

## **Tele-Intervention for Early Hearing Detection and Intervention**

### **A Monograph**

#### **2022**

The Journal of Early Hearing Detection and Intervention is pleased to publish this monograph. Under the leadership of Pam Dawson, the Tele-Intervention Learning Community group has devoted a great deal of time and effort to researching this topic and dissemination of authoritative information. Tele-intervention is an extremely timely topic due to the adaptation to virtual visits that Covid-19 necessitated. Although tele-intervention has been used previously, it is becoming more widely necessary and accepted as providers and caregivers recognize its many advantages. We hope you find the information contained herein of great professional interest and value. Our thanks go to K. Todd Houston, Lauri Nelson, and Kristina Blaiser for serving as managing editors for this monograph. We are grateful to the contributing authors for sharing their research and expertise. Peer-review plays an important part in disseminating research that is relevant and accurate and we appreciate the reviewers who collaborated with the authors and editors to ensure each article's relevance and accuracy.

*The Journal of Early Hearing Detection and Intervention* has an excellent editorial team who publishes the authors' research and writings in our engaging format and we are grateful for their hard work.

Les R. Schmeltz, AuD  
Editor-In-Chief

## Working with Families of Young Children who are Deaf or Hard of Hearing Through Tele-Intervention

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### Abstract

Tele-intervention services have been used for many years to serve families of young children, in addition to or in lieu of traditional in-person intervention services. Recently, the COVID-19 pandemic cultivated urgent dependence on access to effective services via a distance connection. As such, the need for information, guidance, and resources related to tele-intervention as a primary service model has increased. This article serves as the introduction to a monograph that describes practices, circumstances, and perceptions surrounding tele-intervention services for families of children aged birth to five who are deaf or hard of hearing. Topics include: (a) a brief history of tele-intervention as a service delivery model, (b) an overview of tele-intervention for families of children who are deaf or hard of hearing, including the impact of COVID-19 on emergency virtual services, (c) a description of the components of a tele-intervention session with families of infants and toddlers, and (d) a discussion of the challenges implementing services via tele-intervention. Figures containing information related to state funding and ideal session components for tele-intervention services are provided.

**Keywords:** deaf, hard of hearing, early intervention, tele-intervention, family centered early intervention

**Acronyms:** DHH = deaf or hard of hearing; EI = early intervention; FCEI = family-centered early intervention; IDEA = Individuals with Disabilities Education Act; RIDBC = Royal Institute for Deaf and Blind Children; TI = tele-intervention

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Distance technology and use of telecommunication services have become the new normal for general communication and professional operations across the globe. Health, education, and therapeutic service industries have evolved for the digital age, embracing technology as a tool to overcome barriers of distance which may limit the delivery of in-person services. The prefix *tele-*, originating from the Greek adjective meaning far off, is used in words such as *telephone* and *television* to describe early distance technologies. Newer use of the prefix describes a multitude of practices delivered through distance technologies, such as *telepractice*, *telehealth*, *teletherapy*, *telehabilitation*, *tele-education*, and *tele-intervention*. Decades of research and applications of tele-practices have refined the way the world provides and receives care from a distance, paving the way for professionals to make meaningful connections within any discipline, including speech-language pathology and deaf education.

For the purpose of this paper, tele-intervention (TI) refers to a provider engaging with families virtually to provide support for the development of children's communication

and language skills. This work is part of a larger monograph exploring the use and perceptions of virtual service provision in early intervention (ages birth to five) for children identified as deaf or hard of hearing (DHH), with the aim of this specific article being to describe the service delivery model of TI.

Advantages of TI services include the facilitation of access to specialized services regardless of barriers (e.g., geographic, weather, illness), reduction of costs for travel time, flexibility of scheduling, improvement of parent<sup>1</sup> confidence, development of parent skills, and enhancement of connections between families and providers (Ashburner et al., 2016; Behl et al., 2010; Houston & Stredler-Brown, 2012; McCarthy et al., 2012; Molini-Avejonas et al., 2015). These benefits have remained constant over the years. The same constancy is true for the challenges associated with TI. Issues of cost, reimbursement, connectivity, and licensure remain the most often reported barriers to TI (Blaiser et al., 2013; Cole et al., 2019; Houston, 2011; McCarthy et al., 2010; McCarthy et al., 2018). Additional challenges may include the management of child behavior while receiving coaching, the demonstration of techniques, and the need for opportunities for conversations and discussions.

<sup>1</sup>The definition of parents, caregivers, and families encompasses a rich variety of circumstances, cultures, and individual details. To improve readability, the term *parents* is used throughout the article, but is inclusive of all caregivers and family constructs.

## Tele-intervention in Early Intervention for Children who are DHH

Within the field of deaf education, TI has increasingly been used to deliver early intervention (EI) services for children who are DHH ages birth to 5 years. This uptake of TI is the result, in part, of the opportunity to provide specialized services regardless of where the family or provider is located. The provision of traditional in-person, home-based specialized services can be limited for children who are DHH due to a number of known barriers, one of which is the lack of appropriate services in remote or rural areas as a consequence of a shortage of qualified practitioners. By its very nature, TI allows EI providers to overcome physical barriers, thus addressing a number of reported limitations for service provisions in the field of early deaf education.

Virtual services via TI have gained support in recent years due to the increasing need for access to professionals when such barriers exist. Tele-intervention allows early intervention professionals to support families of children who are DHH by providing high-quality care to improve child outcomes without the families needing to travel great distances or relocate to receive ongoing intervention services. TI has been recognized as an accepted provision of service delivery by ASHA for over 15 years (ASHA, n.d.).

In the early years of TI for families of children who are DHH ages birth to 5 years, the goal, which remains today, was to serve families in rural or remote areas outside of the reach of in-person programs. In 2004, the Royal Institute for Deaf and Blind Children (RIDBC) in Sydney, Australia received federal funding for a TI program focused on the use of virtual technology to provide ongoing services to families of children who were DHH living in rural or remote areas across the country. This national program, RIDBC Teleschool, became one of the first models of TI in the field of deaf education, and set the stage for the adoption of TI worldwide (McCarthy, 2012). Programs within the United States looked to the RIDBC Teleschool as a model of TI for use with children who are DHH and their families. Early adopters of TI for this population in the United States included the Center for Communication, Hearing, and Deafness in Wisconsin (2006), Sound Beginnings at Utah State University (2007), St. Joseph Institute for the Deaf in Missouri (2008), and the tri-state TeleCITE collaborative in Colorado, New Mexico, and Wyoming (2009). These trailblazing programs navigated the complexities of establishing virtual infrastructures for their families, often by directly providing the technology and/or devices needed to connect with intervention providers. In some cases, such as in the state of Utah, new internet cables were installed underground for the express purpose of providing access to teleservices across the state (Blaiser et al., 2012). In other states, providers shipped suitcases of equipment, including wifi routers, virtual private network connections, laptops, cameras, and toys or learning materials to families (Broekelmann, 2012; Laliotis, 2012; McCarthy, 2012; Stith et al., 2012).

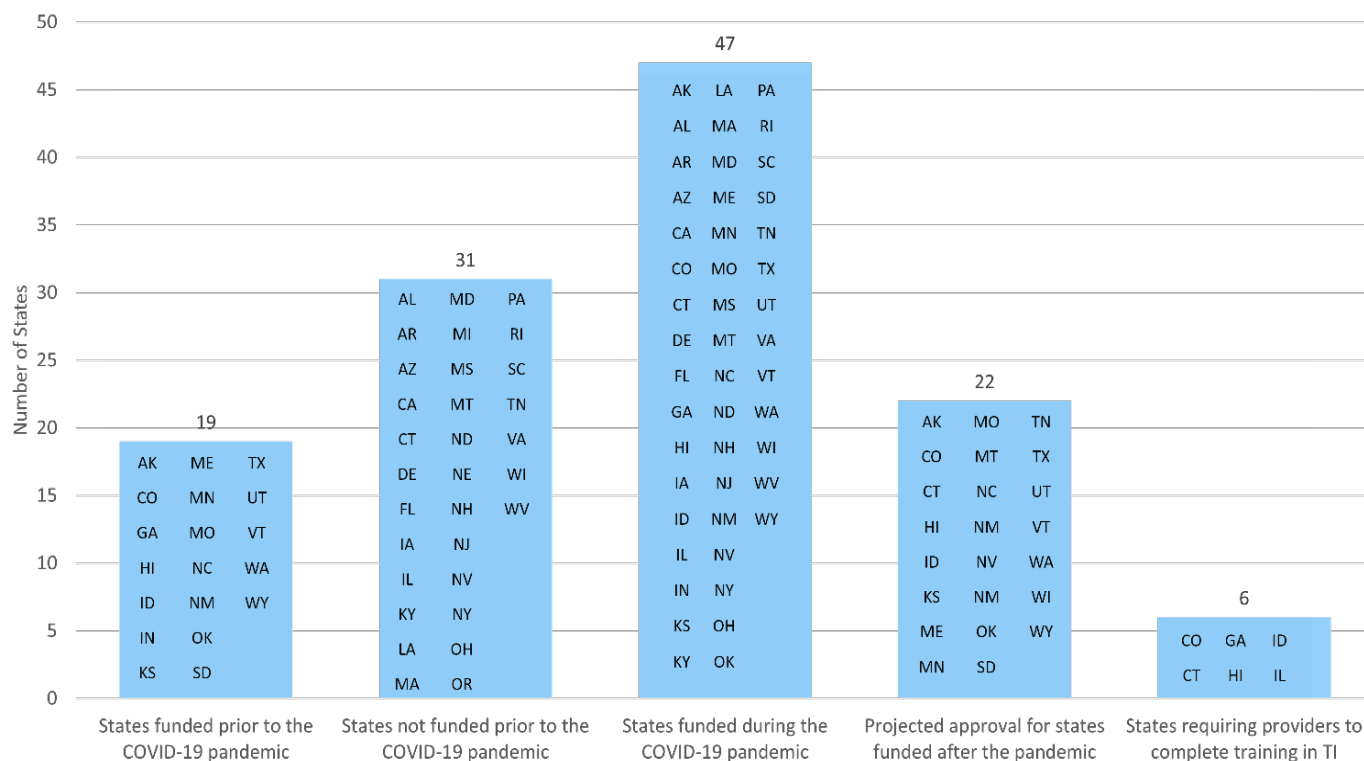
Many of these initial TI programs documented TI as having equal or better outcomes as in-person models. Researchers at Utah State University investigated the expressive language outcomes of children under age five who were DHH enrolled in either the Sound Beginnings TI program or in a traditional in-person program (Blaiser et al., 2013). Results, although reported with a small group of 27 children, revealed both significantly better expressive language scores and significantly higher family engagement in the TI group as compared to the in-person group. Similarly, a multisite study conducted with programs in five states reported significantly higher rates of parent engagement, higher ratings of provider responsiveness to parents, and improved child outcomes in the TI group compared to traditional in-person visits (Behl et al., 2017).

As of 2010, 21 states reported implementing or investigating TI as a method of service delivery for children who are DHH (NCHAM, 2010). To illustrate the landscape of TI services across the United States before, during, and anticipated after COVID, the authors of the current article contacted representatives from all 50 states to ascertain information regarding TI services before, during, and after COVID. Results of those conversations indicated that in 2020, prior to the COVID-19 pandemic, 19 states included TI as an approved/authorized service through Part C of the Individuals with Disabilities Education Act (IDEA), a federally granted early intervention program for infants and toddlers with disabilities. For the purpose of emergency services during the COVID-19 pandemic, 47 states were granted the right through IDEA Part C to use funds for virtual service provision; and three states opted not to approve funding of TI as a service delivery method through Part C. Figure 1 details information about approved reimbursement for TI through Part C by state, as well as the number of states requiring training to deliver services via TI.

As with in-person service delivery, TI providers must develop knowledge and skills specific to virtual service provisions. The prerequisite for TI should include, but not be limited to, experience delivering early intervention services face-to-face. In addition, a TI provider needs to possess knowledge of how to effectively implement coaching strategies over the internet. It is notable that IDEA Part C supports the use of coaching strategies in families' natural environments (IDEA, 2004). In spite of these recommendations, only six states require training for TI as a service delivery model (see Figure 1). During the pandemic, TI services were delivered under emergency conditions, and as such, the only requirement for providing TI in most states was to be a credentialed provider in the state(s) in which one was providing services. Because most providers and families were unprepared for virtual sessions, the uptake of TI during the pandemic may have interfered with the effectiveness of the TI services. Tele-intervention delivered during emergency situations, and not as a regular, planned mode of service delivery, is therefore different than typical TI delivered during non-emergency times.



**Figure 1**  
*Tele-Intervention (TI) Reimbursement through Part C by State*



**Note.** State-by-state information gathered by authors to illustrate the landscape of TI services for children who are deaf or hard of hearing through Part C before, during, and after the COVID pandemic. Reimbursement of costs for TI services through IDEA Part C varied by state, before, during, and projections for after the COVID-19 pandemic.

### A Model of Tele-intervention for Children who are DHH

Early intervention in-person sessions for families and their children who are DHH are deliberate in nature, because providers implement very specific components during the session. The same is true for early intervention sessions delivered virtually. Providers of TI, and in some cases the Part C service coordinator, are responsible for preparing parents to engage in family-centered early intervention (FCEI) via the internet. The web-based technology to deliver a TI session is determined after consultation between the provider and the family. There are several video-conferencing platforms that are HIPAA-compliant including Zoom, WebEx, FaceTime, and Skype.

The provider also confirms that each family has access to reliable internet services, as well as a device with a camera and microphone. In addition, the provider prepares the parent for a virtual session, including the possibility of a technology failure, a time delay, the benefits of a quiet environment with limited distractions, and ways to occupy the child while parent and provider engage in conversations related to reflection, feedback, and joint planning.

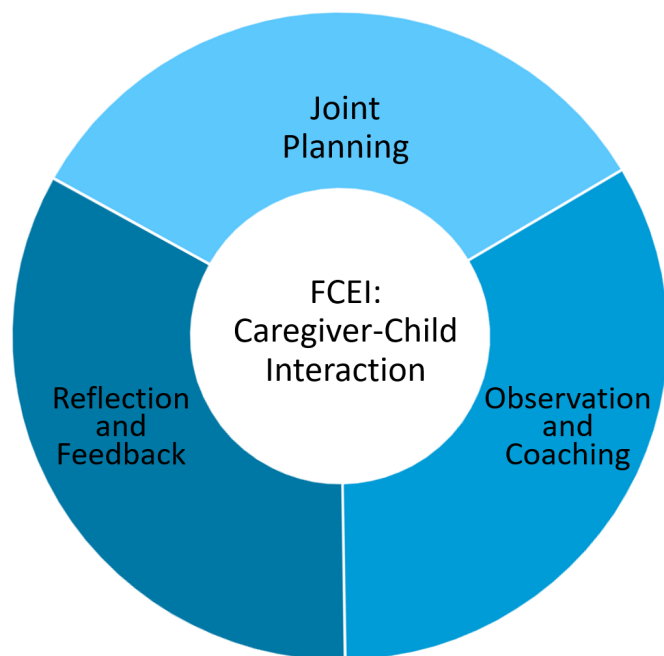
Although the delivery of TI in deaf education has evolved over time, a generally agreed-upon session format closely follows the evidenced-based model of coaching attributed to Dathan Rush and M'Lisa Shelden (Rush & Shelden,

2005, 2011). The Rush and Shelden model includes five components: (a) joint planning, (b) observation, (c) action/practice “coaching”, (d) reflection, and (e) feedback. Each of these components depend on the foundation of a partnership between parents and providers. The coaching model developed by Rush and Shelden provides a framework for an adapted model of FCEI for families of children who are DHH, as illustrated in Figure 2 and described below.

### Joint Planning

As Rush and Shelden (2005, 2011) describe, joint planning occurs as a part of the introduction to the session and includes agreement between the coach (EI provider) and the learner (parent). During the joint planning activity, the provider and parent engage in a discussion of progress since the last session, a brief introduction of the parent's chosen activity for the session, the parent's objectives for the session, the parent's goals for the child, and how the provider will coach the parent to support these objectives. Joint planning is collaborative, but driven by the parent. The provider supports the parent, imparts guidance based on the parent's knowledge and skills, helps to define appropriate goals for the child, and identifies the child's skill-levels. The activities and ideas for session objectives come from the parent; this promotes the development of parental confidence to carry over skills acquired from the coaching sessions into everyday life.

**Figure 2**  
Model of Family Centered Early Intervention (FCEI)



Note. Model of FCEI adapted from Rush, D. D., & Shelden, M. L. (2005). Evidence-based definition of coaching practices. CASEinPoint, 1(6). [https://fipp.ncdhhs.gov/wp-content/uploads/caseinpoint\\_vol1\\_no6.pdf](https://fipp.ncdhhs.gov/wp-content/uploads/caseinpoint_vol1_no6.pdf) and Rush, D. D., & Shelden, M. L. (2011). The early childhood coaching handbook. Paul H. Brookes Publishing Co.

A brief example of joint planning follows:

**EI Provider (EIP):** How have things been since the last session?

**Parent (P):** I've been trying to get Hattie to say more words, but it doesn't work all the time.

**EIP:** Okay. Is that something you want to work on today?

**P:** Yes.

**EIP:** Okay. What is it you are going to do today?

**P:** We're going to play with playdough.

**EIP:** And what are you going to work on?

**P:** I'm going to work on getting word combinations, two or three words. I want Hattie to say word combinations when prompted, but if not, then I want her to at least imitate the word combinations.

**EIP:** Okay, perfect. You want to elicit two or three words at a time from Hattie.

Let's work in the same way we did last week. If Hattie says something, then you will think about her intent, what she's meaning or trying to say; then, think about the language to model so that her production is more correct.

What is your goal for yourself?

**P:** I want to make sure that I am modeling two or three words correctly.

**EIP:** All right, then what I'll do is if Hattie says something and you don't provide a model, I'll remind you by saying "Model that" or "Give her a model." I'll judge whether I think you are stuck and can't think of what to say quickly, by your response. If that happens, then I'll say the words to model and you can just repeat what I've said.

Okay, do you feel good about that?

**P:** Yes.

**EIP:** Let's get started.

### Observation and Coaching

Although Rush & Shelden (2005, 2011) define observation and coaching as separate components, the adapted FCEI model combines observation and coaching to occur simultaneously. Together, these components are an examination of the parent's actions during the activity with his child. The purpose of observation and coaching is to actively watch the parent interaction with the child so the provider can offer the parent suggestions for real-time strategies to embed into the interaction. Observation and coaching give the provider an opportunity to provide immediate comments including positive reinforcement. Coaching is the catalyst which begins the process of empowering parents to help their children develop language. Goals of coaching are to identify the skills and capabilities within parents, enable parents to use their skills to the best of their abilities, and increase their independence using specific techniques which will reduce their reliance on professionals. The provider will provide specific statements to the parent (e.g., That was perfect; she imitated the model you gave her.) During this part of the session, the parent is reminded of the expectations he previously planned for his child and is given specific comments related to his own objectives for himself. The embedded coaching also provides opportunities for the parent to expand his child's speech and language while implementing a fun activity.

An example of coaching follows, where the goal for the parent is to provide prompts that encourage the child to use at least two-word combinations and the goal for the child is to produce at least two-word combinations:

**P:** What color do we have?

**Hattie:** pink

**EIP:** Ask, "What color playdough do we have?"

**P:** What color playdough do we have?

**Hattie:** playdough

**EIP:** Ask again, "What color playdough?"

**P:** What color playdough?

**Hattie:** pink

**P:** pink playdough, Tell me pink playdough.

**Hattie:** pink playdough

**EIP:** Great model. Great imitation.

**P:** What will you do with the playdough?

**Hattie:** smash

**P:** Smash the playdough. Can you tell me that? Smash the playdough.

**Hattie:** mash playdough

**EIP:** Great, you got her to imitate two words.

**Hattie:** Daddy turn

**P:** It's Daddy's turn.

**EIP:** Say, "It's Daddy's turn." Try to get that third word.

**P:** It's Daddy's turn.

**Hattie:** -i- Daddy's turn.

**EIP:** That was great. She tried to add "it's."

**P:** Daddy is smashing the playdough.

**EIP:** Say, "Daddy smashes the playdough." It'll be easier for Hattie.

**P:** Daddy smashes the playdough.

**Hattie:** Daddy smash.

**P:** playdough

**EIP:** Model the whole thing, "Daddy smashes the playdough."

**P:** Daddy smashes the playdough.

**Hattie:** Daddy mash

**EIP:** Model it again.

**P:** Daddy smashes the playdough. Tell me, Daddy smashes the playdough.

**Hattie:** Daddy mash playdough

**EIP:** Woo Hoo! Nice work, both of you! You stuck with it and she did it! Great job.

child were doing during the activity. The purpose of this final component of the session is to actively think about the progress that was made during the session, how the current session can guide the next session, and ultimately, how the session can help the parent carry over skills to facilitate language development at home.

An example of reflection and feedback follows:

**EIP:** How do you think that went?

**P:** I think that was okay?

**EIP:** All right, what do you think went well?

**P:** I think Hattie imitated some word combinations.

**EIP:** Yes, Hattie imitated "pink playdough" and "smash playdough." But she said, "Daddy turn" on her own and tried to imitate "It's Daddy's turn."

What about what you did well?

**P:** I was trying really hard to model three words, but it was hard to think of what to say that's not too much. It's hard for me when it's happening to figure out what words to say.

**EIP:** You did a nice job. Remember, if Hattie says one word, then modeling two words is okay. You are trying to expand her original utterance. When Hattie says two words, like when she said, "Daddy turn," then that's when you want to be sure to model three words, "It's Daddy's turn."

Is there anything about the activity that was hard for you?

**P:** Yeah, it's hard for me to know exactly what to say.

**EIP:** Well, let's think about some two-word combinations that you can use with the playdough activity. Think about verb-noun or an action word to combine with playdough. Hattie said, "smash playdough" what other verbs could you use with "playdough."

**P:** Push?

**EIP:** Absolutely. "Push the playdough. Roll the playdough." Do you have a knife or a scissors?

**P:** Oh yes, I could "Cut the playdough."

**EIP:** Exactly. And you could have Hattie say, "Open the playdough" when you are getting it out.

Then, to expand the utterance to three words, you could either emphasize the little words, the articles such as "the" or you could add the color of the playdough. For example, you could use acoustic highlighting, saying the word you want Hattie to add, "Open **the** playdough." or "Smash **the** playdough." That would be one way to try to get Hattie to add a word, emphasizing it with your voice by saying it just a little bit louder. Another way to

## Reflection and Feedback

The last components of the session are reflection and feedback. In the adapted model of FCEI, these two components are intertwined; happening as two parts of a single conversation. These portions include a thoughtful summary or recap from both the parent and provider. Reflection provides an opportunity for the parent to review his perspective of his communication and his child's engagement in the activity. Reflecting occurs immediately after the activity ends and creates an opportunity for the parent to comment on what went well, what didn't go well, what he would like to do more or less of, what he would like to see the child do more or less of, and what can be modified to meet the intended outcomes. The provider is able to give specific feedback based on the parent's reflection and her own observations and point out what the parent may not have noticed that he or his



*add a third word would be to add the color of the playdough. For example, "Push the pink playdough." Does that sound reasonable?*

**P:** *Yes, it's just hard to remember in the moment.*

**EIP:** *As you do other activities with Hattie, think about it. Think about how to put her thoughts into three words. I think this is a good goal for Hattie. And a good goal for you, to think about how to expand her utterances. What do you think?*

**P:** *That's a good idea. I can try to do that.*

### **Addressing the Unique Challenges of TI while Implementing Family-Centered Early Intervention**

When a session is virtual, the above model of family-centered early intervention is followed closely, with added challenges managing the technology and being in separate physical locations. With training, the provider likely will be more prepared both to explain the unique elements of tele-intervention and to establish expectations with the parent(s). Considerations specific to virtual service provision related to the technology and the setting include time, connectivity, and environment.

#### **Time**

The lack of face-to-face time before and after a virtual session results in fewer opportunities for detailed explanations during the session's activities. For this reason, it is important for the provider and parent to agree on expectations before engaging in TI. This could be accomplished through consultation with the family prior to beginning regularly scheduled sessions, at which time all of the considerations for receiving intervention services via the internet can be reviewed.

TI sessions often have a feeling of immediacy that in-person sessions do not present. Once the computer is on, coaching must begin. When in-person, there may be time both before and after the FCEI session to review updates, provide additional tips or answers to parents, or engage in conversations. To make the most of the session time, the parent and provider may choose to prepare, or engage in joint planning, prior to the session (e.g., via email, telephone, text messaging, etc.). Preparations might include choosing activities together that align with the parents' goals for himself and his child, and encouraging the parent to send questions as they arise day to day via email rather than waiting to address questions during the session. The provider may also choose to send notes to the parent after the session, with additional feedback and tips for future sessions.

#### **Connectivity**

It is important that both provider and parent be prepared for technology failures. In the event of poor connectivity or complete disconnect, the provider can be prepared with options to continue the session including (a) attempting to redial or re-establish the video call, (b) using alternative

audio sources such as a cell phone while continuing video connection, or (c) using a headset to reduce feedback. Tele-intervention services rely on the internet, and thus, there may exist a time delay between voice and motion. For this reason, it is important that providers are careful to not disrupt the flow of the activity or to interrupt the children while giving their responses to their parents. A combination of positive reinforcement and an explanation help the parent to understand what they did that is being reinforced (e.g., "Great model" "Nice job; you held up the toy," "Good; you got eye contact," "Wait time worked; she included *is*"). Simple corrections and positive statements that are specific, quick, and clear are effective ways to provide meaningful feedback while remaining mindful of time constraints and delays.

#### **Environment**

Since TI sessions are often held in the parents' home environment, it is likely that background noise from televisions, family members, or other sources may be present during the session. Prior to beginning regular TI sessions, both the provider and the parent can be thoughtful about the location in which the session will occur. It may be helpful to have a specific space where the child is expected to be during the session (e.g., blanket on the floor, chair at table, high chair) to ensure that the child is within range of the camera. A designated space for TI may signal to the child that when in the space for TI, he will be expected to engage in activities and be held accountable for speech/language objectives.

It is likely that the child will be most engaged when sessions occur in a space where other family members, who are not actively included in the session, are absent. Ideal settings include quiet spaces with minimal competing background noise to ensure the child has an optimal learning environment free from visual and auditory distractions. Rooms in the house that are free of high-traffic (i.e., family members are not often walking through the space) are likely to provide the most focus for all parties participating in the session. Often, siblings are at home during the TI session. This presents an excellent opportunity to include siblings in the session activities.

#### **Conclusion**

The delivery of human services such as health, education, and intervention through telepractice has become increasingly common in today's connected world; there have been particular gains in its use during the global pandemic of 2020. As this virtual model of service provision continues to grow, so too must the understanding of TI in the field of deaf education. Limitations of TI include cost, reimbursement, connectivity, equipment, licensure, management of child behavior, lack of hands-on demonstrations, and limited conversational opportunities. Advantages of TI include access to services, reduced costs in time and travel, and flexible scheduling. Further research is needed to elucidate the advantages, challenges, and recommendations of professionals and families who have engaged in both traditional in-person

services and virtual TI services. Work related to these needs is addressed in the subsequent articles of this monograph (Nelson et al., 2022a, 2022b).

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## Parents' Perspectives about Tele-Intervention Services for their Children who are Deaf or Hard of Hearing

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### Abstract

**Purpose:** In the first of a two-part survey series, this cross-sectional survey study explored parent perceptions of tele-intervention (TI) services for their young children who are deaf or hard of hearing. Using Likert rating scales, the survey queried parent confidence in understanding their child's language development, perceptions of the coaching and support they received, the parent-professional partnership, and overall views and recommendations. Data were collected March-May 2020, not realizing the survey release would coincide with the Covid-19 pandemic and the influx of unexpected virtual services. For this reason, data were stratified between those who had received TI services for more than versus less than three months. Responses for in-person services were also evaluated for additional context.

**Method:** Responses from 48 participants who received TI and 18 participants who received in-person services ( $n = 66$ ) were analyzed using descriptive statistics. Cronbach's alpha showed high internal consistency for all Likert scales; items of each subscale were sum-scored to examine relationships across queried areas of service delivery.

**Results:** Ninety-six percent of all respondents were highly or mostly satisfied with their TI services and 90% would definitely or probably recommend TI to other families. Overall positive findings were found across Likert scale queries, with no differences between parent perceptions of TI and in-person services, nor between TI for more than versus less than three months. However, findings also highlighted areas in which TI and in-person providers could improve intervention effectiveness, including coaching and supports to optimize parent confidence in understanding and facilitating their child's language and communication goals.

**Conclusions:** Parent perceptions of the TI delivery model were favorable. Implications and recommendations for both TI and in-person providers are discussed.

**Keywords:** Tele-Intervention, Deaf or Hard of Hearing, Early Intervention, Family-Centered Care

**Acronyms:** ASL = American Sign Language; DHH = deaf or hard of hearing; LSL = Listening and Spoken Language; TI = tele-intervention

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The diagnosis of hearing loss in an infant or young child is a time of uncertainty for most parents and families, prompting a myriad of questions, introduction to new vocabulary, and engagement in previously unfamiliar services. The journey through the initial diagnosis and the determinations of intervention services to meet the needs of children who are deaf or hard of hearing (DHH) and their families are best supported through a team approach, with professionals who have the skills and expertise aligned with the priorities of parents, caregivers, and

families<sup>1</sup>. As each team member plays a critical part in their respective disciplines, the role of the early interventionist, deaf educator, or speech-language pathologist (hereafter referred to as *providers*) constitutes an essential ongoing partnership with parents to support their child's language, academic, and social-emotional growth.

<sup>1</sup>The definition of parents, caregivers, and families encompasses a rich variety of circumstances, cultures, and individual details. To improve readability, the term "parents" is used throughout the article, but is inclusive of all caregivers and family constructs.

Early intervention in the United States is typically defined as children birth to three years of age, consistent with Part C services under the Individuals with Disabilities Education Act (IDEA, 2004). Children who are identified early and promptly begin appropriate early intervention have better language skills compared with children who were later-identified or who did not receive effective intervention (Ching et al., 2017; Decker & Vallotton, 2016; Sahli, 2019). Children eligible under IDEA when they transition from Part C to preschool continue to benefit from home and/or center-based services from qualified professionals (Division for Early Childhood, 2014; JCIH, 2013).

Parents play a critical role in the success of their child's early language acquisition outcomes in early childhood and during their preschool years. Under a family-centered service delivery model, parents and professionals form partnerships and collaborate to meet the families' goals for their children (Rush & Shelden, 2019). Parents who actively participate in sessions, engage in goal development and decision-making for their child, advocate for their needs, and display confidence in promoting their child's development within the family's daily routines can facilitate the best outcomes (DesJardin, 2009; JCIH, 2013; Moeller et al., 2013; Nelson et al., 2020; Scarinci et al., 2018; Turan, 2012; Weiber, 2015). When serving families of children who are DHH, it is particularly important the provider has the skills and expertise to support the parents in their desired mode of communication and the method for establishing their child's first language, whether using Listening and Spoken Language (LSL), American Sign Language (ASL), or simultaneous communication (i.e., speaking with sign support). Some families may experience limited service delivery options within their region, resulting in services by a provider who does not have specialized skills or expertise to effectively guide LSL or ASL development. Similarly, some families have access to a provider less frequently than needed to ensure timely implementation of intervention goals. These barriers lead many families to seek alternative options that may require additional time, expense, and inconvenience that negatively impacts other facets of the family's routines, obligations, and overall quality of life.

Telehealth equipment and techniques have been used for several decades to provide health care from a distance. Referred to as tele-intervention (TI), this is becoming a more frequent mode of delivery to provide specialized care to children who are DHH and their families. Other terms for TI services may include tele-therapy, tele-habilitation, tele-practice, tele-services, telehealth, and tele-education. In the TI model, video conferencing technology is used to deliver services by linking professionals and families regardless of their respective locations as long as they have access to the internet and to a computer with a camera. This can be particularly valuable for families who live in rural areas, who may have limited local early intervention service options, or who may have other transportation or personal family barriers. Most importantly, TI has shown to be a service delivery model with outcomes similar to those of in-person models (Behl et al., 2017; Havenga et al., 2017; McCarthy et al., 2019, 2020).

As TI services have become more accessible, it is important to understand current issues from both the parent and provider perspectives. Although studies have demonstrated the efficacy of TI services to child and family outcomes, few studies have explored parent perceptions of TI services. It is central to a family-centered model of intervention for parents to have a voice in driving policies and program improvements. Parents must feel supported in the goals and priorities they have for their children and gain confidence in implementing those goals using evidence-based strategies within their daily routines. The purpose of this survey study was to learn more about parent perceptions of their TI services, including confidence in understanding their child's language development, perceptions of the coaching and support they received from their TI provider, their views of establishing a parent-professional partnership with their provider, and other experiences and recommendations related to their TI services. The survey also queried similar responses from parents who received in-person services to provide additional service-delivery context.

## Method

A cross-sectional survey was developed to explore the perceptions of parents concerning services for children who are DHH delivered through a TI model, as well as the perceptions of parents who received in-person services or a combination of both. The survey also queried perceptions of professionals who provided TI services, in-person services, or both. Survey findings from professionals are reported in a companion article within this monograph (Nelson, 2022). The Utah State University Institutional Review Board approved the survey study and there were no financial or other conflicts of interest.

## Survey Instrument

An electronic survey using the Qualtrics platform was distributed to families of children who are DHH, as well as professionals who serve children who are DHH. Respondents who identified as both a parent of a child who is DHH as well as a professional in the field had the option of completing the survey two times—once as a parent and once as a professional.

Survey participants were recruited using several dissemination methods. An email flyer describing the survey was sent to the marketing and communication representatives at OPTION Schools, Inc., and to the American Speech and Hearing Association with a request to disseminate the survey link to their professional membership and to forward the link to families they served. Additionally, flyers were handed out at the March 2020 annual Early Hearing Detection and Intervention national conference. The survey was posted on the [infanthearing.org](https://infanthearing.org) and [heartolearn.org](https://heartolearn.org) websites that provide resources for parents of children who are DHH and professionals who serve them.

Whether receiving in-person or TI services, the survey used questions in three Likert-scale categories to explore parent perceptions of (a) confidence in understanding their

child's language development, (b) coaching and support, and (c) establishing a parent-professional partnership with their provider. The survey also queried demographic data and general satisfaction ratings with their TI or in-person services.

## Results

The electronic survey software recorded 117 initial parent survey activations. Of those, 35 activations contained no data and 16 contained responses to only the first question. These unusable responses were omitted from analysis, resulting in 66 survey participants. Of the 66 survey participants, 73% ( $n = 48$ ) reported they were currently receiving TI services, with 27% ( $n = 18$ ) who reported they were not receiving TI and were currently receiving in-person services. Of the 48 respondents receiving TI services, eight respondents reported they also received additional in-person services, and 40 respondents reported they received TI only and did not receive additional in-person services.

Of the 48 participants receiving TI, data were further stratified by those who had been receiving TI services for more than three months (31%;  $n = 15$ ) with those who had been receiving TI services for less than three months (69%;  $n = 33$ ). The data analysis decision to stratify between more than or less than three months of TI experience was made due to the timing of the survey release with the Covid-19 pandemic. The survey was released in early March 2020, not realizing the following months of data collection (March–May 2020) would be during a large-scale pandemic and the resulting influx of emergency virtual services. Although unintentional, this timing offered an intriguing opportunity to explore perceptions of parents who unexpectedly shifted into receiving emergency virtual services as compared with parents who participated in an established TI program with a provider experienced in delivering TI services prior to the onset of the Covid-19 pandemic. Participant responses for TI and in-person services are reported, as well as the stratified TI data for respondents who had engaged in TI services for more than or less than three months.

The internal consistency for each of the three Likert scales was assessed using Cronbach's alpha. The internal consistency was high for all three, with the scales that queried parent confidence in understanding their child's language development and the scales that queried parent perceptions of coaching and support reaching an alpha of .91. The internal consistency for the scale that queried perceptions in establishing a parent-professional partnership was .88. Due to the high internal consistency of the three scales, the items of each subscale were sum-scored and each was used as an outcome to examine the relationship between TI and in-person services and TI services for more than or less than three months in areas of (a) parent confidence in understanding and supporting their child's language development, (b) coaching and support, and (c) establishing a parent-professional partnership with their provider.

## Participant Demographics

As shown in Table 1, the majority of parent respondents were female (95%,  $n = 63$ ), between 30–39 years of age (58%,  $n = 38$ ), and Caucasian (67%,  $n = 44$ ). Heavier geographic representation was seen for respondents who lived in the West and Midwest than in the Eastern area of the United States, with a relatively equal representation of those who described their residence as rural, urban, or a mix of both.

**Table 1**

*Participant Demographics ( $n = 66$ )*

Gender	
Female	95% ( $n = 63$ )
Male	3% ( $n = 2$ )
Prefer not to answer	2% ( $n = 1$ )
Age	
Under 20 years	0% ( $n = 0$ )
20–29 years	17% ( $n = 11$ )
30–39 years	58% ( $n = 38$ )
40–49 years	23% ( $n = 15$ )
50+ years	1% ( $n = 2$ )
Ethnicity	
Asian	12% ( $n = 8$ )
African American	6% ( $n = 4$ )
Hispanic or Latino	6% ( $n = 4$ )
White	67% ( $n = 44$ )
Other not listed	3% ( $n = 2$ )
Prefer not to answer	6% ( $n = 4$ )
Geographic Region	
West	39% ( $n = 26$ )
Mid-West	32% ( $n = 21$ )
South and South-East	17% ( $n = 11$ )
East and North-East	9% ( $n = 6$ )
Outside United States	3% ( $n = 2$ )
Service Delivery Region	
Urban	36% ( $n = 24$ )
Rural	34% ( $n = 22$ )
Mix of Both	30% ( $n = 20$ )



Of parents who engaged in TI services, 8% ( $n = 4$ ) reported having one TI session per month, 21% ( $n = 10$ ) having two or three TI sessions per month, and 71% ( $n = 34$ ) reported having four or more TI sessions per month. Ninety percent ( $n = 43$ ) reported no concerns with the quality of the internet connection during their TI session. Of parents who received in-person sessions, 55% ( $n = 10$ ) reported having one in-person session per month, 17% ( $n = 3$ ) having two or three in-person sessions per month, and 28% ( $n = 5$ ) reported having four or more in-person sessions per month. See Table 1 for all demographic data.

### Parent Confidence in Understanding Their Child's Language Development

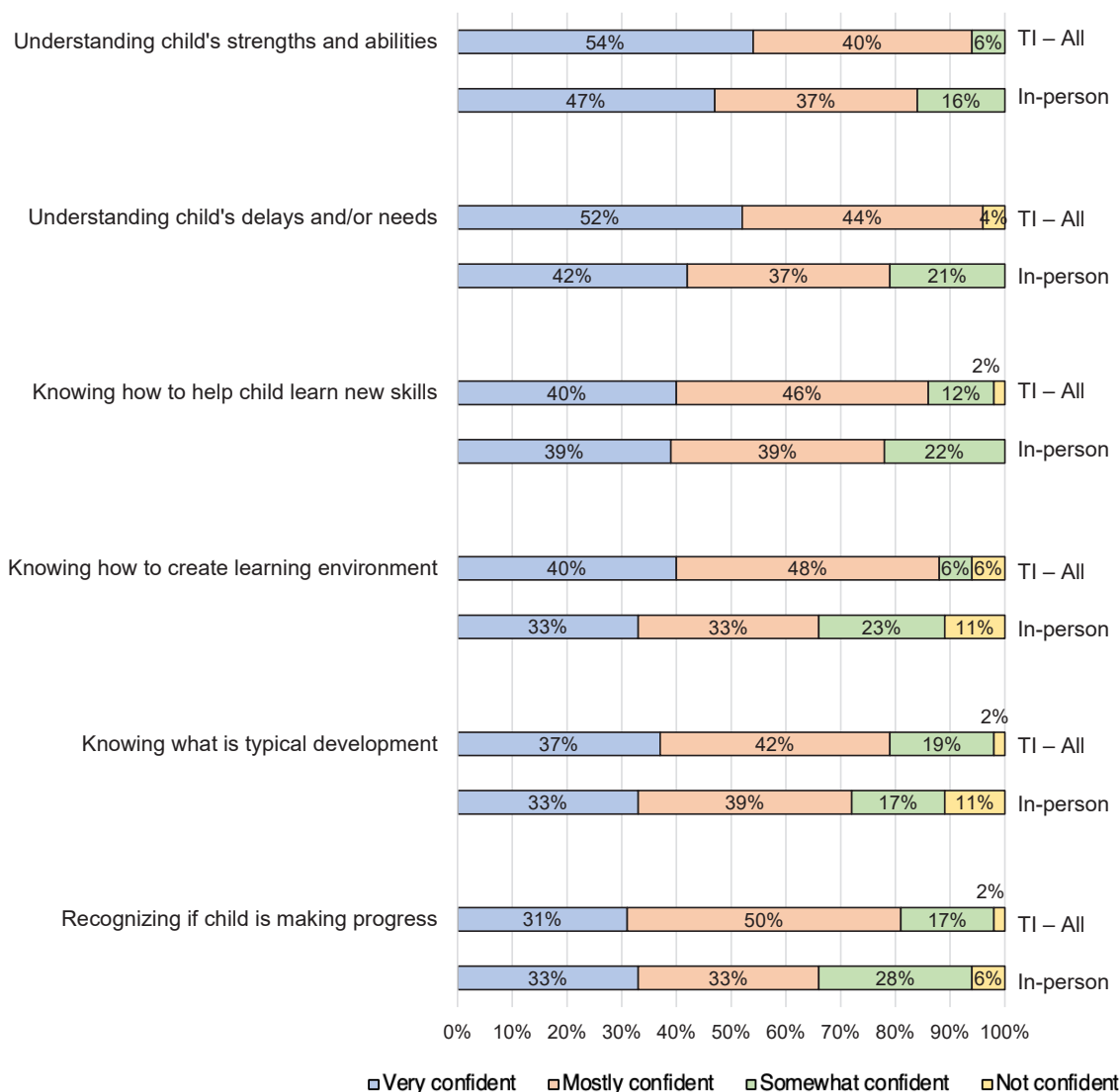
To explore understanding of their child's language development, the survey queried parent confidence in (a) understanding their child's strengths and abilities, (b) understanding their child's delays and/or needs, (c) knowing how to help their child progress and learn new skills, (d) creating a learning environment, (e) recognizing if their child was or was not making expected progress, and (f) understanding what was considered typical

development. Response options were *very confident*, *mostly confident*, *somewhat confident*, and *not confident*.

As shown in Figure 1, the percentage of respondents receiving TI who were *very confident* in these topic areas ranged from 54% ( $n = 26$ ) to 31% ( $n = 15$ ). The topic with the highest number of *very confident* respondents was in understanding their child's strengths and abilities. The topic with the lowest number of *very confident* respondents was in recognizing if their child was or was not making expected progress. Confidence patterns were similar for parents receiving in-person services with the percentage of respondents receiving in-person services who were *very confident* in these topic areas ranging from 47% ( $n = 9$ ) to 33% ( $n = 6$ ). The highest percentage of respondents who were *very confident* was in understanding their child's strengths and abilities and the lowest percentage of respondents who were *very confident* was in two topics, including knowing what was considered typical development and recognizing if their child was or was not making expected progress. See Figure 1 for all confidence ratings for families receiving TI services or in-person services.

**Figure 1**

*Parent Confidence Ratings: In-Person ( $n = 18$ ), Tele-Intervention (TI) All Data ( $n = 48$ )*

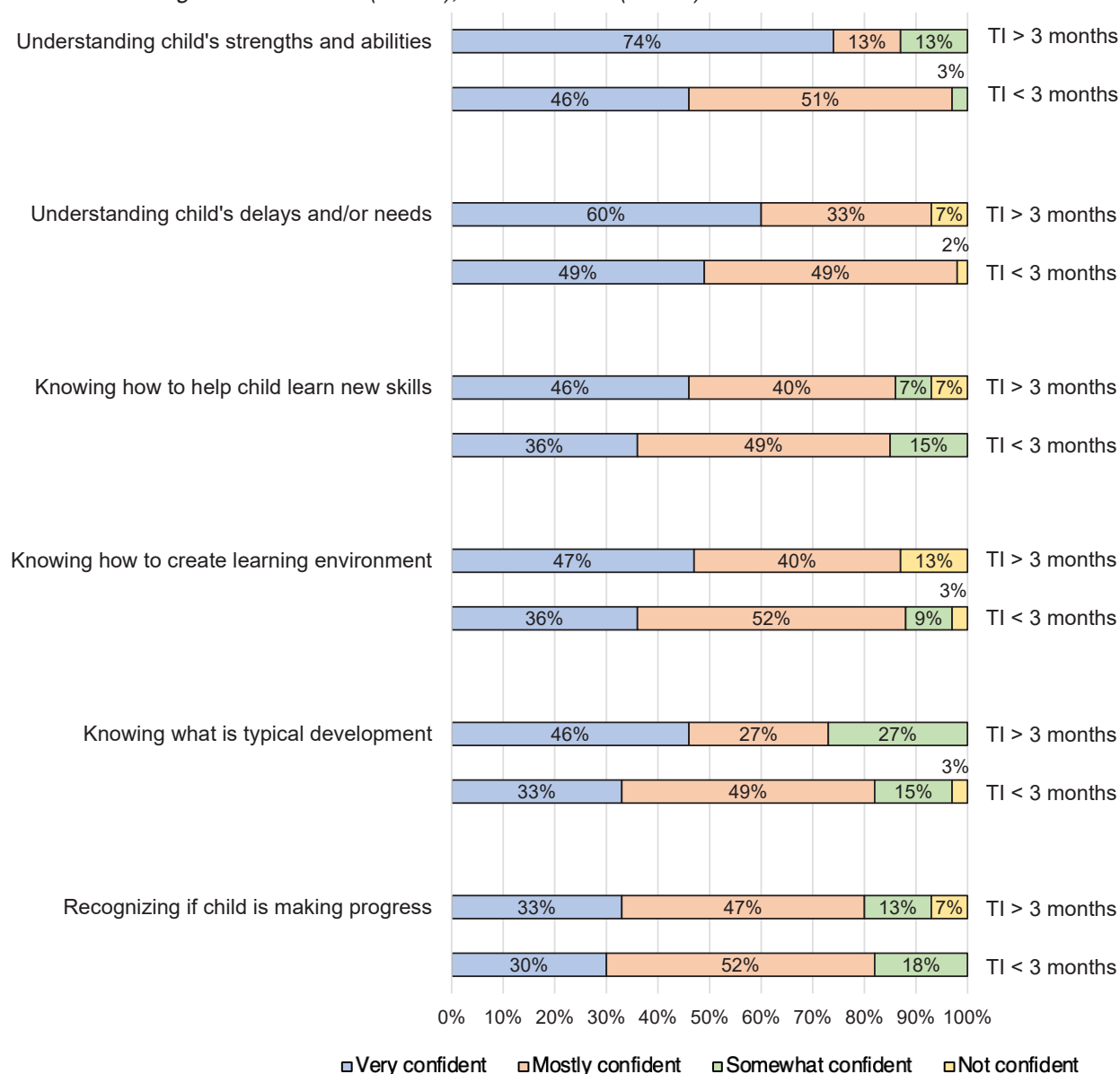


When data were stratified according to those who had been receiving TI services for more than or less than three months, findings showed descriptive differences in parent confidence. Of parents who had been engaged in TI services for more than three months, the percentage of those who were *very confident* ranged from 74% ( $n = 11$ ) to 33% ( $n = 5$ ) across topic areas, whereas the percentage of those who had been engaged in TI for less than three months had *very confident* ratings that ranged from 49% ( $n = 16$ ) to 30% ( $n = 10$ ). The strongest topic area for

parents with more than three months of TI experience was confidence in knowing their child's strengths and abilities; and for parents with less than three months of TI experience, it was confidence in knowing their child's delays or areas of need. The topic area with the lowest percentage of respondents who were *very confident* for both groups was in recognizing how to tell if their child was or was not making progress. See Figure 2 for all confidence ratings for families receiving TI services for more than or less than three months.

**Figure 2**

*Parent Confidence Ratings: TI > 3 Months ( $n = 15$ ), TI < 3 Months ( $n = 33$ )*



*Note.* TI = tele-intervention

Independent sample *t*-tests were performed to analyze how confident parents felt with TI services versus in-person services and whether the length of time using TI-services affected that confidence. Results showed there were no significant differences in confidence between those who received TI services compared to those who received in-person services ( $t = 0.80$ ,  $p = 0.43$ ); and no significant differences in confidence between those who

received TI services for more than three months compared to those who received TI services for less than three months ( $t = 0.21$ ,  $p = 0.83$ ).

### Parent Perceptions of Coaching and Support

To explore parent perceptions of the coaching and support they received from their provider during their TI or in-person sessions, the survey queried how often

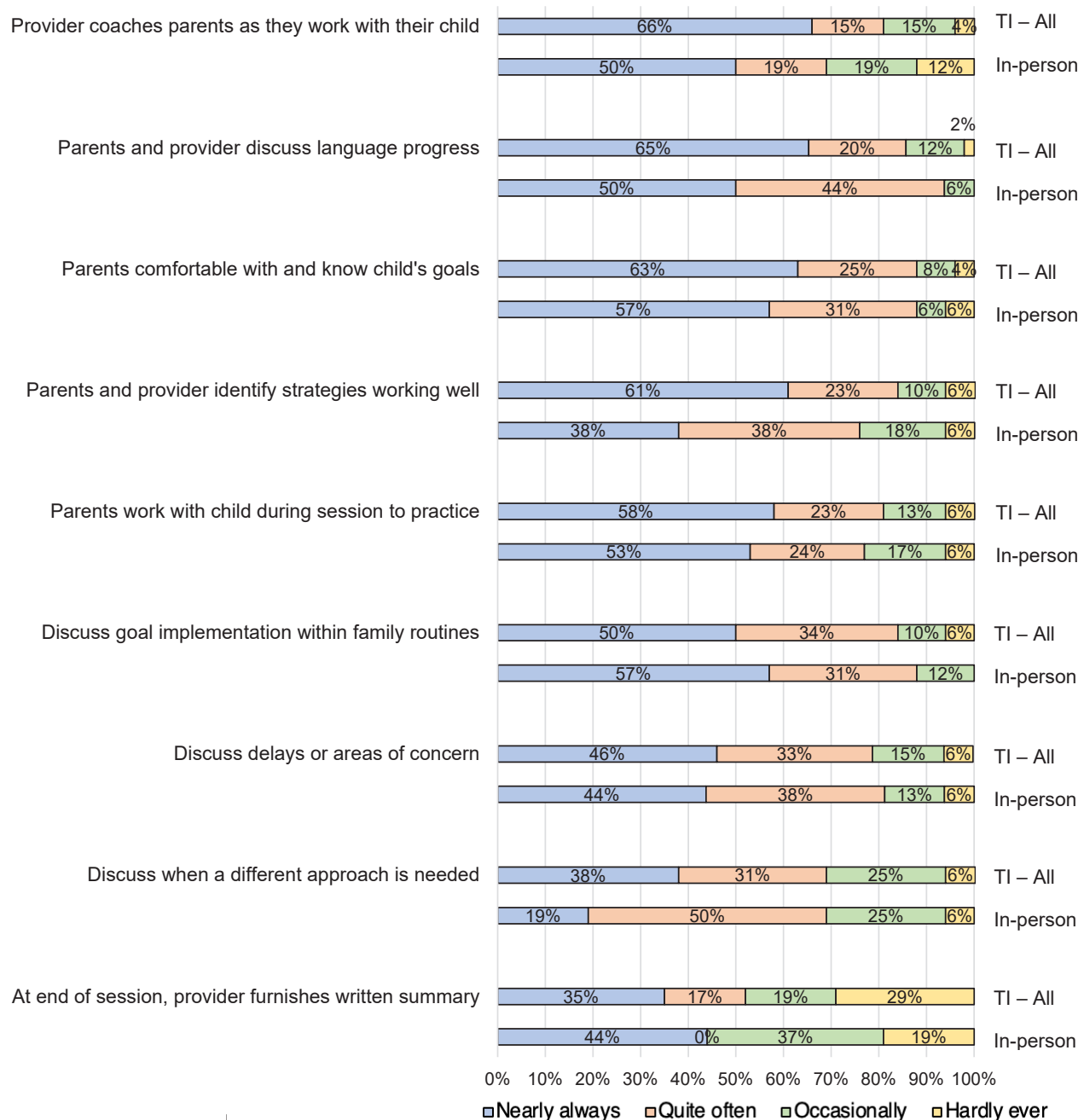
sessions included (a) discussion of the child's growth and progress in language and communication, (b) discussion of the child's delays or areas of need in language and communication, (c) coaching from the provider as parents worked directly with their child during their session, (d) practice opportunities for parents to gain additional practice during the session, (e) discussion of activities and strategies that were working well for parents, (f) discussion of activities that seemed not as effective or may need a different approach, (g) discussion to assure parents were comfortable and confident in knowing their child's goals, (h) discussion of ideas for how to work on the goals within the family's daily routines, and (i) how often the provider

furnished a written summary or feedback from the session for parents to refer to until the next session. Response options were *nearly always*, *quite often*, *occasionally*, and *hardly ever*.

As shown in Figure 3, the percentage of respondents receiving TI services who reported these activities occurred *nearly always* ranged from 66% ( $n = 32$ ) to 35% ( $n = 17$ ). The topic with the highest percentage of *nearly always* responses was in the provider coaching parents as they worked directly with their child during their session. The topic with the lowest percentage of *nearly always* responses was in the provider furnishing a written summary of the session for parents' future reference.

**Figure 3**

*Parent Perception of Coaching and Support: In-Person ( $n = 18$ ), TI All Data ( $n = 48$ )*



Note. TI = tele-intervention



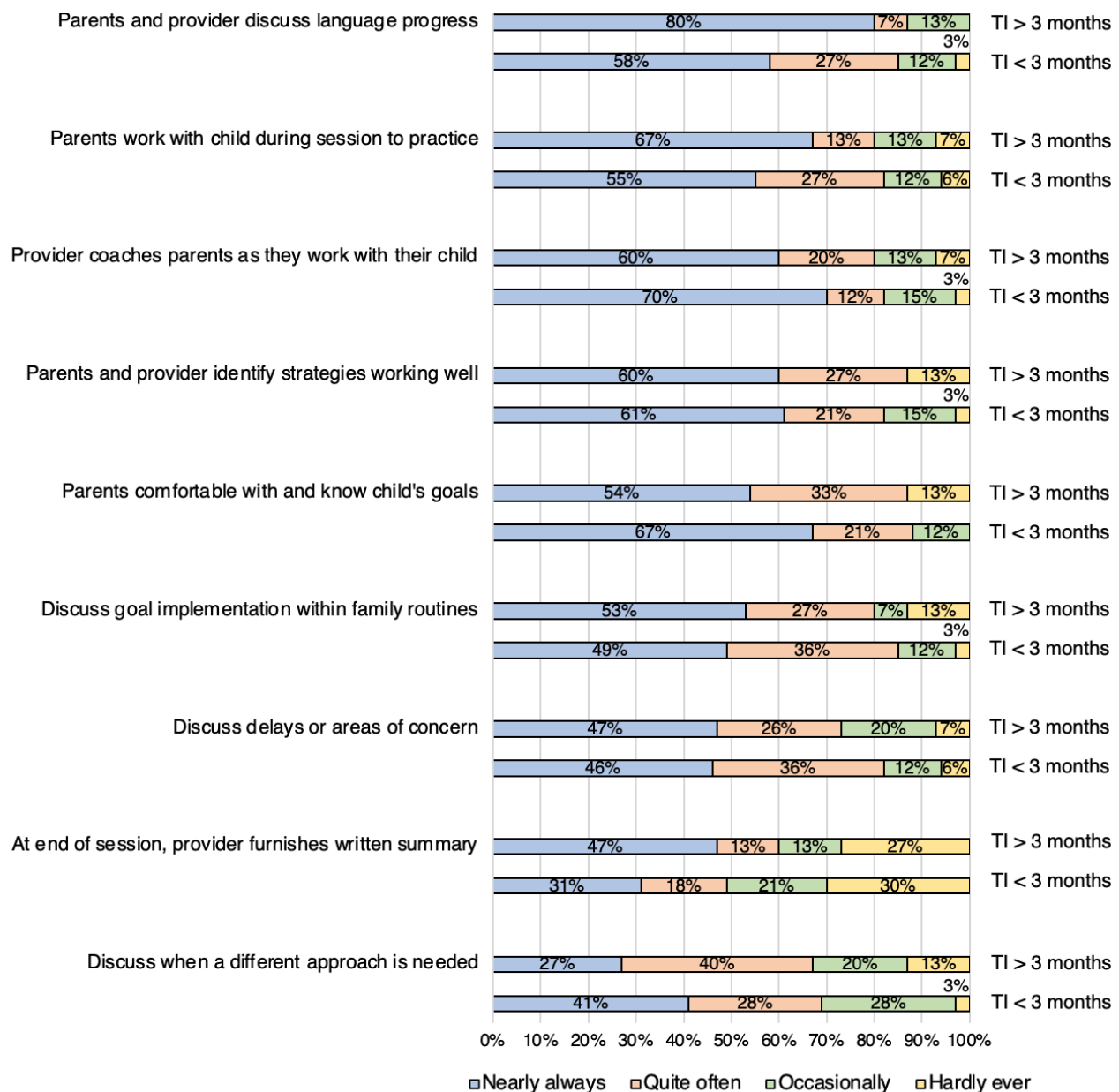
The range for respondents receiving in-person services who reported these activities occurred *nearly always* was 57% ( $n = 9$ ) to 19% ( $n = 3$ ). For in-person services, the two topics with the highest percentage of *nearly always* responses (57% each) were the parents being comfortable with and knowing their child's goals, and parents and providers discussing child goals and providing suggestions for implementation within the family's daily routines. The topic with the lowest percentage of *nearly always* responses was the provider helping parents identify strategies that did not work well or those needing a different approach. See Figure 3 for all provider coaching and support ratings for families receiving TI services or in-person services.

As shown in Figure 4, in the group of respondents who had been engaged in TI services for more than three months, percentages of those who reported coaching and support occurred *nearly always* ranged from 80% ( $n = 12$ )

to 27% ( $n = 4$ ) across topics. The topic with the highest percentage of *nearly always* responses was in the parent and provider discussing the child's progress in language and communication. The topic with the lowest percentage of *nearly always* responses was in the parent and provider discussing when a different approach or strategy was needed. Of parents who had been engaged in TI for less than three months, percentages of those who reported coaching and support occurred *nearly always* ranged from 70% ( $n = 23$ ) to 31% ( $n = 10$ ) across topic areas. The topic with the highest percentage of *nearly always* responses was in the provider coaching the parent as they worked with their child. The topic with the lowest percentage of *nearly always* responses was in the provider furnishing a written summary of the session for parents' future reference. See Figure 4 for all provider coaching and support ratings for families receiving TI services for more than or less than three months.

**Figure 4**

*Parent Tele-Intervention (TI) Perceptions of Coaching and Support: TI > 3 Months ( $n = 15$ ), TI < 3 Months ( $n = 33$ )*



Independent sample *t*-tests were performed to analyze how parent perception of how frequently coaching and support was provided during TI services versus in-person services and whether the length of time using TI services affected that perception of coaching and support. The independent sample *t*-tests revealed there were no significant differences in parent perception of support between those who received TI services compared to those who received in-person services ( $t = 0.13, p = .90$ ). Similarly, there were no significant differences in support between those who had been receiving TI services for more than three months compared to those who had been receiving TI for less than three months ( $t = -0.13, p = 0.90$ ).

### Parent Perceptions of Establishing a Parent-Professional Partnership

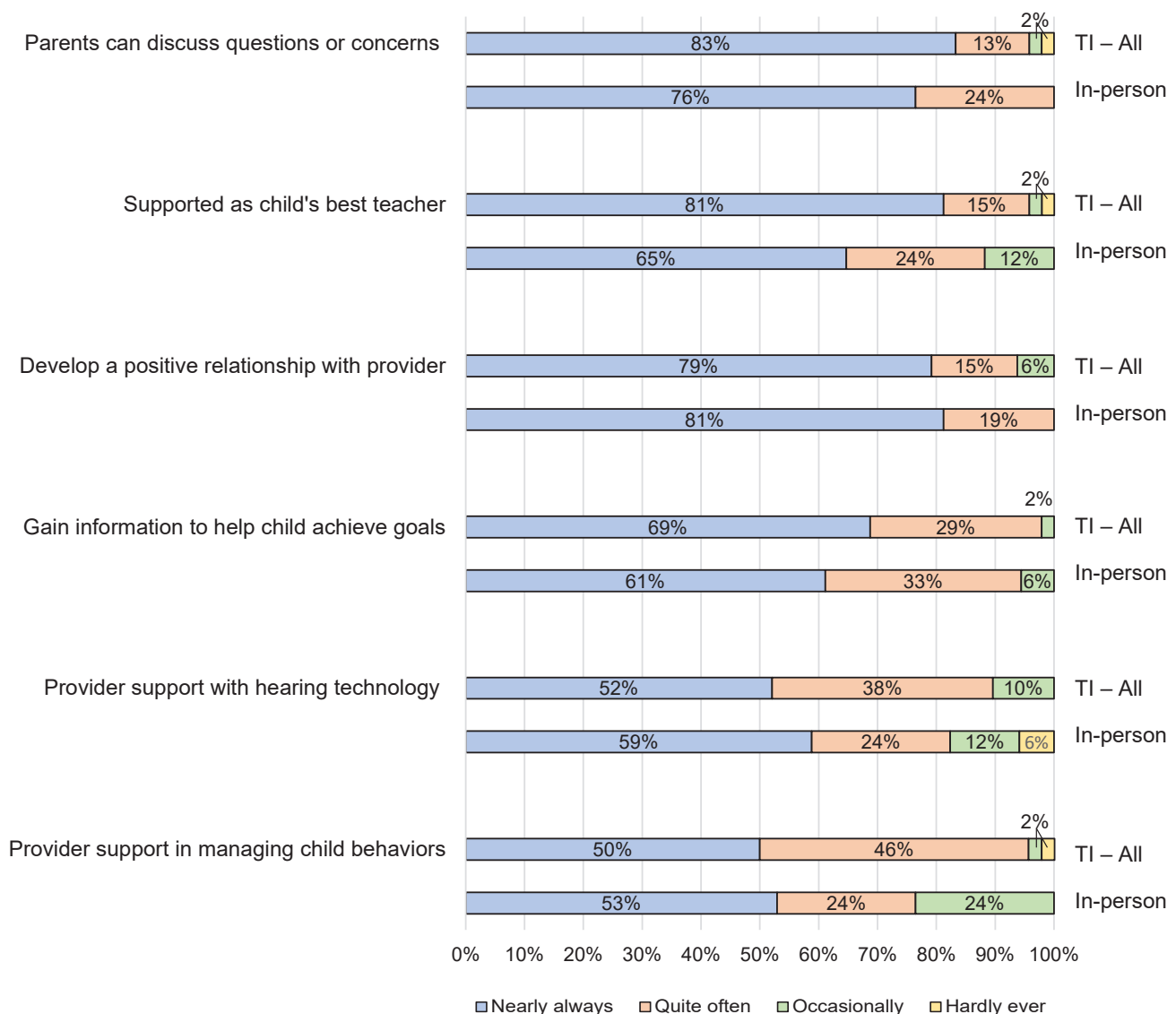
To explore perceptions of the effectiveness of TI in establishing a parent-professional partnership, the survey queried parent views of (a) the ability to develop a positive relationship with their provider through a TI connection, (b)

having the breadth of information needed to help their child achieve their goals, (c) feeling supported in their role as their child's first and best teacher, (d) feeling comfortable in engaging in meaningful discussions, asking questions, or raising concerns even though the provider was not in the same room, (e) feeling supported in managing session logistics and child behaviors, and (f) receiving appropriate information and supports in managing and troubleshooting their child's hearing technology. Response options were *strongly agree*, *agree*, *disagree*, and *strongly disagree*.

As shown in Figure 5, the percentage of respondents receiving TI services who indicated *strongly agree* ranged from 83% ( $n = 40$ ) to 50% ( $n = 23$ ) across topics. The topic with the highest percentage of *strongly agree* responses was parents feeling comfortable in discussing their questions or concerns even though the provider was not in the same room. The topic with the lowest percentage of *strongly agree* responses was the provider adequately supporting parents in managing child behaviors.

**Figure 5**

*Establishing a Parent-Professional Partnership: In-Person ( $n = 18$ ), TI All Data ( $n = 48$ )*



*Note.* TI = tele-intervention

Respondents who received in-person services who indicated *strongly agree* ranged from 81% ( $n = 13$ ) to 53% ( $n = 9$ ) across topics. For in-person services, the highest percentage of *strongly agree* responses was parents feeling they could develop a positive relationship with their provider. The topic with the lowest percentage of *strongly agree* responses was in the provider adequately supporting parents in managing child behaviors. See Figure 5 for all parent-professional partnership ratings for families receiving TI services or in-person services.

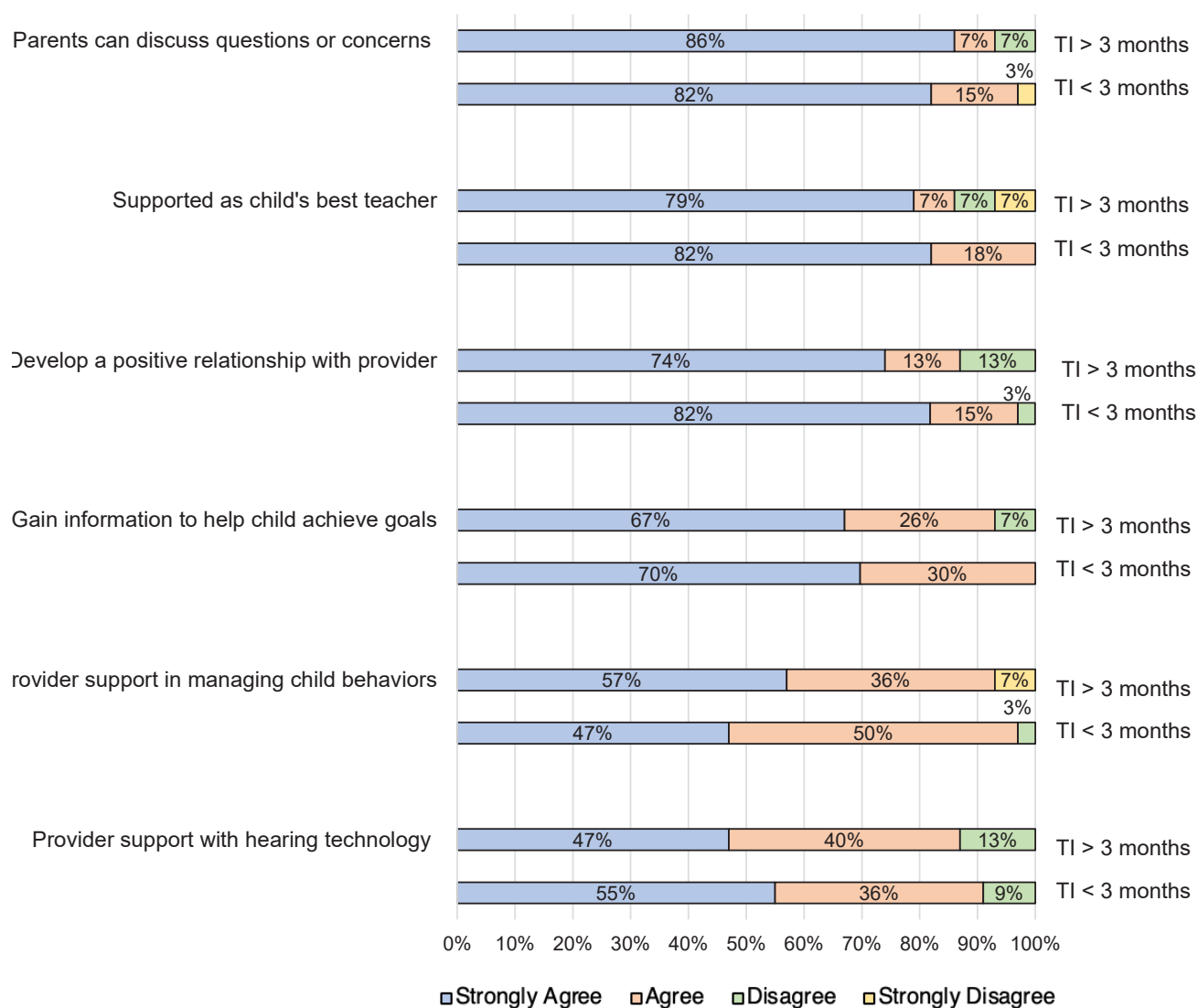
Of respondents who had been engaged in TI services for more than three months, percentages of those who *strongly agreed* ranged from 86% ( $n = 13$ ) to 47% ( $n = 7$ ) across parent-provider relationship topics. The topic with the highest percentage of *strongly agree* responses was parents feeling they could discuss questions or concerns. The topic with the lowest percentage of *strongly agree* responses was parents feeling supported in managing their child's hearing technology. Of parents who had been engaged in TI for less than three months, percentages

of those who *strongly agreed* ranged from 82% ( $n = 27$ ) to 47% ( $n = 15$ ) across topic areas. Three topics had the highest percentage of *strongly agree* responses (82% each): parents feeling they could discuss questions or concerns, parents feeling supported as their child's best teacher, and parents' ability to develop a positive relationship with their provider. The topic with the lowest percentage of *strongly agree* responses was parents feeling supported in managing child behaviors. See Figure 6 for all parent-professional partnership ratings for families receiving TI services for more than or less than three months.

Results from independent  $t$ -tests showed that there was no significant difference in parent perceptions in developing a positive parent-professional partnership between those who received TI services and those who received in-person services ( $t = 0.47$ ,  $p = .64$ ). There was also no difference in agreement ratings between those who had received TI services more than three months compared to those who had received TI services less than three months ( $t = -0.54$ ,  $p = 0.60$ ).

**Figure 6**

*Establishing a Parent-Professional Partnership: TI > 3 Months ( $n = 15$ ), TI < 3 Months ( $n = 33$ )*



*Note.* TI = tele-intervention

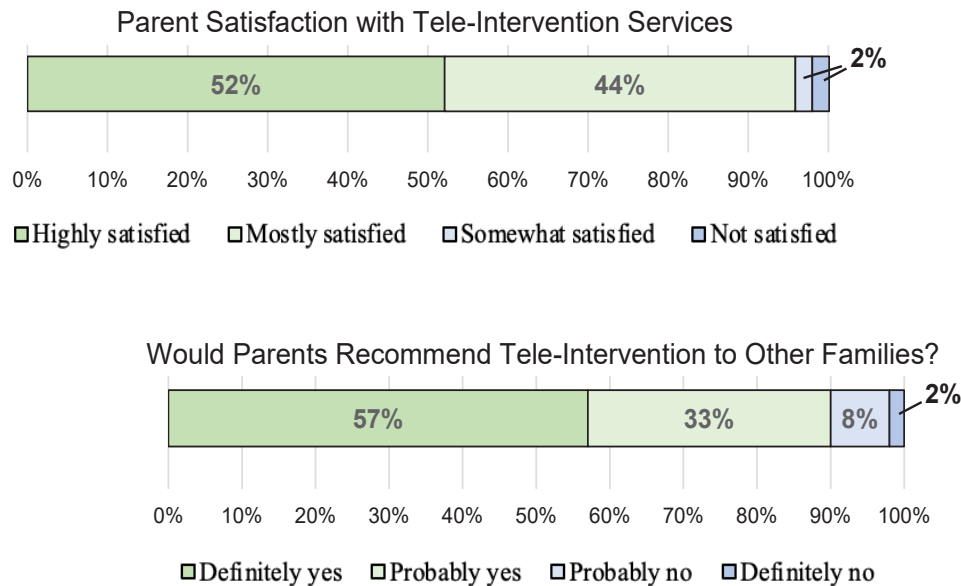


**General Satisfaction of Tele-Intervention Model of Delivery**

The survey queried parent perceptions of overall satisfaction with TI as a model of service delivery. Of the 48 TI participants, 96% (*n* = 46) reported they were

*highly or mostly satisfied* with their TI services and 90% (*n* = 43) reported they *definitely or probably* would recommend TI to other families. See Figure 7 for all response values.

**Figure 7**  
Overall Parent Satisfaction with Tele-intervention (TI) Services: TI All Data (*n* = 48)



**Discussion**

In today’s technology-focused world and compounded by the sudden implementation of virtual educational and medical services due to the Covid-19 pandemic, the establishment and longevity of TI across select aspects of education and healthcare are irrefutable. Although the effectiveness, cost and time savings, and increased convenience of TI to Part C agencies, school districts, or outpatient therapy clinics have been documented, parent experiences and feedback are vital to inform policy and to drive program improvement. Findings from the present study demonstrated positive parent experiences with TI delivery as evidenced by 96% of parent participants indicating they were *highly or mostly satisfied* with their TI services and 90% reporting they *definitely or probably* would recommend TI to other families. Furthermore, study results showed no statistically significant differences between TI and in-person services in parent perceptions of confidence in supporting their child’s language development, coaching and support practices, or in developing a positive parent-professional partnership. Although study findings were overall positive in parent perceptions of TI as a mode of service delivery, they highlighted several important considerations that could improve the intervention effectiveness for both TI and in-person services.

**Parent Confidence in Understanding and Supporting Their Child’s Language Development**

Considering a provider is with the family just 1 to 4 hours per month, the fundamental premise of family-centered services to empower parents with the knowledge and skills to promote their child’s development across daily routines has been promoted as a standard of care for years. Yet only approximately one-third ranging to slightly over one-half of study respondents, for both TI and in-person services, rated themselves as *very confident* across the Likert statements probed. Descriptively, confidence improved for TI parents who had been receiving services for more than three months compared with those who had been receiving TI services for less than three months; although, these differences were not statistically significantly different. Confidence in understanding their child’s strengths, abilities, delays, and needs are paramount to parents’ effectiveness in promoting optimal growth in all aspects of language acquisition. With just one-third of respondents feeling *very confident* in recognizing if their child was making expected progress and fewer than half feeling *very confident* in knowing how to create a learning environment or helping their child learn new skills, providers might consider service delivery adjustments or professional trainings that could positively impact parent confidence in these areas.

## Parent Perceptions of Coaching and Support

The coaching and support skills of the provider can have a direct impact on parents' confidence and effectiveness in supporting their child's language development across settings and within the family's daily routines (Rush and Shelden, 2019; Nelson et al., 2020). When a child is diagnosed as DHH, most parents report feelings of fear, confusion, and grief as they embark on a journey of new terms and concepts in which they likely know very little (Ealy, 2013; Scarinci et al., 2018; Weiber, 2015). A model of coaching and support in harmony with the family's culture and priorities can facilitate positive family experiences and optimal child outcomes. A TI mode of delivery is highly conducive to parent coaching as the physical separation requires parents to carry out the intervention activities. Although there is not a physical separation of the parent and provider for in-person services, a family-centered philosophy similarly advocates a coaching model.

The descriptive survey findings showed approximately two-thirds of TI families and one-half of in-person families reported the provider *nearly always* coached them during their sessions as they worked with their child or that they discussed their child's progress in language and communication. This means one-third to one-half of families had sessions that did not *nearly always* include these components of coaching and discussion of progress. Fewer than half of both TI and in-person survey participants reported they *nearly always* felt comfortable with their child's goals, what to do until their next session, or how to implement their child's goals within the family's daily routines. Similarly, fewer than half of respondents reported their provider *nearly always* discussed their child's areas of delays or concerns or strategies to use when a different approach was needed. These findings were consistent with the survey responses of professionals, where only approximately one-half of provider respondents reported feeling *very confident* in parent coaching (see provider survey findings in Nelson et al., 2022 in this monograph).

In an evidence-based coaching model, parents can gain confidence and increase their own effectiveness in supporting their child's language development when they are supported by a knowledgeable and confident coach. Parents rely on a provider's confidence and expertise to guide joint planning to ensure child goals are consistent with the family's priorities. Providers can support parents in understanding typical developmental milestones, the scope and sequence of age-appropriate learning targets, and in offering suggestions for how those goals could be implemented within daily routines. Guided reflection can be a highly effective component of a TI or in-person session to provide clarity for parents about *why* a particular goal is important to their child's development (Rush & Shelden, 2019). Guided reflection also promotes parent confidence, an exchange of new ideas, comprehension of learning goals and targets, and ways to foster engagement during all daily environments and activities. Open-ended

questions through provider prompts can help identify if parents have misinterpretations of strategies or how to embed their child's goals within family activities. Facilitating opportunities for parents to practice using effective strategies to target their child's goals during the session is an important component of service delivery. As parents take the lead with their child during the session, their knowledge and confidence can be impacted by these direct experiences and by the type of feedback they receive from their provider. For example, a parent who receives general feedback of "*good job*" will not experience the same opportunities for increased knowledge, support, and confidence as a parent who receives specific feedback related to their child's goals, such as "*When you described what you were doing while you and your child were making the bed, you provided valuable opportunities for language and vocabulary growth, while also reinforcing our target of improving her sequencing skills.*"

Whether receiving TI or in-person services, parents' knowledge and confidence can increase when they have a strong understanding of their child's current goals and targets, areas of strength and areas of need, strategies that are working well, and those that may need a different approach. Parents can feel empowered when they can engage in joint-planning, knowing the provider will take the time to learn of their family's needs, activities, and priorities. Parents' knowledge and confidence can increase when they have opportunities to practice strategies during the session, gain ideas and expectations for managing child behaviors during the session, and obtain meaningful feedback that promotes goal implementation during the family's daily or routine activities until their next session.

## Establishing a Parent-Professional Partnership

The parent-professional partnership must be founded on trust, with an assurance the provider will learn of parents' priorities for their child and family, and then provide guidance consistent with those priorities. When the TI delivery model first emerged, a commonly expressed concern was the ability of parents and professionals to develop a positive relationship if they were not in the same room. Over time, parents and providers who engaged in TI services across a variety of educational and healthcare services largely experienced positive virtual connections. This held true in the present study, with approximately 80% of parent participants reporting they *strongly agreed* they could effectively discuss their questions or concerns, they were supported as their child's first and best teacher, and they had developed a positive relationship with their TI provider. Descriptively, a higher percentage of TI respondents reported positive parent-professional partnerships than those reported by respondents who received in-person services. These differences did not reach statistical significance, and the asymmetrical group sizes should render interpretations of TI versus in-person services with caution. However, it was clear the TI mode of delivery was not detrimental to the parent-professional relationship for the majority of

survey participants. Although a positive finding for most participants, the parent-provider relationship should always be of primary importance to all providers in their family-centered services.

### Supporting Hearing Technology

Central to the development of listening and spoken language is use of hearing technology during all waking hours. As this concept is emphasized to parents who have elected LSL for their child, it can provide an added layer of stress if they are unsure about the day-to-day management of the technology. Many children who are developing and using ASL as their first language also use hearing technology, and it can be similarly stressful for their parents to learn the details and ongoing management of their child's devices. Provider support within scope of practice to assist parents in managing and troubleshooting their child's hearing technology (e.g., hearing aids, cochlear implants, assistive listening devices) can offer invaluable reassurance and guidance (Muñoz et al., 2017). Support can include facilitating parent confidence in performing daily listening checks and visual inspections of the devices. It can also include the use of virtual tools and resources (e.g., webcams, screen-sharing, simulation videos, online device manuals) to assist parents in troubleshooting their child's hearing devices as issues occur or through forward-thinking discussions regarding common device challenges. Although audiologists are central to the child's collaborative team, TI and in-person providers can facilitate ongoing guidance in technology use, including helping parents know when to consult with their child's audiologist.

### Study Limitations

The primary study focus was to explore parent perceptions of TI services, with responses from parents receiving in-person services included for context. However, study findings would have been strengthened had there been more responses from families receiving in-person services, with greater symmetry in group sizes. Although the timing of the survey data collection period directly corresponded with the onset of the Covid-19 pandemic and the discontinuation of many in-person services, it was not possible to conclusively discern if or how the pandemic impacted participant responses. The homogeneity of responses, particularly as related to race and gender, are a potential limitation of the generalizability of results in describing parent experiences with TI or in-person services. There are many complexities associated with family-centered services for children who are DHH and their families and many issues and potential concerns were not addressed in the present study, thus highlighting the need to further explore parent perceptions, experiences, and recommendations for both TI and in-person services.

### Conclusions

With 96% of participants being highly or mostly satisfied with their TI services, study findings revealed overall positive perceptions of TI delivery for parents of young children who are DHH. Most parents perceived virtual

sessions to be effective for supporting the parent-professional partnership, promoting confidence, and strengthening skills through coaching. Findings also highlighted areas where professionals could better support parents in both TI and in-person settings, such as ensuring parents have a strong understanding of their child's goals, implementing goals within daily routines, recognizing when strategies are working well and when a different approach may be needed, and providing guidance for technology use. Providers who lack confidence in areas of TI service delivery may benefit from advanced training, which may, in turn, facilitate parents' skills and confidence in optimizing their child's language development. The results of this study are timely given the expanding role TI is playing in the field of deaf education. Tele-intervention may be an increasingly preferred mode of delivery for families with young children and can serve as a powerful platform to ensure families receive appropriate and timely services from a provider with expertise in their child's first language. The long-term impact of the Covid-19 pandemic to future service delivery patterns is unknown. However, some level of continued and expanded TI delivery appears imminent as educational agencies identify options to meet future predictable and unpredictable scenarios. As new circumstances arise and new technologies emerge, it is important to understand the implications for parents and the range of supports they may require. Providers can have a profound impact on parents' knowledge, confidence, and skill as they promote family engagement and facilitate improved child outcomes.

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## Provider Perspectives in Serving Children Who Are Deaf or Hard of Hearing and Their Families using Tele-Intervention

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### Abstract

**Purpose:** In the second of a two-part survey series, this cross-sectional survey study explored professionals' perceptions of tele-intervention (TI) services for young children who are deaf or hard of hearing. Using Likert rating scales and open-ended questions, the survey queried professional's confidence in providing TI services, including their views and recommendations. Data were collected March 2020 to May 2020, not realizing the survey release would coincide with the Covid-19 pandemic and the influx of unexpected virtual services. For this reason, data were stratified between those who had been providing TI services for more than versus less than three months. Responses for in-person providers were also evaluated for additional context.

**Method:** Responses from 123 participants who provided TI and 21 participants who provided in-person services ( $N = 144$ ) were analyzed using descriptive statistics. Cronbach's alpha showed high internal consistency for all Likert scales; items of each subscale were sum-scored to examine relationships across queried areas of service delivery.

**Results:** Provider perceptions of TI services were largely favorable. However, providers with more than three months' experience were significantly more confident in coaching and supporting parents through TI, including more overall favorable views of a TI delivery than providers with less than three months of TI experience. There were no differences in provider confidence in coaching and supporting parents between providers with more than three months' TI experience using TI delivery and in-person providers using in-person delivery.

**Conclusions:** Experienced providers reported confidence in service delivery and positive views of the TI model. Programs seeking to implement virtual services should consider TI training, with a commitment to TI longevity to improve provider efficacy and confidence in TI services.

**Keywords:** tele-intervention, deaf or hard of hearing, early intervention, family-centered care

**Acronyms:** ASL = American Sign Language; DHH = deaf or hard of hearing; LSL = Listening and Spoken Language; TI = tele-intervention

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The successful implementation of newborn hearing screening programs in the United States has facilitated timely diagnosis of hearing loss and referral to early intervention services for families of children who are deaf or hard of hearing (DHH). Children who are DHH (approximately 6,500 infants diagnosed annually in the United States) have better outcomes when families have access to timely and appropriate services to facilitate their child's language and cognitive development (Centers for Disease Control and Prevention, 2017; Ching et al., 2017; Decker & Vallotton, 2016; Yoshinaga-Itano et al., 2017).

Parents<sup>1</sup> of children who are DHH may wish for their child to develop and use Listening and Spoken Language (LSL), American Sign Language (ASL), or a combination of both. Development of the child's first language is best supported by a provider who has skills and expertise to facilitate parents' priorities for their child and family.

<sup>1</sup>The definition of parents, caregivers, and families encompasses a rich variety of circumstances, cultures, and individual details. To improve readability, the term *parents* is used throughout the article, but is inclusive of all caregivers and family constructs.

The Supplement to the Joint Committee on Infant Hearing (JCIH) reported early intervention services provided by professionals who have expertise in working with young children who are DHH yields the best outcomes for children and their families (JCIH, 2013). However, a shortage of qualified professionals with specialized skills to work with young children who are DHH and their families has been documented (JCIH, 2013; Martin-Prudent et al., 2016; Nelson et al., 2014). This has resulted in some families' inability to access services with a provider with LSL or ASL expertise or to receive the optimal frequency of sessions. These concerns impact timely implementation of intervention goals and language targets (Blaiser et al., 2013; Cole et al., 2019; Houston, 2011; Houston & Stredler-Brown, 2012; McCarthy et al., 2010, 2012, 2019).

In an increasingly technology-rich world, virtual services offer a valuable option for parents to engage in EI services with providers who have expertise aligned with the language priorities for their child and family. Referred to as tele-intervention (TI), virtual services can offer increased convenience, accessibility, and frequency of services, while also decreasing travel time, costs, and the impact of geographical barriers (Behl et al., 2017; Blaiser et al., 2013; Hailey et al., 2002). Other terms for TI services include tele-therapy, tele-practice, tele-services, telehealth, and tele-education. In this virtual model, video conferencing technology is used to deliver services by linking professionals and families regardless of their respective locations as long as they have access to the internet and to a computer with a camera. Child outcomes have been found to be similar when services are provided using TI or in person (e.g., Behl et al., 2017; Chen & Liu, 2017; Havenga et al., 2017; McCarthy et al., 2019, 2020).

As the implementation of TI increases for young children who are DHH and their families, it is important to consider the perspectives of providers who use this mode of service delivery. Professionals who partner with families and children who are DHH include specially-trained providers such as teachers of the deaf, early interventionists, speech-language pathologists, and Deaf mentors (hereafter referred to as *providers*). Although studies have explored the efficacy of TI services to child and family outcomes, few studies have explored the parent and the provider perceptions of TI services. It is central to a family-centered model of care for parents to feel supported in the goals and priorities they have for their children and to gain confidence in implementing goals using evidence-based strategies within their daily routines. Similarly, providers can be more effective when they have the training and support needed for effective TI service implementation. The purpose of this survey study was to learn more about the perceptions and feedback of professionals who provide TI services to support the speech and/or language development of children who are DHH, including their confidence in their ability to coach parents, their ability to support the development and needs of the children and families they serve, their opportunity to establish a parent-professional partnership using a TI model of delivery, and their general satisfaction ratings. Professionals who

provide in-person services were invited to participate in the survey to garner additional perspectives and context in service delivery experiences. The survey also queried perceptions of parents who received in-person services or a combination of both in-person and TI. Survey findings from parents are reported in a companion article.

## Method

A cross-sectional survey was developed to explore the perceptions of professionals who provided TI services and/or in-person services to children who are DHH and their families. The Utah State University Institutional Review Board approved the survey study and there were no financial or other conflicts of interest.

## Survey Instrument and Dissemination

An electronic survey using the Qualtrics platform was distributed to professionals who provide services to children who are DHH. Respondents who identified as both a professional in the field as well as a parent of a child who is DHH had the option of completing the survey two times—once as a professional and once as a parent.

Survey participants were recruited using several dissemination methods. An email flyer describing the survey was sent to the marketing and communication representatives at OPTION Schools, Inc., and to the American Speech and Hearing Association with a request to disseminate the survey link to their professional membership. Additionally, flyers were handed out at the March 2020 annual Early Hearing Detection and Intervention national conference. The survey was posted on the [infanthearing.org](http://infanthearing.org) and [heartolearn.org](http://heartolearn.org) websites that provide resources for parents of children who are DHH and professionals who serve them.

## Results

The electronic survey software recorded 206 initial survey activations for questions specific to professionals. Of those, 62 activations contained no data or responses to only the first question. These unusable responses were omitted from analysis, resulting in 144 survey participants. Of the 144 survey participants, 85% ( $n = 123$ ) reported they provided TI services and 15% ( $n = 21$ ) reported they provided in-person services.

Of the 123 participants who provided TI services, data were further stratified by those who had been providing TI services for more than three months (34%;  $n = 42$ ) with those who had been providing TI services for less than three months (66%;  $n = 81$ ). The data analysis decision to stratify between more than or less than three months of TI experience was made due to the timing of the survey release with the Covid-19 pandemic. The survey was released in early March 2020, not realizing the following months of data collection (March 2020–May 2020) would be during a large-scale pandemic and the resulting influx of emergency virtual services. Although unintentional, this timing offered an intriguing opportunity to explore perceptions of professionals who unexpectedly shifted into virtual service delivery as compared with professionals

who had been providing TI within an established TI program prior to the onset of the Covid-19 pandemic. Participant responses for TI and in-person services are reported, as well as the stratified TI data for respondents with more than or less than three months of TI service delivery experience.

In addition to reporting descriptive statistics, the internal consistency of the Likert scales that queried professionals' confidence ratings was evaluated using Cronbach's alpha and items were sum-scored to create a continuous outcome. Independent sample *t*-tests were used to examine the confidence based on providing in-person versus TI-services, if the length of time (coded as TI provider for more than three months or less than three months) affected confidence levels.

### Participant Demographics

The majority of survey respondents were female (96%, *n* = 138) and Caucasian (88%, *n* = 127) with a broad representation across age groups. Heavier geographic representation was seen for the West and Midwest than the Eastern area of the United States. Forty-three percent (*n* = 62) served families primarily in urban regions, 41% (*n* = 59) served families in both urban and rural regions, and 16% (*n* = 23) served families primarily in rural regions. See Table 1 for all demographic data.

### Professionals' Confidence in TI and In-Person Service Delivery

The survey queried professionals' confidence in (a) effectively coaching parents during the session, (b) helping parents to promote optimal language development in their child who is DHH, (c) building positive relationships with parents, (d) supporting parents in creating an effective learning environment, (e) supporting parents in using and troubleshooting their child's hearing technology, and (f) facilitating management of child behaviors during the session. Response options were *very confident*, *mostly confident*, *somewhat confident*, and *not confident*.

As shown in Figure 1, the percentage of respondents providing TI (*n* = 123) who were *very confident* in these topic areas ranged from 57% (*n* = 70) to 18% (*n* = 22). The topic with the highest number of *very confident* respondents was the ability to develop a positive relationship with the families they serve. The topic with the lowest number of *very confident* respondents was supporting parents in managing child behaviors during the session with a TI mode of delivery.

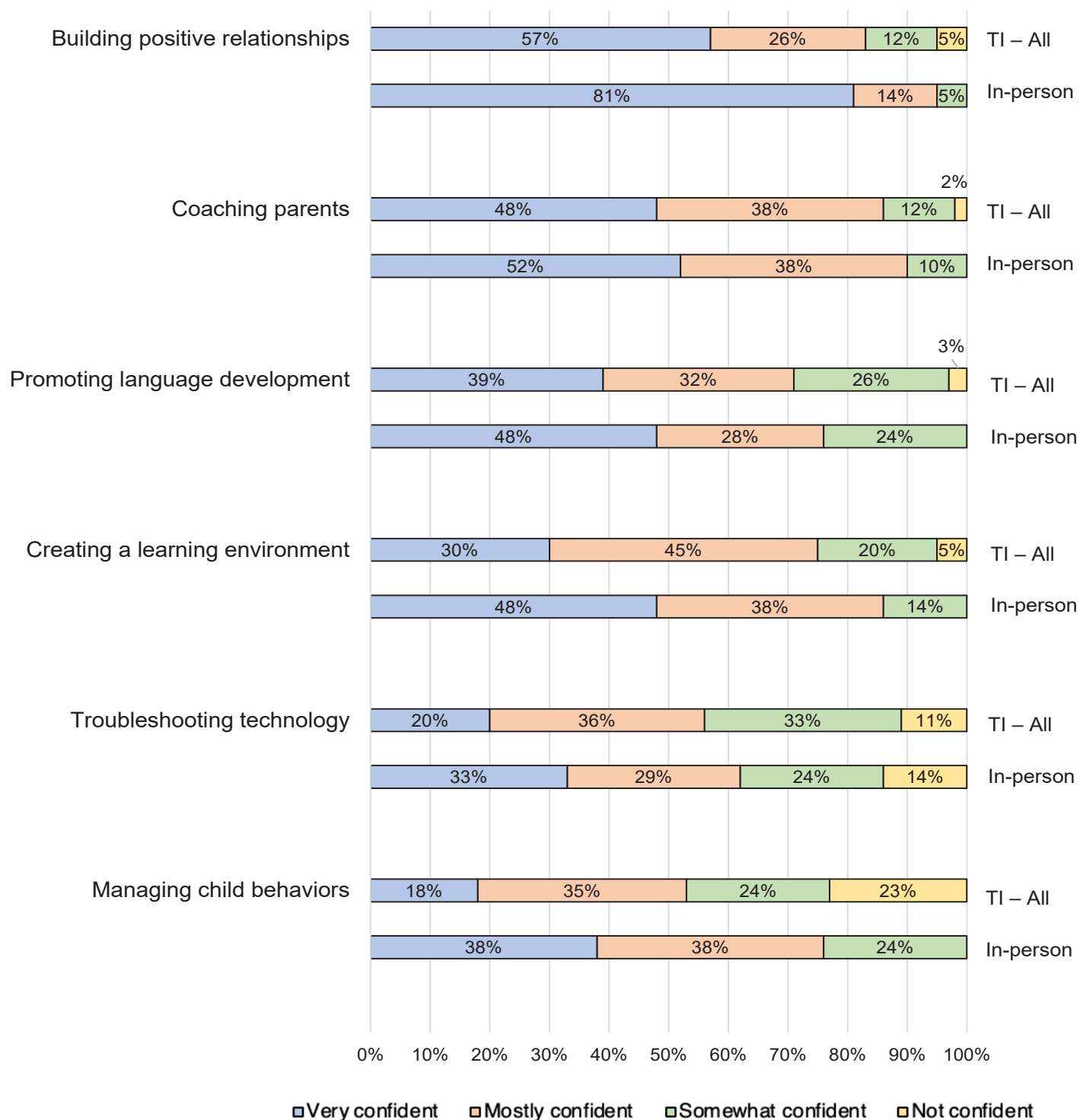
The percentage of respondents providing in-person services (*n* = 21) who were *very confident* in these topic areas ranged from 81% (*n* = 17) to 33% (*n* = 7). The topic with the highest number of *very confident* respondents was the ability to develop positive relationships with the families they served and the lowest percentage of respondents who were *very confident* was effectively supporting parents in using or troubleshooting their child's hearing technology. See Figure 1 for all confidence ratings for professionals who provided TI services or in-person services.

Table 1		
Participant Demographics (n = 144)		
Gender		
Female		96% (n = 138)
Male		1% (n = 2)
Prefer not to answer		3% (n = 4)
Age		
Under 20 years		0% (n = 0)
20—29 years		16% (n = 23)
30—39 years		26% (n = 38)
40—49 years		26% (n = 37)
50—59 years		20% (n = 29)
60+ years		11% (n = 16)
Prefer not to answer		1% (n = 1)
Ethnicity		
African American		1% (n = 2)
Hispanic or Latino		5% (n = 7)
White		88% (n = 127)
Other not listed		1% (n = 1)
Prefer not to answer		5% (n = 7)
Geographic Region		
West		33% (n = 48)
Mid-West		34% (n = 49)
South and South-East		19% (n = 27)
East and North-East		11% (n = 16)
U.S. Territory or Outside United States		3% (n = 4)
Service Delivery Region		
Urban		43% (n = 62)
Rural		16% (n = 23)
Mix of Both		41% (n = 59)

Data were then stratified according to those who had been providing TI services for more than or less than three months. Of 42 participants who had been providing TI services for more than three months, those who were *very confident* ranged from 74% (*n* = 31) to 33% (*n* = 14) across topic areas. Of 81 participants who had provided TI services for less than three months, those who were *very confident* ranged from 48% (*n* = 39) to 10% (*n* = 8) across topic areas. The topic showing the strongest provider confidence for both groups was building positive relationships with parents and families. The topic area with the lowest percentage of provider confidence for both groups was managing child behaviors. See Figure 2 for all confidence ratings for TI providers stratified by those who had been providing services for more than or less than three months.

**Figure 1**

*Provider Perceptions of Coaching and Support: Tele-Intervention (TI) All Data (n = 123), In-Person (n = 21)*



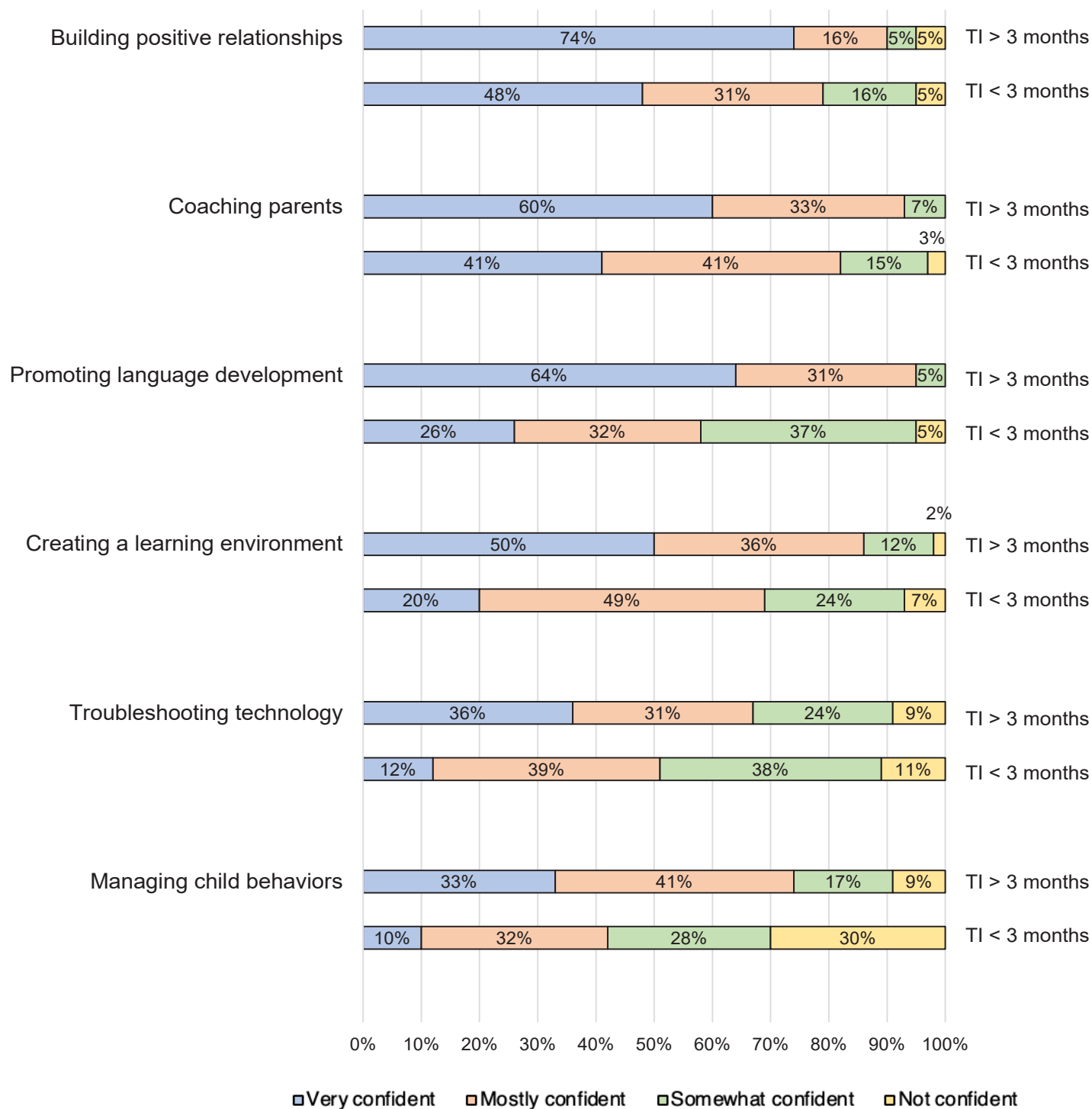
The internal consistency of the confidence scales were evaluated using Cronbach's alpha. The confidence scale reached an alpha of .87 so the items were sum-scored to create a continuous outcome. Independent sample *t*-tests were used to examine the confidence based on providing in-person versus TI-services, as well as if the length of time (coded as less than three months or more than three months) affected confidence levels. The results showed a significant difference in confidence of providers who provided in-person services ( $M = 19.71$ ) compared

to TI services ( $M = 17.85$ ), such that those who provided in person services felt more confident than those who provided TI services ( $t = 2.18, p = 0.04$ ). There was a significant difference in providers who provided services for more than three months ( $M = 19.67$ ) compared to providers who provided services for less than three months ( $M = 17.14$ ), such that those who provided services for more than three months felt more confident than those who provided services for less than three months ( $t = -3.44, p < .001$ ).



**Figure 2**

Provider Perceptions of Coaching and Support: *TI > 3 Months* (n = 42), *TI < 3 months* (n = 81)



Note. TI = tele-intervention

Because there was a significant difference in provider confidence for study participants who had been providing TI for more than three months with those who had been providing services for less than three months, and a significant difference in the confidence of the full data set of TI participants compared with participants who provided in-person services, additional analyses were completed to determine if there was difference in confidence between TI participants with more than three months' experience

and participants who provided in-person services. Due to a high Cronbach's alpha of .85, the items were sum-scored to create a continuous outcome. Independent sample *t*-tests were used to examine the confidence of the providers based on providing services in person compared to those who provided TI services for more than three months. The results showed there was not a significant difference in confidence for providers who provided TI services for more than three months ( $M = 19.95$ )

compared to those who provided in-person services ( $M = 19.71$ ), such that those who provided TI services for more than three months had the same amount of confidence as those who provided in-person services ( $t = -0.25, p = .81$ ).

### Providers' Views of Tele-Intervention Services

The survey queried the 123 respondents who provided TI services on their perceptions of TI delivery as compared with traditional in-person delivery in areas of effectiveness, convenience, provider skill, frequency of visits, and the ability to promote confidence in parents. Response options were *definitely yes*, *probably yes*, *probably no*, *definitely no*, and *not sure*. As shown in Figure 3, the majority of respondents indicated *definitely yes* or *probably yes* that TI services were analogous to in-person services in each inquiry area. For example, 94% ( $n = 115$ ) of respondents reported *definitely yes* or *probably yes* that TI facilitated services with providers who had specialized skills or expertise, and 87% ( $n = 107$ ) and 70% ( $n = 85$ ) reported *definitely yes* or *probably yes* that TI services were as convenient and effective, respectively, as in-person services. Further, 80% ( $n = 98$ ) of respondents reported *definitely yes* or *probably yes* that the TI model offered services more frequently than would be available with in-person services and 85% (104) of respondents believed TI could effectively promote confidence in parents to facilitate their child's language and communication development. Also shown in Figure 3, stratified data showed views of providers with more than three months of TI experience were descriptively more favorable than those with less than three months of TI experience. The internal consistency of the scale was evaluated using Cronbach's alpha. The scale reached an alpha of .80 so the items were sum-scored to create a continuous outcome. Independent sample  $t$ -tests were used to examine the scale based on providing TI services for less than three months or more than three months. The results showed a significant difference in favorability for participants who provided TI services for more than three months ( $M = 22.19$ ) compared to those who provided services for less than three months ( $M = 20.05$ ), such that those who provided TI services for more than three months reported higher favorability ratings than those who provided services for less than three months ( $t = -3.17, p < .01$ ).

In response to the question "How do you feel about providing TI services?" 28% ( $n = 34$ ) and 47% ( $n = 58$ ) of respondents reported feeling *very positive* or *mostly positive*. When stratified according to more than or less than three months' experience, 58% of 42 respondents with more than three months of TI experience ( $n = 24$ ) reported feeling *very positive* and 38% ( $n = 16$ ) reported feeling *mostly positive* about providing TI services. In contrast, just 12% of 81 respondents with less than three months of TI experience ( $n = 10$ ) reported feeling *very positive* and 52% ( $n = 42$ ) reported feeling *mostly positive* about providing TI services. See Figure 4 for all percentages.

### Open-Ended Responses

Seventeen (12%) of 144 respondents provided an open-ended comment. Although the relatively small number of comments were not conducive to a meaningful content analysis, they were reflective of various nuances related to TI service delivery and more than half of the comments made an explicit reference to the Covid-19 pandemic and the unexpected shift to virtual services. For example, representative participant responses included:

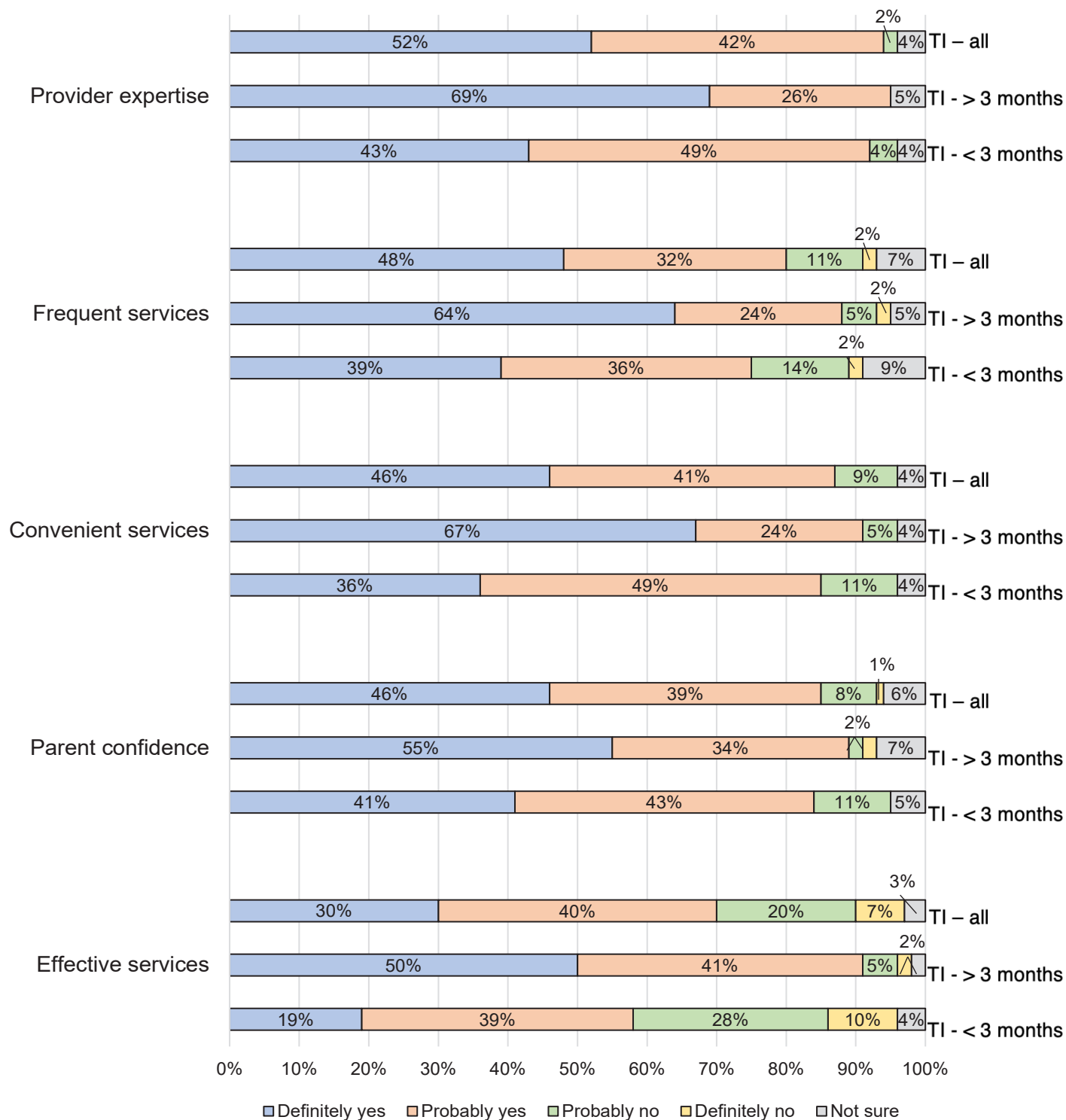
- *I definitely see the value in Tele-intervention. It's just been a challenge having been thrust into it. With proper preparation, materials, etc.,*
- *I think it would be great. I see a huge variety of skills in delivering telehealth among service providers. One family receives a much different service than another in bias, technical skills, and deaf ed supports.*
- *I have had success with tele-intervention but more success with in person services to families.*
- *I have been doing this since the COVID-19 pandemic, but after this I want to keep it part of my regular practice.*
- *Tele-intervention has been found to be very beneficial for most families in our state and now our Part C coordinator is advocating to continue.*

### Discussion

Although the primary purpose of the present study was to explore parent and provider perceptions of TI services, the intersect of the Covid-19 pandemic and the survey release offered a unique opportunity to evaluate perceptions with an atypically large data set of TI providers for the DHH who had less than three months' experience as compared with perceptions of more experienced providers. Because the survey was developed and approved prior to the realization of the scope of the pandemic impact, the survey did not query if the provider was employed in an established TI program and trained in TI delivery or if the virtual services were unexpected and due to the pandemic response. However, with the data collection period occurring simultaneously with school closures due to the pandemic, March 2020 through May 2020, and the large number of respondents with less than three months of experience as compared with the number of respondents with more than three months of experience, it is reasonable to assume a large majority likely were unprepared for the virtual model. As educational professionals faced a sudden and unexpected need to provide virtual services, it became clear not all professional and parent experiences were the same. These potential disparities have prompted local and national inquiry to identify procedures and resources that could facilitate effective and equitable large-scale virtual or hybrid service delivery should the need continue or arise again in the future. As a survey study, it was not possible, nor consistent, with the study design to obtain narrative details of each participant's TI services. However, survey findings demonstrated providers with at least three

**Figure 3**

*Provider Views of Tele-Intervention (TI) Services: All data (n = 123); TI > 3 Months (n = 42), TI < 3 months (n = 81)*

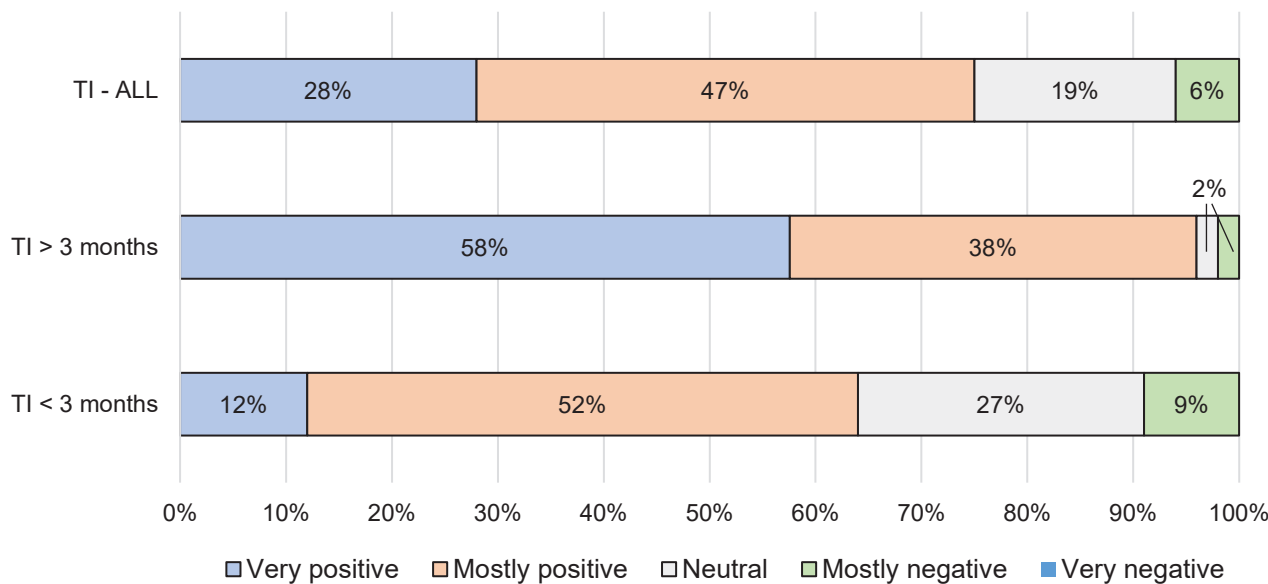


months' experience and/or who provided services within an established TI program, as opposed to inexperienced providers or those delivering unexpected TI services, made a difference to provider confidence and perception of the efficacy of TI. Providers seeking to begin or increase their TI services, but who feel ambivalence in the efficacy of the delivery model or unsure of their own expertise, may consider the overall positive study findings of participants with experience in the TI model. To facilitate confidence and

effectiveness, providers may also consider seeking advanced training to increase knowledge and skills in TI delivery. Study findings also highlighted a range of service delivery implications worthy of consideration for both TI and in-person providers of all experience levels. These service delivery implications included establishing the parent-professional partnership, using a parent coaching model, guiding goal-oriented services, supporting hearing technology, and facilitating positive session management strategies.

**Figure 4**

Provider Responses: "How Do You Feel About Providing Tele-Intervention (TI) Services?" All data (n = 123); TI > 3 Months (n = 42). TI < 3 months (n = 81)



### Parent-Professional Partnerships

As emphasized by multiple national organizations; such as Division for Early Childhood (DEC), JCIH, the Alexander Graham Bell Association, and the Early Childhood Technical Assistance Center (ECTA); an essential priority when serving young children who are DHH is establishing a strong connection and partnership with parents, caregivers, and families. This partnership must be founded on trust and respect, guided by the parents' priorities for their child (DesJardin, 2009; DEC, 2014; Moeller et al., 2013). Seventy-four percent of TI providers with more than three months of TI experience and 81% of in-person providers reported they felt *very confident* in the partnerships they had established with the families they served. This finding illustrates the parent partnership priority most providers feel as a foundational component of their services. With just 48% of TI providers with less than three months of TI experience reporting they felt *very confident* in the parent-professional relationship, these findings must be considered in the context of the difficult extraneous circumstances of the Covid-19 pandemic at the time of survey completion and the sudden transition to a virtual service delivery, not a reflection of professional priority nor a question of feasibility with a virtual model of service delivery.

The importance of providers developing a trusting relationship with families was recognized as a priority by the ECTA center, offering resources to all providers regardless of their level of experience. The ECTA center is funded by a cooperative agreement with the Department of Education's Office of Special Education Programs and provides technical assistance to state agencies to develop high quality early intervention and preschool special education systems. In partnership with The Center for IDEA Early Childhood Data Systems (DaSy), the ECTA center developed an interactive, four-part web

broadcast series aimed at helping providers to develop trusting relationships with families (ECTA, 2017). In the broadcast series, the ECTA center emphasizes that the parent-professional partnership lays the foundation for achieving the long-term intended outcomes for the children they serve and provides evidence-based information and materials to support practices that develop parent-professional trust. In addition to the recorded series, written materials and resources are provided.

### Parent Coaching

Consistent with parent-professional partnership priorities, an effective parent coaching model can provide support and guidance to parents in facilitating their child's language and communication goals across environments and within daily routines. Although TI is particularly conducive to a coaching model since the family and the provider are not in the same physical space, the recommendations of using parent coaching apply equally to both TI and in-person services. With 50–66% of parents reporting the provider *nearly always* coached the parents during an in-person or TI session (see parent survey findings within Nelson et al., 2022 in this monograph) and 52–58% of providers reporting they *nearly always* coached families, this meant more than a third to half of families did not *nearly always* receive parent coaching as a primary component of their services. Furthermore, the definition of what it means to provide or receive parent coaching in actual implementation may not be universally interpreted. Further research to explore detailed intervention methods and activities, how best practice parent coaching recommendations are applied, and documented child language and communication outcomes as a product of specific parent coaching strategies would provide substantial contributions to both TI and in-person service delivery practices.



## Goal-Oriented Services

As reported by the ECTA center and the DEC Recommended Practices (2014), families must receive appropriate supports to understand their child's strengths, abilities, and needs to facilitate optimal child outcomes. As parents of children who are DHH assume their role as their child's most important teachers, most rely on the expertise of the provider to guide them in the scope and sequence of language acquisition. Parents may be wholly invested in promoting their child's language growth throughout the day and within all family activities, but cannot be optimally effective if they do not have clarity as to their child's goals, what they are trying to achieve, and why (Kahn et al., 2009; Nelson et al., 2020; Rush & Shelden, 2019). They must feel confident in how to create a learning environment for their child and then recognize when the child is or is not making expected progress. As shown in the Parent survey (Nelson et al., 2022), many parents lacked confidence across these essential service delivery areas. This may be a result of the finding that fewer than half of provider respondents felt *very confident* in guiding language development and in creating a learning environment. Advanced training and supports for providers could facilitate provider confidence and increase parents' knowledge and skills to support optimal child growth and language priorities.

## Hearing Technology

It is common professional knowledge that consistent access to sound through the use of hearing technology is essential to the development of listening and spoken language (Walker et al., 2015). Many children who are developing and using sign language also use hearing technology. As the value of using hearing technology is emphasized to parents, it can provide an added layer of stress if parents are unsure about the day-to-day management of the technology. Provider support within scope of practice to assist parents in managing and troubleshooting their child's hearing technology (e.g., hearing aids, cochlear implants, assistive listening devices) can offer invaluable reassurance and guidance. Supporting families in hearing technology management is a professional development priority providers should consider as fewer than one third of TI and in-person providers reported they felt *very confident* in assisting parents this way. Providers can offer essential support to parents when they understand basic hearing technology function, how to troubleshoot various devices, or when unsure, the resources to find the needed information (Muñoz et al., 2017). Providers should be ready to guide parents in performing daily listening checks, visual inspections of their child's devices, and discussions regarding common device challenges. In a TI session, providers should feel confident in using a variety of virtual tools and resources (e.g., webcams, screen-sharing, simulation videos, online device manuals) to teach and assist parents in troubleshooting their child's hearing devices as issues occur. Although audiologists are central to the child's collaborative team, TI and in-person providers can facilitate ongoing guidance in technology

use, including knowing when to consult with or refer parents to their child's audiologist.

## Session Management

Parent coaching sessions with young children can be fun, challenging, humorous, and certainly unpredictable, and parents may benefit from productive and non-judgmental discussions regarding ways to support or manage their child's behavior during the sessions. Acknowledging that child behavior may be more challenging when in a virtual session, TI providers can prepare parents by sharing their expectations about a typical session and providing suggestions for managing common challenges. Although challenging behaviors can occur during TI or in-person services despite the best planning, facilitating sessions that involve activities within the families' typical routines can help maintain child engagement and can develop parents' knowledge and confidence in promoting their child's language goals throughout the day. For example, a provider may have planned to suggest using the child's favorite farm toys during the session. Yet upon arriving at the home or connecting virtually, they find the child prefers to stay outside and challenging behaviors are sure to ensue should the provider or parent insist on the child coming inside. Redirecting the session to include digging in the dirt or watering the flowers can minimize difficult behaviors and can model to parents the many activities in which their child's goals can be supported and emphasized. Consistent with a team approach, children who show extreme or alarming behaviors may benefit from an evaluation with a behavior specialist.

## Study Limitations

The primary study focus was to explore perceptions of professionals who provide TI services, with responses from professionals who provided in-person services included for context. However, study findings would have been strengthened had there been more responses from professionals who provided in-person services, with greater symmetry in group sizes. Professionals who provided both TI and in-person services had the option of completing the survey twice. Due to survey anonymity, this resulted in the inability to identify the number of survey respondents who may have completed the survey twice and negated the ability to consider disaggregated findings from professionals with this unique view. Although the timing of the survey data collection period directly corresponded with the onset of the Covid-19 pandemic and the discontinuation of many in-person services, it was not possible to conclusively discern if or how the pandemic impacted participant responses. The homogeneity of responses, particularly as related to race and gender, are a potential limitation of the generalizability of results in describing professionals' experiences with TI or in-person services. These findings were consistent with previous and ongoing concerns raised by the U.S. Department of Education (2016) and the over-representation of Caucasian providers relative to the ethnicities and cultures of the children they serve. There are many complexities associated with family-centered services for children who

are DHH and their families and many issues and potential concerns were not addressed in the present study, thus highlighting the need to further explore professionals' experiences and recommendations for both TI and in-person services.

### Conclusions

With 95% of respondents who had been providing TI services for more than three months feeling *very* or *mostly positive* about TI services, study findings revealed overall positive professional views of the TI delivery model. The timing of the survey release, and the direct correlation with school closures and the onset of sudden and unexpected virtual service delivery, highlighted many of the challenges professionals faced during this difficult period. Although it was not possible to discern the details and experiences of each study respondent relative to the impact of the pandemic, it was clear that professionals with experience in TI services had more favorable perceptions than those with less experience. Findings also highlighted areas where professionals could increase their knowledge and confidence to better support parents in both TI and in-person settings. For example, providers must be knowledgeable in guiding goal development and helping parents recognize how to promote and implement their child's goals within their family's daily routines. As providers gain skills and knowledge across domains of age-appropriate language developmental milestones, they can demonstrate effective strategies for parents, ensure parents have a strong understanding of their child's goals, and help parents recognize when strategies are working well or when a different approach may be needed. Providers who lack confidence in areas of TI service delivery may benefit from advanced training, which may, in turn, facilitate parents' skills and confidence in optimizing their child's language development. The results of this study are timely given the expanding role TI is playing in the field of Deaf education. Tele-intervention may be an increasingly preferred mode of delivery for families with young children and can serve as a powerful platform to ensure families receive appropriate and timely services from a provider with expertise in their child's first language. The long-term impact of the Covid-19 pandemic to future service delivery patterns is unknown. However, some level of continued TI delivery appears imminent as educational agencies identify options to meet future predictable and unpredictable scenarios. As new circumstances arise and new technologies and platforms emerge, it is important to understand the implications for parents and the range of supports they may require. Providers can have a profound impact on parents' knowledge, confidence, and skill as they promote family engagement and facilitate improved child outcomes.

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## A Review of Current Pediatric Tele-Audiology eHealth Platforms

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### Abstract

**Purpose:** The purpose of this study was to identify current pediatric tele-audiology hearing technology platforms for young children who are deaf or hard of hearing and their families.

**Method:** An exploratory, descriptive design was used to evaluate features of available pediatric tele-audiology platforms for parents and audiologists to implement for young children. The study explored internet resources including hearing industry websites, for information related to specific eHealth platform features designed to support pediatric hearing devices currently available to audiologists and families.

**Results:** Of the websites reviewed, only four major technology companies were found to have pediatric tele-audiology ready platforms designed to support young children and their families.

**Conclusions:** Tele-audiology technology platforms for young children are available but limited in comparison to what may be available to older children and adults. A need for more consistency across platforms was identified based on the inconsistent features observed in the available platforms that could be a hinderance to pediatric recipients of tele-audiology services. Future research directions to move eHealth applications forward and determine efficacy are discussed.

**Keywords:** children, deaf or hard of hearing, hearing aids, telehealth, audiology

**Acronyms:** DHH = deaf or hard of hearing; EHDl = early hearing detection and intervention; JCIH = Joint Committee on Infant Hearing

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Tele-audiology, or the implementation of audiological services via telehealth technologies, has increasingly become a growing means for improving access to audiology services for persons who are deaf or hard of hearing (DHH) worldwide. Over the last decade, professional position statements (American Academy of Audiology [AAA], 2021; Audiology Australia, 2020), clinical guidelines (American Speech-Language Hearing Association [ASHA], n.d.a; Cason & Cohn, 2014), expert opinions (Ballachanda, 2019; Montano et al., 2018), empirical reviews (Krumm, 2016; Muñoz et al., 2021; Swanepoel & Hall, 2010), training resources (e.g., National Center for Hearing Assessment and Management [NCHAM], 2021), and a myriad of online and professional publications have advocated for its wide implementation and application in audiology. Although historically reserved for populations with restricted or limited access to in-person services, advances in telecommunications have permitted tele-audiology services today to serve the needs of all patients regardless of location or proximity to an audiology clinic. Since the first iterations of tele-audiology services were developed to provide real-time assessment

of auditory thresholds via the internet (Givens et al., 2003; Givens & Elangovan, 2003), tele-audiology options have greatly expanded for both evaluation and treatment opportunities for children and adults who are DHH.

One advancement in tele-audiology is that of eHealth platforms. As defined by the World Health Organization (WHO, 2021):

e-Health is the cost-effective and secure use of information and communication technologies (ICT) in support of health and health-related fields – [encompassing] multiple interventions, including telehealth, telemedicine, mobile health (mHealth), electronic medical or health records (eMR/eHR), big data, wearables, and even artificial intelligence. (<https://www.who.int/westernpacific/activities/using-e-health-and-information-technology-to-improve-health>)

As applied in multiple health professions, electronic communications link patient owned technologies to clinic managed technologies, creating new opportunities for (a) real-time synchronous videoconference appointments



in patient homes, (b) asynchronous and secure options for exchanging health information over cloud-based web portals before or between appointments, and (c) for online social networking and peer support group development. An interest in eHealth applications has been recognized in audiology by both patients and hearing care professionals (Meyer & Hickson, 2021). In addition, at least five of the leading global hearing technology companies (Sonova, Demant, WS Audiology, Starkey, and GN Hearing), have developed remote eHealth platforms for at least one or more of their product lines in recent years to meet the growing demand of eHealth related tele-audiology services (Copithorne, 2021). Despite the rapid growth in these offerings, it is unclear whether these platforms are well suited to support the needs of young children who are DHH and their families.

The current global emergency greatly limited access to pediatric audiology centers, creating challenges for timely monitoring, management, and support of pediatric patients in meeting early hearing detection and intervention (EHDI) goals set forth by the Joint Committee on Infant Hearing (JCIH, 2019) and professional pediatric practice guidelines (ASHA, n.d.b). Despite growing interest in pediatric tele-audiology applications, variability in service modalities and perceptions of audiologists surrounding tele-audiology have been identified in the tele-audiology literature (Govender & Mars, 2017; Krumm, 2016; McCarthy et al., 2018; Muñoz et al., 2021; Swanepoel & Hall, 2010). Comprehensive pediatric tele-audiology services are likewise scarce throughout the profession (Eikelboom & Swanepoel, 2016). Traditionally, in-person pediatric audiology care is the standard approach of practice in developed countries for evaluating auditory function and monitoring hearing technology to ensure optimal audibility. Limitations to administering eHealth services comprehensively, such as the inability to complete real-ear probe microphone verification measures, simulated test box measures, acoustic feedback measurements/management, and physical device and earmold troubleshooting/management arguably may be reasons why they have not yet been widely adopted by pediatric audiologists.

Studies surrounding pediatric tele-audiology applications for young children who are DHH (birth to 5 years) have grown in the areas of infant and pediatric hearing screenings (Ameyaw et al., 2019; Botasso et al., 2015; Krumm et al., 2005; Krumm et al., 2007; Krumm et al., 2008; ; Skarzyński et al., 2016; Stuart, 2016), infant diagnostic hearing assessments (Stuart, 2016; Williams et al., 2020), pediatric cochlear implant mapping (Goehring & Hughes, 2017; Hughes et al., 2016; Hughes, Goehring et al., 2018; Hughes, Sevier et al., 2018) and pediatric hearing aid management (Muñoz et al., 2017; Neumann et al., 2021). Of all these studies, only one (Neumann et al., 2021) has explored the use of a manufacturer developed eHealth platform with young children and their families as the target population. In this study, Neumann and colleagues (2021) incorporated a repeated measures design, sampling a group of audiologists and parents of

children who are DHH (age 5–17) to gather information about the usability of the remote eHealth platform for pediatric patients. Three scheduled eHealth platform appointments were completed with the parent and child using a mobile smart device application called the myPhonak app, that was compatible with an adult hearing aid adapted for pediatric use. Parents and audiologists were asked subjectively to report their experiences after these sessions regarding the usability, convenience, confidence, and satisfaction of remote services provided while using the app. After the third visit, most of the participating parents ( $n = 18$ ) and audiologists ( $n = 18$ ) reported they were either extremely likely or very likely to use remote services again in the future. In addition, more than half of the parents (10/18) reported they preferred a remote support visit over a face to face or hybrid visit.

Although a rapid growth in research is encouraging, it is anticipated that pediatric applications for eHealth will continue to evolve as new evidence becomes available and other legal and logistical eHealth clearances are granted. As the number of individuals and families seeking tele-audiology services increases, the need for access to appropriate evidence-based tele-services from audiologists and multidisciplinary teams will continue to grow as well. Given increased numbers of families and children who could benefit from the expansion of pediatric tele-audiology services, and a lack of well-defined studies on children using them, the need for a concise clinical guide to existing commercially available platforms and their pediatric applications was identified. The purpose of this study was to provide a review on current tele-audiology eHealth platforms and their application for young children who are DHH and their families.

## Method

Hearing industry websites in the United States with published information related to eHealth or remote care platforms were included in this review, provided the scope of their website addressed topics related to tele-audiology and possible pediatric applications for young children age birth to 5 years. In an effort to provide a concise reference for pediatric audiologists in the United States who provide services to young children who are DHH, only the six major hearing aid brands (Phonak, Oticon, ReSound, Widex, Signia, and Starkey), the three major makers of bone anchored (i.e., osseointegrated implant) hearing systems (Cochlear, MED EL, and Oticon Medical), and the three major cochlear implant company websites (Advanced Bionics, Cochlear, and MED EL) in the United States were reviewed for this study. Company websites were accessed and reviewed in November and December 2021.

## Procedures

An initial search of hearing aid manufacturer websites known to have developed eHealth platforms was completed, using listings from published resources made available online by NCHAM and Copithorne (2021). See Appendix for full list of URL hyperlinks.

Other implantable technology manufacturer websites, hearing health consumer focused sites, and websites that included information related to eHealth features in hearing technology for children who are DHH in the United States were also reviewed using a Google Chrome search engine. Only one news website was found from this latter search, from MedicalNewsToday.com, that yielded recommendations and hyperlinks of where to potentially consider ordering pediatric hearing aids online.

During the review, it was noted if information about specific pediatric line products or eHealth tele-audiology platforms was not available for a given manufacturer. eHealth design features deemed important for families and pediatric audiologists seeking information about eHealth platforms were identified and adapted from two online resources (NCHAM, 2021; Copithorne, 2021). These were adapted further in comparing them to evidence-based recommendations for the selection and fitting of pediatric amplification on young children (AAA, 2013). In total, twelve important pediatric features were identified for use in the review of existing eHealth platforms (see Figure 1).

**Figure 1**  
*Twelve eHealth Platform Features Deemed Important for Young Children and Families*

Telecommunication Support	Feedback Measurement
Telecommunication Feedback	Manual/Volume Controls
Additional Remote Accessory Requirements	Firmware Upgrades
Remote Programming/Fine Tuning Features	Datalogging
Remote Battery Status Monitoring	Apple Operating System (iOS) Compatibility
Remote Diagnosis of Hardware Issues	Android Operating System (OS) Compatibility

Analysis of available pediatric hearing technologies and compatible eHealth platforms found online were explored using a Microsoft Excel Spreadsheet. Hearing technologies deemed appropriate for young children (i.e., behind-the-ear hearing aids, bone anchored hearing systems processors, and cochlear implant processors) were analyzed by manufacturer, and a grouping of the findings of select eHealth options were described based on their pediatric design features.

**Results**

A total of 4 eHealth platforms (four of the six hearing aid companies) were found to have potential capabilities of being used with young children age birth to five years, and all were available via smart device (phone/tablet) online software applications. In the smart device application webstores (i.e., Apple App Store, Google Play Store), the four tele-audiology eHealth platforms identified were advertised with age/content ratings for users age 4 and older for Apple iOS/

iPadOS users, and all ages (i.e., “Everyone”) for Android OS users. Apps found with ratings for older age groups on the Apple store were excluded from the review, including the Starkey Thrive app (for users ≥ 12 years), the Signia app (for users ≥ 17 years), and the Oticon Medical Ponto Care™ app (for users ≥ 12 years), due to these ratings indicating a better application with children older than the younger targeted population (birth to five years). As of the time of this study, the Cochlear Remote Check system (Cochlear Limited, 2021) was listed as having approval for their newest cochlear implant processor; however, it was not yet available to access for review. Likely it would have been excluded due to it being advertised for users ≥ 6 years. Only one of the six hearing aid manufacturers (Phonak) was found to have a pediatric dedicated platform (myPhonak Junior app) separate from their app for older patients (myPhonak app, rated for users ≥ 17 years). See Table 1 for summary information related to each connecting platform or smart device app.

**Pediatric Design Features**

A summary of important pediatric design features important for eHealth platforms reviewed is provided in Table 2. Similarities across the platforms were identified in communication support, synchronous remote programming, datalogging, and smart device compatibility; however, ReSound and Widex were found to have slightly more features available in their eHealth platform apps compared to Phonak and Oticon. Resound and Widex both include features such as being able to remotely diagnose hearing aid hardware issues, provide remote feedback measurements for troublesome feedback issues, and send remote firmware upgrades when warranted.

**Discussion**

The primary purpose of this review was to identify existing eHealth platforms for hearing devices that may be used with young children, age birth to five years. This review identified four platforms that may be deemed eligible for this population, based on the age ratings of the apps in the Apple App Store (four years and older) and Google Play Store (all ages). The strength of this review is that it provides pediatric audiologists and clinical researchers with up-to-date information about available eHealth platforms that are freely accessible and available to young children who are DHH and their families. Many features of these platforms appear to be well suited to meet parent and audiologist pediatric amplification monitoring needs.

Despite the benefits of what this review found, this article also highlights there is limited evidence on the efficacy of eHealth platform use for young children who are DHH. An interesting finding is that the pediatric features from the two hearing aid manufacturers with pediatric line products were not as comprehensive in their eHealth platforms compared to the other non-pediatric line product platforms. Also evident from this review was the variety of other manufacturer developed eHealth platforms (i.e., Starkey, Signia, Cochlear, and Oticon Medical) that were designed and rated for older child (≥ 6 years) and adult populations, suggesting a lack of evidence to establish any efficacy of those platforms with young children at present.

**Table 1**

Summary of eHealth Platforms and Pediatric Hearing Devices Available as of December 2021

eHealth Platform	Manufacturer Compatible Pediatric Device(s)	Name of Mobile App (OS)	Cost
<b>Phonak Remote Support</b>	Phonak Sky M, Sky Link M, Naida P UP	myPhonak Junior (iOS, Android)	Free
<b>Oticon RemoteCare</b>	Oticon Xceed Play, Opn Play	Oticon ON (iOS) Oticon Remote Care (Android)	Free
<b>ReSound Assist Live</b>	ReSound LiNX Quattro, LiNX 3D, ENZO Q, ENZO 3D, Key	ReSound Smart 3D (iOS, Android)	Free
<b>Widex Remote Care</b>	Widex* MOMENT, EVOKE, BEYOND, UNIQUE, DREAM	Widex Remote Care (iOS, Android)	Free

Note: \*indicates a non-pediatric line specific device.

**Table 2**

Summary of Pediatric Design Features Available in Reviewed eHealth Platforms

	Phonak	Oticon	ReSound	Widex
Telecommunication Support	✓	✓	✓	✓
Telecommunication Feedback	✓	-	✓	-
Additional Remote Accessory Not Required	✓	✓	✓	-
Synchronous Remote Programming	✓	✓	✓	✓
Remote Battery Status	✓	✓*	✓*	✓
Remote Diagnosis	-	-	-	✓
Remote Feedback Measurement	-	-	✓	✓
Manual/Volume Controls	✓	✓†	✓	✓†
Remote Firmware Upgrades	-	-	✓	✓
Datalogging	✓	✓	✓	✓
iOS Compatible	✓	✓	✓	✓
Android OS Compatible	✓	✓	✓	✓

Note: \*indicates rechargeable models only.

†indicates a separate app is required.

As mobile technologies are becoming the mainstay worldwide, and as app/software based learning programs improve, it is critical that patients of every age, including young children, are provided with appropriate and timely access to the available features of eHealth platforms to enhance and support intervention goals. More research is needed to determine what aspects of these platforms may be best suited for pediatric audiologists to incorporate into their regular monitoring practices. The importance of EHDl practices is well-established. The reality of advanced features eHealth has to offer, such as datalogging, synchronous fitting and troubleshooting, and private telecommunication health lines, is consistent with patient, family, and clinician interests alike (Neumann et al., 2021).

Now is the time to continue advancing these technologies to reach all families where possible.

### Pediatric Tele-Audiology Resources

The purpose of this article was not to advocate that eHealth platforms are the only type of tele-audiology service that should be incorporated with young children. The reader may be interested in other aspects of tele-audiology they would like to implement in their practice, and for a more sequential guide on how to set up pediatric tele-audiology services for young children, the reader is encouraged to study NCHAM's Resource Guide Supporting Tele-audiology (<https://infanthearing.org/teleaudiology/index.html>; NCHAM, 2021) developed by



the NCHAM Tele-Audiology Steering Committee. The processes outlined in this online resource will provide a greater depth of practical information.

### Limitations and Future Directions

Although all families with young children who are DHH may benefit from some level of tele-audiology service delivery, it is important to acknowledge that tele-audiology services, including the use of eHealth platforms, may not be appropriate in all circumstances or for all pediatric patients. Pediatric audiologists work together with other professionals to evaluate outcomes and to determine if tele-audiology services will likely result in improved hearing and listening outcomes for each child. It is also important to remember that local, state, national, and international regulatory requirements surrounding telepractice must be adhered to prior to initiating any eHealth services, despite their free availability to consumers and clinicians alike. It is the responsibility of each pediatric audiologist and hearing care professional to verify the legal policies and requirements in place regarding the provision of telepractice prior to exploring the potential of meeting patients' needs through eHealth platforms and service modalities.

This review was developed to serve as a general framework, offering audiologists access to streamlined, evidence-based information to help make appropriate clinical decisions for young children who are DHH and their families who may seek tele-audiology services and eHealth platform options specifically. It should be noted, however, that pediatric tele-audiology research faces challenges in providing standards that can be applied across all young children and their families. Due to the critical developmental years where language develops, there is often limited opportunities to conduct controlled research with children birth to 5 years of age, including in areas of tele-audiology. Furthermore, the controlled research available with young children is continually limited by factors such as sample sizes, a wide range of interventions and communication modalities, accessibility to tele-audiology services, hearing technology options, and complex case histories. Therefore, it is difficult to apply evidence across all or even a larger subset of young children who are recipients of pediatric tele-audiology. It is imperative that pediatric audiologists consider the evidence alongside the needs of each child and family they serve to provide best clinical care possible.

Although new evidence is emerging in pediatric tele-audiology, particularly on the heels of the global COVID-19 pandemic, it was not considered necessary in the current document to explore every experimental application of tele-audiology with pediatric populations. Therefore, the authors acknowledge the limitations of the current document not necessarily reviewing every potential eHealth platform or service delivery modality that may incorporate similar eHealth principles. Future guidelines and revisions of this review should be developed as more empirical evidence becomes available to incorporate more rigorous and updated reviews of empirical literature surrounding the use and application of eHealth platforms in pediatric audiology.

### Conclusion

The present study revealed that eHealth platforms currently available with compatible hearing technologies might benefit children who are DHH and their families. There are several available platforms at no cost to patients that indeed have many features that would benefit both families and audiologists alike for different age groups. This review highlighted that there is a dire need for more research to establish efficacy measures for the application of eHealth platforms across the lifespan, and across more types of hearing technology for young children than just hearing aids. This review can provide the assistance needed by pediatric audiologists and families of children who are DHH to make device selections if specific features of eHealth platforms are desired. In addition, this review might also provide a knowledge base on which pediatric hearing care providers and clinical researchers may build further tele-audiology intervention outcome studies.

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## Appendix

Websites Accessed for the Review in November and December 2021

Source	Website URL
<b>Hearing Tracker</b>	<ul style="list-style-type: none"> <li>• <a href="https://www.hearingtracker.com/services/remote-care">https://www.hearingtracker.com/services/remote-care</a></li> </ul>
Google Sheet of comprehensive brand comparison	<ul style="list-style-type: none"> <li>• <a href="https://docs.google.com/spreadsheets/d/1osFr44SNiPmZFALI5oBY-XDJIVosZyRKYPNiIjUmz5s/edit">https://docs.google.com/spreadsheets/d/1osFr44SNiPmZFALI5oBY-XDJIVosZyRKYPNiIjUmz5s/edit</a></li> </ul>
<b>National Center for Hearing Assessment and Management's TeleAudiology Resource Guide</b>	<ul style="list-style-type: none"> <li>• <a href="https://infanthearing.org/teleaudiology/index.html">https://infanthearing.org/teleaudiology/index.html</a></li> </ul>
Excel spreadsheet provided to NCHAM Courtesy of the Canadian Hearing Society	<ul style="list-style-type: none"> <li>• <a href="https://infanthearing.org/teleaudiology/docs/Remote%20Hearing%20Aid%20Programming.xlsx">https://infanthearing.org/teleaudiology/docs/Remote%20Hearing%20Aid%20Programming.xlsx</a></li> </ul>
<b>Major Hearing Aid Manufacturer Websites</b>	
Phonak	<ul style="list-style-type: none"> <li>• <a href="https://www.phonakpro.com/us/en/products/hearing-aids/sky-marvel/overview-sky-marvel.html">https://www.phonakpro.com/us/en/products/hearing-aids/sky-marvel/overview-sky-marvel.html</a></li> <li>• <a href="https://www.phonak.com/us/en/hearing-aids/apps/myphonak-junior-app.html">https://www.phonak.com/us/en/hearing-aids/apps/myphonak-junior-app.html</a></li> </ul>
Oticon	<ul style="list-style-type: none"> <li>• <a href="https://www.oticon.com/professionals/pediatric">https://www.oticon.com/professionals/pediatric</a></li> <li>• <a href="https://www.oticon.com/support/remote-care">https://www.oticon.com/support/remote-care</a></li> </ul>
ReSound	<ul style="list-style-type: none"> <li>• <a href="https://www.resound.com/en-us/hearing-loss/children">https://www.resound.com/en-us/hearing-loss/children</a></li> <li>• <a href="https://www.resound.com/en-us/hearing-aids/apps/smart-3d">https://www.resound.com/en-us/hearing-aids/apps/smart-3d</a></li> </ul>
Widex	<ul style="list-style-type: none"> <li>• <a href="https://www.widex.pro/en/products/remote-hearing-aid-fitting">https://www.widex.pro/en/products/remote-hearing-aid-fitting</a></li> </ul>
Signia	<ul style="list-style-type: none"> <li>• <a href="https://www.signiausa.com/signia-app/">https://www.signiausa.com/signia-app/</a></li> </ul>
Starkey	<ul style="list-style-type: none"> <li>• <a href="https://www.starkey.com/hearing-aids-for-children">https://www.starkey.com/hearing-aids-for-children</a></li> <li>• <a href="https://www.starkey.com/hearing-aids/apps/thrive-hearing-control">https://www.starkey.com/hearing-aids/apps/thrive-hearing-control</a></li> </ul>
<b>Major Hearing Implantable Technology Company Websites</b>	
Advanced Bionics	<ul style="list-style-type: none"> <li>• <a href="https://www.advancedbionics.com/us/en/home/solutions/marvel/kids.html">https://www.advancedbionics.com/us/en/home/solutions/marvel/kids.html</a></li> </ul>
Cochlear	<ul style="list-style-type: none"> <li>• <a href="https://www.cochlear.com/us/en/home/products-and-accessories">https://www.cochlear.com/us/en/home/products-and-accessories</a></li> <li>• <a href="https://www.cochlear.com/us/en/professionals/connected-care/remote-care">https://www.cochlear.com/us/en/professionals/connected-care/remote-care</a></li> <li>• <a href="https://www.medel.com/en-us/hearing-solutions">https://www.medel.com/en-us/hearing-solutions</a></li> </ul>
MED EL	<ul style="list-style-type: none"> <li>• <a href="https://blog.medel.pro/remote-care-telemedicine-digital-resources/">https://blog.medel.pro/remote-care-telemedicine-digital-resources/</a></li> </ul>
Oticon Medical	<ul style="list-style-type: none"> <li>• <a href="https://www.oticonmedical.com/us/support/professionals/bone-conduction">https://www.oticonmedical.com/us/support/professionals/bone-conduction</a></li> <li>• <a href="https://www.oticonmedical.com/us/app/ponto-care/aftercare">https://www.oticonmedical.com/us/app/ponto-care/aftercare</a></li> <li>• <a href="https://www.oticonmedical.com/about-oticon-medical/latest-news/corporate-news-articles/2021/introducing-ponto-5-family">https://www.oticonmedical.com/about-oticon-medical/latest-news/corporate-news-articles/2021/introducing-ponto-5-family</a></li> </ul>
<b>Oticon Medical Medical News Today Article</b>	<ul style="list-style-type: none"> <li>• <a href="https://www.medicalnewstoday.com/articles/best-hearing-aids-for-kids">https://www.medicalnewstoday.com/articles/best-hearing-aids-for-kids</a></li> </ul>

## Telepractice-Based Assessment of Children who are Deaf or Hard-of-Hearing: Focus on Family-Centered Practice

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### Abstract

Ongoing assessment and progress monitoring is considered best practice to serve children who are Deaf or Hard-of-Hearing (DHH), yet logistics related to provider shortages, distances between families, and illness make regular assessment difficult if not impossible. In the last ten years, telepractice has become a more commonly used service delivery model for serving children who are DHH and their families, however, many providers lack the training needed to adequately assess this population (Behl & Kahn, 2015). With explicit planning of the assessments and tools needed on both sides of the camera, providers can create a shared framework to collect the information necessary to create a family-centered, comprehensive assessment plan that empowers families to engage in collaborative decision-making needed to optimize the outcomes of their child. This paper outlines a tutorial of provider considerations to incorporate family-centered practices as a central aspect of assessment via telepractice and provides an example of how assessments can be administered with the use of technology.

**Keywords:** telepractice, family-centered, assessment, Deaf

**Acronyms:** CDI = MacArthur Bates Communication Development Inventory; DHH = deaf or hard of hearing, EHDl = Early Hearing Detection and Intervention; EI = Early Intervention; FOS = Family Outcomes Survey; RBM = routine-based model

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State Early Hearing Detection and Intervention (EHDI) systems have been successful in supporting newborn hearing screening and increasing early intervention enrollment rates after diagnosis of congenital hearing loss (Subbiah et al., 2018). However, systematic early assessment and intervention protocols for children who are Deaf or Hard-of-Hearing (DHH) still lag behind these identification systems. Assessment and intervention of children who are DHH is particularly challenging when families live in remote locations. Telepractice has gained momentum as a service delivery model over the last ten years as a way to address these challenges (Behl et al., 2017; Blaiser & Behl, 2016; Houston, 2019). However, with COVID protocols in 2020, the need for telepractice for assessment and intervention quickly went from a service delivery option to a service provision necessity. Although COVID protocols may change and allow face-to-face intervention to resume, it will be important to sustain telepractice efforts to provide comprehensive assessment of young children who are DHH in remote areas.

Telepractice not only offers equitable services to children who are DHH regardless of the presence of a local provider, it also epitomizes families as the center of early intervention. Family-centered practices are the foundation for early intervention programming and focus on families as collaborative partners and the experts on their child

(Bruder, 2000). The Joint Committee on Infant Hearing (JCIH) 2019 Position Statement outlines key aspects of family-centered care as strength-based, collaborative, and proactive (Dunst et al., 2007; Dunst & Dempsey, 2007; JCIH, 2019). In a family-centered approach, providers create a shared framework for assessment and intervention by collecting information from families through tools such as case history, interview, observations, and inventories. With this information, an intervention program can be developed to focus on the family's individual priorities, strengths, needs, and resources. Fortunately, families who have received early intervention services via telepractice feel more engaged and empowered in the early intervention process because they, instead of the provider, are in the "driver's seat" as a primary support for their child's growth and development (Behl et al., 2017; Blaiser et al., 2013; Estabrooks et al., 2020).

The use of telepractice to perform speech and language assessments in early childhood has been questioned by some early interventionists, service providers, and program administrators. However, recent studies have demonstrated consistent reliability, validity, and overall efficacy of pediatric speech and language assessment results when obtained through a telepractice service delivery model (Bernie, 2019; Sutherland et al., 2021; Taylor et al., 2014). Similarly, Manning et al. (2020) found

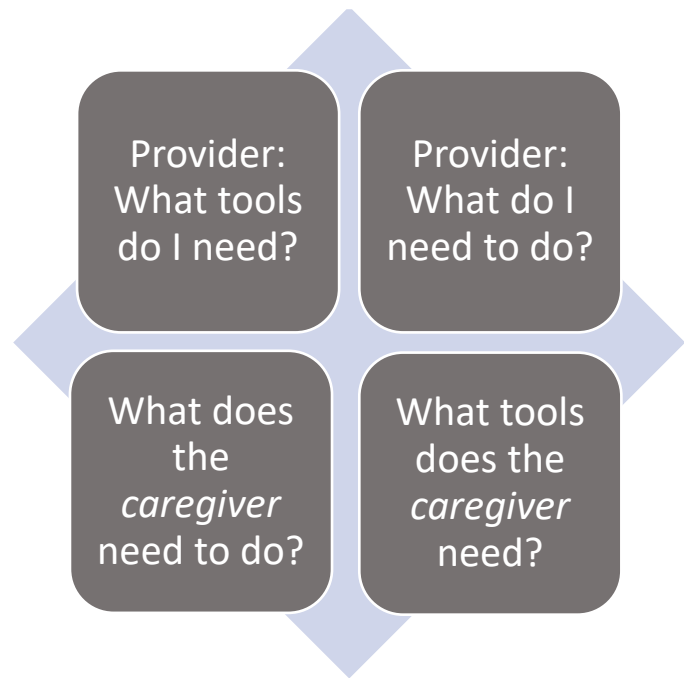


that language samples derived from parent-child play and collected via telepractice were feasible, reliable, and valid.

Successful assessment administration via telepractice requires systematic consideration of what needs to be done during an assessment as well as the tools that are needed to accomplish this goal. Telepractice is unique both in that there are different tools available than in-person models and that the provider needs to consider what is happening on the end-users (the family's) side of the camera. An important aspect of providing assessment via telepractice is understanding four primary considerations of assessment and potential modifications that need to be made as shown in Figure 1.

As shown in Table 1, key aspects of family-centered assessment of young children who are DHH include interview, observation/ language samples, and inventories. In telepractice, the provider is reliant on the caregiver's reports and interactions with the child as a key part of the collection of data and information. It is important for the provider to consider and be explicit with the caregiver about what needs to be done and to provide explanations why. Caregivers want, by nature, for their child to be successful in assessments and may have a difficult time not trying to help their child *perform*. Providers need to give caregivers clear expectations of what is needed in terms of time commitment and space for the different aspects of the assessment process.

**Figure 1**  
*Key Considerations for Assessment via Telepractice*



**Table 1**  
*Provider and Caregiver Considerations for Assessment via Telepractice*

Task	Description	Provider process	Caregiver process
Interview	Families provide information about their priorities, concerns, resources, and daily routines.	<ul style="list-style-type: none"> <li>Identify key instruments/questions</li> <li>Prepare family for the amount of time it will take</li> <li>Send questions in advance or electronically</li> </ul>	<ul style="list-style-type: none"> <li>Answer questions</li> <li>Schedule time (with less distractions to focus on the questions)</li> </ul>
Observation/Language sample	Providers observe and can record a family's routines and interactions in a natural environment.	<ul style="list-style-type: none"> <li>Identify what aspects of care provider is looking for (caregiver-child interaction, child auditory skills, child's use of sign/gestures)</li> <li>Inform family about the purpose of the observation/language sample</li> <li>Provide instructions for the sample (what type of routine, open-ended questions, wait time)</li> </ul>	<ul style="list-style-type: none"> <li>Identify a time/routine for observation</li> <li>Understand the purpose of the observation/ language sample</li> <li>Engage with child</li> </ul>
Inventory	Inventories provide an existing framework for collecting information in relation to a child's skills, family support.	<ul style="list-style-type: none"> <li>Identify the appropriate inventories</li> <li>Provide family with inventories</li> <li>Provide instructions, a time estimate, and clarifications as needed</li> </ul>	<ul style="list-style-type: none"> <li>Identify a family member to complete the inventories</li> <li>Complete the inventories</li> </ul>

## Tools

After the provider and caregiver have established what needs to be done, they can work together to effectively determine the tools that are needed (on both sides of the camera) to accomplish these goals (see Table 2). Providers need to assess the technology that is being used

and/or support that is needed on either side of the camera to successfully meet the assessment needs. Examples include recording of the session for review and analysis, interview and/or inventories sent ahead of time (either paper or electronically), and an opportunity to prepare the caregiver for the tasks of participating in assessment.

**Table 2**

*Provider and Parent Assessment Tools*

Task	Description	Provider needs/tools	Caregiver needs/tools
Interview	Families provide information about their priorities, concerns, resources, and daily routines.	<ul style="list-style-type: none"> <li>Identify instruments</li> <li>Share ahead of time</li> <li>Paper/electronic</li> </ul>	<ul style="list-style-type: none"> <li>Computer</li> <li>Scanner/Scanning app on technology</li> <li>Time</li> <li>Quiet space</li> </ul>
Observation/Language sample	Providers observe and can record a family's routines and interactions in a natural environment.	<ul style="list-style-type: none"> <li>Ability to record</li> <li>Visualized results</li> <li>Shared drives</li> <li>Shared drives</li> </ul>	<ul style="list-style-type: none"> <li>Camera/audio</li> </ul>
Inventory	Inventories provide an existing framework for collecting information in relation to a child's skills, family support.	<ul style="list-style-type: none"> <li>Paper-based or electronic-based</li> <li>Data visualized results</li> </ul>	<ul style="list-style-type: none"> <li>Computer/tablet/phone</li> <li>Time to complete</li> </ul>

Providers should discuss with the caregivers ahead of time the need for a quiet place with age-appropriate and preferred toys, a familiar routine, and the caregiver's use of wait time for the child to initiate and/or respond. In times of COVID, when families are working from home and may be moving from meeting to meeting, it is important to provide additional time for the caregiver to complete inventories and/or case history and interview questions. When these are sent in advance electronically in an email or a simple Google form, the caregiver has increased time and space to thoughtfully answer the questions rather than rush the answers between meetings.

### Telepractice Assessment Examples

#### Routines-Based Interview

The Routines-Based Model (RBM; McWilliam, 2010) provides a framework for providers to work with families to collect and use an *ecomap* of the families' day to identify and target different routines throughout the day as opportunities for intervention. McWilliam (2020) outlined how RBMs can successfully be integrated as part of a telepractice service delivery model (<http://naturalenvironments.blogspot.com/2020/03/tele-intervention-and-routines-based.html>). Understanding a families' unique routines is particularly important for the Early Intervention (EI) provider who serves children who are DHH. Full-time access to well-fitted hearing technology is integral to the communication, social-emotional, and academic success of young children who are DHH and

use spoken language (Tomblin et al., 2014). Use of the Routines Based Interview helps the EI provider to identify when and how to integrate use of hearing technology throughout the family's day. Hearing aid retention, while often a challenge for families of young children who are DHH (Munoz et al., 2014), can be supported when providers and families work together to determine when hearing technology can be integrated into daily routines.

#### Observation and Language Samples

A key part of assessment in early intervention is observation of the interactions between the child and their caregiver. Observations can provide rich information about turn-taking, engagement, responsiveness, and the child's communication skills and development. Telepractice offers an excellent opportunity for a provider to be a non-intrusive observer of the interactions between a caregiver and a child in their natural environment. When providers get permission to use and share recordings as part of telepractice, these recorded observations give providers the ability to share specific examples with the caregiver as a coaching tool to address strategies such as wait time, responsiveness, and following the child's lead. Telepractice, and the recording of the assessment or session, allows the provider to share the interaction with the caregiver or other family and care providers to provide explicit examples of skills and opportunities. In situations when observation is difficult, the family can record their routine and share it with the provider.

Language samples are the gold standard of assessment and provide valuable information about a child's early communication strengths and opportunities (Blaiser & Shannahan, 2018; Werfel & Douglas, 2017). Language samples of toddlers show the child's lexical diversity, semantic relational categories, and presence or absence of early developing morphemes. Providers can use word clouds (as shown in Figures 2 and 3) as a family-centered

tool to share vocabulary-based language sample results. Word clouds are a visual display of the number of total words and the number of different words a child produces. Because caregivers have a visual example of their child's productions, this creates a shared communication framework for discussion of the language sample analysis and can create a more effective plan for intervention programming.

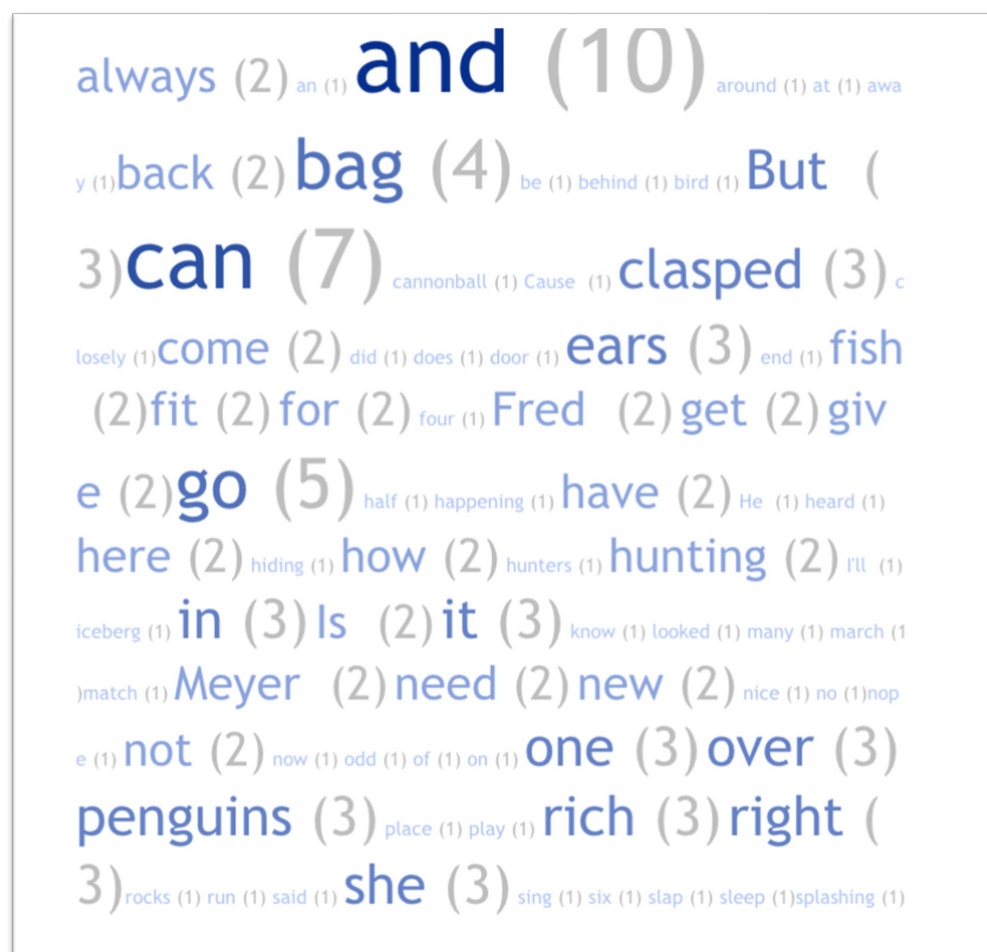
**Figure 2**

*First Example of a Word Cloud from a Language Sample of a Child Using Mostly Nouns and Verbs*



**Figure 3**

*Second Example of a Word Cloud from a Language Sample with a Child Using Grammatical Morphemes, Conjunctions, and Adjectives*



Inventories

Caregiver-completed inventories engage families in the assessment process and provide a criterion-referenced way to assess a child’s communication development.

The MacArthur Bates Communication Development Inventory (CDI; Fenson et al., 2006) is a caregiver-report instrument that provides information about the child’s receptive and expressive vocabulary as well as gestures and early syntactic development. CDI scores have been correlated with standardized language assessment such as the Preschool Language Scale, 5<sup>th</sup> Edition (PLS-5; Zimmerman et al., 2011) and Clinical Evaluation of Language Fundamentals, 5<sup>th</sup> Edition (CELF-5; Wiig, 2013) as well as linked with later executive function skills (Castellanos et al., 2016; Thal et al., 2007).

The Family Outcomes Survey (FOS; Bailey et al., 2011) is a nationally recognized tool used to assess family’s perceptions about their levels of support, understanding of their child’s development, and access to community resources. The FOS is posted on the ECO Center website (<http://www.the-eco-center.org>) in multiple languages with open access for states, local programs, and researchers. Blaiser et al. (2013) and Behl et al. (2017) used the FOS to measure family support in families who used telepractice and those who received in-person intervention. Results indicated no statistically significant differences between these groups showing that families in the telepractice condition felt equally as supported, educated, and included in their community. The FOS is a particularly useful way to identify the unique support needs of each family (i.e., links to community resources, information about child development, tools to support family’s ability to help support growth).

For children who use hearing technology, it is important to have an ongoing record of how the child is using auditory skills as a part of communication in their daily lives (McCreery et al., 2015). Of the many questionnaires

that have been developed to assess auditory outcomes in children who are DHH, the LittleARS (Tsiakpini et al., 2004), ABEL (Purdy et al., 2002), and PEACH (Ching & Hill, 2007) are some of the more reliable and frequently used questionnaires. Caregiver reports through use of questionnaires are recommended as a primary method for documentation and assessment of auditory skill development (Bagatto et al., 2011). These questionnaires are a reliable means for infant and toddler testing because young children are less likely to participate in unfamiliar situations and environments making it difficult to complete formalized testing (Coninx et al., 2009). Auditory skill inventories can be predictive of later language abilities (Ching & Hill, 2007).

Example of Comprehensive Online Assessment Battery

Idaho is a rural state with a lack of providers who specialize in serving children who are DHH in each of the eight educational regions throughout the state. Comprehensive assessment of young children who are DHH requires a substantial amount of travel, time, and resources for families who live in rural/remote areas. Therefore, there was a need for an assessment battery that could be accessed by families regardless of their geographic location. A collaborative team of stakeholders in Idaho identified a framework that integrated the administration of these inventories as a way to meet the needs across the state. At the onset of the project, project leaders worked with the Idaho Educational Services for the Deaf and Blind (IESDB) and statewide stakeholders from the Idaho Community Collaboration (ICC; Blaiser & Bargaen, 2020) representing assessment end-users (parents/family members, providers, administrators) with geographic diversity and a spectrum of communication modalities. Based on discussions with the ICC group, the inventories found in Table 3 were identified to capture specific aspects of communication development: vocabulary (signed, spoken, and both), complex language use, early auditory skill development, and family support.

Table 3  
Idaho Collaborative Assessment Project Battery of Assessments

Domain	Outcome measure	Age range
Receptive and Expressive Vocabulary	MacArthur Bates Communication Development Inventory-Words & Gestures (Fenson et al., 2006)	8–18 months
	MacArthur Bates Communication Development Inventory-Words & Sentences (Fenson et al., 2006)	16–30 months
Complex Language/ Pragmatics	Language Use Inventory (O’Neill, 2009)	18–47 months
Family Support	Family Outcomes Survey (Bailey et al., 2011)	0–36 months
Auditory Skill Development	LittleARS (Tsiakpini et al., 2004)	0–48 months



This online assessment battery, the Idaho Collaborative Assessment Project (ICAP; Blaiser et al., 2020), was developed to meet the needs of the state and to help ensure that assessments were accessible to all families (regardless of proximity to provider or geographic location) and implemented with support from foundation funding. Permission to put the assessment in an online format using Qualtrics was obtained from the inventories' publishers. This online administration of the assessments was more time and cost-efficient than a paper-based system with mailing and/or scanning assessments as part of data collection and data entry. In 2020, given stringent COVID protocols, the system remained intact with little to no changes except for new time constraints and stressors on family members and providers.

The online format provided families with an opportunity to complete the inventories in their own home at their convenience and increased efficiency as families were technically entering their own information into the system. To date, over 85 families have participated in the ICAP project from all of the six regions in Idaho.

### **Collaboration**

Telepractice offers increased opportunities for interprofessional collaboration in the assessment process by providing increased flexibility of scheduling and connecting. Children who are enrolled in early intervention can be seen by a variety of providers: early interventionist, speech-language pathologist, developmental specialist, teacher of the DHH, and audiologist. Each of these providers play a unique and beneficial role, yet often come to the table with varying perspectives as well as educational and personal backgrounds. Given this variation, there is limited ability to interpret and integrate assessment results into intervention plans and family support. When the primary provider on a child's educational team lacks training about childhood hearing loss, they may not be well-equipped to assess communication outcomes or support the family's understanding of the effect of hearing loss on the child's overall development. A shared framework that is easy to "decode" is particularly important in EI where some providers are unsure of the link between well-fit hearing technology, auditory skill development, and the use of complex spoken language. Providers are the catalyst in supporting families in understanding and integrating assessment results and need to have confidence in interpreting and sharing assessment results.

### **Example of a Telepractice-Based Assessment**

Sam is a two-year, three-month old child who has been seen via telepractice for three months. Because the sessions occur via telepractice, both of Sam's parents are able to participate in the sessions. The EI provider is working with the family to collect assessment data for the upcoming transition meeting. As part of this process, the EI provider has arranged to observe Sam and his parents as they prepare and eat lunch. The family has shared that this routine is one they enjoy together as Sam loves helping to cook and cut the fruits. During this observation,

the EI provider is collecting a language sample as well as noting the strategies that parents are using to call attention to sound, as well as model and support language. The EI provider will use the language sample to assess Sam's Mean Length of Utterance, Number of Different Words, Number of Total Words, intelligibility, topic maintenance, and initiations. The EI provider reflects that the observation on Zoom was even more effective than language samples/ observations in the past as she was able to be *invisible* to the child and get a better sense of what language has been used in the home with less prompting from the families.

To make the results easy for the parents to read, she will use a word cloud to visually display the results of the vocabulary Sam is using. The family will also complete the online version of the Language Use Inventory (O'Neill, 2009) to assess language complexity, a fillable PDF of the MacArthur Bates Communication Development Inventory (Fenson et al., 2006), and the LittleEARS (Tsiakpini et al., 2004) to supplement the information gathered from the observation. The provider will set up a Zoom call, with the permission of the family, to connect with the child's clinical audiologist and to ensure up-to-date information about hearing technology, wear time, and programming changes are included with the assessment report.

### **Discussion**

The purpose of this article was to provide a tutorial and example of how telepractice can be used to meet best practice in family-centered assessment of young children who are DHH. Assessment is the foundation for programming effective intervention, monitoring progress, and determining service eligibility. Ongoing comprehensive assessment following the diagnosis of a hearing loss is integral to ensuring that children who are DHH develop communication and academic outcomes similar to their same-age hearing peers. Ongoing assessment is a primary tenet of best practice guidelines for young children who are DHH and a pivotal piece of ensuring that an intervention program is effective and on-track (JCIH, 2007, 2019). Telepractice helps to provide equity in access to high quality family-centered assessment practices for children who are DHH, regardless of their geographic location, shortages of highly qualified personnel, or travel conditions. Assessment practices via telepractice are most effective when providers consider assessment goals, evaluate technology needs and capabilities, and integrate knowledge about a family's resources and needs as they relate to being able to engage in the assessment process. Future directions to ensure that best practice is implemented should include pre- and post-service training and support for providers to use and integrate telepractice with young children who are DHH. Additionally, there is a need for cross-training of providers to understand what assessment protocols can be used, and how they can be interpreted, to optimize the outcomes of young children who are DHH.

Although telepractice has been integral to offering continuity of care during the COVID pandemic, it is important to understand that many families, prior to

COVID, were faced with lack of services due to their geographic location and/or the lack of providers. Being family-centered means considering the family's time and ability to engage in interviews, complete inventories, and create a quiet, focused place for observation. In a truly family-centered approach, technology can be used to create alternative times and spaces for collecting what is needed as part of a comprehensive assessment process. The lessons learned in the last two years offer a first step toward equitable access to high quality service delivery and assessment practices.

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## Frequently Asked Questions about Receiving Tele-Intervention Services

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### Abstract

Resources related to parent perceptions and needs in receiving tele-intervention (TI) services are provided through Frequently Asked Questions.

**Keywords:** tele-intervention, deaf, hard of hearing

**Acronyms:** DHH = deaf or hard of hearing; FCEI = family-centered early intervention; NCHAM = National Center for Hearing Assessment and Management; TI = tele-intervention

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A need existed to help parents<sup>1</sup> and providers understand the benefits and challenges of tele-intervention (TI) for families of children who are deaf or hard of hearing (DHH). As a result, a group of stakeholders came together to form a TI Learning Community sponsored by the National Center for Hearing Assessment and Management (NCHAM). The Learning Community began in early 2010 with six program leaders and has expanded to over 40 individuals across the United States (Behl et al., 2012; NCHAM, n.d.). The focus of the Learning Community was to identify and disseminate evidence-based practices that support TI (Behl et al., 2012). The culmination of the Learning Community's compilation of knowledge and lessons learned was the creation of the "Tele-intervention Resources Guide" (<http://www.infantheating.org/ti-guide/index.html>). Additionally, group members produced other publications to further the knowledge base regarding TI (Behl & Kahn, 2015; Cason et al., 2012; Cole et al., 2019). The Learning Community partnerships also served as a foundation for an important efficacy study demonstrating the effectiveness of TI (Behl et al., 2017). Out of concern for a lack of voice related to parent engagement in TI, the community engaged parents in presenting their perspectives through a series of video-recorded interviews. In this current article, quotes from

some of these videos are embedded to support responses to questions frequently asked about TI by either parents or professionals.

### Frequently Asked Questions

#### How are issues related to connectivity and technology managed?

The parent and provider will work together to create a plan for addressing issues related to connectivity and technology. In 2020, 90.3% of North America had access to and used the internet daily, including mobile internet access (Broadband Search, 2020). However, since high-speed internet continues to be a challenge in more rural or mountainous areas, consider alternatives for connecting such as using a mobile hotspot on a smartphone. Although technology may not fail as often as thought, any failure at all may be disruptive to a session. Therefore, it is essential to have a plan to manage technology issues (e.g., screen freezes, call is dropped, poor connectivity, video delay). It is recommended that providers and parents restart the session or provide another means by which to communicate, such as by cell phone, landline, through text, or email.

There are several video-conferencing platforms that are HIPAA-compliant and offer end-to-end encryption. These secure programs can be easily installed on home computers, tablets, and even smartphones. The number of available video-conferencing platforms has increased

<sup>1</sup>The definition of parents, caregivers, and families encompasses a rich variety of circumstances, cultures, and individual details. To improve readability, the term *parents* is used throughout the article, but is inclusive of all caregivers and family construct.



dramatically since the COVID-19 pandemic. One parent shares her experience using technology to access TI services:

*We've had some providers come in-home and it's wonderful to have in-home care services provided, but at the same time I feel like the tele-therapy that's provided through FaceTime through an iPad is very similar to an in-person model. And so for me, I see very little, if any, difference in it.*

### **How do the parents establish a meaningful relationship with the tele-therapist?**

Teletherapy sessions will be conducted using a family-centered early intervention (FCEI) model which includes joint planning, observation, coaching, reflection, and feedback. These components are explained further in the first article of this monograph (Rudge et al., 2022). The implementation of the FCEI model will aid in the development of a meaningful relationship. The provider will apply FCEI techniques during virtual sessions in much the same manner as during in-person sessions with a few adjustments.

To aid in the relationship building, the parents will work with the provider to determine whether conversations outside of the TI session may be beneficial, since conversations can sometimes be difficult to have when the child is present. This dynamic, the parent working with the child and the provider coaching the parent, helps to develop a meaningful relationship as illustrated by the following quote:

*I had some reservations about [if] you could make the same kind of connection with a therapist [via TI]. You know, when you're in the room with [the provider], it is easy to develop a relationship, especially with a little girl [child's name]'s age. I had reservations about being able to make some sort of connection, but, I mean, it was just as easy as if they were in the home and in-person.*

Another caregiver describes his experience with TI:

*We've had some providers come in-home, and it's wonderful to have in-home services, but at the same time, I feel like the teletherapy that's provided through an iPad is very similar to an in-person model. And so for me, I see very little, if any, difference. And as a matter of fact, if you were to ask me what differences there are, it would be really challenging for me to come up with a difference because it's so strong through technology by utilizing the iPad.*

### **How do the provider and parent work together to manage the child's behavior?**

Research supports coaching and parenting programs delivered via telehealth to manage challenging behaviors and to support positive behavior (Rush & Sheldon, 2019).

This research has shown that programs delivered to parents via telehealth help manage behavior and result in improved parenting efficacy and reduced challenging behavior. This means that, although challenging behavior can occur during sessions, there are a number of strategies that can be used to support parents managing the behavior in their home environment. Below is the perspective of a father of an 18-month old:

*Oftentimes, challenges are minimal... because it is like having someone in person. With that being said, I think regardless of whether it's through teletherapy or whether it is in-person, when you are working with an 18 month old; keeping attention will always be a challenge. And so, there have been times during the teletherapy session that she has lost focus or she's just wanting to be finished. There were helpful guidelines provided to me about how to keep her engaged in activities. She wasn't wanting to look at a book, so instead of me just trying to get her to look at this book by turning pages, we came up with a way. The therapist suggested 'You can do [a countdown], say, 'Three, two, one...' and open the book. Then, in that way, it engaged her, so she was excited to open the book. It kept her attention, and we were able to keep the therapy session going a little longer as a result of that suggestion.*

### **How does the parent prepare the learning environment for a tele-intervention session?**

The success of a TI session will increase when the parent considers the learning environment. As a parent is learning new techniques and strategies, it is beneficial to be in an environment free of distractions (e.g., television, toys which aren't used for the session, people passing through the room, etc.) Additionally, the optimal learning environment is free from interruptions (e.g., from non-participating family members, visitors, phone calls, etc.). Another consideration is the placement of the child in relation to the parent and the camera. However, it is important to remain flexible in this regard, because there are many times when it could be appropriate to be mobile depending on the activity (e.g., going on a walk, playing outside, cooking in the kitchen). A TI provider shares how she coaches parents to prepare for TI sessions:

*I talk with parents about the space they will use for TI sessions. I remind them to limit noise and other distractions so that both the parent and child will be able to focus on the session. I tell parents to gather together some activities that their child would be happy to participate with. It could be books or toys that they typically play with. They can also gather something that they have had trouble playing with or not yet played with that they would enjoy having my input to use. I recommend parents have the activities near them to*

*have them ready. If the parents gather these activities together before the session, have them nearby, and have thought about how they will do these activities with their child, it will help the child stay engaged. With a virtual session, the parents may need to prepare several activities depending on the length of the session in order to keep the child's interest. If the child starts to lose interest, the parents need to be able to change activities quickly.*

### **How does the provider provide feedback to improve interactions with the child?**

Providers will provide feedback in real-time during the session, as a part of reflection at the end of a session, or at another time after the session. Feedback in real-time during the session may include comments of affirmation, suggestions for adjusting one's technique, ideas for vocabulary or language to use, other strategies to implement, and introductions to new techniques. At the end of the session, feedback may occur as a part of "Reflection and Feedback," the final component of a coaching session (Rudge et al., 2022). At this time, feedback from the provider will be based on the parent's reflections about the session, including what strategies went well or did not go well, and which techniques the parent would like to practice or implement more often. Feedback may also occur at another time after the session ends, and could be received in a variety of ways, such as through text messages, phone calls, email, or virtual video conferencing. Ultimately, no matter when the feedback occurs, the goal is to improve parent-child interactions, much the same as during in-person sessions. A father describes how he perceives real-time feedback during the session:

*Oftentimes, it's just positive reinforcement when we're having a session. It may be, "[Parent], I really like how you just did that with [child]. I really like how you use that phrase. I really like how you identified those objects. I really like how you gave her choices." And also supplementing it so there may be sessions where I would feed [child] a banana and to be able to incorporate her helping me peel the banana, cut the banana. So it's modeling those behaviors and using those behaviors to gain spoken language and for her to better understand that process of learning.*

### **How does the provider describe or model techniques and strategies?**

The provider will describe and model techniques and strategies at different times: before the session, during the session, or after the session, in much the same manner as during in-person sessions. Together, the provider and caregiver will identify a strategy to be practiced (e.g., wait time, eye contact, joint attention, expanding an utterance). Then, the provider will describe the selected strategy by labeling it, defining it, and giving examples of how to

implement it during activities with the child. During the parent-child interaction, the provider will give feedback in real-time related to the implementation of the selected strategy. Modeling of the strategy may occur through the suggestion of specific vocabulary and language to use during the parent-child interaction.

As necessary, alternative modeling of strategies may be presented to the parent to further explain the technique and allow for a better understanding of the expectations, such as:

- Using props to represent the child (e.g., baby doll, stuffed animal, puppet)
- Using props to demonstrate the strategy (e.g., book, toy, food item)
- Show a short video of the strategy during the session
- Using real-life photo examples to model the strategies
- Using a digital whiteboard to draw pictures representing the techniques

A parent describes how she receives descriptions of techniques and modeling of strategies during a TI session:

*When my daughter and I are reading a book, my provider will stop me, and say, "Why don't we ask her this question on this page to help her increase her communication?" Then, we'll go to that page and I'll ask her the question that my provider suggested, "What do you see?" My daughter will say what she sees, and then she might say things that she didn't say when we read the book before, because the last time I was giving her all the details. When I followed her directions, my provider said, "I really noticed she was saying these things because of the way you asked the question to her." It really helps when my provider stops me as we are doing something to give me feedback and focus on what we are doing well.*

Another parent comments on how she receives instruction about techniques and strategies:

*I think tele-intervention, for us, worked better when there was something going on that we needed to work on, because it forced me to be a leader. [Provider] would be like, "Okay, now do this," or "I want you to try to make your voice go higher," or something like that. She couldn't step in and physically do it. She would model it or direct me to change what I was doing in order to help [child's name].*

### **When is time arranged to allow for the parent to ask the provider sensitive questions and to have discussions?**

The parent and provider together will arrange a mutually agreeable time to have conversations. These conversations may occur before, during or after a session, and may happen in a variety of ways, such as through text messages, phone calls, email, or virtual video conferencing. Due to the nature of the TI session, it is sometimes difficult to have significant conversations with one's child present. When this is the case, the provider can work with the parent to schedule a specific time for having an uninterrupted conversation at which time sensitive questions may be asked. A TI provider shares her strategy for engaging in conversation during a session:

*I recommend that parents have a snack or drink available for the child, so they can talk with the provider at the end of the session while the child is enjoying the snack. Parents can also have a highly preferred activity available, such as play-doh, that the child can engage with independently while the parents and providers are talking.*

### **How is the parent supported as my child's first and best teacher?**

The provider's goal is to provide enough direction and guidance to empower the parent to be able to help their child on their own. The provider will work to integrate evidence-based strategies into a family's typical routines (e.g., making a snack, getting dressed, getting ready to go outside). As a result, the family is more in control of the session and develops greater ownership of what they are doing to support their child's development. A grandparent describes her appreciation of the provider's effort to incorporate strategies into the family routine:

*I always appreciate the interaction that I have with the provider on those suggestions. One example would be, there are times where I may be talking too quickly. And that would make it challenging for [child] to learn or be able to process what I'm saying. And so, suggestions like "just slow down a bit," . . . Many times you just need someone to remind you to just slow down so she can better understand. Or use short sentences, use words and sounds that she would be able to understand.*

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## Training the Next Generation of Practitioners In Early Intervention and Telepractice: Three University Models

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### Abstract

The COVID-19 pandemic continues to shape the provision of family-centered early intervention services for children who are deaf or hard of hearing and their families. In programs, schools, and centers, direct in-person contact with families has been significantly curtailed as a means to limit the exposure to and spread of the virus. Emergency remote learning has led to an increase in telepractice, also referred to as tele-intervention, as the designated model of service provision. Most early interventionists, speech-language pathologists, and teachers of the Deaf were not sufficiently trained to suddenly implement emergency remote teaching or telepractice services. Service providers had no option but to forge ahead with the provision of services, often with limited or no prior knowledge and experience, using only telecommunications technology. Fortunately, however, some university training programs have integrated telepractice into their curricula and practica experiences for many years, and three of those programs are profiled here.

**Keywords:** university training, personnel preparation, graduate training, speech-language pathology, Deaf Education, family-centered early intervention, telepractice, tele-intervention

**Acronyms:** DHH = deaf or hard of hearing; LSL = listening and spoken language; SLP = speech-language pathologist; TDHH = teachers of the deaf and hard of hearing; TI = tele-intervention

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The COVID-19 pandemic has forced state early intervention programs, public schools, and other service providers to shift their models of service delivery and instruction to online, synchronous tele-intervention, telepractice, and distance learning services<sup>1</sup>. Whereas, emergency remote teaching and telepractice services helped to mitigate the spread of the virus, most early intervention providers, especially teachers of the deaf and hard of hearing (TDHH) and speech-language pathologists (SLP), lacked the necessary knowledge and skills to effectively deliver these services. Given the public health crisis, these professionals had to suddenly embrace the task at hand and become remote teachers and telepractitioners with little or no prior preparation.

For nearly two decades, the American Speech-Language-Hearing Association (ASHA) has recognized telepractice as a viable and appropriate service delivery model (ASHA, 2005a, 2005b). However, in a recent study, only 5% of respondents who were practicing speech-language pathologists reported

using telepractice service delivery models prior to the pandemic (ASHA, 2020a). By May 2020, precautions brought on by Covid necessitated that 84.8% of speech-language pathologists were using telepractice service delivery models and more than half, 56%, found the experience to be challenging (ASHA, 2020b; Campbell & Goldstein, 2021). Likewise, most graduate training programs in Speech-Language Pathology and Audiology offered little or no instruction or practica in telepractice prior to the pandemic (Behl & Kahn, 2015; Grogan-Johnson et al., 2015; Wilson & Seal, 2015). Similarly, tele-intervention services have been shown to be quite effective and efficient when serving young children who are deaf or hard of hearing (DHH) and their families (Behl et al., 2017; Blaiser et al., 2013; Houston & Stredler-Brown, 2012; McCarthy et al., 2018). However, Jackson and colleagues (2015) found that most service providers with a Deaf Education background lacked sufficient training in the use of distance technology to deliver family-centered early intervention and other remote instruction, and the researchers posited that university training programs had to do more to incorporate these competencies into their curricula prior to graduation.

<sup>1</sup>For the purposes of this article, the terms “tele-intervention” and “telepractice” will refer to the use of distance telecommunication technology to deliver family-centered services to children who are deaf or hard of hearing and their families.



Three university training programs, two in Speech-Language Pathology and one in Deaf Education, are presented as models of preservice preparation. Each of these programs have incorporated tele-intervention service delivery into their curricula, practica, and field-based experiences for over a decade. Although faculty continue to refine the academic content in each program as new technologies, policies, regulations, and digital resources evolve, the three university programs—the University of Akron, Utah State University, and Idaho State University—ensure that their graduates develop the competencies to serve children who are DHH through in-person sessions, tele-intervention, and hybrid models. With these competencies, graduates can tailor their service provision to meet the individual needs of each child and family on their caseload.

### **Telepractice and eLearning Laboratory, Audiology and Speech Center, School of Speech-Language Pathology and Audiology, University of Akron (Akron, OH)**

The Telepractice and eLearning Laboratory (TeLL) was established in 2011 within the Audiology and Speech Center in the School of Speech-Language Pathology and Audiology at the University of Akron. Graduate students participating in the TeLL develop knowledge and clinical competencies in meeting the listening and spoken language needs of young children who are DHH through family-centered early intervention services while, at the same time, learning to deliver services through in-person, telepractice, and hybrid models. In 2012, the Graduate Studies Program in Listening and Spoken Language (GSPLSL), a personnel preparation grant (Houston, 2012-2018, H325K120356) funded through the Office of Special Education Programs (OSEP) at the U.S. Department of Education, was established to provide specialized training to graduate students in meeting the communication needs of young children who are DHH. The goal was to ensure that students could deliver appropriate services whether the families chose in-person services, synchronous telepractice sessions, or a hybrid model. With the establishment of GSPLSL, two new courses were added to the curriculum for graduate students funded on the grant. The first course focused on the foundational knowledge and skills of meeting the listening and spoken needs of young children who are DHH, and the second course was devoted to the delivery of telepractice services.

Building on the success of the GSPLSL, a second personnel preparation grant was funded in 2021 (Houston & Meibos, H325K210083, 2021-2026) by OSEP in the U.S. Department of Education. This new funding establishes the Interprofessional-Hearing Early Access Response Through Telepractice (I-HEART) Project. At a minimum, the I-HEART Project will train 30 graduate students, 20 in Speech-Language Pathology and 10 in Audiology. The primary goals of the project are focused on students learning to work interprofessionally to serve young children who are DHH and their families through telepractice,

in-person, and hybrid models. Students selected to participate in the project have specific competencies that are required to be mastered in interprofessional practices such as those delineated by the Interprofessional Education Collaborative (2016). Those competency areas are described as follows:

- Values/Ethics: Work with individuals of other professions to maintain a climate of mutual respect and shared values;
- Roles/Responsibilities: Use the knowledge of one's own role and those of other professions to appropriately assess and address the healthcare needs of patients and to promote and advance the health of populations;
- Interprofessional Communication: Communicate with patients, families, communities, and professionals in health and other fields in a responsive and responsible manner that supports a team approach to the promotion and maintenance of health and the prevention and treatment of disease; and
- Teams & Teamwork: Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles to plan, deliver, and evaluate patient/population-centered care and population health programs and policies that are safe, timely, efficient, effective, and equitable.

Similarly, the students obtain competencies in evidence-based practices that support the delivery of family-centered early intervention (ASHA, n.d.a; n.d.b); Moeller et al., 2013; NCHAM, 2021) and those that support listening and spoken language outcomes for children who are DHH (AG Bell Academy of Listening and Spoken Language, 2022). The Nine Domains of Knowledge are:

- History, Philosophy, and Professional Issues
- Education
- Emergent Literacy
- Hearing and Hearing Technology
- Auditory Functioning
- Spoken Language Communication
- Child Development
- Parent Guidance, Education, and Support
- Strategies for Listening and Spoken Language Development

And finally, the students must achieve competencies in telepractice service delivery, and those competencies are delineated in five domains: (a) Speech-Language Pathology and Audiology, (b) Ethical, Legal, and Reimbursement Policies, (c) Technology Used for Telepractice Service Delivery, (d) Practice: Delivering Telepractice Services, and (e) Sustainability. These five domains are further explored in Table 1. (These competencies were adapted from ASHA's Telepractice Knowledge and Skills; 2005a; ASHA's Telepractice Portal, n.d.b; as well as from Brennan et al., 2010; Houston, 2013; Lowman, 2017; Lowman et al., 2022; Richmond et al., 2017; McCarthy, 2013; Walker, 2015.)

The I-HEART Project co-directors and other faculty will continue to refine these telepractice competencies as new policies are implemented, changes to licensure occur, new technology platforms are developed, and when innovative digital resources are created and published. (For a more thorough discussion of telepractice competence, please see Lowman et al., 2022.)

Prior to the start of classes in August of each year, grant scholars attend a mandatory three-day intensive workshop

focused on telepractice. Students learn the basic knowledge and skills of telepractice service delivery, from the types of technology used to planning and executing simulated telepractice sessions with their peers. Students assigned to the TeLL, during their in-house rotation, attend a weekly clinical seminar designed to support their telepractice clinical experience. Students discuss cases, troubleshoot technology challenges, and collaborate on developing digital activities to support the treatment goals addressed in their sessions.

**Table 1**

*Telepractice Service Delivery Core Competencies: Interprofessional-Hearing Early Assessment Response Through Telepractice (I-HEART Project)*

DOMAIN	PURPOSE
Domain 1: Speech-Language Pathology & Audiology	Knowledge and skills related to identification, assessment, and treatment of hearing and speech-language disorders across the lifespan.
	Competencies/Goals: <ol style="list-style-type: none"> <li>1. Students remain in good standing within their plan of study and/or discipline—both academically and clinically.</li> <li>2. Students demonstrate how to use appropriate assessment and treatment knowledge and skills, depending on the diagnosis.</li> <li>3. Students continue to gain competence and independence across the Big Nine clinical areas as defined by the American Speech-Language-Hearing Association (ASHA).</li> </ol>
Domain 2: Ethical, Legal, & Reimbursement	Knowledge and skills related to ethical, legal, and reimbursement issues, mandates, and responsibilities related to telepractice.
	Competencies/Goals: <ol style="list-style-type: none"> <li>1. Students will demonstrate knowledge and skills related to telepractice service delivery models as defined by the American Audiology Association (AAA).</li> <li>2. Students will demonstrate knowledge and skills related to Health Insurance Portability and Accountability Act of 1996 (HIPAA), Family Educational Rights and Privacy Act (FERPA), the Health Information Technology for Economics and Clinical Health Act (HITECH), and other federal laws and policies related to telepractice service delivery.</li> <li>3. Students will demonstrate the knowledge and skills of state policies and licensure requirements related to telepractice service delivery.</li> <li>4. Students will demonstrate the knowledge and skills regarding informed consent of clients and families when providing telepractice services.</li> <li>5. Students will demonstrate the knowledge and skills related to ethical practice within telepractice as defined by ASHA, AAA, and the American Telemedicine Association (ATA)—as well as other related sources.</li> <li>6. Students will demonstrate the knowledge and skills related to Medicare, Medicaid, and third-party reimbursement for telepractice services.</li> </ol>
Domain 3: Technology Used For Telepractice Service Delivery	Knowledge and skills specific to the selection, set-up, use, and troubleshooting of teleconferencing/telepractice equipment and connectivity.
	Competencies/Goals: <ol style="list-style-type: none"> <li>1. Students will demonstrate the knowledge and skills to effectively plan and select telepractice equipment that will meet the service delivery needs of the populations served.</li> <li>2. Students will demonstrate the knowledge and skills to set up telepractice equipment for successful service delivery.</li> <li>3. Students will demonstrate the knowledge and skills to troubleshoot telepractice equipment (e.g., computer, monitor, audio, video, etc.) when problems occur.</li> <li>4. Students will demonstrate the knowledge and skills to effectively troubleshoot connectivity/bandwidth issues that may occur.</li> <li>5. Students will demonstrate the knowledge and skills to effectively use telepractice equipment for the delivery of telepractice services.</li> <li>6. Students will demonstrate the knowledge and skills to connect other peripheral devices to the telepractice equipment for use in clinical assessment and treatment sessions.</li> </ol>

Table 1 continued

DOMAIN	PURPOSE
Domain 4: Practice: Delivering Telepractice Services	Knowledge and skills related to the selection of clients, implementation of assessment and intervention practice in a tele-environment, progress monitoring, and setting considerations.
	<p>Competencies/Goals:</p> <ol style="list-style-type: none"> <li>1. Students will demonstrate the knowledge and skills for selecting clients who are appropriate for telepractice service delivery.</li> <li>2. Students will demonstrate the knowledge and skills for obtaining appropriate informed consent and maintaining confidentiality and privacy of patient contact and interactions within telepractice service delivery.</li> <li>3. Students will demonstrate the knowledge and skills to complete appropriate audiological, speech, or language assessments through telepractice service delivery models.</li> <li>4. Students will demonstrate the knowledge and skills to provide family-centered early intervention through telepractice service delivery models.</li> <li>5. Students will demonstrate the knowledge and skills of adult learning practices when providing parent coaching and other assessment or treatment activities through telepractice service delivery models.</li> <li>6. Students will demonstrate the knowledge and skills to set up the professional's telepractice space or setting, especially in the layout of the equipment, lighting, and audio that are adequate for telepractice service delivery.</li> <li>7. Students will demonstrate the knowledge and skills to advise the client/parents on appropriate set up and in-home setting for optimal telepractice service delivery.</li> <li>8. Students will demonstrate the knowledge and skills to develop digital materials to be used in the assessment and treatment of hearing, speech, and language disorders.</li> </ol>
Domain 5: Sustainability	Knowledge and skills related to building and sustaining a telepractice model.
	<p>Competencies/Goals:</p> <ol style="list-style-type: none"> <li>1. Students will demonstrate the knowledge and skills to conduct a needs assessment to determine the feasibility of a telepractice program.</li> <li>2. Students will demonstrate the knowledge and skills to conduct outreach to community stakeholders related to telepractice service delivery.</li> <li>3. Students will demonstrate the knowledge and skills to develop a business plan to support a telepractice service program.</li> <li>4. Students will demonstrate the knowledge and skills to effectively evaluate telepractice program service delivery and outcomes</li> </ol>

Since the TeLL was launched, the commitment to telepractice has permeated the graduate program. Faculty now discuss how a client with a specific diagnosis (e.g., hearing loss, fluency disorders, voice disorder, speech or language delays, etc.) can be served through in-person, telepractice, and hybrid models. All graduate students complete at least one semester of telepractice experience in the Audiology and Speech Center clinic with additional experiences gained through community placements, such as the local children's hospital, public schools, and private practices.

**Utah State University Interdisciplinary Graduate Training Program for Deaf Education, Speech-Language Pathology, and Audiology Students (Logan, UT)**

The Listening and Spoken Language (LSL) graduate training program at Utah State University (USU) is a comprehensive interdisciplinary program for Deaf Education, SLP, and Audiology students to gain skills and competencies in providing family-centered,

evidence-based services for children who are DHH to learn to listen and talk. Students from all three disciplines take many of the same LSL courses, attend a weekly interdisciplinary seminar together, and work alongside one another to complete practicum experiences every semester of their graduate program. Audiology and SLP students participate in the LSL program as an *emphasis*, consisting of extra coursework and practicum in addition to completing all requirements associated with the core Audiology or SLP programs of study. The LSL Deaf Education program is not an emphasis but is a full stand-alone Master of Education and Teacher Licensure program. The Deaf Education program is available to campus-based students and to distance students, contingent upon distance students having access to an approved practicum site. The Audiology and SLP programs are accredited by the American Speech and Hearing Association and the LSL Deaf Education program is accredited by the Council on Education of the Deaf. Since 2012, the USU program has provided students



with tuition support funded through the Office of Special Education Programs (OSEP) personnel preparation training grants at the U.S. Department of Education.

The fundamental philosophies and priorities of the Interdisciplinary LSL Deaf Education program were guided by, and carefully mapped to, the national standards for teacher preparation and the principles of evidence-based practices outlined by the Council for Exceptional Children (CEC) and the Council on Education of the Deaf (CED) national standards for serving children who are DHH and their families (2018/2019). The LSL coursework was also informed by the knowledge and skills recommended by the Division for Early Childhood (DEC) personnel standards (2017) and by Moeller et al. (2013) specific to serving children ages birth to three who are DHH and their families. The program is routinely evaluated to ensure the nine domains critical to LSL development, identified by the Alexander Graham Bell (AGBell) Academy for Listening and Spoken Language are effectively embedded in the curriculum. The priorities emphasize (a) family-centered services founded on trust and assurance that the provider will take the time to learn the parents' priorities for their child and to understand what is important to them and their family; (b) use of parent coaching to support development across environments and daily routines aligned with the family's needs and preferences; (c) culturally competent services that address the diverse cultural and linguistic needs of children who are DHH and their families, including Deaf Culture and continuum of family preferences; (d) a comprehensive understanding of the auditory hierarchy and the use of effective LSL strategies to maximize auditory perception development; (e) priorities in development language and literacy foundations that are fundamental to all other aspects of a child's academic experiences; (f) an understanding of audiology and hearing technology concepts; and (g) goal-oriented, data-driven services through interdisciplinary collaboration.

To ensure students develop breadth of competencies, the program includes both synchronous and asynchronous coursework as well as practicum placements each semester in various service delivery settings, such as the classroom, individual therapy, early intervention, parent-infant toddler groups, and the audiology clinic. Deaf education and SLP students also have at least one full semester of providing services of using a tele-intervention (TI) mode of delivery, with most students having a TI placement for two full semesters. Long before the COVID-19 pandemic forced educators to provide emergency virtual services, the USU-LSL graduate training program was providing TI to families of children who are DHH in a variety of locations across the United States. Students at USU learn the TI model can provide easier access for parents to receive services regardless of their location, may offer more flexibility around work schedules, and can provide specialized services from trained providers who understand LSL strategies and priorities.

In addition to experiencing the positive aspects of the TI model, students must also recognize the potential

challenges in a TI delivery and the adaptations and competencies that facilitate successful services. Similar to center-based or in-person services, students must learn to build and maintain trust and rapport as they help guide parents in promoting their child's development within daily routines and according to family priorities (Early Childhood Technical Assistance Center, 2017). However, many students initially express trepidation or a lack of confidence in knowing how to promote a strong parent-professional relationship via a virtual connection. To prepare students for their TI placement, the use of role-play between students and supervisors is a strong training tool for TI sessions. For example, guidance and practice in using question prompts that promote conversation to build the relationship rather than those that prompt single-answer or yes/no responses can facilitate student readiness for their first TI session. This can be particularly valuable given there are not the same contextual cues or conversation-starters in a TI session that are typically available with in-person services, such as commenting on how beautiful the home is or a photo on the wall. In addition to building rapport, students learn these initial conversations are informative to learning about family activities, daily routines, or other priorities that can be incorporated into intervention plans. Similarly, students must learn to be good listeners and be mindful of their non-verbal behaviors. Although these skills are equally essential for in-person services, poor development in both expressive and receptive communications may be more noticeable or distracting when providing TI services than are apparent when parents and providers are in the same physical space. With parent permission, TI sessions that are recorded can facilitate valuable opportunities for students to engage in self-reflective learning as they and their supervisors watch the recording, and make time-stamped observations using a program such as [GoReact](#) (i.e., taking note of their body language, attentiveness, facial expressions, conversational effectiveness, or other verbal and non-verbal behaviors that may positively or negatively impact the TI session).

Priorities of goal-oriented, family-centered services are the same whether delivering services via TI or in-person. Students must learn the coaching model (Rush & Shelden, 2019) and prepare for sessions that match the family's naturally occurring routines in the home and are flexible in making seamless adaptations to those plans when necessary (NCHAM, 2021; Poole et al., 2020). In fact, at USU the documents developed for early intervention preparation are referred to as *Family Session Planning Guides* rather than lesson plans to reinforce the concept of family-focused services and not implementation of rigid or pre-determined lesson plans. The need to be flexible, with skills to adapt the session focus, is emphasized in the TI practicum since many families may wish to engage in sessions while on vacation, at the park, or other various non-traditional locations. This can be intimidating for some students as they experience the necessity of developing strong competencies in auditory perception, speech, and language development hierarchies and the ability to think on their feet as they adapt their coaching strategies



consistent with the session details or circumstances. Yet, within a short time, most students report this variability in TI services to be highly enjoyable as it promotes rich and authentic learning experiences.

To provide goal-oriented services, students must develop skills and competencies in administering and interpreting standardized, non-standardized, and curriculum-based assessments, and then interpreting findings to provide individualized instruction specific to the needs of each child. Assessment can be challenging when using a TI mode of delivery (see Blaiser et al., 2022 in the present monograph), however, developing competencies in obtaining appropriate assessment data in TI services is critical to graduate training experiences. Students learn strategies for collecting and using language samples to monitor growth across developmental domains, using electronic versions of standardized assessments, and other developmental checklists or curriculum-based assessments. In other words, delivering services using a TI model does not preclude the priorities for collecting data and providing data-driven services. Students gain skills in recognizing how assessment data, combined with their breadth of knowledge in effective service delivery, clinical judgement, and a diagnostic teaching approach, can facilitate partnering with parents to implement services that are developmentally appropriate and address the needs and priorities of each child and family.

Supporting parents in understanding, managing, and troubleshooting their child's hearing technology is also an important component of being a service provider for children who are DHH and their families. Providing hearing technology support through a virtual connection may seem daunting to students or professionals who are new to a TI model of delivery, however, students quickly learn they can be highly successful in providing support in hearing technology management through the virtual connection. For example, students should be prepared with similar listening check or troubleshooting materials on their end as those being used by the parents. Having a listening tube or stethoscope along with a mock hearing aid to use as demonstration can offer parents more specific and effective guidance than attempting to verbalize instructions without any visual support. There are also many picture and video materials available on manufacturer websites that provide training and guidance. Students are cautioned that simply advising the family to check the manufacturer website is not consistent with a family-centered approach, as the volume of electronic resources available to families can be overwhelming, with challenges in finding the information specific to their child's technology. Parents may similarly benefit from guidance in understanding the importance of creating an optimal acoustic environment, including suggestions and strategies specific to their child, home, and family. This guidance can occur as seamlessly and effectively using a virtual connection as can occur with in-person services.

For all practicum experiences at USU, students are placed with master-level Deaf Educators or SLP's who either provide the direct services or they provide nearly

100% supervision as students deliver services. This model supports students in developing the breadth and depth of skills outlined in national standards for professional competencies. Deaf education, SLP, and audiology students learn together as a collaborative cohort and develop discipline-specific skills to serve children who are DHH and their families in providing in-person or TI services. Including TI in graduate student training is essential to ensure future professionals gain competencies to effectively serve families who benefit from the TI model.

### **Idaho State University Speech-Language Pathology Graduate Program (Meridian, ID)**

Because a substantial proportion of Idaho is considered rural, it is necessary to train students in the Idaho State University (ISU) Speech-Language Pathology graduate training program best practices related to telepractice. ISU's American Speech-Language Hearing Association (ASHA) accredited program, enrolls approximately 60 SLP graduate students each year in two in-person cohorts (Meridian and Pocatello) and one online cohort.

In 2015, the ISU HATCH (Helping Adults Talk to Children) Lab developed a telepractice-based curriculum for students and professionals who were serving children who are DHH. This curriculum was developed to be an interactive supplement to the free online curriculum offered by the National Center for Hearing Assessment and Management ([www.ti101.org](http://www.ti101.org)). The HATCH lab curriculum focused on family coaching as a central tenet to the telepractice curriculum, with interactive, asynchronous opportunities to experience and compare the effectiveness (or non-effectiveness) of different coaching techniques.

Since Spring of 2020, there has been a needed shift to integrate telepractice across coursework, clinical practicum, and research for the entire SLP program. ISU has highlighted the following ways to integrate telepractice across three primary areas: coursework, clinical experiences, and research. Key competencies identified for graduate students using telepractice include ability to:

- navigate and effectively use a variety of technology platforms;
- identify key aspects of assessment and intervention for a variety of clinical populations;
- use technology and resources to effectively meet assessment and intervention needs;
- integrate interprofessional and family collaboration into service delivery; and
- find, evaluate, and adhere to current best practice guidelines for the profession.

### **Coursework**

Telepractice has been integrated into the SLP graduate curriculum as part of graded activities. Coaching and reflection assignments are given and concentrated

instruction and discussion time are allotted in courses for telepractice assessment and intervention issues students may face. Students learn about equipment/setup (including greenscreen, microphones/headsets, etc.), presentation of materials (slide sharing so presenter remains on the main screen), engaging activities, working with facilitators to elicit speech sounds in children, and behavior management. Instead of focusing on one teleconferencing platform, the ISU program supports students' exploring and experiencing the fundamentals of platforms in general. This is particularly important when professionals will be responsible for providing services to clients within different districts or organizations that may have chosen different platforms for a variety of reasons.

Coursework specific to working with children who are DHH has been developed for providers using telepractice and/or in itinerant models. For example, students explore case studies that use telepractice as a way to virtually connect for interprofessional teaming. Students also have the opportunity to observe in different classroom settings via telepractice to provide comments/feedback. Students involved with ISU's Helping Adults Talk to Children (HATCH) Lab have been exposed to the process of data collection measuring the effectiveness of telepractice with young children who are DHH. In one study, families received weekly educational courses to support child language (Blaiser et al., 2016; Weitzman & Blaiser, 2018). Results of these studies demonstrated high satisfaction with families who participated (i.e., of seven families who piloted the project, 100% rated satisfaction as *high* or *very high*).

### Clinical Experiences

Students provide services to clients throughout the lifespan via telepractice. To obtain additional clinical expertise prior to serving clients, students participate in Simucase (virtual case studies), lab meetings dedicated to telepractice training, and collaborative efforts to identify and share resources for telepractice for different clinical populations. Clinical faculty developed role play activities for students to rehearse key aspects of assessment and intervention via telepractice (Woods et al., 2021). SLP students participate in a Telepractice Showcase to share creative methods they developed/implemented within sessions to facilitate client participation, motivation, and efficiency and effectiveness of therapy. These clinical resources and demonstrations are shared with students and faculty and with the statewide preceptors who may have been required to integrate telepractice into service delivery without training.

For intervention for children who are DHH, telepractice often needs to encompass auditory access through hearing technology (i.e., wearing the correct hearing technology, the ability to troubleshoot connection through bluetooth, correct settings of FM/DM system) through collaboration with an educational/clinical audiologist and/or Teacher for the DHH. Graduate students learn how to modify and enhance visual cues for children who are DHH (particularly in speech production intervention) such as making the camera screen as big as possible. In-person facilitators have been useful in providing additional

models and feedback to the SLP such as correct/incorrect productions of high frequency sounds that are not always heard via Zoom.

### Research

ISU's graduate students have opportunities to participate in research examining assessment and intervention protocols via telepractice. For example, ISU's HATCH and Child Language Labs have been examining the effectiveness of language sample collection and analysis via Zoom for school-age children with and without language impairments as well as preschool children who are DHH. Faculty are investigating telepractice as a way to increase intensity of service delivery with children with Speech Sound Disorders with hearing children and children who are DHH.

Telepractice has become commonplace for many providers, many of them who initiated practice without warning and/or training. With telepractice integrated into coursework, clinical experiences, and development of evidence-based clinical best practice, a future generation of clinicians will have the tools to provide high-quality services to individuals with communication disorders regardless of their geographic location.

### Conclusion

The COVID 19 pandemic has taught us a great deal about how we, as a society, can tolerate a worldwide health crisis. Because of emergency remote teaching and learning, professionals had to quickly pivot to online platforms to deliver early intervention, instructional, or clinical services. More importantly, the viability of these online platforms and the effectiveness of tele-intervention and telepractice service delivery models for diagnostic, treatment, and intervention services have been proven, with favorable results for most populations served. As we look forward, the demand for tele-intervention and telepractice services will continue to grow and expand. University training programs will need to do more to integrate telepractice-related content, practice, and competencies into their curricula so that new graduates will be fully prepared to seamlessly move between in-person to telepractice service delivery whenever it is required. These three university programs have developed models for other universities to follow.

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## Achieving Successful Outcomes in a Tele-Intervention Program

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### Abstract

For well over a decade, family-centered early intervention services have been delivered through models of tele-intervention (TI) to children who are deaf and hard of hearing (DHH) and their families. Ongoing outcome data continue to demonstrate the viability, effectiveness, and positive impacts these services provide to both the service providers and the families served. However, establishing a successful TI program requires careful planning to reduce or eliminate barriers and potential roadblocks. When these challenges are adequately addressed, TI programs are more likely to achieve the primary goal of delivering appropriate family-centered early intervention.

**Keywords:** tele-intervention, telepractice, family-centered early intervention, hearing loss, deaf, hard of hearing

**Acronyms:** DHH = deaf or hard of hearing; IT = information technology; TI = tele-intervention

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Most professionals providing family-centered early intervention services are comfortable with in-person (i.e., in the home, center, or educational facility) services, the standard practice prior to the COVID-19 pandemic. The public health crisis forced professionals, with little to no lead time, to change their service delivery to being completely online—using various virtual platforms to deliver early intervention and emergency remote learning. Although many professionals embraced this challenge and successfully transitioned to tele-intervention<sup>1</sup> (TI) providers, others struggled with this service delivery model due to a lack of careful program and service planning and little or no professional development.

However, as described in this issue, there are distinct advantages of tele-intervention services for parents, families, and caregivers<sup>2</sup> of children who are deaf or hard of hearing (DHH), such as having access to a provider with specialized skills, service delivery convenience, and effectiveness that can be better than or equal to in-person services (Behl et al., 2017; Blaiser et al., 2013; Houston & Stredler-Brown, 2012). The urgent and unexpected

implementation of emergency remote intervention during the COVID-19 pandemic was met with mixed reviews from both parents and professionals and should not be viewed in the same context as the benefits and successes of established TI programs (see Rudge et al., 2022 in the present monograph). The establishment of a successful TI program requires careful planning through the administration of a thorough needs assessment, service provider training, and ongoing program support and evaluation.

### Needs Assessment: A Place to Start

Prior to initiating any new TI program, a thorough process of review should be implemented by a team of dedicated professionals. The California Telehealth Resource Center (CTRC) first published the Telehealth Program Developer Kit in 2014, and recently updated it in 2021, as a roadmap for successful telehealth program development. Additionally, the American Speech-Language-Hearing Association (ASHA) suggested a similar process of telepractice program development (2010). The following process combines the key elements of these recommended steps and serves as a starting point for program administrators and service providers when implementing a program of TI services. Each early intervention program is different, and the following steps should be adapted as needed to accommodate local or state needs, policies, and procedures.

<sup>1</sup>For the purposes of this article, the terms tele-intervention and telepractice will refer to the use of distance telecommunication technology to deliver family-centered services to children who are deaf or hard of hearing and their families.

<sup>2</sup>The definition of parents, caregivers, and families encompasses a rich variety of circumstances, cultures, and individual details. To improve readability, the term parents is used throughout the article, but is inclusive of all caregivers and family constructs.

## Assess and Define

Three steps support assessing the environment and defining the proposed program.

### Step 1: Assess Service Needs and Environment

- Assess the service needs of the families and children within the program.
- Identify potential TI opportunities.
- Assess the organizational or program readiness to launch a TI program.

### Step 2: Define the TI Program Model

- Consider the type of TI program that will meet the needs of the families/children served. That is, will synchronous, asynchronous, and hybrid models be used?

### Step 3: Develop a Business and/or Funding Case

- Determine the impact of the proposed TI program (i.e., the number of families served, reduced travel costs of service providers, more consistent level of early intervention provided and better child/family outcomes, cost effectiveness, etc.).

The first three steps will determine the early intervention and community needs that would be supported through the development of a TI program. Within Step 1, a needs assessment is undertaken to collect quantitative data on service level needs. Based on the information gathered, the type of TI service can be defined and a certain level of specificity can be developed about the TI program model. During these initial steps, the business case will be considered to determine how the program fits into the organization's business model, funding model, or revenue streams. In summary, the first three steps will:

- Identify and document the need and rationale for the planned TI program;
- Define the early intervention or other services the TI program will deliver;
- Determine the funding source (whether state funding or third-party reimbursement will be used for reimbursement);
- Describe how the targeted services will be delivered; and
- Perform a market analysis to determine if there is a market for the proposed service and a willingness and mechanism to pay for it.

## Develop and Plan

Two steps support fully defining the activities necessary for program implementation.

### Step 4: Develop and Plan Program and Technology

- Create a detailed project plan.

### Step 5: Develop a Performance Monitoring Plan

- Define monitoring and evaluation mechanisms and program improvement processes.

Steps 4 and 5 focus on planning and identifying the tasks that need to be done and the steps required to achieve each of the work products. In these steps, the team should continue to focus on planning and not doing. It is important to capture the steps that the staff/team will be undertaking, who is responsible for each, and when those steps or work products are expected to be completed. In summary, Steps 4 and 5 will:

- Use all of the information collected in Steps 2 and 3 to create a plan that details all of the areas that require work during the implementation;
- Define all the tasks needed to build, test, deploy, and operate the program;
- Determine who will be needed to perform the tasks;
- Estimate the hours required to do the work (effort);
- Estimate the timeline for the work;
- Determine if additional staff are required in certain areas; and
- Develop a plan to monitor program performance and evaluate the TI program.

## Implement and Monitor

The final two steps support implementation and ongoing monitoring.

### Step 6: Implement the TI Program

- Perform the work required to implement the program.

### Step 7: Monitor and Improve the Program (ongoing)

In the final two steps the team is ready to implement the TI program. Steps 6 and 7 allow an organization or early intervention program to use the written plans developed in Steps 5 and 6. Because there are written plans, the program administrators can fully monitor the progress and provide assistance when challenges arise. Likewise, the team can monitor the documented time, costs, and use of resources to support the TI program. Ongoing monitoring of the program will continue and the use of performance indicators can be used to assess the impact of the program. In summary, Steps 6 and 7 will:

- Put into action the plans, decisions, and approaches identified in Step 4; and
- Begin monitoring the program using the approach identified in Step 5.

Completing a comprehensive needs assessment that leads to a comprehensive implementation plan will ensure that the TI program will be successful. While the above steps describe a broad approach, an effective and efficient TI program will also incorporate the following considerations provided by Boisvert and colleagues (2012).

1. The TI program must adhere to all professional licensure requirements for the service providers

as well as all federal laws and regulations, such as the Family Educational Rights and Privacy Act (FERPA, 1974), the Health Insurance Portability and Accountability Act (HIPAA, 1996), and the Health Information Technology for Economics and Clinical Health (HITECH, 2009) Act.

2. Service providers must have a high level of technological competence, and the program should develop its own standardized protocol for service delivery. A broadband Internet connection is, at a minimum, required to sustain adequate audio and video input and output necessary for the delivery of early intervention and assessment sessions. The provider's and family's location should have a computer or laptop, a larger monitor, webcam, microphone, speakers, and an online platform (e.g., Zoom for Healthcare, WebEx, etc.) that allows screen sharing. Although having these components at the remote site (i.e., family's home) would be ideal, families are increasingly using their smartphones or tablets for these connections.
3. There is a range of supplementary equipment that can enhance the quality of the TI services. Additional tools, devices, and equipment vary according to the application of services and the desired outcomes of the program. For example, a second or third monitor, web and document cameras, headphones, cell phones, and back-up storage devices may be required.
4. On-site or support personnel are essential to delivering quality TI services. When considering TI, most sessions will likely involve connecting to the family's home. In these situations, the on-site personnel or e-helper is actually the parent or caregiver and should be trained in how to access the TI platform, troubleshoot issues when there are problems, and understand how to use and manipulate their technology (e.g., smartphone, tablet, laptop) in support of the TI session. Furthermore, the parent or caregiver may be the primary consumer of the early intervention. That is, the service provider is demonstrating techniques and strategies to facilitate communication or other developmental objectives and will then coach the parent or caregiver to successfully integrate the strategies into the child's daily routines and play.
5. The TI program should be evaluated for clinical effectiveness and must include client (if applicable), parent/caregiver, and service provider satisfaction surveys to obtain quality assurance outcome measures (ASHA, 2010). Ongoing documentation and progress monitoring should occur using a safe, secure caseload management system. The documentation for TI should include the same information as in-person services: (a)

date of the session, (b) length of the service, (c) technical issues encountered, (d) intervention goals addressed, and (e) data collected for each target objective. Service providers must document family and/or child progress and outcomes toward each goal addressed as well as any additional referrals and/or recommendations (Boisvert et al., 2012).

6. Successful TI programs must have access to information technology (IT) support who are experts in technology selection and compatibility when initiating the program. When TI services are launched, ongoing IT support will be required to maintain the technology as well as facilitating quality assessments, managing firewalls and encryption, and ensuring sufficient bandwidth.
7. All service providers require initial and ongoing training to remain informed about any advancements in technology, practices, and TI methodologies. Boisvert and her colleagues (2012) suggest the following topics should be addressed: (a) an overview of the feasibility, standards, benefits, and limitations of TI; (b) the necessity to obtain outcome data using standardized procedures and processes; (c) evidence of professional certification and licensure; (d) regular scheduled meetings; (e) intervention and assessment planning; (f) data collection and documentation; (g) data security and privacy; (h) intervention or clinical techniques and behavioral management strategies; (i) a review of assessment (e.g., speech, language, developmental, etc.) and screening protocols that are used with TI; (j) consultation with parents/guardians, caregivers, special educators, and other service providers (i.e., specialists, physicians, etc.); (k) print and digital resources and materials to be used in TI; and (l) the collaboration with on-site personnel or e-helpers.

The implementation plan described above provides an overview of steps that should be taken to ensure the successful launch and maintenance of a TI program. However, the plan can be adjusted to include local and state policies, populations served, and other administrative or program limitations.

### **Barriers to Tele-Intervention Programs**

Administrators and service providers seeking to implement a comprehensive TI will face barriers and other challenges that must be addressed to ensure the long-term success of the effort. Otto and Harst (2019) investigated the implementation barriers for telemedicine initiatives, and their findings indicated three (sometimes overlapping) areas that presented the most challenges—people-related barriers, process-related barriers, and object-related barriers.



## People-Related Barriers

People-related barriers are defined as the needs and expectations of the *consumer* of the TI service and the service provider. That is, when designing a TI program, the users of the service must be considered. Questions such as who will be consuming the intervention (i.e., parent, child, family, etc.)? How will those individuals interact with the TI platform? Is the technology chosen to deliver the service appropriate, or does it have its own limitations?

Another aspect of the people-related barriers is the training in the use of the technology. The service provider should be highly trained in how to use the TI platform, including how to troubleshoot the equipment and Internet connection when issues arise. Likewise, the parent or family also must know how to access the TI platform and how to do some troubleshooting of their technology (i.e., laptop, tablet, smartphone, etc.). If additional support personnel, such as e-helpers, are required, those individuals should be highly trained as well.

Administratively, ensuring that the program's leadership supports and has buy-in will be critical to the long-term success of the TI services. Administrators can provide and reinforce needed policies and procedures, allocate resources, and become strong advocates for the program.

## Process-Related Barriers

Process-related barriers refer to barriers that inhibit the seamless and effective integration of TI services into the program's current system. Resistance to change can occur at all levels, from the service providers to key administrators. Conducting a needs assessment, sharing information, being transparent in program planning, and communicating with all stakeholders are required steps to diminish or eliminate any resistance.

In a similar fashion, the consumers of the TI program—the parents or families—also may be resistant to receiving this service based on preconceived beliefs about its effectiveness. Making sure that parents and caregivers fully understand how these services will benefit the child and family may be an important aspect during the initial intake process.

Another aspect of process-related barriers includes how the TI operates. That is, does the program have clearly established operating procedures? The service provider should have well-defined procedures for scheduling, planning, delivering both intervention and assessment sessions, and for communicating with those families being served. Additionally, the service provider should have a method for capturing outcome data for individual sessions as well as for the overall program.

The parents or family receiving the TI service also must be fully informed about the processes involved in service delivery, and they should understand their expected level of participation, materials, and the goals and objectives of the session prior to the appointment. Beyond simple troubleshooting, parents or caregivers also should be

aware of IT resources and who to contact when more serious technology issues do occur.

And finally, the funding of the TI program must be defined. Will public funding be available to support the services and/or will reimbursement from insurance companies and other third-party funders be necessary to sustain the service? Regardless of the approach, prior approval may be required before initiating the service followed by the collection and submission of ongoing documentation of intervention outcomes.

## Object-Related Barriers

Object-related barriers are typically technologically based. The TI platform should be user-friendly and easily accessible to the parent or caregiver. Systems that are overly cumbersome and confusing will cause frustration and contribute to a lack of buy-in from the parents or family.

The difficulty securing at least a broadband Internet connection that is reliable continues to be a major barrier to some families in rural settings but also can be an issue in more urban areas. Families who lack a stable Internet connection may benefit from a mobile hotspot, if one can be provided. In other situations, using a neighbor's or relative's Internet connection may be an option, but would require the family to physically relocate to another setting for the session. Local public libraries, public health centers, and public schools also have been used when families had no or limited access to a broadband Internet connection, but when this occurs, the service provider must plan accordingly. Some training of the site's staff may be required to ensure successful TI sessions.

Although most barriers discussed can be described as people, process, or object related, there are situations that may involve a combination of these factors. Additionally, specific state systems or early intervention programs may face challenges not listed above, and therefore, the barriers discussed are not an exhaustive list. With careful planning, most of these barriers can be overcome and successful TI sessions can be accomplished.

## Top Ten Tips and Strategies for Successful Tele-Intervention Service Delivery

Training and experience with the TI model can increase professionals' comfort level and effectiveness in guiding virtual family-centered sessions. This top 10 list of tips and strategies will assist professionals new to TI services in implementing TI services for children who are DHH and their families:

1. **Prioritize Development of the Parent-Professional Relationship.** A central component of providing effective family-centered services is developing a strong and positive parent-professional relationship with families. Professionals who are new to the field or who are accustomed to traditional in-home services may feel apprehensive about their ability to connect with families via a TI model. As discussed in the



parent survey (see Nelson et al. 2022, in the present monograph), these relationships can be just as strong for parents and families who use TI services as they are for in-person services. Professionals who take the time to learn of the family, their culture, their activities, and their desires for their child can have a meaningful impact on the child and family well-being. This service delivery priority can and should be an unwavering aspect of family-centered care, whether services are in-person or delivered via TI.

2. **Be Prepared with Materials to Facilitate Demonstration.**

A central premise of parent coaching is helping parents identify how their child's speech, language, or other developmental goals can be embedded throughout the day during typical daily routines. For this reason, many in-person providers bring few if any materials into the home to reinforce the importance of identifying listening and language opportunities that naturally occur and to reduce the parent perception that facilitating their child's goals requires specifically prepared materials. The TI model, with the provider not physically present in the home, is even more conducive to facilitating parent coaching to emphasize the role of parents as their child's most important teacher. However, this should not be interpreted by TI providers as an invitation for complacency in their preparation. Providers should be well-organized and prepared with materials on their end that may be used for demonstration. For example, coaching parents in using *auditory first* during a book reading activity can be more effective if the provider also has a book on their end to model the strategy rather than relying only on verbal descriptions. A TI provider who has toys or materials commonly found in most homes may find it improves their ability to demonstrate concepts and increase parent comprehension.

3. **Be Flexible.** Providing intervention services using a virtual connection can facilitate coaching opportunities in a variety of settings, reinforcing to parents the various strategies they can implement across environments to promote their child's goals and development. For example, the TI provider may join the family while they are visiting grandparents, outside gardening, or even when on vacation, thus expanding language and listening opportunities that naturally occur within the family's activities. An approach that is flexible can help reduce parent stress and promote a positive parent-professional partnership as parents feel the provider's support and understanding of the many demands they face. And most importantly, it can effectively support parent understanding of how to foster their child's developmental goals throughout the day within natural activities, various locations, and under a

range of circumstances.

4. **Stay Calm and Confident.** Many TI providers find it helpful to set the pace of the session by controlling their rate of speech and projecting a calm demeanor. This can be particularly important if the session doesn't go as planned. For example, parents may feel stress or tension if their child misbehaves or if there are distractions occurring in the home that impact the session. As these situations arise, a calm and confident provider can guide the conversations or diffuse the situation in positive ways. The provider can reassure the parent of their empathy and understanding and allow time for the parent to take care of the situation. Similarly, challenges associated with technology also require a calm and confident response from the provider. With any virtual connection, occasional disruptions are sure to arise (e.g., computer malfunction, power outage, poor internet connection). A clear and predetermined response plan to situations as they may occur can minimize frustration and portray the desired professionalism of service delivery.
5. **Get Comfortable with the Virtual Connection.** Since the onset of the Covid-19 pandemic, parents and professionals have engaged in virtual connections more frequently than at any time in the past. However, for some adults, there can be a period of adjustment in seeing themselves and communicating with others on a computer screen. Professionals and parents who feel reticence may find it encouraging to know that, with time and experience, their comfort and confidence with virtual services can increase. Similarly, children may have a period of behaving differently when they see themselves on the screen, such as becoming shy or being silly, until the services become routine rather than novel. Encouraging open conversations about potential concerns parents may have about themselves or their children can give providers insights as to how to support the virtual connection.
6. **Evaluate Your Own Facial Expressions and Mannerisms.** Professionals may be so inclined to focus on parents and the priorities within the session they forget to also evaluate their own behaviors and mannerisms. In a TI session, facial expressions can play a prominent role in the communication. For example, imagine the parent who feels insecure in trying a new strategy and the words the professional says are not congruent with the look on their face. This mismatch could instill hesitancy for the parent in trying new strategies in the future. Managing challenging behaviors from the child who is DHH or other siblings in the room can be difficult and stressful for parents. Professionals who believe they are patiently waiting or pondering how they

might provide suggestions may inadvertently add to parental stress if their facial expressions appear disapproving or impatient. Similarly, professionals may subconsciously show other mannerisms in which they may not be aware. For example, excessively touching one's face, playing with one's hair, or looking elsewhere in the room rather than the computer camera might be distracting to parents. A purposeful evaluation of facial expressions and other non-verbal mannerisms could inform the professional in meaningful ways to assure they convey the tone or communications intended.

7. **Guide Parents in Incorporating Their Child's Goals into Everyday Activities and Routines.**

At the end of each session, parents should feel confident and empowered in knowing how to help promote their child's goals as routine components of their day. Parents who leave a session with the perception of having *homework* may not fully understand the goals of family-centered intervention and the importance of fostering their child's goals within natural and meaningful activities. Further, parents may exhibit confidence in carrying out specific activities as they occur during the session and with the TI provider present yet be insecure in using effective strategies when the provider is not there to provide coaching. Taking the time to brainstorm concrete examples of how specific goals or targets might be implemented in a variety of ways may be beneficial for parents. Such discussions can trigger an array of new thoughts as the parent and provider identify suggestions together, consistent with the activities typical of the family. And it can be satisfying and confidence-boosting for parents when they come up with their own ideas, possibly resulting in more consistent and effective implementation. Even when parents are adept at fostering their child's goals within their daily routines, the benefit of such brainstorming support should not be underestimated, particularly as the child progresses and new goals are identified.

8. **Learn to Take Notes with Minimal Distractions.**

Whether brainstorming implementation of child goals, collecting ongoing data, or taking general notes, TI providers must learn to do these tasks with minimal distractions. In a virtual connection, there is a greater potential for miscommunication if the provider appears to be multitasking, regularly looking away from the camera, or having lengthy pauses in the conversation. Whether taking hand-written or electronic notes, providers can minimize session disruptions by being mindful of activities or behaviors that are distracting or may be misinterpreted by their virtual communication partners. This can take planning, practice, and a purposeful mindfulness for each provider to

identify the strategies that work best for them.

9. **Provide a Written Summary.** As providers develop the skills to take meaningful notes throughout the session, they are then better equipped to provide parents with a written summary at the end of each session. A parent-friendly written summary can provide invaluable guidance to ensure parents can recall the details of the session, their child's goals and targets, and the jointly discussed suggestions for implementation. According to the parent survey (see Nelson et al., 2022 in the present monograph), just 35% of parents regularly received a written summary of their intervention session. For many parents, such omissions are not in keeping with practices of optimal family-centered care.

10. **Be Creative!** Tele-intervention offers a multitude of possibilities in supporting the development of children who are DHH and the willingness to be creative can foster boundless opportunities for both providers and families. This could include activities involving singing and using music or engaging with various apps or programs to create an art project. With the over-abundance of electronic resources, it can feel overwhelming to providers and there is no need to learn or use everything available. However, identifying a few tried and true resources to encourage creativity in session engagement can offer powerful examples to families of the potential that is there for them on a daily basis. Providers who are willing to try new things and take the family's lead in supporting them in their activities may find TI offers surprising and unique opportunities in service delivery.

## Conclusion

The use of telecommunications and online platforms to deliver family-centered early intervention services for children who are DHH has been shown to be efficient, cost effective, and supportive of positive child and family outcomes. Going forward, families will continue to request these services as a means of necessity when securing hard-to-find and consistent early intervention services from well-trained providers. Regardless of where they live—in rural or urban communities—TI may be the best and most appropriate service delivery model to be used with a family. As early intervention programs develop and maintain TI programs, careful planning and ongoing data collection are critical for the long-term success of these efforts. Roles should be clearly delineated, and service providers, families, administrators, and other community stakeholders must work together to establish clear policies and procedures that will define the TI services. Barriers must be identified and, hopefully, mitigated or eliminated. When these steps are taken, the TI program will more likely achieve its primary goal of providing ongoing, evidence-based, and successful family-centered early intervention.

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## Tele-Intervention Resources

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### Abstract

The pandemic presented challenges and opportunities to grow as early intervention providers. This document provides a compilation of resources specific to providing tele-intervention for children in early intervention who are deaf or hard of hearing.

**Keywords:** EI = early intervention; EHDI = Early Hearing Detection and Intervention; TI = tele-intervention

**Acronyms:** ASHA = American-Speech-Language-Hearing Association; ATA = American Tele-medicine Association; DHH = deaf or hard of hearing; ECI = Early Childhood Intervention; ECTA = Early Childhood Technical Assistance Center; EHDI = Early Hearing Detection and Intervention; EPB = evidence based practice; FIPP = Family Infant and Preschool Program; HRSA = Health Resources and Services Administration; NCHAM = National Center for Hearing Assessment and Management; TI = tele-intervention

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The restrictions of the COVID-19 pandemic forced many early intervention (EI) providers and families to adopt an emergency virtual service delivery model. The exigent nature of the pandemic necessitated the rapid transition to virtual early intervention, often without the benefit of training and guidance for both providers and caregivers regarding the use of virtual platforms, objectives, procedures, and the overall dynamics of the virtual session. As restrictions begin to ease and in-person home visits once again become possible, many providers and caregivers may be wondering how tele-intervention (TI) services might be a part of ongoing early intervention for children who are deaf or hard of hearing (DHH). Reviewing desired family outcomes and the components of high-quality TI services will be necessary as caregivers and providers determine their intervention plan forward together. The purpose of this article is to highlight resources pertaining to the provision of high-quality TI services in keeping with recommended family-centered early intervention practices. Thorough descriptions of each resource are provided followed by a table summarizing the resources offered for tele-intervention for children who are DHH (see Tables 1–4).

### Overview of Resources

The National Center for Hearing Assessment and Management (NCHAM) works to support access to appropriate EI services for families of children who are diagnosed as DHH. In the spirit of this mission, NCHAM has been promoting the role of telehealth in providing timely, family-centered services and has supported a Tele-Intervention Learning Community since 2010. Defined

broadly, telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration (see Table 2, [HRSA: Telehealth Programs](#)). The term *tele-intervention* (TI) is a term coined by NCHAM to refer to the application of telehealth technologies to providing EI services. The resources listed in Tables 1–4 and throughout the article may also use the terms telepractice, telehealth, teletherapy, and telehabilitation to describe a multitude of practices delivered through distance technologies.

NCHAM has developed a [Tele-Intervention Resource Guide](#) that highlights recommended practices for conducting TI sessions along with important information about technology considerations, licensure and reimbursement, privacy, and security. The Tele-Intervention Guide is one part of a larger [Telehealth Resource Guide](#) that also includes training in providing early intervention services to families of infants and toddlers who are DHH via distance technologies. An additional [Tele-Audiology Guide](#) is also available. There is more information about the Resource Guide in the sections below.

The resources included in this article are organized from the most general to the most specific for providing virtual early intervention services to children who are DHH and their families. The list is not meant to be comprehensive, but rather a compilation of some of the available opportunities to learn more about: (a) general telehealth, (b) telehealth in early intervention, and (c) tele-intervention for children who are DHH.



**Table 1**  
*Overview of Resources*

Resource Name	Summary
<a href="#">The National Center for Hearing Assessment and Management (NCHAM)</a>	<ul style="list-style-type: none"> <li>• National Technical Resource Center</li> <li>• Provides: <ul style="list-style-type: none"> <li>○ Technical assistance</li> <li>○ Training</li> <li>○ Evidence-based practice information</li> <li>○ Partnership opportunities</li> </ul> </li> </ul>
<a href="#">HRSA: Telehealth Programs</a>	<ul style="list-style-type: none"> <li>• Telehealth program topics include: <ul style="list-style-type: none"> <li>○ Evidence Based Network</li> <li>○ Licensure Portability Grant</li> <li>○ Broadband Pilot</li> <li>○ Centers of Excellence</li> <li>○ Rural Health Research Centers</li> <li>○ Network Grant</li> <li>○ Resource Center</li> <li>○ Technology-Enabled Learning</li> </ul> </li> </ul>
<a href="#">NCHAM Tele-Intervention Resource Guide</a>	<ul style="list-style-type: none"> <li>• Practical information for Tele-Intervention (TI) application with additional links in sidebar</li> <li>• Three 101 learning courses for families, providers, and administrators</li> <li>• Overview of supportive technology</li> <li>• Information on privacy/security, licensing, and reimbursement</li> <li>• Guidance on TI outcome evaluation</li> <li>• Models of group TI options</li> <li>• Video examples of TI services</li> </ul>
<a href="#">Telehealth Resource Guide</a>	<ul style="list-style-type: none"> <li>• Information on telehealth and EMDI systems</li> <li>• Links to resources</li> <li>• List of resource centers by region</li> </ul>
<a href="#">Tele-Audiology Guide</a>	<ul style="list-style-type: none"> <li>• Recommendations for the practice of remote audiology with children from birth to 5 years old</li> <li>• Information on licensure reimbursement, legislation, standards, protocols, equipment, technology, privacy, family consent, professional approaches, model for improvement, and additional resources</li> <li>• Training options and guides</li> <li>• Evaluation procedures</li> <li>• Video examples</li> </ul>

### General Telehealth Resources

#### [Center for Connected Health Policy](#)

Center for Connected Health Policy (CCHP) is a National Tele-Health Policy Resource Center that serves as an independent center of excellence in telehealth policy. CCHP provides technical assistance to 12 regional Telehealth Resource Centers (TRCs), state and federal policy makers, national organizations, health systems, providers, and the public. CCHP also maintains an [online report](#) on current Tele-Health State Laws and Reimbursement Policies.

#### [HRSA Tele-Health Regional Technical Assistance Centers](#)

The United States Health Resources and Services Administration (HRSA) Telehealth Regional Technical Assistance Centers assist organizations, providers, and communities in implementing cost effective and sustainable telehealth programs.

#### [American Tele-medicine Association \(ATA\)](#)

Although focused primarily on clinical practice, the ATA also offers resources to accelerate telehealth program implementation and performance, including curated business tools, resources, and research and analysis to support telehealth initiatives.

#### [American Speech Language and Hearing Association \(ASHA\)](#)

ASHA maintains an extensive [tele-practice portal](#) for speech pathologists and audiologists. Resources include key issues, ethical considerations, licensure and certification, reimbursement, and tele-practice technology. There is also a [Tele-practice Special Interest Group](#) available to members. ASHA also provides [telepractice resources](#) related to COVID-19.

**Table 2**  
*General Telehealth Resources*

Resource Name	Summary
<a href="#">Center for Connected Health Policy</a>	<ul style="list-style-type: none"> <li>• Specific information about telehealth policies by state</li> <li>• Medicaid webinars</li> <li>• Expert advice</li> <li>• Information on pending legislation</li> </ul>
<a href="#">HRSA Tele-Health Regional Technical Assistance Centers</a>	<ul style="list-style-type: none"> <li>• Technical assistance and resources based on region</li> <li>• Individual consultations, trainings, webinars, and conferences availability depending on location</li> </ul>
<a href="#">American Tele-medicine Association (ATA)</a>	<ul style="list-style-type: none"> <li>• An association focused on tele-health and increasing medical access</li> <li>• Virtual events scheduled regularly on various aspects of tele-health for members only</li> <li>• Resource page with practice guidelines, quick-start guide, research, webinars, podcasts, and recorded conferences</li> </ul>
<a href="#">American Speech-Language-Hearing Associations (ASHA) Tele-practice portal</a>	<ul style="list-style-type: none"> <li>• ASHA tele-practice page including an overview, key issues, resources, and references</li> <li>• Sidebar with access to ASHA evidence maps on the topic, special interest groups, and related products and articles</li> </ul>
<a href="#">ASHA Tele-practice Special Interest Group</a>	<ul style="list-style-type: none"> <li>• ASHA special interest group 18 focused on tele-practice</li> <li>• Information on current research, and articles related to tele-practice are linked and can be sorted by “most recent,” “most read,” and “most cited”</li> </ul>
<a href="#">ASHA Telepractice resources</a>	<ul style="list-style-type: none"> <li>• Resources for additional information on: <ul style="list-style-type: none"> <li>○ telepractice basics</li> <li>○ state regulations</li> <li>○ reimbursement</li> <li>○ current research</li> <li>○ the telepractice community</li> </ul> </li> <li>• Specific issues</li> </ul>

### Telehealth Resources Specific to Early Intervention

Since the COVID-19 pandemic, there has been an abundance of guidance, training, and research available regarding the delivery of virtual, family-centered early intervention to young children and their families. The pandemic necessitated a rapid transition to emergency virtual services for many early intervention providers. Many of the resources below were initially created to support EI providers during that transition. Some have been updated and expanded to include more in-depth guidance and training on the appropriate use of tele-intervention as a service delivery model.

#### [Division for Early Childhood](#)

Division for Early Childhood began providing resources to support virtual Early Intervention during the COVID-19 pandemic, including routines-based intervention, assessments, dealing with challenging behaviors, and finding ways to engage parents.

#### [Family, Infant and Preschool Program \(FIPP\)](#)

As a National Center of Excellence, FIPP has designed a series of tele-intervention infographics on intervention practices, teaming practices, provider roles, and supporting practitioners virtually.

#### [American Speech Language and Hearing Association \(ASHA\) - COVID-19 Web Event Series on Early Intervention](#)

ASHA developed a series of recorded web chats to address the specific needs of those who operate or work in Part C EI programs or other EI practices during the COVID-19 pandemic. The web event series can be found on their website under COVID-19 Web Event Series on Early Intervention. Topics include:

- Office of Special Education Programs (OSEP) Guidance for Part C services
- Telepractice Assessment and Evaluation
- Empowering Families and Professionals

#### [Early Childhood Technical Assistance Center \(ECTA\)](#)

The ECTA website provides remote service delivery and distance learning resources for states' early intervention Part C and early childhood special education IDEA Part B Section 619 programs including technology and privacy, reimbursement, provider and educator use of technology, family resources, state guidance and resources, and research.

## Early Intervention Colorado (EI Colorado) - Online Tele-Intervention Training for Early Intervention Professionals

The online tele-intervention training for early intervention professionals is offered through the Office of Early Childhood, this four-module training discusses

considerations for platforms to use, provides examples of what telehealth sessions look like, and suggests ways to troubleshoot issues. The last module is more interactive in showing short clips, then asking learners to reflect on scenarios they see that reflect good telehealth practice and things that could be improved. This training is free to anyone wanting to take it.

**Table 3**

### *Early Intervention Resources*

Resource Name	Summary
<a href="#">Division for Early Childhood</a>	<ul style="list-style-type: none"><li>Information sources for early intervention and early childhood telehealth:<ul style="list-style-type: none"><li>Articles and blog posts</li><li>Resource lists</li><li>Individual resources</li><li>Networking information</li><li>Audio interviews and podcasts</li><li>Children's stories</li><li>Videos</li><li>Webinars</li></ul></li></ul>
<a href="#">Family, Infant and Preschool Program (FIPP)</a>	<ul style="list-style-type: none"><li>Early Childhood Intervention (ECI) video</li><li>Infographics on ECI practices, teaming, roles, and practitioner support<ul style="list-style-type: none"><li>A ECI guide for practitioners</li></ul></li></ul>
<a href="#">American Speech Language and Hearing Association (ASHA) - COVID-19 Web Event Series on Early Intervention</a>	<ul style="list-style-type: none"><li>Topic focuses:<ul style="list-style-type: none"><li>The Big Picture</li><li>Telepractice Evaluation and Assessment for evaluation and assessment</li></ul></li><li>Empowering Families and Professionals</li></ul>
<a href="#">Early Childhood Technical Assistance Center (ECTA)</a>	<ul style="list-style-type: none"><li>Video on remote service delivery</li><li>Breakdown of terminology</li><li>Links to professional associations including ASHA</li><li>Additional resources on telehealth<ul style="list-style-type: none"><li>Equity information</li></ul></li></ul>
<a href="#">Early Intervention Colorado (EI Colorado) - Online Tele-Intervention Training for Early Intervention Professionals</a>	<ul style="list-style-type: none"><li>Telehealth training with certificate</li><li>Information on becoming an Early Intervention Assistive Technology Consultant in Colorado</li></ul>

### **Telehealth Resources Specific to Early Intervention for Children who are DHH**

#### Hearing First: Learning LSL through Telepractice

Hearing First is an online professional community that includes free learning experiences, resources and forums. Their primary focus is on Listening and Spoken Language. Their website includes printable handouts, parent perspective videos, and access to the "Time for Telepractice" recorded webinar.

#### NCHAM Recorded Webinars

NCHAM also has recorded webinars to help providers who want to improve the telehealth experience. They continue to add resources, but three webinars are:

#### Ensuring Ongoing Access to High Quality Early Intervention Services through Telepractice

#### Tips and Tools to Support Effective Tele-practice Sessions

#### Transitioning for Emergency Tele-intervention to Ongoing Tele-intervention Sessions

### National Center for Hearing Assessment and Management (NCHAM) Tele-Intervention (TI) Introductory Courses

NCHAM provides online tele-intervention training. The TI 101 Training Courses are recommended resources for those seeking to understand key components to implementing TI. These free courses contain real-life scenarios, video clips, and implementation tools for EI direct service providers, families interested in TI, and EI program administrators. Three courses are available:

- For Administrators—How to create a tele-intervention component for EI services
- For Providers—How to implement TI and engage families
- For Families—How to partner with providers for successful TI sessions.

**Table 4***Early Intervention Resources for Children who are Deaf or Hard of Hearing*

Resource Name	Summary
<a href="#">National Center for Hearing Assessment and Management (NCHAM) Tele-Intervention (TI) Introductory Courses</a>	<ul style="list-style-type: none"><li>• Tele-Intervention (TI) training videos for:<ul style="list-style-type: none"><li>◦ Families—Focus on being successful with TI</li><li>◦ Providers—Focus on implementation of TI components</li><li>◦ Administrators—Focus on creating a TI component</li></ul></li></ul>
<a href="#">Hearing First: Learning LSL through Telepractice</a>	<ul style="list-style-type: none"><li>• Information on listening and spoken language intervention</li><li>• Handouts on Listening and Spoken Language (LSL) intervention via telepractice</li><li>• Additional handouts with LSL strategies</li><li>• Video resources</li><li>• Additional Resources</li><li>• Course catalog for telepractice with LSL</li></ul>
<b>NCHAM Recorded Webinars</b>	
<a href="#">Ensuring Ongoing Access to High Quality Early Intervention Services through Telepractice</a>	<ul style="list-style-type: none"><li>• Hour long video recording of webinar by Dr. Blaiser about telepractice access</li></ul>
<a href="#">Tips and Tools to Support Effective Tele-practice Sessions</a>	<ul style="list-style-type: none"><li>• Hour long video recording of webinar by Dr. Houston on tips and tools for effective tele-practice sessions</li></ul>
<a href="#">Transitioning from Emergency Tele-intervention to Ongoing Tele-intervention Sessions</a>	<ul style="list-style-type: none"><li>• 30 minute video recording of webinar by Lauren Smith, MEd, on transitioning from emergency tele-intervention to ongoing tele-intervention</li></ul>