated to maintain the session schedule, participate in sessions, be trained to deliver instructions, prompts, and reinforcers as well as to collect data, prepare for challenging behavior, be available to assist during the short breaks, and provide technological support. Although the intensity of involvement differs based on the telehealth direct service model, the client characteristics, and progress in the course of service (Nohelty, Hirschfeld, and Miyake 2021), the caregivers should have clear and detailed expectations of their role before the start of telehealth services.

Additionally, due to the nature and demand of telehealth service, establishing rapport with the caregivers and maintaining it throughout telehealth service requires much more attention than in in-person sessions. Within in-person sessions, a practitioner can develop and maintain rapport by engaging in professional discussion at a parent training session and casual conversation during a downtime, as well as before and after a session. On the other hand, telehealth direct service limits such opportunities since the practitioner might not be near the caregivers when the client is taking a short break or a telehealth session begins and ends without time to warm up or wind down. It is, thus, recommended that ABA practitioners take time with the caregivers to engage in rapport building more deliberately by arranging a parent meeting and discussing their concerns (e.g., Taylor et al., 2018). Belisle et al. (2021) attempted to increase caregiver involvement by setting up a consistent time
for the session and by sending reminders a day and 30 min before each session. Noh-
elty, Hirschfeld, and Miyake (2021) also provided a list of skills in TTTIM that a practitioner should engage to develop and maintain rapport with caregivers during telehealth direct service such as greeting caregiver, using everyday language, being respectful/professional, setting clear session expectations, providing rationale/purpose of lesson, providing directions on program/behavior intervention plan, providing frequent reinforcer to caregiver, and collaborating to collect data.

Lastly, given the degree of parental involvement in telehealth direct service it is appropriate to consider what model is appropriate for each family. The telehealth direct model and the parent-coaching model both have advantages and weaknesses, and discussion with the caregivers about which model is the most appropriate for the family is recommended. For instance, the caregivers’ involvement is most likely demanding in both models at the beginning of telehealth service, but the caregivers’ involvement in telehealth direct sessions might decrease over time as the practitioner–client relationship strengthens and the client might no longer need constant support. Thus, the telehealth direct model would provide caregivers an opportunity to take a rest or engage in some other activities. In addition, with telehealth direct service, a skilled practitioner provides service, while with the parent-coaching model, some caregivers might require time and effort to acquire different behavior analytic skills even with the instruction of a practitioner (see Lerman et al., 2020 for discussion). The parent-coaching model, on the other hand, can positively contribute to the increase in teaching opportunities outside the ABA service as the caregivers learn ABA techniques (see Ferguson, Craig, et al., 2019 & Unholz-Bowden et al., 2020, for review). It also helps develop a positive parent–therapist relationship (Wallisch et al., 2019; Yang et al., 2021) as well as it is better suited for teaching skills that are difficult over videoconferencing such as daily living skills (Gerow et al., 2021). Thus, the discussion of which telehealth service model(s) are most beneficial for each family is recommended.

**Caregiver Support—Case Example**

With Rob, his mother was present at every session. At the beginning during the first few sessions, she sat next to Rob throughout the session to support him. She set up a computer for telehealth, arranged a board game, and supported Rob in his use of the computer. After five sessions, Rob was able to participate independently and he did not need to have his mother sitting next to him throughout the session. Rob’s mother was still in the house so that she could come and help him at a time of difficulty, such as technological difficulties and challenging behaviors, but she was able to engage in other household activities for the most part.

For Kelly, his parents were also present but at varying degrees during each session. During the first few sessions, one of Kelly’s parents set up his computer and sat near him in the same room. Once Kelly learned to set up the telehealth application, his parents left the room to engage in other activities. During those
times when Kelly engaged in challenging behavior due to the technological issues (four sessions in the beginning), his father, who had been helping Kelly, resolved the technological issues.

Communication between the caregivers of both clients and the first author occurred via phone calls, email, and text. Communication about session scheduling and cancellations, program planning and behavior management was discussed through those media weekly. In addition, a weekly scheduled parent training session was conducted with Kelly’s caregivers remotely to address concerns outside telehealth direct ABA sessions.

**Rapport Building—Practice Recommendations**

It is well-evidenced in the in-person ABA practice literature that a good therapeutic rapport is needed for successful intervention outcomes (Bickman et al., 2004; Karver et al., 2006; Magito McLaughlin & Carr, 2005; Shillingsburg et al., 2014). Moreover, the parents of children with autism also agree about the importance of rapport between professionals and their children (Hodgetts et al., 2013). Goldstein and Glueck (2016) also found that psychologists and psychiatrists can and should develop rapport with young clients and their families during mental health evaluations via telehealth.

For ABA telehealth service, some studies suggested building rapport during the initial assessments (Simacek et al., 2020) and when conducting functional analysis (Wacker et al., 2013) using partial and parent-coaching telehealth models. These studies recommended engaging in a series of free play sessions with clients and their caregivers so that they can get used to the telehealth environment and build rapport before conducting assessments. Similarly, with in-person ABA practice, several authors (Carbone et al., 2007; Shillingsburg et al., 2014, 2019; Taylor & Fisher, 2010) suggested having a demand-free session in the beginning, allowing clients to engage in preferred activities, providing a reinforcer on a dense schedule, and embedding the instructions with positive reinforcement before a practitioner fades in demands slowly over time. For the telehealth direct model, a few authors reported conducting rapport building, though no details were described and it is unclear how rapport took place (e.g., Nohelty, Bradford, et al. 2021).

Thus, based on aforementioned studies (Carbone et al., 2007; Shillingsburg et al., 2014, 2019; Simacek et al., 2020; Taylor & Fisher, 2010; Wacker et al., 2013), it is probably safe to recommend that the first several telehealth direct sessions be allocated to pairing and building rapport. For example, during the first few sessions, an ABA practitioner can play a client’s favorite songs or videos using the monitor-sharing (based on preference assessment; see the Preference Assessments and Reinforcers section below). An ABA practitioner and a client can also play various kinds of games together over the monitor. If a client does not approach the computer monitor, an ABA practitioner could still provide positive verbal comments, narrations, and fun sounds on the activity in which the client is engaging (e.g., the client is playing with a toy on the floor).
One way to test the presence of good rapport is whether there is an absence of escape-maintained problem behavior and whether the client follows instructions (e.g., Magito McLaughlin & Carr, 2005). In the case of telehealth direct service, one can check if a client spends the majority of the session time in front of the computer, interacts with an ABA practitioner, and follows simple directions or responds to the ABA practitioner’s questions (e.g., come back, show me your toy, what are you eating?) with minimal prompts as well as the absence of problem behavior. It is also a good sign when a client initiates interaction with a practitioner as soon as the session begins. Thus, ABA practitioners should seek out opportunities to engage in joint activities that a client prefers during the first few telehealth direct sessions and establish and maintain rapport throughout the length of service.

**Rapport Building—Case Examples**

After the client suitability analysis showed Rob’s readiness for telehealth service, the first author began implementing telehealth direct sessions with Rob’s mother’s support. One of the initial concerns was whether or not rapport was present at initial telehealth sessions. During in-person sessions, Rob did not show interest in using electronics. Thus, we needed to test whether any activities on the computer monitor would help in building rapport and function as a reinforcer (see more on this in the Preference Assessments and Reinforcers section). In addition, the first author needed to make one major change in transition because Rob’s RBT was no longer able to provide service due to the restriction of the insurance policy, necessitating transitioning to a BCBA/BCBA-D as the direct service provider. Thus, in order to have a smooth transition, the first author strategized such that, in the very first telehealth session, the RBT and the first author met with Rob together and engaged in rapport building activities such as drawing (RBT was drawing on the computer screen) and a board game (Rob’s mother rolled the die and moved a figure for the RBT), both of which the RBT had used as a reinforcing activity during in-person sessions. In addition, the RBT used a website, Boomlearning.com. From the second session, the first author was the only therapist and the RBT was not present. The first author tried different activities for rapport building during the first five sessions such as drawing, playing a board game, as well as Boomlearning.com (the details about this website are in the Preference Assessments and Reinforcers section below). When the author found a strong reinforcing activity during five sessions, Rob’s behavior suggested a development of rapport. For instance, he approached the monitor and greeted the first author at the beginning of every session throughout the course of telehealth service. He had a smile on his face and did not engage in escape behavior. His participation and engagement with the first author increased session by session. Thus, based on the approach behavior at the beginning of the sessions, Rob’s positive demeanor, and the increased duration of participation, it can be said that rapport was present. The transfer of rapport from the in-person to the telehealth was probably aided by rapport the first author built with Rob during in-person service, as the first author had been working with Rob from time to time when the RBT was absent for the previous two years in addition to a weekly supervising visit. Rapport
was maintained primarily by using the first 10 to 15 min engaging in Rob’s favorite activities without presenting any tasks. A strong rapport was observed throughout the length of the telehealth service based on the task completion and the absence of escape-maintained problem behavior during the sessions (e.g., Magito McLaughlin & Carr, 2005).

With Kelly, the first author and Kelly played different games online without giving any task demands in the first session. As Kelly responded well, the first author and Kelly’s parents decided to introduce Kelly’s peer via online in the next session for the social skills training. In the second session, Kelly’s father was present in Kelly’s room but did not sit next to him and Kelly’s peer joined the session via telehealth. Kelly responded well to both the first author and his peer (e.g., Kelly engaged in joint activities with the peer and he was smiling throughout the session). From that session onward, good rapport continued for the period of the telehealth service such that Kelly was present at the beginning of each session, greeted the first author and did not engage in escape-maintained challenging behavior. The rapport the first author had with Kelly while conducting in-person sessions readily transferred to telehealth. Similarly, rapport with Kelly’s peer also transferred in short time and continued for the rest of the telehealth service.

**Preference Assessments and Reinforcers—Practice Recommendations**

One major challenge during telehealth direct service is finding reinforcers. Due to the nature of telehealth, many potentially reinforcing activities are not in our reach such as sensory toys, physical play, community locations, and outside activities. Others, such as edibles and short breaks, would require parental support. This might be the most challenging aspect of implementing telehealth direct ABA sessions. Guidelines by CASP (2020), Rodriguez (2020), and Nohelty, Hirschfeld, and Miyake (2021) mentioned that reinforcers should be used during telehealth direct sessions, but no detailed considerations were given. Similarly, other studies on telehealth direct ABA services did not specify the type of reinforcers used in their studies (Cihon et al., 2021; Pellegrino & DiGennaro Reed, 2020; Pollard et al., 2021) with an exception of Ferguson et al. (2020) and Nohelty, Bradford, et al. (2021). Ferguson et al. noted that they used only verbal praise for correct responses and suggested that future studies explore whether other types of stimuli such as edibles and tangibles would serve as reinforcers via telehealth. Nohelty, Bradford, et al. indicated that participants received praise, a preferred item, and/or a token for a correct response, although it was not specified which of these stimuli were delivered via telehealth by the therapists or which were delivered in-person by caregivers. Belisle et al. (2021) reported the difficulty of delivering social cues as reinforcers via telehealth. To solve this issue, the practitioners were encouraged to be more animated when delivering social praise, to embed YouTube videos in their programming, and to engage in preferred topics in conversation with their students. Thus, finding a reinforcer that staff can deliver remotely could help in building rapport and overall
greater client engagement, as suggested by some scholars (Carbone et al., 2007; Magito McLaughlin & Carr, 2005).

Furthermore, none of the previous studies focused on delivering direct ABA services via telehealth mentioned whether they conducted any form of preference assessments. Although previous studies on telehealth showed that in-person staff can be remotely taught to conduct preference assessments (Ausenhus & Higgins, 2019; Higgins et al., 2017; Machalicek et al., 2009), to the best of our knowledge, no study explored application of different preference assessments in telehealth direct therapy. Nevertheless, preference assessments should be conducted regularly in order to identify potential reinforcers that can be delivered by practitioners via telehealth. The use of various types of preference assessment procedures developed for in-person practice have face validity with telehealth. For example, an ABA practitioner can remotely conduct a single-stimulus preference assessment (see Hagopian et al., 2001, for description of a single-stimulus preference assessment in in-person service). A practitioner presents an activity and sees whether a client would come close to the computer monitor or not, and measures how long the client engages in an activity. For example, the practitioner can play several videos on the shared computer monitor and measure how long the client watches each of them. By comparing approach/avoidance behavior and the duration of engagement, one can assess the preference of a given activity. We can also use the brief (Carr et al., 2000) or the daily (DeLeon et al., 2001) multiple stimulus preference assessment if various activities can be presented visually at once such as using application icons on the computer monitor (see Curiel et al., 2018, for more information on web-based multiple stimulus preference assessment). For example, websites such as ABCya.com and Boomlearning.com present many game applications (icons) on the monitor at once. A practitioner can share their computer screen with the client via a videoconferencing application and ask the client to pick a game application verbally. The practitioner and the client can play a chosen application for a given time and then return to the previous page to pick a game again. As the practitioner repeats this process, they can rank-order the preferences among game applications. Similarly, a practitioner could use PowerPoint or Microsoft Word to create a list of activities by placing several photos simultaneously on a page and instruct the client to “pick one.” We can also use a verbal stimulus choice assessment (see Northup et al., 1996) for the children who are able to verbally identify their preferences (Kuhn et al., 2006). These different types of preference assessments are still useful in direct telehealth service, although the modality of reinforcers the practitioners can assess and deliver via telehealth is limited to visual and/or auditory stimuli.

As reinforcers are mainly limited to computer/electronic games and videos in the technician-delivered model, finding potent reinforcers for individuals who find little or no interest in computer/electronic games and videos is limited. The limitations to assess and deliver potential reinforcers via telehealth might affect the productivity, compliance to treatment, and the rate of challenging behavior in ABA service without relying on caregiver support.

One factor that should be taken into consideration on the effectiveness of reinforcers is motivating operations. When conducting telehealth direct service, other service providers most likely provide telehealth-based service to clients as well. For
instance, the clients’ schools might be providing telepractice-based education, extra-curricular activities might be delivered remotely, and/or other medical or related services such as a speech/language pathologist service. In addition, much of the clients’ free-time entertainment may consist of audio/visual stimuli, such as YouTube videos or video games, especially during the pandemic. It is therefore in the practitioners’ interest to ask the caregivers how their clients spend a day during leisure periods and with other service providers so that the practitioners can prepare effective reinforcers (e.g., Michael, 2000). Similarly, practitioners also need to consider whether the clients’ environment contains freely available competing reinforcers as well as distracting stimuli. Since our clients are at home, they could have all the things they like around the house: toys, electronics, food, bed and sofa, parents and siblings, as well as various kinds of noises and distractors. The question is whether reinforcers within our control have a greater value than other stimuli that are concurrently available to our clients. For instance, therapists (psychologists, psychomotor therapists, and an art-based therapist) in Oudshoorn et al.’s (2021) study reported that their participants with mild intellectual disabilities were checking smartphones more often in telehealth than during in-person sessions, which negatively affected their level of participation. Practitioners may need to work with the caregivers to facilitate the arrangement of a context in which competing reinforcers or distractors are minimized during sessions.

Preference Assessments and Reinforcers—Case Examples

With Rob, the RBT had been using board games as a primary reinforcing activity in the in-person sessions among other activities such as drawing, stickers, and cards before the transition to telehealth. In in-person session before the pandemic, Rob preferred to engage in different board games for a full session (one and a half hours) and the RBT would intersperse acquisition tasks in-between such as mands, intraverbals, matching-to-sample (MTS), and tacts (derived from the VB-MAPP). When the telehealth service began, we first explored whether the board games would still serve as a reinforcing activity. Rob’s mother sat with him in front of the computer and took the first author’s part by rolling a die, moving a figure, and stopping the game when the first author ran a program such as intraverbals. This arrangement lasted only five sessions as Rob’s engagement time with the board games decreased progressively (which correspondingly decreased in the number of teaching trials). Therefore, a single-stimulus preference assessment (Hagopian et al., 2001) was conducted. In the first telehealth session, where the RBT was present, the RBT tried a website called Boomlearning.com for rapport building and Rob responded well. Boomlearning.com is a website that contains many educational applications such as matching games and interactive stories. For example, one application contains 25 MTS questions about everyday items. Another application on the website features a story of a farmer whose animals ran off from his farm and the goal is to find them all and return them to the farm. Thus, different applications within Boomlearning.com were presented and the ones Rob spent a longer time with were used as potentially reinforcing activities. As suggested by Hagopian et al., approach and avoidance
behavior were used to measure Rob’s preference in the single-stimulus preference assessment. With the identification of the proper reinforcers, Rob was able to stay for a full session with an average of 70 trial opportunities interspersed. In addition, with the introduction of Boomlearning.com, we discovered that we did not require the mother’s constant support throughout the session (she was able to do other activities in the house), and Rob was able to sit in front of the computer and engage with the first author by himself.

The preference assessment was conducted over time as Rob’s approach behavior decreased to a particular activity. That is, during the length of telehealth service, Rob’s preference shifted from one activity to another over time such that after being exposed to Boomlearning.com for a month or so, Rob’s approach behavior decreased and he became less responsive to instructions for acquisition programs. In this case, another preference assessment was conducted. That is, when Rob’s approach behavior decreased with Boomlearning.com, several other online activities such as ABCya.com were introduced to assess whether it would function as a reinforcer using the single-stimulus preference assessment. Though both Boomlearning.com and ABCya.com were mostly cost-free, most other websites and game applications are not. An additional limitation for the practitioners and the families is therefore a financial one especially when we rely heavily on electronic games and videos as reinforcers.

With Kelly, a verbal preference assessment was conducted. Various telehealth-friendly games were presented to him such as Bingos, Treasure Hunt, Scavenger Hunt, Hangman, Story Dice, and Would-You-Rather questions as well as some online games such as Spot the Difference, Tic Tac Toe, and Battleship, and Kelly was able to verbally respond to what he wanted to play and in what order along with his peer. This was repeated at every session. Aside from the interactive activities, the monitor-sharing feature of WebEx also functioned as a reinforcing activity such that Kelly or his peer would share their computer monitor and share their preferred activities (e.g., games and pictures).

Session Frequency and Session Length—Practice Recommendations

In the case of in-person ABA service, CASP categorizes services as either comprehensive or focused based on dosages among other features (CASP). A comprehensive treatment involves about 30–40 h per week of direct ABA service, whereas a focused ABA treatment is typically 10–25 h per week. To our knowledge, there have been no studies examining the effect of treatment dosage or model (focused versus comprehensive) in telehealth direct ABA service. Despite the lack of research, a few studies reported the treatment dosage. For example, Pollard et al. (2021) reported that, across 17 participants with autism (average age: 11 years old), treatment dosage of telehealth direct ABA service (a mixture of all three models) was on average 11 h per week (range 5–18). The same participants had received on average 12 h per week of direct in-person service before transitioning to telehealth service. Pollard et al. demonstrated that their participants showed a similar level of progress via telehealth compared to in-person service. Similarly, Nohelty, Bradford, et al.
(2021) provided, on average, 5.4–20.9 h a week of telehealth direct ABA service to seven participants with autism (between the ages of four to 16 years), six of whom received ABA service for the first time without prior in-person ABA service experience. Their participants all acquired skills to meet mastery criteria for their respective targets.

Some studies that focused on examining an effect of a particular procedure on skill acquisition via telehealth also reported the length of a session. Ferguson et al. (2020) provided telehealth direct ABA service using a probe-break-teaching cycle twice a day for five days a week. In their study, each teaching session lasted about two to five minutes with a one- to five-minute break in between a probe and teaching session. Thus, their telehealth direct session was somewhere between 10 and 30 min per day. Pellegrino and DiGennaro Reed (2020) provided independent skills training once a day for one to three days per week to adults with intellectual and developmental disabilities (IDD). In each session, they worked on one to three skills such as simple cooking and computer skills. Although they did not report how long each teaching session lasted, they reported that a baseline session was discontinued when it exceeded 10 min even if the participants did not complete a task. Cihon et al. (2021) examined the effectiveness of the Cool Versus Not Cool procedure to teach children with autism conversational skills using telehealth direct service. Sessions occurred once a day, 2–5 days a week, depending on the participant and the interventionist availability. Intervention sessions lasted an average of 10 min (range 7–17 min).

Based on the studies above, the frequency and the duration of telehealth direct service can vary while maintaining the effectiveness of the treatment. Thus, we recommend that ABA practitioners be flexible at deciding the session length and frequency when using telehealth direct ABA service given the client needs. Although it is probably common to provide a similar dosage of service as in-person, there is a benefit in having a short and effective session with a focus on one or two skills when resources are limited (see Suess et al., 2016 for discussion).

To have a longer session, there are a few factors that contribute to the determination of a session length in in-person ABA service, which are conceivably also the case for telehealth direct service. Factors such as (a) the client suitability, (b) reinforcers, (c) rapport, and (d) a short break play a role. In addition to the discussion of (a), (b), and (c) in previous sections, another contributing factor is a short break (also called downtime, noncontingent break; Ferguson et al., 2020; Nohelty, Hirschfeld, and Miyake 2021; Rispoli et al., 2013). For in-person ABA service, a noncontingent break is recommended, as it was shown to increase compliance during discrete-trial training (Rispoli et al., 2013). Nohelty, Hirschfeld, and Miyake (2021) also recognized the importance of the short break in telehealth direct sessions and they included downtime in their TTTIM. Ferguson et al.’s (2020) telehealth study also provided a 1–5 min break to their participants in between a probe and training. A short break is also argued to alleviate the negative health problems associated with prolonged exposure to the computer (Ellahi et al., 2011; Gerr et al., 2002; Stanam et al., 2019). In summary, ABA practitioners should address the following questions: (a) What items and activities work as a reinforcer in telehealth practice? (b) How many reinforcers do we have?, (c) How long does each reinforcer
last before the client gets satiated?, (d) How many short breaks are effective in providing service?, and (e) How long the client can remain engaged in tasks and activities?

**Session Frequency and Session Length—Case Example**

At the beginning of the transition, it was difficult to estimate how long a telehealth session should be or how often per week it could be implemented. With Rob, the session length was initially decreased from 1.5 h to, however, long Rob could stay in front of the computer. In the beginning, Rob stayed in front of the computer monitor for 30 min to one hour before he would mand for the termination of a session. Rob was able to mand for the termination of an activity or a session by saying, “All done,” “Goodbye,” “Sleepy,” and “[the first author’s name] going to another client.” He could also move away from the computer and not come back or to tell his mother he was done verbally. With the use of the board games as a potential reinforcer in the beginning of the telehealth service, Rob’s mands for the session termination increased in frequency over five sessions and the length of session duration shortened. However, following the introduction of the Boomlearning.com, he was able to remain on task for 1.5 h straight almost every session and his manding to terminate a session stopped occurring. At that point, Rob’s mother and the first author decided to provide telehealth direct service at the same dosage as was in in-person.

The other difficulty that emerged was the introduction of a short break (e.g., non-contingent breaks, Rispoli et al., 2013), as Rob would misunderstand a break as if it were the end of the session. The caregiver’s support was needed during breaks to bring him back to the computer, and one time, this led to challenging behavior when the caregiver asked him to return to the computer. When providing in-person sessions at Rob’s house, a short break (typically five minutes) was easier to implement as the RBT would stay in his vicinity, indicating that the session was still on. In contrast, when in telehealth, it was difficult to distinguish between a short break and the end of the session. As a result, the use of short breaks with Rob did not become a part of the session. Although we did not try at the time, we could have provided discrimination training for Rob such that he could learn to take a short break.

Contrarily with Kelly, it was easier to have a longer session (two hours), as he was able to take frequent breaks (5 min) in between various activities that would last 15–20 min each and he would come back to the computer independently without the first author or his caregivers’ prompts. As a part of session activities, he also engaged in some exercises or games that made him walk around the rooms, such as a Scavenger Hunt and Kids Yoga, which might have also contributed to maintaining Kelly’s participation as he did not have to sit in front of the computer for the entirety of a session.
Program Adaptation—Practice Recommendations

We recognize the need for program adaptation, and there are many steps involved in this process. Although CASP (2020), Rodriguez (2020) and Nohelty, Hirschfeld, and Miyake (2021) lightly mention this aspect, they did not provide any recommendations on how to adapt or modify programs specific to telehealth. Rodriguez, for example, recognized that substantial program modifications are needed when a client relies on physical prompting and a dense schedule of reinforcement, but specific aspects of modifications were not discussed. We suggest that ABA practitioners assess whether a given program requires adaptation for telehealth and if it does, what types of changes are needed. Some aspects to take into consideration are (a) adaptation of materials, (b) adaptation of target responses, (c) adaptation of prompts, (d) generalization across modalities, and (f) procedural limitations. In the next section, we discuss each of these points.

Adaptation of Materials

Adaptation of program materials is needed when the materials are not easily transferable to telehealth. For example, the programs that require 3D objects such as object motor imitation programs, mand programs, MTS programs, and listener responding programs require more modifications, whereas the programs that use 2D visual and auditory stimuli as a part of instruction are relatively easy to transfer to telehealth. We will consider an example of the listener responding program of getting household objects. Without caregiver support, this program would need to be modified as a practitioner cannot follow a client around the house and/or use physical and gestural prompts. There are at least three ways to approach this issue. One is to use caregiver-assisted or caregiver-implemented telehealth models for these types of programs. The second is to put the program on-hold until there is an opportunity for in-person service. And the third is to modify the materials to adapt to telehealth. For example, instead of using 3D objects, the practitioners use a 2D representation of the household objects such as a picture on the computer screen. A caution is needed when we modify the materials since we are changing the program from a listener responding to a part tact and part listener responding program. To the best of our knowledge, no research was conducted to show the validity of these modifications. Alternatively, if the practitioners use the Zoom platform, they can use a bidirectional interface function with the “Take Remote Control” option (Belisle et al., 2021). With this function, a client is able to control the screen as well. In this way, the practitioner can present 2D stimuli and ask the client to click the correct stimulus.

Moreover, even when the program incorporates 2D stimuli, if a client uses a small screen such as a tablet or a smartphone, the visibility of 2D stimuli is not guaranteed (e.g., Oudshoorn et al., 2021). In such a case, ABA practitioners might need to reduce the number of stimuli to present on the screen at once, which might conflict with certain programs such as a MTS program that uses five items in an array.
Adaptation of Target Responses

Types of behavior we can shape in telehealth direct service are limited to the ones ABA practitioners can observe via a videoconferencing application (unless a caregiver is involved). The practitioners can mainly observe the client’s verbal responses and motor responses (mostly the upper body movements and the facial movements). More difficult to observe are receptive responses, such as pointing, matching, and touching, a whole-body movement, such as gross motor skills and independent skills, and some social responses, such as gestures and body language. Although it might be possible that the practitioners can arrange a specific technological setup that allows such responses to be recorded (such as making an application that allows the client to respond by touching a screen or via a mouse as Belisle et al. (2021) suggested or setting up multiple cameras to capture a whole-body movement), these technologies are not readily available for everyone at this point.

For the above-mentioned types of responses, the best option most likely is to use a caregiver-assisted telehealth model or caregiver-implemented telehealth model. Mattson et al. (2020) suggested developing digital instructional activities through Google Slides, which would aid the caregivers to implement them easily. If the caregiver is not available, the practitioners could change the programs from the ones requiring motor responses such as listener responding by feature, function, class (LRFFC) to the ones that target other verbal operants such as tact and intraverbal. For example, if the client is able to say “yes/no,” the practitioner could share a screen with several pictures of objects and ask, “which one is a banana?” Then, the practitioner would point to each picture with the mouse cursor and ask, “this one?” and the client could vocally say “yes/no” or use a sign, a gesture or an augmentative and alternative communication device to say “yes/no.” Similarly, some social skills such as orienting one’s body to a speaker or a listener can be modified as orienting to a computer monitor.

Adaptation of Prompts

The types of prompts possible in telehealth direct service are also of consideration. Just like the target behavior and the instructional materials, the prompts are also limited to visual and auditory modalities without caregiver support. The types of prompts that can be provided via visual modalities include gestures, pictures, letters/words, as well as modeling (Pellegrino & DiGennaro Reed, 2020; see, however, the Procedural Limitations section below for the difficulty of using the model prompt). Auditory prompts include vocal sounds and sounds delivered via technology such as instrumental sounds and pre-recorded sounds. The use of each prompt depends partially on the client’s responsiveness to it and client’s ability to attend to that type of stimulus. For example, one can use a mouse cursor as a visual prompt when asking the client to select a picture among three different ones, but whether or not the mouse cursor has stimulus control as a prompt can depend on the client’s past history. Similarly, the client must be able to read if the practitioner uses letters/words as a prompt. Furthermore, a practitioner could use a stimulus prompt by making
the target picture larger and/or more prominent compared to the distractor pictures. Thus, the practitioner needs to consider which prompt would be effective for a given client for each program via telehealth.

Generalization Across Modalities

In the midst of the COVID-19 pandemic, many practitioners were concerned about transferring ABA service from in-person to telehealth, but it is also a concern whether the skills acquired in telehealth generalize to in-person settings or how ABA practitioners can program generalization between modalities. For example, Nohelty, Hirschfeld, and Miyake (2021) collected generalization data (generalization probes consisted of one trial of each skill) for three out of seven participants and showed that skills were generalized from telehealth to an in-person setting when probed by caregivers. Cihon et al. (2021) examined the effectiveness of the Cool Versus Not Cool procedure to teach children with autism conversational skills. Their intervention began with one-on-one telehealth direct service between an ABA practitioner and a client, and then in generalization probes via telehealth, they brought another ABA practitioner as a conversational partner with the clients one-on-one. Although generalization was successful with another therapist in telehealth, it was not demonstrated whether the effectiveness of their procedure could generalize to a same-aged peer or in an in-person setting. Thus, we recommend planning for generalization probes across settings with a caregiver and with a peer to assess whether the acquired skills generalize from telehealth to an in-person setting.

Procedural Limitations

ABA practitioners need to be aware of procedural limitations and plan to overcome them when providing telehealth direct ABA service. Although both discrete-trial training procedures and natural environmental training (NET) procedures are found to be effective via telehealth (Nohelty, Bradford, et al., 2021), “natural environment” in telehealth direct services is limited compared to in-person. Although Nohelty, Bradford et al. used NET to teach skills such as folding clothing, typing on computer, teaching the concept of friendship, and prosody, in a traditional in-person NET context an ABA practitioner captures a naturally occurring situation such as playing with Legos to target skills such as manding and tacting (Sundberg & Partington, 1998). With telehealth, there are fewer options to set up learning opportunities. One way to overcome this issue is to consider online games and applications as a natural environment. A practitioner can play a video game such as a house building game and a Christmas tree decoration game to capture a situation for manding and tacting targets (more on this issue in the case example below).

Likewise, it is difficult to implement the programs that require specific equipment such as a swing and specific locations such as a bathroom and a park due to many challenges. To the best of our knowledge, the only study that examined such programs in direct telehealth session was Pellegrino and DiGennaro (2020). Pellegrino and DiGennaro Reed taught independent and leisure skills such as light cooking and
using computer skills to two adults with IDD via telehealth direct sessions, but their client characteristics and teaching environment were different from what we usually encounter in a typical direct telehealth ABA service. For example, their participants were adults with IDD who were vocally verbal and worked part-time jobs. Furthermore, the participants had access to the enhanced written instructions with the pictures or the diagrams of the steps for each skill, in addition to the model and verbal prompts that the experimenters used via telehealth. That is, prompts were delivered via telehealth only when the participants did not follow the written instructions. Finally, it was not clear where the camera/computer was placed while observing one participant cooking and to what extent the camera captured the participant’s behavior in the kitchen or whether there were multiple cameras in the room. Likewise, there could be multiple screens in the teaching environment through which the model prompts might have been delivered. Given these limitations, it would be more practical to use a caregiver-implemented or parent-coaching telehealth model to implement such programs (see Gerow et al., 2021; Pollard et al., 2021; Sivaraman et al., 2021).

Program Adaptation—Case Example

For Rob, his main programs consisted of intraverbals, tacts, and mands among others from the VB-MAPP. Most programs had to be modified to some extent when transitioned to telehealth. For example, many mand and tact programs (e.g., mand with preposition, tact with adjectives) had to be tailored to activities possible in telehealth using NET. A manding with prepositions program was modified such that Rob would ask the first author to move some items in a video game to another place (e.g., during the house building game he would say “Put a chimney on top of the roof.”) or Rob would mand with adjectives for specific materials while building a house in the game (e.g., “Let’s pick a brown square window.”).

More difficult for implementation was the LRFFC program. The difficulty with LRFFC program implementation was threefold: (a) the difficulty of using a traditional target response, (b) the difficulty of presenting stimuli, and (c) the difficulty of prompting. First, since the LRFFC program required a physical and not verbal response, such as pointing, its implementation via telehealth required significant modifications on the target response. For instance, instead of conducting training on traditional LRFFC, the first author modified this program for Rob such that the program was presented to evoke an intraverbal response with visual prompts. The author would share a PowerPoint slide with six pictures and deliver a verbal instruction (e.g., What has a tail?). Rob would respond verbally to this question instead of pointing or picking a picture. This modification also affected the types of stimuli presented and the prompts used such that, unlike in-person, a 3D object was not used and the verbal and visual prompts (words and pictures) were used to shape a correct response as opposed to physical and gestural.

The first author also used pre-existing lessons in Boomlearning.com for the LRFFC programs and Listener Responding programs such as a Yes/No question and Belongs/Doesn’t Belong question. Although these ready-made applications were
convenient, modifying the content was not possible. The application did not allow the first author to increase or decrease the number of trials, change the order of each question, or the arrangement of stimulus locations according to Rob’s performance. Thus, instead of relying on the performance in one set of a ready-made lesson, the first author used multiple lessons that addressed the same targets to ensure the acquisition and generalization of skills.

With Kelly, his acquisition programs consisted of social skills programs derived from the SS assessment. Although the programs’ goals stayed relatively the same, the activities to practice social skills were changed. Before transitioning to telehealth, Kelly’s social skills programs were conducted with peers in-person in various locations such as at home, at a park, and a mall with various activities such as physical play, ball games, card games, and board games. When transitioned to telehealth, some of the programs were implemented in telehealth with one of his peers and with activities that were possible via telehealth such as Hangman, Tic-tac-toe, and Bingo. Even when using the same game such as Charades, some programs’ goals were modified because the game was done over the videoconferencing application. For instance, instead of orienting his body toward a peer, Kelly was asked to position himself so that his body was oriented toward the monitor and camera when he was acting or watching.

The conversational program goals remained the same as in-person and Kelly practiced asking questions of interest to others, taking turns in conversation, and making reciprocal comments over telehealth. In this program, prompts were modified such that the first author used the mute function and the text function as a prompt to facilitate Kelly’s responses. For example, the first author turned on and off Kelly’s microphone to take a turn in conversation. On the other hand, other social skills programs such as modifying his own behavior based on an adult’s gestures, keeping personal space, and making eye contact were difficult to conduct in telehealth. Therefore, these programs were put on hold during telehealth direct services.

Behavior Management—Practice Recommendation

Behavior management is an important part of telehealth direct service not only when assessing client suitability for telehealth service (CASP, 2020; degli Espinosa et al., 2020; Rodriguez, 2020), but also in the course of service. For a client who shows challenging behaviors prior to the beginnings of the telehealth sessions, a functional behavior assessment and a behavior management plan are needed if one is to provide telehealth service (see degli Espinosa et al., 2020; Rodriguez, 2020). Even when the client has no history of challenging behavior at the initial assessment, challenging behaviors might develop over the course of telehealth service. It is especially difficult to assess initially whether challenging behavior might be an issue if the function is related to technological issues specific to a telehealth setting such as internet interruption and access to telehealth-delivered reinforcers. Caregivers might be able to inform a practitioner prior to implementing telehealth service how likely it is that their child would engage in challenging behavior in the face of
various internet-related issues if they had prior knowledge about their child’s behavior under these circumstances.

ABA practitioners need to continuously monitor the client’s behavior such as precursor behaviors that might lead to challenging behavior over the course of telehealth service and have frequent communication with the client’s caregivers. If new challenging behavior emerges, ABA practitioners need to conduct a functional behavior assessment and devise a behavior intervention plan and provide parent training using the telehealth parent-coaching model to implement the plan (Lerman et al., 2020; Pollard et al., 2017; Romani & Schieltz, 2017). A frequent rate of challenging behavior and the increased demand for the caregiver involvement might make telehealth service difficult to continue, and it should be re-assessed whether telehealth direct service model is appropriate (CASP, 2020; Rodriguez, 2020). This is especially important for certain types of behaviors such as self-injury that require the caregivers’ physical interventions. Without caregiver assistance for managing severe challenging behaviors, there is a great risk in working with the individuals via telehealth if practitioners cannot physically intervene to maintain safety of the client. Practitioners and caregivers need to assess and reassess the situation continually and together make the best decision.

**Behavior Management—Case Example**

For six months prior to transitioning to telehealth Rob had not engaged in challenging behavior, but his challenging behaviors emerged a few times after transitioning to telehealth direct service, though they were low in frequency and minor in intensity. Rob once engaged in crying to gain access to his regular computer when his mother used the family’s computer for a telehealth session, as his regular one was not working properly. His mother logged in to the videoconferencing application from the family’s computer at the beginning of the session and Rob was already crying and verbally requested his mother to use his regular computer. His mother vocally responded to him that the regular one was broken and he had to use that computer. Rob refused to use the new computer despite the best efforts of his mother and the first author. The first author and Rob’s mother eventually decided to terminate the session. The mother was able to fix the computer before the next scheduled session time, and this behavior did not occur again.

Similarly, Kelly’s challenging behavior emerged a few times in the beginning of telehealth service although his challenging behavior had not occurred for a few months prior to telehealth. For example, when the internet was interrupted in the middle of a session, Kelly hit the computer repeatedly, though lightly. At another time, when his father found that Kelly was on a game application during the telehealth session and blocked the access, Kelly hit his father multiple times with low intensity. These incidents occurred four times in the beginning of the telehealth service, and it once led to a high-intensity tantrum, at which time Kelly’s father implemented the behavior intervention plan previously devised for in-person service while the first author connected with Kelly’s father over the phone to supervise its implementation. Kelly’s parents and the first author discussed several strategies to
prevent and manage these behaviors. For example, in order to prevent Kelly’s challenging behavior, his parents and the first author decided not to use an iPad as it had weaker internet connectivity compared to the desk-top computer and the iPad also had more game applications that he would play instead of participating in sessions. With these preventive strategies, Kelly’s challenging behavior quickly decreased and was replaced by whining when technological issues (e.g., internet interruption) recurred from time to time.

Technological Issues—Practice Recommendation

Technological difficulties interfere with telehealth service in a unique way and some issues may be persistent (see Luxton et al., 2014). Although a reliable internet connection, software, and hardware are recommended for telehealth sessions (Baumes et al., 2020), in real-life practice it is hardly feasible to ensure them with every client in every session. Some practitioners (e.g., Oudshoorn et al., 2021) and some clients’ families might not have enough resources to secure high-quality software, hardware, and/or high-speed internet all the time. For example, the Federal Communications Commission (2019) reported that 21 million Americans did not have access to high-speed internet as of 2017. Likewise, Pollard et al. (2021) reported that 18% of their participants’ families that received telehealth direct ABA services were provided with equipment and/or Wi-Fi. Furthermore, Romani and Schieltz (2017) needed to provide computer, web cam, Ethernet cable, and internet service to the family involved in their ABA research study as the family did not have access to any of these items. Thus, the quality of telehealth communication (e.g., speed of internet, internet connectivity, microphone quality, camera quality, etc.) very often varies across families and ABA practitioners, and over time (e.g., equipment failures, changes in internet speed). The recent survey with behavioral health providers who used telehealth to provide pediatric patient care also showed that technology issues were the most frequent barriers to treatment in telehealth (Frye et al., 2021).

There are several aspects ABA practitioners should take into consideration when facing technological difficulties. First, as discussed above, if technological difficulties interfere with sessions and lead to severe challenging behavior, the practitioner and the family need to develop a strategy to resolve it or determine whether telehealth direct service is an appropriate option (Lerman et al., 2020; Pollard et al., 2017; Romani & Schieltz, 2017). Second, if technological difficulties interfere with taking data and the delivery of instructions, reinforcers, and prompts, an ABA practitioner may need to modify a criterion for correct responses or ask a caregiver for support (e.g., Nohelty, Bradford et al., 2021). For example, when an interruption occurs during the instruction, a practitioner might ignore that trial or repeat the instruction and count the client’s response as correct, or the practitioner might need to ask the caregiver whether the client emitted a correct response. Third, both the practitioners and the families require sufficient knowledge of telehealth technology. For example, ABA practitioners are recommended to be familiar with various telehealth application’s functions such as the chat function and the monitor-sharing...
function and determine whether these are beneficial for a given client. Wootton et al. (2020), for example, suggested that the practitioner carefully selects the videoconferencing platform and learns it extensively before providing services. Fourth, ABA practitioners and caregivers troubleshoot in the course of telehealth service. For instance, before the session starts, the caregiver should close active applications and software programs that could lead to slower computer performance. If the internet connectivity is consistently slow during the session, for example, caregivers could reboot a router. If the WiFi is down, the cell phone’s hotspot might be used (see Lee et al., 2015; Lerman et al., 2020; Wootton et al., 2020, for more detailed discussion on troubleshooting technological issues). Although caregiver support can alleviate technical issues somewhat by measuring responses, providing reinforcers, and directly promoting the clients, this increase in participation might become a burden for the caregivers in the long run (more on this in the Caregiver Support section).

As expected, ABA practitioners are not the only ones who face the technical difficulties in telehealth service. Clinicians in other medical fields face technological issues and still continue with telehealth service. When technological difficulties arise, these medical practitioners would usually either wait until the difficulty goes away so that they can continue with their medical practice or they would reschedule a session (Wade et al., 2014). The same can be said for ABA practice. If minor technological issues occur, ABA practitioners should follow a priori devised plan for addressing these issues. If technological difficulties and technical malfunctions persist across multiple sessions, the more extensive troubleshooting needs to be done, as the consistent technological issues have multiple adverse effects on clients and treatment effectiveness (Luxton et al., 2014; Wootton et al., 2020).

Technological Issues—Case Example

With Rob, on some occasions, it was difficult judging whether his verbal utterances were correct when engaging in intraverbal programs, for technical reasons. If Rob’s voice was too quiet or he was away from the microphone, his responses were inaudible. If there was a delay or a break-up in video and/or audio streaming on either end, Rob’s responses were not detected. Similarly, the delivery of an instruction, a reinforcer, and a prompt over a videoconferencing application was also disrupted at times when the internet connection was slow or interrupted briefly. In such cases, it was hard to know whether the instruction was delivered in fragments or if Rob responded accurately, and/or with an appropriate latency. The similar issue arose when Rob used the smartphone as the screen was small and it was hard to see him and the microphone was not as sensitive. In these cases, the first author either repeated the instruction or discarded the trial and presented the instruction sometime later.

As discussed earlier, technological difficulties led to challenging behaviors on several occasions while working with Kelly. In addition, during the social skills sessions with Kelly and his peer, having access to a chatbox became a distracting factor as Kelly typed nonsense words in the chatbox to his peer and became less responsive to the first author’s instructions. Similarly, Kelly turned on his own monitor-sharing...
function without permission and interrupted the on-going activity. Both of these behaviors occurred in the beginning of the service. Since the Webex software allows controlling the participants’ chatbox function and the monitor-sharing function, the first author started controlling these functions as needed.

Summary

In this section, we provided preliminary recommendations for telehealth direct ABA service and identified several aspects that should be taken into consideration during planning and implementing services. We also presented issues and recommendations for each aspect of practice with the case studies. Again, these recommendations are preliminary in nature and warrant further research to develop more evidence-based practice guidelines (See Table 1 for practice recommendation summary and suggestions for possible future research).

Social Validity

We conducted the parent and client survey on telehealth service using a series of open-ended questions via email communication (Appendix 1; Ferguson, Cihon, et al., 2019; Wolf, 1978). Rob’s mother responded to this telehealth experience as beneficial as she witnessed that her son was able to learn via telehealth. She reported that telehealth was not particularly challenging to her while Rob was in session. His mother reported that Rob showed excitement for telehealth sessions and he “remind[ed] [her] the session schedule” every week. The disadvantages of telehealth service as Rob’s mother saw it was lacking “physical interaction and hands-on activities” with the practitioner, which she valued during in-person sessions. Though her attitude toward telehealth service was positive and satisfactory to her expectations, she viewed this service modality as a temporary option until the pandemic ends.

Kelly’s family also saw telehealth service positively. His father expressed that telehealth service was satisfactory and the biggest benefit was being able to have sessions during the pandemic. On the other hand, the father also felt that telehealth service was limited and less fluid compared to in-person sessions. It was not clear for him whether there was a meaningful change in Kelly’s behavior due to telehealth service except that he thought this experience might have been beneficial in working on Kelly’s focus. He did not report any difficulties associated with telehealth service. Kelly himself expressed that he liked both in-person and telehealth sessions and that he had no preference between them. If he had to choose one, Kelly said he would choose in-person because he “liked the in-person interaction better.” When asked about telehealth sessions, he “enjoyed playing Tic Tac Toe online.” He also did not have any difficulties participating in telehealth sessions.
Thus, both families reported positively on telehealth service and saw it as a valuable option at the time of pandemic. Interestingly, the caregivers did not see telehealth sessions as particularly difficult or challenging. On the other hand, both families felt the telehealth sessions lacked physical interaction and preferred in-person sessions if given a choice.

Although there were no social validity measures taken on the part of the practitioners as the first author was the clinician for these cases, some issues are relevant for clinicians in general. The first author experienced that telehealth sessions require a different approach and behavioral repertoire compared to in-person sessions. Other professions such as psychiatrists recognize the risks of telehealth burnout (Vogt et al., 2019), and this is probably a risk for ABA practitioners as well owing to many factors. For instance, the lack of breaks during a session can contribute to the burnout. Furthermore, telehealth service requires a practitioner’s undivided attention to a client even more than does in-person service, since we cannot detect all the bodily cues that the clients display that might indicate the client’s condition (Cowan et al., 2019). Moreover, the practitioners’ focus is constantly on the screen with little opportunity to move their bodies, a health risk. One way to alleviate this stress would be to use a stand desk or to incorporate physical activities into the sessions and skill acquisition programs, such as Scavenger Hunt, Activity Bingo and some programs could be implemented while standing. In turn, this experience also teaches us how much we as practitioners use non-verbal interaction to make moment-by-moment clinical decisions (e.g., to prompt a client to ask for a break upon seeing early warning signs, to change a reinforcing activity based on the client’s level of engagement, or to have a short break) and improve the effectiveness of our service.

On a positive note, the rather restricted nature of telehealth helped improve the first author’s skills as a practitioner. In telehealth, the only modes of stimuli available at hand are either visual or auditory stimuli for both reinforcers and prompts. As a consequence, the practitioners are challenged to use reinforcers more effectively to maintain the client’s participation for an extended period of time and help them learn new skills. When the practitioners go back to in-person sessions, this skill becomes useful.

Limitations

There are several limitations that are important to consider. First, this article was developed based on the two authors’ clinical experiences and literature review. The current literature on telehealth direct ABA is limited, and it is likely the case that with future research these recommendations will be modified and improved. In Table 1, we address the warranted future research on various aspects of telehealth direct ABA service to clarify the current gap in the literature. Furthermore, we are also aware that the presented case studies were anecdotal in nature and not are easily generalizable to the population as a whole. For instance, both cases used focused-ABA service with three to six hours a week and the first author, who is BCBA-D, was the direct service provider. These might not be common for the other ABA service.
recipients. Likewise, clinical experience of two clinicians is most likely not the representation of all clinicians. Given these limitations, this article should be treated as a discussion starter and preliminary recommendations toward the development of comprehensive practice guidelines for telehealth direct ABA service.

**Closing Remarks**

The present article aimed to provide preliminary practice recommendations and discussion for telehealth direct ABA service with children with autism. Despite the immediate needs, the research in this area is still at its beginning stage and we are far from solidifying practice guidelines. Even so, various authors have provided guidelines for different aspects of telehealth ABA services (CASP, 2020; Nohelty, Hirschfeld, and Miyake 2021; Rodriguez, 2020). Our recommendations focused on the practical side of conducting telehealth direct ABA service. We can foresee in the future there will likely be an increase in telehealth ABA service even after the COVID-19 pandemic, as more than half of the counties in the United States (U.S.) still do not have BCBAs (Yingling et al., 2021) and less than 4% of the total number of the Behavior Analyst Certification Board certificants reside in countries outside of the USA and Canada (BACB, 2019). Accordingly, the demands for telehealth ABA will most likely increase (Antezana et al., 2017; BACB, 2021; Heitzman-Powell et al., 2014; Yingling et al., 2021). Thus, we hope these practice recommendations contribute to a better telehealth direct service for ABA practitioners.

**Appendix 1**

**Social Validity Questionnaire**

**For Parents**

What do you think were the benefits of participating in telehealth sessions?
What were the difficulties/challenges you faced participating in telehealth sessions (e.g., technologies, scheduling, behavior management, family issues)?
What were the differences between telehealth and in-person sessions?
If you can choose, would you rather have an in-person session or telehealth session? Why?
Was telehealth service satisfactory to your expectation?
Did you see meaningful changes in your child’s behavior as a result of telehealth service?

**For Children**

What did you like about the sessions online?
What did you think was difficult about doing the online session? Which one do you like the better, in-person or online and why?

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Declarations

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Consent for Publication Written informed consent was obtained from legal guardians for participation and publication of this study to this journal.

Ethics Approval After consultation with a local IRB, it was determined that IRB approval was not needed. Furthermore, “A case report is a medical/educational activity that does not meet the U.S. Department of Health and Human Services definition of ‘research’, which is: ‘a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.’ Therefore, the activity does not have to be reviewed by an IRB (https://www.hopkinsmedicine.org/institutional_review_board/guidelines_policies/guidelines/case_report.html”).

Informed Consent Written informed consent was obtained from legal guardians for participation and publication of this study to this journal.

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