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A New Age of Telehealth: Pediatric Speech-Language Pathology Services during the COVID-19 Pandemic and Beyond

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A New Age of Telehealth:

Pediatric Speech-Language Pathology Services during the COVID-19 Pandemic and Beyond

by

Deborah R. Campbell

A dissertation submitted in partial fulfillment
of the requirement for the degree of
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ABSTRACT

The COVID-19 pandemic potentially changed the landscape of how speech-language pathologists provide services. Prior to March 2020, pediatric speech-language therapy provided via telehealth was limited; however, the COVID-19 pandemic caused a worldwide conversion from in-person care to a remote service delivery model. This conversion brought to the fore possible benefits and utility of telehealth use. Yet, clinicians potentially experienced barriers to its use, including the lack of validity and reliability evidence for remote administration of several pediatric assessments. For the viability of remotely delivered speech-language services to continue and evolve in a post-pandemic world, further research is needed to identify changes to telehealth barriers and benefits. This manuscript includes investigations into how telehealth delivery of pediatric speech-language pathology services changed as a result of the COVID-19 pandemic, and also examined the extent to which clinicians’ reservations about the reliability and validity of telehealth speech sound assessments were justified.

Study 1 sought to capture changes in speech-language pathology clinicians’ telehealth experiences before and during the COVID-19 pandemic and predictions about post-pandemic telehealth services. The Telehealth Services: Pediatric Provider Survey (Part 1) was created to gather self-reported responses from speech-language clinicians in a variety of employment settings who were serving primarily pediatric (i.e., children from birth through age 21) clients. Survey results documented how pediatric speech-language clinicians’ (n=293) use of telehealth dramatically increased from before March 2020 to October 2020. This shift from in-person care to synchronous videoconferencing effectively created a new generation of telepractitioners. Even
though most clinicians initially used telehealth due to employer mandates to lower infection risk for both client and clinician, over time pediatric speech-language pathology clinicians increased their telehealth proficiency and recognized the benefits of telehealth. This new generation’s adoption of telehealth and the rapid improvement in proficiency was a testament to the resiliency of providers and potentially had long-term effects on the future of telehealth use.

Study 2 examined the resulting evolution in the technology, connectivity, and the extent of implementation of evaluation and treatment services before and during the COVID-19 pandemic and predictions about post-pandemic telehealth services. The Telehealth Services: Pediatric Provider Survey (Part 2) was created to identify telehealth barriers that were eliminated and those that persisted during the pandemic. Additionally, the survey sampled pediatric speech-language clinicians’ perceptions about advantages and disadvantages of remote delivery of evaluation and treatment services. Elimination of regulatory and insurance hurdles allowed children from varying socioeconomic backgrounds living in rural, suburban, and urban areas access to telehealth. Telehealth technology shifted from computers with external hardware and specialized software to commercially available equipment, such as handheld portable devices with built-in audio-visual components and publicly available videoconferencing platforms. Connectivity of these devices continued to be problematic, however, and lack of technology prevented some children from accessing care. Judgments about the appropriateness and effectiveness of evaluations and treatments varied based on the age and communication disorder of a child. Although some participants expressed uncertainty about the effectiveness of telehealth compared to in-person care, telehealth was widely recognized as a viable delivery method. Clinicians anticipate that new research and innovations resulting from the surge in
telehealth use have the potential to continue improving telehealth service delivery, bolstering the viability of telehealth long after the COVID-19 pandemic is gone.

Study 3 investigated the reliability and validity of a speech sound assessment administered in real-world scenarios. Thirty-nine three- to eight-year-olds were administered the Goldman Fristoe Test of Articulation-3rd Edition (GFTA3). Using a counterbalanced administration, licensed speech-language pathologists (SLPs) concurrently scored the children’s responses in person, and in two telehealth conditions, typical and enhanced. The results were compared mean composite scores and interrater reliability and descriptive statistics summarized scoring disruptions and findings on the SLP post-assessment survey. Results revealed that all scoring conditions were highly correlated, with mean differences revealing no significant systematic difference of one condition over- or under-estimating another. Final sounds in words (e.g., /l/), sounds that were difficult to see (/g/) and some cognate pairs (e.g., t/d) most often attenuated reliability, which still averaged 85-87% agreement between conditions. Reported child behavior and technology disruptions did not affect SLPs’ ability to score responses, mainly because of the GFTA3’s administration procedures that allow target items to be prompted or repeated. Therefore, this study supports the provision of a pediatric speech sound assessment using consumer-grade equipment, as in person, typical telehealth, and enhanced telehealth scoring conditions produced nearly identical scoring results. However, SLP participants’ post-assessment survey results revealed skeptical attitudes toward remote delivery of standardized tests, an ongoing barrier to widespread telehealth use.

Pediatric speech-language pathology clinicians’ experiences during the COVID-19 pandemic were unprecedented. It forced an entire generation of clinicians and their clients to quickly adapt and evolve into a therapy world that was contingent on technology. Yet, the
necessity of telehealth revealed to clinicians its many benefits. Sadly, it also brought to their attention telehealth’s ongoing barriers, such as the significant deficiencies in research that support the use of telehealth. These studies represent the beginning of a new age of telehealth research.
CHAPTER 1:
INTRODUCTION

The use of telehealth as a remote delivery method for providing speech-language therapy services through telecommunication technology (i.e., synchronous videoconferencing) is not new (Coufal et al., 2018; Houston et al., 2012). In the profession of speech-language pathology, the term telehealth is synonymous with the terms telepractice, telespeech, teletherapy, teleassessment, and telerehabilitation (American Speech-Language-Hearing Association, 2016a, b; Freckman et al., 2017; Keck & Doarn, 2014), all of which have been around since the 1990s (Sutherland et al., 2018; Houston et al, 2012). Although speech-language pathologists (SLPs) have used telehealth over the years to treat conditions such as stuttering, adult communication disorders, and pediatric speech and language delays, barriers prohibited widespread use (Sutherland et al., 2018; Tohidast et al., 2020). Challenges, such as licensure, reimbursement, and limited connectivity, deterred providers from venturing into the world of telehealth (Bashshur et al., 2020; Houston et al., 2012). SLPs who offered their services remotely viewed telehealth as a flexible and beneficial alternative to in person care, such as providing therapy to clients who live in locations where care is otherwise inaccessible (Blaiser, 2016; Freckman et al., 2017; Grogan-Johnson et al., 2013; Wales, et al., 2017; Weidner & Lowman, 2020). Remote speech-language therapy services were viewed as having a limited scope of utility.

Then, on March 11, 2020, the World Health Organization declared COVID-19 a pandemic (Cucinotta & Vanelli, 2020). All at once, telehealth became an essential service delivery method for a worldwide group of medical and educational providers to continue to provide care.
Government agencies, aware of the implications of COVID-19, began to make sweeping changes that assisted in making the use of telehealth viable. They allowed interstate licensing, removed regulatory restrictions, and most importantly, provided reimbursement for services (Bashshur et al., 2020). Speech-language pathologists had to quickly adopt and pivot to this unfamiliar delivery model. When the world was encouraged to stay at home, wear masks, and socially distance, telehealth became the avenue that speech-language pathologists could use to access their clients while avoiding risk to this infectious disease (Smith et al., 2020).

Even though many clinicians had never performed an evaluation or implemented a treatment plan via telehealth, the pivot to a delivery method that required technology was not unrealistic (Pamplona & Ysunza 2020; Tohidast et al., 2020; Wang et al., 2020). SLPs were already using technology to provide therapy services. Augmentative and alternative communication (AAC) devices, tablet-based applications (i.e., apps), electronic medical records, and mobile devices (i.e., smart phones) had been a part of their daily lives for at least a decade (Clarke & Williams, 2020; Du & Salen, 2020). As a result, providers discovered the feasibility of providing services via telehealth during this unprecedented time. Many clinicians could clinically manage speech and language disorders without compromising the quality of care or health of clients (Tohidast et al., 2020).

For school districts and pediatric therapy practices around the country, telehealth was now a viable, if not the only, option available to provide therapy to their students and clients during the pandemic (Gati et al., 2020). However, despite the removal of regulatory barriers that prevented clinicians from providing services via telehealth prior to COVID-19, technological barriers continued to interfere with SLPs attempts to provide services (Benda et al., 2020; Bashshur et al., 2020; Keck & Doarn, 2014). SLPs and clients often lacked telehealth...
infrastructure, such as affordable broadband and availability to appropriate equipment, needed to provide adequate connectivity for a clinical session (Smith et al., 2020; Tohidast et al., 2020). In addition, research on the minimum technological requirements to provide effective assessment and intervention services was limited. Prior studies of the effectiveness of pediatric telehealth services often used custom-built computers and applications ideal for research conditions, in contrast to readily accessible broadband and consumer-grade, commercially available equipment (Dahiya et al., 2020; Hodge et al., 2019; Sutherland et al., 2017; Taylor et al., 2014). Thus, these studies rarely represented real-world scenarios for pediatric SLPs delivering telehealth services in a typical therapy setting.

The research supporting the validity and reliability of diagnostic evaluations administered via telehealth, even in optimal research conditions, is limited and varies in quality (Sutherland et al., 2017; Taylor et al., 2014; Wales et al., 2017). Although a few pediatric assessments have been validated through synchronous telecommunication, including a standardized language evaluation (Blaiser, 2016; Sutherland et al., 2015; Waite et al., 2006, Theodoros et al., 2010) and a cognitive assessment (Hodge et al., 2019; Wright, 2020), research on current versions of standardized pediatric speech-language tests delivered via telehealth are nonexistent (Taylor et al., 2014). Thus, this new demand for pediatric speech and language telehealth services has created an urgency for researchers to perform validity studies evaluating the reliability of the instruments used for teleassessments.

The purpose of this multi-manuscript dissertation was to investigate the use and effectiveness of telehealth services in the pediatric population prior to and after March 2020 (COVID-19). In particular, clinicians were surveyed to identify perceived benefits and barriers experienced while providing therapy via synchronous videoconferencing. To establish ecological
validity, questions investigated the minimum technological requirements needed by speech-language pathologists and their clients to provide therapy services remotely and how speech-language pathologists’ perceptions changed during the pandemic. Finally, the validity, inter-rater reliability, and feasibility of a standardized speech sound assessment administered remotely was evaluated using three scoring conditions. The Goldman Fristoe Test of Articulation-3rd edition (Goldman & Fristoe, 2015) was used to evaluate the accuracy of scoring speech sounds in real-world scenarios, with in person administration in a clinic setting compared to two remote equipment variations, a typical and enhanced condition.

For the first two studies, a two-part survey was developed and delivered on-line through social media, ASHA’s Special Interest Groups, and professional groups via email. Pediatric speech-language pathologists were invited to describe their experiences and express their impressions of telehealth. The first purpose was to investigate the use of telehealth services prior to and after March 2020 (COVID-19). The second purpose was to explore the perceived effectiveness and appropriateness of telehealth pediatric speech-language and literacy-based services, as well as clinicians’ experiences with the technology needed to perform these vital services prior to and after March 2020 (COVID-19). Speech-language pathology clinicians, including master’s and bachelor level pediatric providers, answered questions organized into 13 domains: (I) Employment and Experience; (II) Telehealth Services: Previous (prior to the beginning of the pandemic, March 2020); (III) Telehealth Services: Recent (immediately after the pandemic, March to July 2020); (IV) Telehealth Services: Current (during the survey period, (August) September to October 2020); (V) Telehealth Services: Future (2021 and beyond); (VI) Reasons for Telehealth Usage; (VII) Client/Student Settings; (VIII) Telehealth Hardware & Software Used; (IX) Perceptions of Technology; (X) Evaluations Administered via Telehealth;
The third study was informed by the survey results and policies that questioned the appropriateness of conducting diagnostic evaluations using videoconferencing, especially for speech sound assessments. Due to the significance of the auditory requirements needed to make fine perceptual judgments, the objective of this study was to investigate the reliability and validity of scoring of a speech sound assessment using typical technology in contrast to enhanced technology compared to a traditional, in-person evaluation. Additionally, upon completion of the experiment, clinicians completed a post-assessment questionnaire to gather their impressions of the remote delivery parameters and the children’s responding to testing via a telehealth delivery model.

In summary, COVID-19 brought the world of telehealth from the periphery into the mainstream for many speech-language pathologists. Although the pandemic may have jump-started its use for many clinicians, it is possible that perceptions have changed, making telehealth a viable alternative to in-person care for well into the foreseeable future. However, the speed in which synchronous telecommunication has been adopted to provide therapy services now needs research to support it, most notably in the area of speech sound assessments. This multi-study paper investigated clinicians’ experiences with telehealth during the worldwide pandemic and contribute to the body of literature on teleassessment and the breadth of appropriate usage.

References


CHAPTER TWO:
GENESIS OF A NEW GENERATION OF TELEPRACTITIONERS:
THE COVID-19 PANDEMIC AND PEDIATRIC
SPEECH-LANGUAGE PATHOLOGY SERVICES

Note to Reader
This chapter’s manuscript has been accepted for publication to American Journal of Speech-Language Pathology.

Abstract

Purpose: In March 2020, the COVID-19 pandemic caused a worldwide shift from in-person care to synchronous videoconferencing or telehealth. Many barriers to remote service delivery were eliminated, effectively creating a new generation of telepractitioners. This study chronicles changes in speech-language pathology clinicians’ use and perceptions of telehealth with pediatric populations.

Method: The Telehealth Services: Pediatric Provider Survey was created in multiple steps and then distributed broadly through social media and professional community sites. Respondents were speech-language pathologists and speech-language pathology assistants in a variety of employment settings from across the country and abroad who were serving primarily pediatric clients ($n=269$). Survey questions sought to capture changes in speech-language pathology clinicians’ experiences with and perceptions of telehealth before, during, and predictions after the COVID-19 pandemic. Analyses identified factors that influenced the use of telehealth services before and after March 2020 (COVID-19).
**Results:** Survey results documented the dramatic increase in telehealth use from before March 2020 to October 2020. The reasons pediatric speech-language pathology clinicians used telehealth during the pandemic were mostly a result of employer mandates or lowering infection risk for both client and clinician; however, over time, pediatric speech-language pathology clinicians increased their telehealth proficiency and discovered the benefits of telehealth.

**Conclusion:** The adoption of telehealth and the rapid improvement in proficiency is a testament to the resiliency of providers and has long-term effects on the use of telehealth into the future.

**Introduction**

Prior to March 2020, only 1.6% to 9% of global pediatric speech-language pathology services were provided via telehealth and using telecommunications technologies for synchronous videoconferencing (ASHA, 2002, 2020b; Fong et al., 2020; Hill & Miller, 2012; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Many speech-language pathologists questioned the efficacy of telehealth or raised concerns about client comfort (Freckmann et al., 2017; Keck & Doarn, 2014; Lustig & Institute of Medicine (U.S.), 2012). Medicare, Medicaid, and many private insurers limited reimbursement for telehealth to specific services or providers (Martinez et al., 2020; Mechanic & Kimball, 2020). When a patient was fortunate enough to have telehealth coverage, finding a provider who was experienced in its use was challenging (Mechanic & Kimball, 2020). Fewer than 25% of graduate programs addressed telepractice, and state licensing boards prohibited synchronous videoconferencing across state lines (ASHA, 2016; Grillo, 2017; Grogan-Johnson et al., 2015, Houston et al., 2012; Martinez et al., 2020; Mechanic & Kimball, 2020). Reimbursement, training, and licensure barriers hampered universal adoption of telehealth (Coufal et al., 2018; Dekhtyar et al., 2020; Houston et al., 2012; Martinez et al., 2020; Mechanic & Kimball, 2020; Mohapatra et al., 2015).
For clients receiving therapy through school-based services, the availability of speech and language intervention via synchronous videoconferencing was just as bleak. In 2012, a survey reporting telepractice used by school-based speech-language pathologists revealed only 1.8% of respondents had used this delivery method and they were more likely to be younger speech-language pathologists (Tucker, 2012). The findings in this study were consistent with previous surveys conducted by the American Speech-Language Hearing Association (ASHA) in 2002 and 2011 (Tucker, 2012). Speech-language pathologists in the schools identified administrative hurdles, such as the lack of allocation of funds for technology and personnel, lack of training, limited facility readiness, as well as negative attitudes towards telepractice (Tucker, 2012; Sanchez et al., 2019).

Speech-language pathologists in both health and education settings have expressed reservations about forgoing face-to-face interaction. Speech-language pathologists questioned how they could deliver therapy without the use of traditional procedures, such as tactile cueing or directly manipulating a client’s articulators (Coufal et al., 2018; Freckmann et al., 2017). Speech-language pathologists’ negative attitudes, such as the perceived impersonal delivery of services or limited client-caregiver-clinician interactions, represented additional barriers to implementation of telehealth services (Freckmann et al., 2017). Thus, lack of knowledge and training in telehealth as well as speech-language pathologists’ perceptions and attitudes about remote service delivery prevented providers from considering synchronous videoconferencing as a viable option for their services (ASHA, 2002; Grillo, 2017; Taylor et al., 2014).

Even though speech-language pathologists may have been lacking formal telehealth training, clinicians in all therapy settings were gaining experience with the infrastructure and technology that provides the foundation for telehealth service delivery. For example, speech-
language pathologists have been using tablet-based software applications (apps) and videoconferencing on their own computers or smart phones. Speech-language pathologists unknowingly were benefiting from advancements in mobile technology, synchronous electronic communication, and improvements in high-speed broadband connections, all fundamental components and experiences that make telehealth feasible (Bashshur et al., 2020; Coufal et al., 2018; Dekhtyar et al., 2020; McClellan et al., 2020; Mohapatra et al., 2015).

Then a novel coronavirus, COVID-19, forced “essential critical infrastructure workers” (Silver et al., 2020), including speech-language pathologists, to assess the risk of infection for both clients and clinicians when providing in-person care. Suddenly, the utility of telehealth usage came to the fore (Gaeta, 2020; Wang et al., 2020; Zhu et al., 2020). Speech-language pathologists, educators, and healthcare workers instantly participated in a massive, worldwide conversion from in-person care to telehealth (Bashshur et al., 2020; Smith et al., 2020; Tohidast et al., 2020). School-based clinicians, working under stay-at-home orders, adopted telecommunication services, as it was the only option available for providing synchronous services. Most of the telehealth barriers that existed prior to COVID-19, including reimbursement, regulations, and technology as well as speech-language pathologists’ negative perceptions of telehealth dissipated (Keck & Doarn, 2014; Lustig & Institute of Medicine (U.S.), 2012; Freckmann et al., 2017). Because telehealth enabled speech-language pathologists to provide care without the risk of spreading COVID-19, clinicians were forced to consider the viability of telehealth as a new option for service delivery (Tohidast et al., 2020).

To identify the effects of the COVID-19 pandemic on speech-language pathologists and their clients, the American Speech-Language Hearing Association (ASHA) and researchers surveyed service providers. For example, in March 2020, Fong, Tsai and Yiu (2020) found 72%
of speech-language pathologists were new to telehealth and the majority had no prior training in
the delivery method. In March and May 2020, ASHA investigated the needs of members, students and assistants (ASHA, 2020a, b). In March, 87.5% of speech-language pathologists across all practice settings noted that COVID-19 had a major or moderate impact on them professionally or academically. In May, ASHA asked participants about their use of remote services prior to COVID-19 and currently. They reported that 4.5% of speech-language pathologists across all practice settings had previously used telehealth but that 63% were using it currently. However, 60.9% of speech-language pathologists found delivering their clinical services remotely as their greatest challenge. In November 2020, Tenforde et al. (2020) reported measures of high patient satisfaction with telehealth, across age and conditions for pediatric clients. Additionally, families responded positively when asked about their willingness to participate in future telehealth visits.

The surge of telehealth implementation during the pandemic is creating the opportunity for permanent adoption of remotely delivered speech and language services. Temporary, emergency waivers may soon become permanent, removing many of the previous reimbursement and regulatory barriers (Ortega et al., 2020; Tohidast et al., 2020). However, some issues and concerns that existed prior to COVID-19 still remain, such as disparities among those who have access to technology and broadband internet (Benda et al., 2020; Fong et al., 2020; Monaghesh & Hajizadeh, 2020; Ortega et al., 2020; Smith et al., 2020). However, we do not know the extent to which the lack of technology or its infrastructure prevents clinicians and clients from connecting via telehealth during COVID-19. We do not know how the attitudes of clinicians, most specifically pediatric speech-language pathologists, have changed as a result of the
increased use of synchronous, videoconferencing during the pandemic. Thus, much remains unknown.

**Purpose**

Although previous studies have collected information about use of and attitudes toward telehealth in the provision of pediatric (i.e., children birth to age 21) speech-language services, most of these data were collected prior to the COVID-19 pandemic (Manning et al., 2020; Orlando et al., 2020). Prior to March 2020, telehealth research was limited due to the prolific barriers and restrictions creating underutilization of this delivery method within the pediatric population. However, COVID-19 created a surge in speech-language pathologists using synchronous videoconferencing (ASHA, 2020b). The makeup of this cadre of speech-language pathologists included medical and educational providers, early-career and seasoned clinicians, and rural and urban speech-language pathologists. What made them unique was that they had rarely or never used telehealth previously to provide speech-language pathology services (ASHA, 2020b; Fong et al., 2020). Thus, what was known previously about telehealth use and providers’ opinions potentially has changed, with the genesis of a large, new cohort of telepractitioners. Yet, since the onset of the COVID-19 pandemic, there has been limited research investigating how the surge in telehealth use has affected pediatric speech-language pathology clinicians and their ability to provide therapy services remotely. Thus, a survey was developed with the aim to investigate the impact of COVID-19 on the provision of speech-language services using a telehealth delivery model.

*The Telehealth Services: Pediatric Provider Survey* was constructed to identify factors influencing the use of telehealth services before and after the onset of the COVID-19 pandemic. Speech-language pathology clinicians provided retrospective data before and immediately after
the pandemic, current data for the survey time period, and their predictions about future telehealth use. The data obtained have the potential to expand our knowledge about the future of telehealth use among pediatric speech-language pathologists. This may lead to additional research supporting the sustainability of long-term adoption of this delivery model, allowing clinicians to advocate for the permanent elimination of previous barriers (i.e., lack of reimbursement, limited clinical training) that had deterred speech-language pathologists from offering services via telehealth. Therefore, to inform this research, the follow questions were addressed:

(1) What is the employment setting and level of telehealth experience for clinicians providing speech-language therapy services prior to and after March 2020 (COVID-19)?
(2) To what extent did telehealth use change from prior to and then during the COVID-19 pandemic? Did the use of telehealth over time relate to speech-language pathology clinicians’ predicted future use of remote delivery of therapy services?
(3) What are the reasons stated for telehealth use prior to and immediately after March 2020 (COVID-19) and into the future?
(4) How does the use of telehealth over time influence speech-language pathology clinicians’ perceived proficiency in providing remote therapy services?

Method

Survey Development

The Telehealth Services: Pediatric Provider Survey was constructed in stages using the process and standards described for questionnaire development (AERA, APA, & NCME, 2014; Plake & Wise, 2014; Presser et al., 2004; Willis, 1999). First, the content validity was investigated to assess the appropriateness of the tool for making decisions and interpretations about the involvement of pediatric speech-language pathologists in performing therapy services via a telehealth delivery model (Cook & Hatala, 2016). A literature review as well as an
examination of current surveys (i.e., March - July 2020) confirmed that this content was relevant and not previously studied. Five steps were used to create and review the survey’s domains and their component questions.

The survey was validated through the following steps: (1) generate a blueprint of survey items, (2) create an initial pool of survey questions (3) test the presentation functioning of question items (continued throughout the validation process) (4) review of survey questions by at least five telepractice experts in the field of pediatric speech-language pathology; revise questions for clarity and relevance based on feedback (5) implement cognitive interviews with the revised survey by at least five practicing pediatric speech-language pathologists currently using telepractice; revise questions for clarity and relevance based on feedback.

**Step 1: Survey Blueprint.** To identify the impact of the sudden widespread use of telehealth, there was a need to investigate clinicians’ experiences performing therapy services remotely. Therefore, the first step was to refine the purpose of the proposed tool. Questionnaires disseminated during the period of March 2020 to July 2020 were reviewed. For example, in March and May of 2020, ASHA (2020a, b) surveyed its members and inquired about the needs of audiologists and speech-language pathologists during COVID-19. The Aggarwal et al. (2020) survey in May 2020 noted the uptick of speech-language pathologists in India using telepractice after COVID-19. Based on this review of available surveys at the time of tool development, it was determined that none adequately represented the content of the identified need. For example, studies reported the increase in the number of speech-language pathologists who were doing telehealth prior to and directly after COVID-19, but they did not report the weekly volume of services that clinicians were providing during these time periods (e.g., 25% of their caseload receiving therapy remotely). Prior surveys acknowledged that COVID-19 was a significant reason most practitioners chose to use telehealth at the onset of pandemic. However, they did not ask what reasons clinicians were doing telehealth prior to March 2020 (COVID-19) or their rationale for telehealth, other than the pandemic, after March 2020. Subsequently, a review of the literature on telehealth, as well as the terms speech-language pathologists used, such as
telepractice, telespeech, teletherapy, teleassessment, and telerehabilitation, was conducted to investigate the history of synchronous videoconferencing to provide pediatric speech and language services (American Speech-Language-Hearing Association, 2016a, b, c; Cason & Cohn, 2014; Freckman et al., 2017; Keck & Doarn, 2014). Based on the review of surveys and extant literature as well as feedback from telepractitioners currently providing speech and language therapy, an initial blueprint of items was produced. This consisted of ideas, such as reasons providers might continue or abandon telehealth after the COVID-19 pandemic, and effects of speech-language pathologists’ clinical experience, technical skills, or prior telehealth knowledge on current attitudes toward telehealth.

**Step 2: Creation of Survey Questions.** Question development followed Dillman’s (2000) “Principles of Writing Survey Questions.” Survey items were created to ask questions with a single idea per question, stated both sides of an attitude question in the stem (i.e., agree or disagree), used simple language, and included precise estimates to avoid vague quantifiers (i.e., rarely). During this step of the development process, 61 questions were initially created. Among those 61 questions, 27 were deemed relevant to the research questions for this study. Based on the literature review and feedback from practicing speech-language pathologists, questions were grouped by topic. Each of the six topics contained an item pool of up to 14 questions.

The survey questions were entered into REDCap (Research Electronic Data Capture) allowing the survey to be administered electronically. REDCap is an electronic data capture tool hosted at the University of South Florida. REDCap is a secure, web-based software platform designed to support data capture and analysis for research studies (Harris et al., 2009).

**Step 3: Expert Panel Review.** Speech-language pathologists with expertise in the area of telehealth were asked to review the survey. These professionals were identified from authors who had published in the area of telehealth, business owners of telepractices, and leaders of the ASHA Special Interest Group on Telepractice. Sixteen individuals were contacted by email and asked to participate in an expert review of the proposed survey. Nine of them chose to participate. They were asked to provide feedback on the relevance and the clarity of each item.
using a 5-point rating scale. An additional, open-ended question option was available for each item, allowing experts to provide further information about their response, such as suggestions for modifying wording for greater clarity or opinions about relevance of questions to the proposed research. Any items that 75% of the experts rated as somewhat or not relevant or somewhat or not clear were considered candidates for elimination or major revision. Experts’ suggestions were reviewed and considered for possible question revisions.

Based on the expert feedback, 4 irrelevant questions were eliminated, 12 vague questions were reworded for clarity, and 3 new questions were added. More significantly, the questionnaire was reorganized. In the original version of the survey, questions were grouped by topics that concurrently inquired about speech-language pathologists’ and their clients’ experiences. The experts suggested grouping the questions into more specific domains, separating questions pertaining to the speech-language pathology clinician vs. their clients. The questions for each topic focused solely on questions related to clinician’s experiences before and after the onset of COVID-19. Prior to the next step, all of the survey changes and revisions were made, and the revised online questionnaire items were tested for accurate functioning in REDCap.

**Step 4: Cognitive Interviews.** The last step, prior to disseminating the final version of the instrument, were cognitive interviews with five seasoned pediatric clinicians. The interviews followed Willis’s (1999) guide to cognitive interviewing. Speech-language pathologists completed the survey using a think-aloud procedure. Two speech-language pathologists had prior experience with telehealth and three were new to this service delivery model. One speech-language pathologist was interviewed in-person while the other four were interviewed via FaceTime. During the cognitive interviews, clinicians were asked to verbalize their answer choices, telling the survey developer everything that came to mind about how they arrived at their answers. Feedback was requested for every survey item. Anytime a speech-language pathologist was unsure of the content presented, such as concerns about clarity or meaning, they were engaged in a discussion to discern possible alternative wording or to make suggestions about ways to revise the survey item.
Upon completion of the cognitive interviews, additional revisions to the survey instrument were made. This included: reformatting questions to improve ease of response; eliminating more questions; rewording questions for clarity; changing questions to emphasize the focus on the clinicians’ perspectives; streamlining the survey with additional branching of survey items; and defining terms used for clarity (i.e., suburban, rural, urban; socioeconomic status). The finalized questionnaire can be found in Appendix D.

The final survey was comprised of six topics that each participant was asked to self-report: employment and experience, telehealth services prior to the beginning of the pandemic, immediately after the pandemic began, during the survey period, future (2021 and beyond) and reasons for telehealth usage.

**Step 5: Survey Dissemination.** In September of 2020, after receiving IRB approval, the survey, *Telehealth Services: Pediatric Provider Survey*, was disseminated (on-line and by email). A one-paragraph overview explaining the purpose of the questionnaire was used to invite pediatric speech-language pathology clinicians to complete the survey. This was emailed to the directors of pediatric practices, school district speech-language pathology administrators, members of state and national organizations (i.e., ASHA, Florida Speech-Language Hearing Association (FLASHA), Learning Disabilities Association (LDA), Florida Learning Disabilities Association (FLDA)), West Central Early Steps early intervention providers (i.e., birth to three providers), and posted on social media sites (i.e., closed and public Facebook groups with pertinent interests, such as pediatric speech language-pathologists, school-based speech language-pathologists, telepractice). Additionally, this survey was shared on ASHA’s State Advocates for Reimbursement (STARS) committee message board as well as the Special Interest Groups 1 (Language, Learning and Education), 11 (Administration and Supervision), and 18 (Telepractice). Follow-up reminders were sent and posted weekly until the survey closed on October 31, 2020.

Survey participation was voluntary. Participants provided informed consent prior to proceeding with the questionnaire. The survey was designed to be completed in one
administration; however, participants were provided the option to return at a later date if they were unable to finish in one sitting. During the survey, each respondent was asked to answer questions about past, recent and future experiences.

**Data Analysis**

**Experience and Setting.** Descriptive statistics were used to summarize demographic data. Due to question responses being independent of one another, partial data were included.

**Provision of Telehealth Services.** Descriptive statistics were used to summarize the reasons speech-language pathology clinicians reported providing telehealth therapy service, before and after the COVID-19 pandemic. Descriptive statistics also summarized the participants’ impressions of the impact of the COVID-19 pandemic on their employment and ability to deliver in-person speech-language therapy services. A repeated measure ANOVA was used to compare the mean scores of the frequency of telehealth use prior to March 2020, during March to July 2020, August to October 2020 and predicted utilization for 2021 and beyond.

**Proficiency.** Descriptive statistics were used to compare the mean scores of the telehealth proficiency changes over time, as self-reported by survey participants.

**Results**

**Participant Demographics**

A total of 293 speech-language pathology clinicians completed the survey. None of the respondents were omitted, as they all met the inclusion criteria. Because participants were able to choose the items they completed, 8.5% of the 293 participants did not answer all of the questions presented.

Demographic information is presented in Table 1.1. The clinicians practiced in 38 states, the District of Columbia, as well as from outside of the United States. Florida was overrepresented and the southwest was somewhat underrepresented in the sample. The majority of participants were from suburban areas \( n = 164 \). The most common primary employment settings were schools \( n = 78 \) and private practices \( n = 64 \). The survey included a variety of
speech-language pathology clinicians, including speech-language pathology assistants. The vast majority of respondents (82%), though, held a master’s degree ($n = 238$).

The participants’ experience in the profession of speech-language pathology ranged from less than 1 year to 55 years with a mean of 16.7 years of experience ($SD = 11.7$). The participants’ telehealth experience ranged from less than one year to 34 years with a mean of 1.88 years of experience ($SD = 2.9$), with the majority of clinicians (80%) reporting telehealth experience of one year or less. Approximately 74% of participants reported completing courses and/or training on providing direct therapy services via telehealth. The majority of respondents reported completing one (33%) or more (67%) courses on telehealth, with many (31%) reporting that they performed mock therapy sessions with a peer or coworker.

**Participants’ Locations when Providing Telehealth Services**

Participants were asked where they were located when providing telehealth services. For clinicians providing telehealth services prior to the COVID-19 pandemic ($n=52$), home was the most frequent location (52%), followed by office (34%), school (12%), and car (1.5%). However, since the increase of telehealth services began occurring as a result of the COVID-19 pandemic, survey respondents ($n=243$) reported an increase in services being performed from home (78%) immediately after the onset of COVID-19, with a large drop off of office (18%) and school (2%). There was a shift to more office and school-based telehealth services in August 2020), with home reported at 61%, office increasing to 24%, school increasing to 13%, and car still at 2%.

**Participants’ Provision of Telehealth Services**

Survey participants were asked to reflect on past experiences, current experiences, and future expectations about providing speech-language therapy services remotely during four separate time periods. Only 18% of respondents ($n=54$) reported that they had provided telehealth services remotely prior to the pandemic, whereas 87% ($n=246$) of clinicians reported they had provided telehealth therapy services in the months after the pandemic began. This high rate of telehealth use continued during the pandemic, with 90% of clinicians responding they
provided direct telehealth therapy services. When asked if they would continue to provide speech-language therapy services remotely in 2021 and beyond, almost all of respondents (87%) predicted they would provide telehealth services in the future.

A speech-language pathology clinicians’ years of experience did not negatively impact future telehealth use. Speech-language pathology clinicians with 15 or more years of experience \((n=115)\) predicted they would provide telehealth services \((87.8\%)\) in the future at the same rate as clinicians with less than 15 years of experience \((n=131; 87.6\%)\).

Setting did not negatively relate to predictions for future telehealth use. Survey participants from settings with more than 20 respondents (i.e., clinic, early intervention, independent contractor, private practice, school and university) predicted frequent telehealth use in the future, with the highest percentage reported by early intervention speech-language pathology clinicians at 95\% \((n=46)\) and the lowest reported by clinicians in school settings at 79\% \((n=78)\).

Speech-language pathology clinicians were asked to retrospectively self-report the percentage of their clients in a typical week who received services via telehealth. Prior to the COVID-19 pandemic, 84\% of respondents reported serving 0\% of their caseload via telehealth and 4\% reported serving 100\% of their clients remotely. In contrast, immediately after the pandemic began \((n=272)\), only 13\% reported serving none of their caseloads via telehealth and 40\% of clinicians reported serving 100\% of their clients via telehealth. During that same period, the clinicians reported their average telehealth use per week was 69\% \((SD = 37)\) of their caseloads, with a median of 89\%. This trend continued during the pandemic with only 12\% reporting they were not providing services via telehealth and 34\% of clinicians reported providing all of their services via telehealth; the average telehealth use per week was reported as 64\% \((SD = 38)\) of their caseloads being treated via telehealth, with a median of 80\%. When predicting into the future, only 15\% indicated they would not provide telehealth services and 9\% reported they would provide all of their services via telehealth. The remaining clinicians
predicted they would provide some telehealth services going forward, with predictions averaging 45% (SD = 34) of their caseloads being treated via telehealth, with a median of 48%.

Survey participants retrospectively self-reported the percentage of telehealth services they performed weekly (a) prior to the COVID-19 pandemic (March 2020), and (b) immediately after the pandemic began (March to July 2020); they also reported the percentage of telehealth services they performed (c) during the survey period (August to October 2020); and (d) predicted for the future (2021 and beyond). A 6 (setting) x 4 (time) mixed ANOVA was performed to evaluate the percentage of telehealth services performed weekly over the four time periods for the six primary employment settings with more than 20 survey respondents (i.e., clinic, early intervention, independent contractor, private practice, school and university). A summary of the participants’ responses is presented in Figure 1.1. The results revealed significant main effects for time, [$F(3, 214) = 151.9, p < .0001$], and for setting, [$F(5, 216) = 3.21, p = .0082$], and no significant setting x time interaction. As is evident in Figure 1, independent contractors showed the most telehealth use. A post-hoc Tukey HSD comparison test indicated the mean score for independent contractors was significantly different from schools ($p < .010$) and clinics ($p < .012$), whereas comparisons among the other settings did not differ significantly.

**Participant’s Reasons for Providing Telehealth Services**

Participants retrospectively self-reported the reasons they were providing speech-language services remotely prior to the COVID-19 pandemic. As can be seen in Table 1.2, 67% of respondents reported they were not providing telehealth services. Clinicians who were providing speech-language therapy services remotely reported the ability to provide services for clients who travel long distances for in-person care (18%), to provide care to clients living in rural areas (17%) and for the convenience of the client (17%) as the top three reasons for providing telehealth services. Only 5% of respondents reported that they did not provide telehealth services immediately after the pandemic began. Notably, 42% reported telehealth services were mandated by their employer. Clinicians who were providing speech-language therapy services remotely also reported lowering potential COVID-19 spread among speech-
language pathologists and clients (68%), lowering their clients’ exposure risk for illness (72%), lowering potential exposure risk for the clinician (65%) as the top three reasons for providing telehealth services. When clinicians (n=265), were asked about their future use of telehealth, only 8% of clinicians predicted they would not be providing therapy services remotely. Clinicians predicted the top three reasons they will provide speech-language therapy services remotely will be to lower clients’ exposure risk for illness (72%), to lower clinicians’ exposure risk for illness (58%), and for the convenience of the client (54%).

COVID-19’s Impact on Employment and Service Delivery

Participants retrospectively self-reported the effect of the COVID-19 pandemic on their employment and ability to deliver in-person speech-language therapy services. Immediately after the pandemic began, 26% of clinicians reported their employer temporarily closed, 11% reported being furloughed, and 4% were provided paid-time-off during their employer’s temporary closure. For clinicians who continued to provide care, they reported how their service delivery for speech-language services was affected by the pandemic. The majority of respondents (93%) reported they were able to provide direct telehealth therapy services. Yet only 28% of clinicians reported that the choice of in-person care or telehealth services were optional for their clients; 72% of clinicians reported that the only way their clients could receive therapy services was via telehealth. For the clinicians for whom telehealth was optional for their clients, 77% reported that their clients were open to either telehealth or in-person therapy services. In-person care was affected by the pandemic, with only 19% of clinicians reporting the ability to continue to provide face-to-face services and 18% reporting they were able to continue to practice off-site (i.e., travel to the client’s home); and 30% reporting they were providing therapy services through an alternative method of delivery (i.e., paper packets, parent consultation).

During the survey time period (August to October 2020), a small percentage of respondents reported their employment continued to be affected. Employers temporarily closed for 4% of clinicians, 1% stated they had been furloughed, and <1% were provided paid time off during their employers’ temporary closures. In contrast, service delivery continued to be
impacted. The majority of clinicians (95%) reported they were able to provide direct telehealth therapy services but only 53% stated they were able to continue to provide in-person therapy services. Off-site services (i.e., travel to the client’s home) continued for 28% of survey participants. Lastly, 18% of respondents stated they were providing therapy services through an alternative method of delivery (i.e., paper packets, parent consultation).

Participants’ Proficiency Providing Telehealth

Participants who were providing speech-language therapy services via telehealth prior to the COVID-19 pandemic \((n=49)\) were asked to retrospectively rate their own level of proficiency (on a 0 to 100 scale) in delivering these services. The median score was 84 with a mean proficiency reported of 79.8 \((SD = 17.1)\). Participants who were providing speech-language therapy services via telehealth immediately after the pandemic began were asked to retrospectively rate their own level of proficiency (on a scale of 0 to 100) in delivering services remotely. The median score was 64 with a mean proficiency rating of 61.1 \((SD = 24.0)\). However, participants who were providing speech-language therapy services via telehealth during the survey period (August to October of 2020) \((n=240)\) rated their own level of proficiency similar to the clinicians who were providing remote therapy services prior to the pandemic, with a median score was 83 and a mean proficiency reported of 76.8 \((SD = 20.2)\). As can be seen in Figure 1.2, the first and third panels are both skewed to reflect higher self-reported telehealth proficiency ratings, whereas the middle panel (immediately post-pandemic) is shifted down to reflect lower self-reported proficiency ratings and is more normally distributed.

Discussion

This paper describes the development, distribution, and responses to the Telehealth Services: Pediatric Provider Survey Questionnaire. The questionnaire was designed to identify the effects of the sudden widespread use of remote delivery of services, investigate pediatric speech-language pathology clinicians’ experiences performing these vital services, and inquire about possible reasons clinicians used telehealth before and after the COVID-19 pandemic.
Previous studies from Tucker (2010) and Freckmann et al. (2017) emphasized that one significant barrier of widespread speech-language pathology telehealth use was the reluctance of speech-language pathologists to attempt remote delivery of therapy services. The COVID-19 pandemic quickly changed this reluctance, requiring an entire generation of clinicians to learn to adapt and use telehealth to provide vital speech-language services, thus potentially eliminating a long-standing barrier.

Not surprisingly, the results of this study identified a significant increase in telehealth use from prior to the COVID-19 pandemic (March 2020) to after the onset of the pandemic (i.e., March to July 2020 and August to October 2020). These findings are consistent with previous surveys in the United States and other countries. For example, Aggarwal et al. (2020) reported not only an increase in therapy services delivered remotely in India immediate after the COVID-19 pandemic, but acceptance and predicted future use. Speech-language pathologists who previously used telehealth understood its potential to provide access to clients in a larger geographical area and not predominantly clients who lived in rural areas (Sutherland et al., 2016; Manning et al., 2020). The pandemic enabled a diverse group of pediatric speech-language pathologists to finally experience this utility.

In contrast to other surveys completed after the pandemic, the Telehealth Services: Pediatric Provider Survey Questionnaire gathered more specific information about clinicians’ use of telehealth to provide services. Respondents were asked to indicate the percentage of services provided via telehealth in a typical week. The majority of speech-language pathology clinicians (93%) were using telehealth immediately after the onset of the COVID-19 pandemic and 42% of them initially were forced to use telehealth, as it was the only option clinicians had to continue to provide care to their clients. As time went on, though, clinicians reported they
continued to use telehealth to provide therapy services (95%). Moreover, the majority of survey participants responded positively when asked if they will continue to provide therapy services remotely in 2021 and beyond (87%), predicting that 45% of their caseload will be treated via telehealth.

Future telehealth use was not influenced by the clinician’s years of experience, in contrast to the Tucker (2012) findings. Tucker found that telehealth willingness was inversely related to age, suspecting the relationship was the result of young speech-language pathologists’ familiarity with the technology. Future telehealth use also was not influenced by the clinicians’ work setting. This, too, was in contrast to Tucker (2012) and ASHA (2002, 2011, 2014, 2016) surveys that found limited telehealth use in several settings, including schools and universities. The desire to continue the remote delivery of services beyond what was initially perceived to be short-term use during the pandemic may indicate a significant change in attitude toward telehealth services, from early career to seasoned clinicians, no matter the setting. Fong et al. (2020) reported that speech-language pathologists’ acceptance of telehealth’s effectiveness is aided when clinicians are provided professional development. This also seems to be true of clinicians who are forced to adopt telehealth as a new and necessary professional expectation.

One reason for this attitudinal change may be clinicians’ perceived proficiency in being able to deliver services remotely. The few clinicians with telehealth experience prior to the onset of the pandemic rated their proficiency in delivering therapy service via synchronous videoconferencing highly. In contrast, the self-reported proficiency ratings were much lower among clinicians who began using telehealth immediately after the pandemic. Among those who continued to provide telehealth services during the pandemic, however, high ratings of self-reported proficiency became evident. Previous telehealth research reported one barrier to remote
The delivery of speech-language therapy services was apprehension to even try telehealth. The sudden need to use telehealth during the pandemic allowed speech-language pathology clinicians who previously had not considered the utility of telehealth to discover its many benefits. This was apparent when speech-language pathology clinicians reported the reasons they were using telehealth.

Speech-language pathology clinicians’ reasons for telehealth use changed over time. For providers who used telehealth prior to the pandemic, their primary reason for telehealth use was based on distance (35%) (i.e., ability to provide therapy services for clients who travel long distances for in-person or to provide therapy services to rural areas) and convenience (32%) for both client and clinician. This was supported by the locations in which speech-language pathology clinicians provided therapy services, mostly from home (52%) and their office (34%). During the pandemic, reasons revolved around safety, by lowering infection risk for both client and clinician (72%) or because it was mandated by an employer (42%). This again was supported by the locations in which speech-language pathology clinicians provided therapy services, with an increase in services being provided from home (78%) and a decrease in services delivered in clinicians’ offices (18%). However, clinicians who may have discovered the benefits of telehealth report they will continue to provide services remotely in the future for the same pre- and post-pandemic reasons: distance, convenience, and safety.

During the COVID-19 pandemic, telehealth initially offered the ability for speech-language pathologists to work from home and children to receive services in the safety of their own homes. Yet, as a result of the increase in services being provided remotely, clinicians quickly adapted to using this new option of service delivery and seemed to have recognized the utility of telehealth (Tohidast et al., 2020). COVID-19 potentially has changed the landscape of
healthcare and education forever. Current and future speech-language pathologists should therefore be afforded the opportunity to continue to expand and grow our knowledge about telehealth services, including training at the academic level, clinical work in the professional setting, and research about assessment and intervention services.

Limitations

Limitations should be considered when interpreting the results of this study. The sample size of 293 is relatively small in relation to the population of pediatric speech-language pathologists and speech-language pathology assistants. Additionally, due to the nature of distributing the survey through social media and ASHA’s special interest groups, a rate of return could not be calculated. Finally, 25% of the respondents came from one state (Florida), which could bias results.

Although speech-language pathology assistants were invited to participate, there was a low percentage of respondents without a master’s degree. In addition, information on the type of certification or licensure for each survey participant was not collected. Therefore, it is unknown how many of the survey participants with bachelor’s degrees were grandfathered speech-language pathologists, speech-language pathology assistants, speech-language pathology graduate students, or school-based clinicians with a speech-language impaired professional certificate or teaching certification.

Conclusions and Future Research

The unprecedented challenges brought on by the COVID-19 pandemic forced many medical and education providers to immediately consider and implement the delivery of their pediatric speech-language therapy services through synchronous videoconferencing. As this study has revealed, the adoption of telehealth and the rapid improvement in proficiency is a testament to the resiliency of providers. Thus, the pandemic created a new cohort of speech-language pathology clinicians across all settings and not limited by age or experience. This
cohort, the next generation of telepractitioners, plan to continue using this delivery model, both in the short- and long- term.

However, for telehealth to sustain and evolve in a post-pandemic world, further research should investigate how speech-language pathology clinicians and clients perceive telehealth use and identify any barriers that continue to exist post-COVID-19. The surge of telehealth use could be indicative of permanent changes in attitudes and reductions in barriers that once existed prior to March 2020. Other types of therapy providers have begun to investigate these changes. For example, clinicians with knowledge and experience using telehealth in mental health settings were more likely to have positive opinions about its use (McClellan et al., 2020). Physical, occupational, and speech therapy as well as audiology visits were often not eligible for insurance company reimbursement prior to the pandemic; currently, telehealth visits are covered by insurers. Thus, telerehabilitation is now available to treat a variety of conditions and clients have subsequently reported high patient satisfaction with this service delivery option (Steuerwald et al., 2018; Tenforde et al., 2020). Therefore, factors that optimize speech-language therapy services delivered remotely should be researched.

Barriers to remote delivery of care is an ongoing concern for all telehealth providers (Benda et al., 2020; Ortega et al., 2020). Even though many pediatric clients were able to receive speech-language therapy services remotely during the COVID-19 pandemic, there remained those for which the option of telehealth was not viable. Further research should investigate the more nuanced information about how telehealth is administered and its effectiveness with different subgroups of pediatric clients, such as by age, condition, location, and socio-economic status. Furthermore, research should identify what new technologies and applications are still needed to overcome ongoing challenges.

Finally, speech-language pathologists who previously performed the majority of their evaluations and treatments in-person, have now pivoted to providing these same services remotely. This increase of telehealth use, as a primary delivery method, now and in the future opens the door to new lines of research, investigating the feasibility, validity and reliability of
diagnostic services being provided remotely. Unfortunately, this line of research has been limited in pediatric speech-language pathology when compared to other allied health fields. For example, in psychology, Wright (2018, 2020) compared face-to-face administration to remote delivery of cognitive and achievement tests, determining the online procedure was a viable alternative. In occupational therapy, Worboys et al. (2018) found hand function assessments performed via telehealth had high levels of agreement with a traditional clinic model for objective measures. Therefore, future speech-language pathology studies involving therapy evaluations and treatment procedures should now include both delivery modalities – in-person and remote – when evaluating their effectiveness.

As speech-language clinicians have considered the scope of utility of telehealth, they have discovered unanticipated benefits of its use and plan to continue providing care using synchronous videoconferencing. It is now the job of researchers to investigate the relative effects of speech-language therapy services being provided remotely.

References


Wright, A. J. (2018). Equivalence of remote, online administration and traditional, face-to-face administration of the Woodcock-Johnson IV cognitive and achievement tests. *Archives of Assessment Psychology, 8*(1), 23-35.

Table 1.1

Participant Demographic Information

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</tbody>
</table>

The regions are as follows: Northeast (ME, MA, RI, CT, NH, VT, NY, PA, NJ, DE, MD); Midwest (OH, MI, IN, IA, WI, IL, MN, MO, ND, SD, NE, KS); Southeast (VA, WV, KY, NC, SC, TN, GA, FL, AL, MS, AR, LA); Southwest (AZ, TX, OK, NM); West (ID, CO, NM, AZ, UT, NV, CA, OR, WA, AK, WY).
## Table 1.2

*Reasons for Providing Telehealth Services Over Time*

<table>
<thead>
<tr>
<th>Reason</th>
<th>Before March 2020 n=262</th>
<th>August to October 2020 n=264</th>
<th>2021 and beyond n=265</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was not providing Telehealth services</td>
<td><strong>n = 175; 67%</strong></td>
<td><strong>n = 14; 5%</strong></td>
<td><strong>n = 22; 8%</strong></td>
</tr>
<tr>
<td>Ability to provide services while lowering potential Covid exposure risk to SLP and client</td>
<td><strong>NA</strong></td>
<td><strong>n = 178; 68%</strong></td>
<td></td>
</tr>
<tr>
<td>Ability to provide therapy services for clients who travel long distances for in-person</td>
<td><strong>n = 48; 18%</strong></td>
<td><strong>n = 74; 28%</strong></td>
<td><strong>n = 107; 40%</strong></td>
</tr>
<tr>
<td>Ability to provide therapy services to rural areas</td>
<td><strong>n = 44; 17%</strong></td>
<td><strong>n = 64; 24%</strong></td>
<td><strong>n = 100; 38%</strong></td>
</tr>
<tr>
<td>It is required/mandated by my employer</td>
<td><strong>NA</strong></td>
<td><strong>n = 110; 42%</strong></td>
<td><strong>n = 68; 26%</strong></td>
</tr>
<tr>
<td>Convenience of client</td>
<td><strong>n = 45; 17%</strong></td>
<td><strong>n = 105; 40%</strong></td>
<td><strong>n = 142; 54%</strong></td>
</tr>
<tr>
<td>Convenience of clinician</td>
<td><strong>n = 40; 15%</strong></td>
<td><strong>n = 73; 28%</strong></td>
<td><strong>n = 97; 37%</strong></td>
</tr>
<tr>
<td>Lower the exposure risk for illness: client</td>
<td><strong>n = 36; 14%</strong></td>
<td><strong>n = 190; 72%</strong></td>
<td><strong>n = 164; 62%</strong></td>
</tr>
<tr>
<td>Lower the exposure risk for illness: clinician</td>
<td><strong>n = 35; 13%</strong></td>
<td><strong>n = 172; 65%</strong></td>
<td><strong>n = 153; 58%</strong></td>
</tr>
<tr>
<td>Lower the exposure risk for medically fragile children</td>
<td><strong>n = 39; 15%</strong></td>
<td><strong>n = 152; 58%</strong></td>
<td><strong>n = 141; 53%</strong></td>
</tr>
<tr>
<td>Ability to provide therapy to clients who may have otherwise canceled appointments</td>
<td><strong>n = 38; 15%</strong></td>
<td><strong>n = 110; 42%</strong></td>
<td><strong>n = 134; 50%</strong></td>
</tr>
<tr>
<td>Reduce clinician exposure to sick clients</td>
<td><strong>n = 28; 11%</strong></td>
<td><strong>n = 137; 52%</strong></td>
<td><strong>n = 128; 48%</strong></td>
</tr>
<tr>
<td>Ability of clinician to work from home</td>
<td><strong>n = 43; 16%</strong></td>
<td><strong>n = 93; 35%</strong></td>
<td><strong>n = 128; 48%</strong></td>
</tr>
<tr>
<td>Ability for client to have access to experts</td>
<td><strong>n = 37; 14%</strong></td>
<td><strong>n = 65; 25%</strong></td>
<td><strong>n = 93; 35%</strong></td>
</tr>
<tr>
<td>Cost effective means of providing services</td>
<td><strong>n = 28; 11%</strong></td>
<td><strong>n = 53; 20%</strong></td>
<td><strong>n = 77; 29%</strong></td>
</tr>
<tr>
<td>Other</td>
<td><strong>n = 16; 6%</strong></td>
<td><strong>n = 13; 5%</strong></td>
<td><strong>n = 16; 6%</strong></td>
</tr>
</tbody>
</table>

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Figure 1.1

Percentage of Telehealth Services Reported or Predicted Over Four Time Periods by Respondents from Six Employment Settings when Surveyed in September 2020

Figure 1.2

Histogram and Box Plot Showing Self-Reported Telehealth Proficiency Before and After COVID-19 Pandemic

Note: box = 25th - 75th percentile; diamond = mean; circle = outlier; red bracket = shortest half of data (densest region)
CHAPTER THREE:
EVOLUTION OF TELEHEALTH TECHNOLOGY, EVALUATIONS,
AND THERAPY: EFFECTS OF THE COVID-19 PANDEMIC ON PEDIATRIC
SPEECH-LANGUAGE PATHOLOGY SERVICES

Note to reader

This chapter presents a manuscript that has been submitted to American Journal of Speech-Language Pathology for publication and is currently under review.

Abstract

Purpose: Telehealth services experienced exponential growth during the COVID-19 pandemic. This survey was created to examine the resulting evolution in the technology, connectivity, implementation of services, and attitudes of pediatric speech-language pathology clinicians using synchronous videoconferencing.

Method: The Telehealth Services: Pediatric Provider Survey participants were 259 speech-language clinicians in a variety of employment settings from across the country and abroad. Analyses identified telehealth barriers eliminated and those that persisted during the pandemic, advantages, and disadvantages of remote delivery of evaluation and treatment services, the most common telehealth technology used by clinicians and their clients to access care, and clinicians’ predictions about the optimization and future of telehealth.

Results: Elimination of regulatory and insurance hurdles allowed children from varying socioeconomic backgrounds living in rural, suburban, and urban areas access to telehealth.
Telehealth technology shifted from computers with external hardware and specialized software to commercially available equipment, such as handheld portable devices with built-in audio-visual components and publicly available videoconferencing platforms. However, connectivity of these devices continued to be problematic, and lack of technology prevented some children from accessing care. Judgments about the appropriateness and effectiveness of evaluations and treatments varied based on the age and communication disorder of a child. Although some participants expressed uncertainty about the effectiveness of telehealth compared to in-person care, telehealth was widely recognized as a viable delivery method.

**Conclusion:** Although clinicians reported many advantages of telehealth, some barriers identified reported prior to COVID-19 still persist. Clinicians anticipate that new developments have the potential to continue improving telehealth service delivery, bolstering the viability of telehealth long after the COVID-19 pandemic is gone.

**Introduction**

In December 2019, the first reported case of the coronavirus disease (COVID-19) was announced in Wuhan City, China (Tohidast et al., 2020; Rothan & Byrareddy, 2020; Zhu et al., 2020). By March 2020, the disease was classified as a pandemic and had spread worldwide (Cucinotta & Vanelli, 2020). For several service-based occupations, such as speech-language pathology, most client care was paused, interrupted, or pivoted to other service delivery models (Tohidast et al., 2020). Even though speech-language pathologists (SLPs) were classified as “essential critical infrastructure workers” (Silver et al., 2020), the shortage of personal protective equipment, coupled with the highly contagious nature of the virus forced a vast majority of speech-language pathology providers to switch to synchronous videoconferencing (i.e.,
telehealth, telepractice, telerehabilitation, telespeech) if they wanted to continue providing direct patient care (Tohidast et al., 2020).

Although the concept of telehealth was not new, many speech-language pathology providers were using this delivery method for the first time in their career (Aggarwal et al., 2020; ASHA, 2020; Fong et al., 2020; Silver et al., 2020). Prior to the COVID-19 shutdowns in March 2020, research investigating the prevalence of its use by pediatric SLPs ranged from 1.6% to 9% (ASHA, 2002; Fong et al., 2020; Hill & Miller, 2012; Mohan et al, 2017; Taylor et al., 2014; Tucker, 2012). Acceptance of telehealth into mainstream, clinical practice was hindered by barriers to care, including limited insurance compensation, strict regulations, and lack of adequate technology, as well as SLPs’ negative attitudes toward telehealth (Lustig & Institute of Medicine (U.S.), 2012; McClellan et al., 2020). However, immediately after the pandemic began, government agencies waived the hurdles of interstate licensing, regulatory restrictions and, most importantly, limited reimbursement. Thus, the potential long-term viability of widespread use of telehealth became evident (Bashshur et al., 2020).

Although some barriers were eliminated, many remained. Most notably, concerns remained about the resources needed to provide adequate Internet connectivity for a clinical session (i.e., affordable broadband, hardware and software) and about the skepticism of SLPs towards telehealth use (Smith et al., 2020; Tohidast et al., 2020). Surveys administered after the onset of the coronavirus pandemic confirm many of these ongoing limitations. Based on a May 2020 survey, ASHA reported that 84.8% of SLPs were delivering therapy services via telehealth and 55.6% considered the experience challenging. Tenforde et al. (2020) investigated the feasibility and satisfaction of adult and pediatric clients receiving telehealth services. Although they reported high patient and parent satisfaction, lack of hands-on care and limitations of technology remained a concern. Aggarwal et al. (2020) examined the attitudes of SLPs towards this sudden increase in telepractice. Although survey findings revealed greater acceptance of this delivery model, SLPs reported that sessions were more stressful than in-person care. They
identified inadequate Internet connectivity as an ongoing barrier to providing therapy services remotely.

An estimated 1 out of 4 Americans still do not have devices or broadband internet to participate in remote care (Benda et al., 2020). However, ongoing state initiatives, such as Maine’s ConnectME, are working to eliminate these disparities (Benda et al., 2020; “How States are Expanding Broadband,” 2020). As a result, traditional high-speed internet access as well as expansion of mobile broadband connections are allowing more communities (rural to urban) access to digital services. Grants, such as those offered through the Veterans Affairs Offices of Rural Health, Connected Care, and the CARES Act funding to support Remote Learning, have provided hardware and software to individuals who may otherwise have been unable to afford the technology vital for telehealth speech and language services (“Funding Digital Learning,” 2020; Zulman et al., 2019).

Researchers are aware of the role technology and connectivity play in providing effective therapy evaluations and treatments via synchronous videoconferencing (Bashur et al., 2020; Benda et al., 2020; Rauwerdink et al., 2019). Taylor et al. (2014) noted that studying telehealth under ideal research conditions in contrast to real-world scenarios is a limitation to this line of research. Using costly, custom-built equipment designed for research purposes make the results of many investigations largely inapplicable to typical therapy practices (Sutherland et al., 2017). Fortunately, advancements in mobile technology (i.e., tablets, smart phones), the availability of a wide variety Health Insurance Portability and Accountability Act (HIPAA) or Family Educational and Privacy Act (FERPA) complaint videoconferencing platforms, and improvements in high-speed broadband connections have changed the landscape of telecommunication. SLPs and clients are no longer tethered to high-end, desktop computers with direct cable connections and external hardware to benefit from quality, synchronous videoconferencing (Coufal et al., 2018; Dekhtyar et al., 2020; Mohapatra et al., 2015). Reasonably priced, consumer-grade, commercially available and school-issued hardware and
software have allowed audio and visual conferencing to be widely available (Isaki & Farrell, 2015; Sutherland et al., 2017).

Research investigating the effectiveness of telehealth evaluation or intervention services needs to mirror current, real-world conditions to reevaluate prior findings and apply them to everyday use (Benda et al., 2020; Sutherland et al., 2016; Taylor et. al., 2014). For example, Grogan-Johnson et al. (2013) used laptop computers with specialized software for videoconferencing to compare remote delivery of therapy services to in-person intervention for children with speech sound disorders. Although their study found no differences in the two methods of services delivery, the technology used was representative of a research laboratory rather than a typical clinical setting. Coufal et al. (2018) compared traditional delivery of speech therapy to telepractice. They used desktop and laptop computers but had a custom-built software platform used for videoconferencing and high-speed internet access. Similar to the Grogan-Johnson et al.’s results, they found no significant differences between the two delivery methods for children with speech sound disorders. Although studies like these support the remote delivery of speech therapy services, researchers’ use of advanced technology may restrict potential application to present-day teletherapy practices.

Investigators have begun to recognize this deficiency and are beginning to fulfill this need by shifting to commercial-grade technology. Isaki and Ferrall (2015) provided intervention services via synchronous videoconferencing using Wi-Fi enabled second generation Apple iPads and the devices’ built-in FaceTime software. They investigated the effects of their remotely delivered pediatric speech and language therapy services over two academic semesters. Results indicated that participants met their speech goals and the majority of their language goals, consistent with previous studies that had used different technology (i.e., desktop and laptop computers). Similarly, Langbecker et al. (2019) performed a two-year study investigating the impact of remotely delivered speech and language therapy services on education outcomes. They used iPad Airs with commercially available rehabilitation software (i.e., NeoRehab) or the school’s own room-based videoconferencing software. Results revealed a sustained positive
change for children over multiple semesters. Both studies were significant for their treatment outcomes and the ability of SLPs to replicate the telehealth hardware and software used. Despite a lack of experimental rigor, these studies illustrate the potential of using readily available technology for the remote delivery of speech-language therapy services.

SLPs’ attitudes and perceptions about providing effective care remotely may continue to be an obstacle to widespread acceptance (Sutherland et al., 2017). This could not be truer than in the area of diagnostics, specifically, pediatric standardized assessments (Farmer et al., 2020). Concern has been expressed about the appropriateness of remote administration of evaluation tools (Kaplan, 2020). Although some studies have compared speech-language therapy services delivered via telehealth and in-person (e.g., CELF-4; Waite et al., 2010), the literature on telehealth evaluations is sparse. Sutherland et al. (2018, 2019) and Wright (2018, 2020) stressed the need to compare telehealth to in-person diagnostics for children of different ages and disabilities. This lack of research is disconcerting to many SLPs, in light of ASHA’s position that telepractice “must be equivalent to the quality of services provided in person” (ASHA, 2020). The current volume and range of care being provided through telecommunication is unprecedented and although ASHA acknowledged that the COVID-19 pandemic created unique and less than ideal circumstances, the need to evaluate the quality of speech and language evaluation services using this delivery model continues to be imperative (ASHA, 2020).

ASHA acknowledges this deficiency, noting that several pediatric assessments lack evidence of validity and reliability for remote administration (ASHA, 2020; Farmer et al., 2020). Standardized evaluations conducted with deviations, such as prompting or modifications to delivery, may impact interpretation of scores or require the child be reassessed in the future through in-person administration to acquire valid results. Therefore, for the future viability of telehealth to be considered after COVID-19 restrictions are gone, research is needed to address this gap.

The technology available to provide remote speech and language services has evolved dramatically since the inception of telehealth (Houston et al., 2012). When the COVID-19
pandemic caused the worldwide conversion from in-person care to telehealth, SLPs began delivering therapy services to a whole new generation of Internet-connected children (Tohidast et al., 2020). The implementation of remote services on such a vast scale resulted in both provider and client using a broad range of equipment and software variations, creating questions about the effectiveness of services provided using current, real-world technology (Snodgrass et al., 2017). Furthermore, with limited research in the area of standardized assessments administered via telehealth, SLPs lacked the procedural infrastructure to provide diagnostic assessments to children of different ages and for certain conditions, increasing the level of complexity when providing evaluation services (ASHA, 2020; Farmer et al., 2020). Thus, additional questions arise as to the perceptions and opinions of SLPs as to the level of difficulty to administer standardized assessments for tests previously only validated through in-person administration.

Surveys developed at the onset of the COVID-19 pandemic attempted to answer some of these questions. The Silver et al. (2020) questionnaire inquired about the risk of exposure to COVID-19 for health care workers, such as SLPs, as critical infrastructure workers. The Everything SLP website and closed Facebook group run by Bill Connors (2020) administered an on-line survey completed in mid-2020 that described the typical telepractice SLP as well as employment-related findings, such as salaries, benefits, and productivity. Aggarwal et al.’s (2020) study discussed the uptick of SLPs in India using telepractice after COVID-19 and the Fong et al. (2020) survey reported on increased telehealth use in Hong Kong during the pandemic. Campbell and Goldstein’s (in press) questionnaire reported the dramatic increase of telehealth use during the pandemic across a broad range of speech-language pathology provider types (e.g., speech-language pathologists, graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians). Survey respondents reported the increase in use was mostly a result of employer mandates or to lower infection risk for both client and speech-language clinicians. Clinicians also noted that they increased their telehealth proficiency and discovered the benefits of telehealth.
Even though these surveys were informative, critical questions pertinent to the delivery of speech-language services remain unanswered. Most surveys were SLP-centric, collecting limited data about the clients receiving therapy services remotely. For example, studies inquired about the SLPs’ setting (i.e., school, private practice), but not the child’s location where the telehealth services were being performed (i.e., home, car). Survey results reported on software platforms (i.e., Zoom) being used to deliver services remotely; however, data were not collected on the hardware being used by the client to receive those therapy services. SLPs reported difficulty delivering therapy services remotely; yet the questionnaires did not delve into the possible reasons for this difficulty. Surveys asked providers about their overall experiences in providing telehealth evaluation and intervention services in contrast to inquiring about the specific areas of pediatric services (e.g., dual language learners, social aspects of communication). Therefore, a survey was developed with the aim to further investigate the impact of the sudden, widespread use of remote therapy services on the provision of speech-language services using a telehealth delivery model.

**Purpose**

The purpose of this research is to identify the factors influencing the use of telehealth services delivered before and after March 2020 (COVID-19). In particular, a survey was constructed to identify barriers pediatric speech-language clinicians (e.g., speech-language pathologists, graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians) experienced upon their conversion to telehealth and to assess whether attitudes about telehealth changed as a result of providing speech, language, and literacy-based therapy services. These perceptions may vary based on the particular evaluation and intervention services administered via synchronous videoconferencing. The survey also sought to determine the real-world technology being used in therapy practice (i.e., hardware and software) and their perceived adequacy when providing telehealth services.
The data obtained have the potential to expand our knowledge about the future of telehealth use among pediatric speech-language clinicians. The results of this study may identify barriers that continue to limit access to these vital services and inform future research on the effectiveness of using current, telehealth infrastructure when providing remote therapy services. The following questions were addressed:

1. What are the perceived technological barriers that may limit access to speech and language telehealth services?

2. What are speech-language clinicians’ perceptions and opinions of the appropriateness and effectiveness of speech-language evaluations and treatments delivered via synchronous videoconferencing and do they differ when considering children of different ages and communication disorders?

3. What common hardware and software technologies do pediatric speech-language clinicians currently use to provide telehealth speech and language services?

4. What common hardware technologies do clients receiving telehealth speech and language services currently use?

5. What are the perceived advantages, disadvantages, and predictions about future of pediatric speech-language telehealth services?

Method

Survey Development

The *Telehealth Services: Pediatric Provider Survey* was constructed in stages using the process and standards recommended for questionnaire development (AERA, APA, & NCME, 2014; Plake & Wise, 2014; Presser et al., 2004; Willis, 1999). First, the content validity was investigated to assess the appropriateness of the tool for making decisions and interpretations about the involvement of a broad range of pediatric speech-language clinicians in performing therapy services via a telehealth model (Cook & Hatala, 2016). A literature review as well as an
examination of current surveys (i.e., March - July 2020) confirmed that this content was relevant and not previously studied.

The survey was validated through the following five steps of the development process: (1) generate a blueprint of survey items, (2) create an initial pool of survey questions (3) test the presentation functioning of question items (continued throughout the validation process) (4) review of survey questions by at least five telepractice experts in the field of pediatric speech-language pathology; revise questions for content, clarity and relevance based on feedback (5) implement cognitive interviews with at least five practicing pediatric clinicians currently using telepractice; revise questions for clarity and relevance based on feedback.

**Step 1: Survey Blueprint.** The first step was to refine the purpose of the proposed tool. Questionnaires disseminated during the period of March 2020 to July 2020 were reviewed. Based on the review of available surveys at the time of tool development, it was determined that none adequately represented the content of the identified need. Subsequently, a review of the literature on telehealth, as well as alternative terms used, such as telepractice, telespeech, teletherapy, teleassessment, and telerehabilitation, was conducted to investigate the history of synchronous videoconferencing to provide pediatric speech and language services (American Speech-Language-Hearing Association, 2016a, 2016b; Cason and Cohn, 2014; Freckman et al., 2017; Keck & Doarn, 2014). After reviewing the recent surveys, extant literature, and input from telepractitioners currently providing speech and language therapy, an initial blueprint of items was produced. This consisted of ideas, such as how reliability is maintained when providing standardized assessments via telehealth and does a child’s age, disability, or behavior affect a clinician’s attitude toward providing evaluations and treatment via a remote delivery model.

**Step 2: Creation of Survey Questions.** Question development followed Dillman’s (2000) “Principles of Writing Survey Questions.” Survey items were created to ask questions with a single idea per question, stated both sides of an attitude question in the stem (i.e., agree or disagree), used simple language, and included precise estimates to avoid vague quantifiers (i.e., rarely). During this step of the development process, 61 questions were initially created. Among
those 61 questions, 34 were deemed relevant to the research questions for this study. Based on the literature review and feedback from practicing clinicians, questions were grouped into seven topics. Each topic contained an item pool of 1 to 14 questions.

The questions about employment and experience contained items about providers location, practice setting, and education. Questions about clients contained items about a child’s location, socioeconomic status, and telehealth setting. The questions about technology contained items about telehealth platforms and clinician’s and client’s hardware used for telehealth. The questions about teleassessment and telehealth therapy services contained items about a clinician’s perceived effectiveness of providing speech-language evaluations and interventions via remote delivery based on a child’s age or condition. Finally, questions contained items about the clinicians’ perceived advantages and disadvantages of remote delivery of speech and language services as well as their opinion about the future of telehealth services.

The survey questions were entered into REDCap (Research Electronic Data Capture) allowing the survey to be distributed electronically. REDCap is an electronic data capture tool hosted at the University of South Florida. REDCap is a secure, web-based software platform designed to support data capture and analysis for research studies (Harris et al., 2009).

Step 3: Expert Panel Review. Sixteen SLPs with expertise in telehealth were asked to review the survey items. These individuals had published research in the area of telehealth, were business owners of telepractices, or were leaders of the ASHA Special Interest Group on Telepractice. The sixteen SLPs were contacted by email and asked to participate in an expert review of the proposed survey. Nine of them chose to participate. The REDCap online version of the questionnaire as well as a pdf copy of the survey was emailed to each clinician. They were asked to provide feedback on the relevance and the clarity of each item. The ratings used a 5-point scale. An additional, open-ended question option was available for each item, allowing experts to provide further information about their response, such as suggestions for modifying the questionnaire content, proposing wording for greater clarity or opinions about relevance of questions to the proposed research. Any items that 75% of the experts rated as somewhat or not
relevant or somewhat or not clear were considered candidates for elimination or major revision. Experts’ suggestions were reviewed and considered for possible question and content revisions.

The survey was revised based on the expert feedback. Eight irrelevant questions were eliminated, six vague questions were reworded for clarity, and seven new content questions were added. More significantly, the questionnaire was reorganized. In the original version of the survey, questions were grouped by topics that concurrently inquired about the clinician’s and their client’s experiences (e.g., asking clinicians about the client’s and their reasons for possible telehealth use in the future). The experts’ suggested grouping the questions into more specific domains and separating questions pertaining to clinicians vs. their clients. Survey questions were structured to focus on clinician and client demographics, their telehealth technology, clinicians’ telehealth evaluation and intervention experiences, and clinicians’ opinions about telehealth use. Prior to the next step, all survey changes and revisions were made, and the revised online questionnaire items were tested for accurate functioning in REDCap.

**Step 4: Cognitive Interview**: The last step, prior to disseminating the final version of the instrument, was a cognitive interview with five seasoned pediatric SLPs. The interviews followed Willis’s guide to cognitive interviewing. SLPs completed the survey using a think-aloud procedure (Willis, 1999). Two SLPs had prior experience with telehealth and three were new to this service delivery model. One was interviewed in-person and the other four were interviewed via FaceTime. An online version of the questionnaire as well as a pdf copy of the survey was emailed to each SLP prior to initiating the cognitive interview. During the cognitive interviews, SLPs were asked to verbalize their answer choices, telling the survey developer everything that came to mind about how they arrived at their answers. Feedback was requested for every survey item. Anytime a SLP was unsure of the content presented, such as concerns about clarity or meaning, they were engaged in a discussion to discern possible alternative wording or to make suggestions about ways to revise the survey item.

Upon completion of the cognitive interviews, additional revisions to the survey instrument were made. This included: reformatting questions to improve ease of response;
eliminating more questions; rewording questions for clarity; changing questions to emphasize the focus on the child’s technology use and telehealth setting; emphasizing whether a question was collecting information about the clinician or client; adding additional options for topic items (e.g., platform and additional hardware used); and defining terms used for clarity (i.e., suburban, rural, urban; socioeconomic status). The finalized questionnaire can be found in Appendix A.

The final survey was comprised of seven topics:

1. The employment and experience topic consisted of seven questions, one of which branched to one additional question if answered, yes. These questions established the clinician’s years of experience and practice location as well as training in the area of telehealth.

2. The client/student topic consisted of three questions. This established the client’s location, telehealth setting, and socioeconomic status.

3. The telehealth hardware and software topic consisted of four questions. This established the clinician’s hardware and software use.

4. The perceptions and use of technology topic consisted of seven questions about their clients’ accessibility of technology and connectivity to participate in telehealth.

5. The teleassessment topic contained one question and, if answered yes, branched to three additional questions about the clinician’s opinions about the appropriateness and effectiveness of telehealth evaluations for children of different ages and disorders.

6. The telehealth therapy services topic contained two questions, one of which branched to collect additional information about level of effectiveness in the area in which the clinician had experience treating via remote delivery.

7. The views on telehealth topic contained 14 closed-ended and 4 open-ended questions about clinician’s overall views on teleassessments and direct therapy services administered via telehealth.

**Step 5: Survey Dissemination:** In September of 2020, after receiving IRB approval, the survey, *Telehealth Services: Pediatric Provider Survey*, was disseminated on-line and by email. A one-paragraph overview explaining the purpose of the questionnaire was used to invite
participants to complete the survey. To reflect real-world contemporary practices, eligibility for inclusion was broadly defined as “pediatric speech-language clinicians”: speech-language pathologists (i.e., master’s, doctorate, professional) and bachelor level speech-language therapy providers (e.g., graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians with a professional certificate or teaching certification). This broad definition allows for the inclusion of all respondents providing pediatric speech-language services via telehealth. The exclusion criteria for survey participation were speech-language clinicians who do not provide pediatric therapy services or pediatric speech-language clinicians who never provided telehealth therapy services. The survey invitation was emailed to directors of pediatric practices, district speech-language pathology administrators, members of state and national organizations (i.e., ASHA, Florida Speech-Language Hearing Association, Learning Disabilities Association, Florida Learning Disabilities Association), West Central Early Steps early intervention providers, and posted on social media sites (i.e., closed and public Facebook groups with pertinent interests, such as pediatric speech-language pathology and telepractice). Additionally, this survey was shared on ASHA’s State Advocates for Reimbursement committee message board as well as the Special Interest Groups 1 (Language, Learning and Education), 11 (Administration and Supervision), and 18 (Telepractice). Follow-up reminders were sent and posted weekly until the survey closed on October 31, 2020.

Survey participation was voluntary. Participants provided informed consent prior to proceeding with the questionnaire. The survey was designed to be completed in one administration; however, participants were provided the option to return later if they were unable to finish in one sitting. During the survey, each respondent was asked to answer questions about past, recent, and future experiences.
Data Analysis

Demographics of Telehealth Provider and Client: Descriptive statistics were used to summarize the diversity of the speech-language clinicians, including where they currently reside, their level of education, pediatric experience, telehealth experience, and employment setting. Descriptive statistics were used to summarize the pediatric clients, including where they currently reside, reported socio-economic status, and telehealth setting. Due to each question’s response being independent of the others, partial data were included.

Telehealth Technology and Barriers to Care: Descriptive statistics were used to summarize the speech-language clinicians’ and clients’ hardware and software used during telehealth therapy sessions. Descriptive statistics also summarized telehealth barriers experienced by the speech-language clinicians’ clients.

Telehealth Evaluative and Treatment Services: Descriptive statistics were used to summarize the self-reported ratings of level of difficulty and level of effectiveness by client condition. Descriptive statistics also summarized how the pediatric clients accessed their therapy materials.

Views on Telehealth: Descriptive statistics were used to summarize speech-language clinicians’ responses to 14 questions, grouped by theme, about overall views of telehealth. In addition, content analysis, with responses grouped by theme, was used to analyze open-ended questions about telehealth: advantages, disadvantages, the future of telehealth and optimization.

Results

Participant Demographics

A total of 259 speech-language pathology clinicians participated in the survey. None of the respondents were omitted, as they all met the broadly defined “pediatric speech-language clinician” inclusion criteria. Because participants were able to choose the items they completed, 10% of the 259 participants did not answer all the questions presented.
Demographic information is presented in Table 2.1. The clinicians practiced in 38 states, the District of Columbia, as well as outside the United States. Florida was overrepresented and the southwest was somewhat underrepresented in the sample. The majority of participants were from suburban areas \( (n = 145) \). The most common primary employment settings were schools \( (n = 70) \) and private practices \( (n = 58) \). The vast majority of respondents \( (93\%) \) held at least a master’s degree. We do not have a breakdown of bachelor degree respondents and could include graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians with a professional certificate or teaching certification.

Participants’ experience in the profession of speech-language pathology ranged from less than 1 year to 55 years with a mean of 16.6 years of experience \( (SD = 11.6) \). Participants’ telehealth experience ranged from less than 1 year to 34 years with a mean of 1.9 years of experience \( (SD = 3.0) \), with the majority of clinicians \( (79\%) \) reporting telehealth experience of one year or less.

**Demographics of Telehealth Clients**

Demographic information for clients is presented in Table 2.2. Participants reported that 36% had clients in rural areas, 69.4% had clients in suburban areas, and 35.7% had clients in urban areas. To further understand the demographic make-up of the respondents’ clients, the clinicians were asked what percentage of the children on their caseloads resided in the reported locations: rural, suburban, and urban. The majority of clinicians reported spending 74.4% \( (SD = 25.67) \) of their day working with children from suburban areas.

Participants reported the socioeconomic status of their clients; 57% had clients classified as low income, 67% had clients classified as middle income, and 18% had clients classified as high income. The socioeconomic status of clients was unknown by 14% of participants.

Participants reported their clients’ location when telehealth therapy services were provided. The majority of children were seen in their own homes \( (97\%) \), followed by a family member’s residences \( (32\%) \), daycare \( (14\%) \), school \( (13\%) \), car \( (13\%) \), parents’ workplaces \( (5\%) \), and public places \( (4\%) \), such as a library.
**Barriers to Telehealth Access**

The reasons reported for why families have reservations about participating in telehealth therapy services is summarized in Table 2.3. Clinicians reported families’ having concerns about the child’s lack of willingness to participate in sessions (77%), families’ lack of comfort with videoconferencing (61%), and families’ lack of affordable access to internet connectivity (58%).

Survey participants estimated the mean percentage of willing clients who did not have the resources to participate as 19% ($SD = 19.26$). When asked what resources interfered with telehealth services, clinicians reported families having a lack of available internet access (62%), a lack of a technology device) (58%), and a lack of affordable internet access (49%) as major barriers. Additional barriers reported were financial limitations (22%), lack of data plan (16%), lack of access to software (10%), and other factors (e.g., inconsistent and poor connectivity; 9%). Only 15% of respondents reported no barriers for those clients willing to do telehealth. When asked what percentage of families required instructional assistance to learn how to videoconference for the first time, the mean percentage was 54% ($SD = 35.32$).

**Opinions about Telehealth Evaluations and Treatments**

Only 52% ($n=135$) of survey participants had performed standardized assessments and evaluations via telehealth. Respondents reported evaluating children ages six to eight years old most frequently (62%) followed by three to five years old (58%), and nine to eleven years old (52%). Their level of agreement as to whether evaluations were more difficult to administer remotely compared to in-person for each age categories was reported on a 0-100 analog scale, ranging from strongly disagree to strongly agree. Clinicians reported the three most difficult ages in which to administer standardized assessments were ages three to five (68%, $SD = 25.05$), ages birth to two (60%, $SD = 29.03$), and six to eight (54%, $SD = 28.13$).

Survey participants’ ratings of whether evaluations were more difficult to administer remotely compared to in-person based on the child’s communication disorder are summarized in Table 4. Three conditions had less than 20 survey responses: Voice and Resonance, Hearing, and Swallowing/Feeding. However, these evaluation areas tend to make up a smaller portion of a
typical pediatric SLP’s caseload. For many conditions, clinicians reported similar amount of difficulty ranging from 52% (for Cognitive Assessments) to 64% (for Speech Sound Production Evaluation). Clinicians reported the three most difficult conditions in which to administer standardized assessments were Speech Sound Production (64%, $SD = 29.93$), Communication Modalities or AAC (62%, $SD = 33.34$), and the Social Aspects of Communication (59%, $SD = 27.46$, $n=63$). In contrast, Fluency Evaluations were noticeably less difficult to accomplish (39%).

Respondents were asked to indicate how their clients accessed telehealth evaluation materials. They ($n=133$) reported the five most common ways were through screen sharing (81%), holding materials up to the camera for the child to view (50%), using materials in the child’s natural environment (44%), providing materials to client in advance (28%), and using a document camera (26%).

Survey participants reported the ages of the children to which they were providing direct therapy services via telehealth. The respondents reported treating children ages three to five years old (65%) and six to eight years old (65%) most frequently and nine to eleven years old slightly less (63%).

Survey participants reported the conditions they have treated via telehealth (summarized in Table 4). The five most common were Expressive and Receptive Language disorders (96%), Speech Sound Production (86%), Social Aspects of Communication (i.e., challenging behaviors, ineffective social skills; 74%), Cognitive Aspects of Communication (i.e., executive functioning, memory, problem solving; 56%), and Fluency (42%). A follow-up question asked respondents to rate the level of effectiveness of services provided remotely based on the child’s communication disorder using a 0-100 analog scale, ranging from strongly disagree to strongly agree. For many conditions, clinicians reported similar amounts of effectiveness ranging from 83% (for Literacy and Written expression) to 74% (for Speech Sound Production). Communication Modalities (i.e., AAC) was reported to be least effective when taught remotely.
Respondents were asked to indicate how their clients accessed telehealth therapy materials. Similar to evaluations, the three most common were screensharing (84%), holding materials up to the camera for the client to view (66 %), and using materials in the client’s natural environment (65%). In addition, clients accessed online materials during sessions (56%), used therapy applications (43%), were provided materials in advance (40%), accessed shared files (28%), and viewed materials via a document camera (22%).

**Clinicians’ Hardware and Software use**

Respondents reported the devices used for telehealth. The majority of clinicians used a computer/laptop (93%), followed by a tablet (23%) and cellphone (23%). One-quarter of respondents reported using multiple devices at one time. Clinicians were asked the percentage of time they used various devices to provide telehealth services. The mean percentage of use was 94% (SD = 15.22) for computers, 36% (SD = 31.21) for tablets, and 15% (SD = 20.67) for cellphones. The audio components used for the audiovisual connection when providing synchronous videoconferencing included the device’s own speakers (65%), headphones (57%), and external speakers (11%).

Respondents were asked to identify additional hardware used for the audiovisual connection when providing synchronous videoconferencing. The most common was headphones (over-the-ears-40%, earbuds-37%), followed by an additional device, such as another computer or tablet (41%) or cellphone (36%). Clinicians reported using additional computer screens (28%), external webcams (24%), document cameras (22%), augmentative alternative communication devices (15%), external microphones (15%), external speakers (12%), and other hardware (i.e., smartboard; .8%). Only 9% of participants reported that they did not use any additional hardware to provide telehealth services.

Survey participants reported the telehealth platforms used when providing synchronous videoconferencing. The majority of clinicians used Zoom (78%), followed by a FaceTime (21%) and other (20%) platforms, such as WebEx, Google Meet, and Go to Meeting. Other common platforms included: Microsoft Teams (15%), Doxy (15%), Google Hangouts (13%) Google
Classroom (11%), Therapplatform (10%), What’s App (5%), Skype (4%), Presence Learning (3%), Facebook Messenger (3%), and Blink Session (2%).

Clients’ Hardware

Respondents identified the devices used by their clients when receiving telehealth services. Clinicians reported clients using a computer/laptop (87%) the most, followed by a tablet (79%) and cellphone (67%). Almost half of the respondents (44%) reported using combination of devices (varied from session to session). Only 3% of survey participants did not know which devices their clients were using. Clinicians estimated the frequency of use averaging 55% ($SD = 25.49$) for computers, 35% ($SD = 22.26$) for tablets, 26% ($SD = 21.34$) for cellphones, and 41% ($SD = 33.39$) for multiple devices.

Participants reported the audio components clients used. The most common was the device’s own speakers (79%) followed by headphones (42%), external speakers (7%) and unknown (11%). The mean percentage of use was 83% ($SD = 23.12$) for device’s speakers, 34% ($SD = 25.41$) for headphones, and 59% ($SD = 36.88$) for external speakers.

Views on Telehealth

Speech-language clinicians were asked 14 questions, grouped into three main themes, about their overall views of speech-language services provided via telehealth. Question responses were reported using a 0-100 analog scale, ranging from strongly disagree to strongly agree. Figure 2.1 presents the means and standard deviations grouped thematically.

The first theme, *telehealth infrastructure*, encompassed questions about audio-visual and connectivity quality and hardware and software connectivity choices. Three questions pertaining to audio-visual and connectivity quality were highly rated, ranging from mean scores of 85.3 to 90.9%. Five questions pertaining to hardware and software connectivity choices ranged from mean scores of 63.7% to 81.2%; the choice of videoconferencing platforms and clients’ hardware received lower ratings. The second theme, *teleassessments*, encompassed two questions pertaining to reliability and validity of telehealth assessments that received lower ratings, ranging from mean scores 60% to 71.7%, and two questions pertaining to ease of
telehealth test administration that raised even more concern, with ratings ranging from mean scores 44.8% to 57.1%. The final theme, *telehealth use*, inquired about the comparison of telehealth to in-person care, with two questions ranging from mean scores 59% to 61%. These ratings represent a fair amount of concern about telehealth use in comparison to in-person care.

**Views on Telehealth: Content Analysis**

The final survey items consisted of four open-ended questions. Answers to the questions were subjected to content analysis, with responses identified by themes that were grouped into response categories (Miller et al., 2014). Results of the analyses are summarized in Table 2.5.

The advantages of telehealth question (*n*=190) were determined to have eight major content themes. At least 25% of respondents identified a client’s ability to access services (44%), family involvement (40%), safety (33%), convenience (31%) and scheduling flexibility (31%) as the most common advantages to telehealth speech and language therapy services.

The disadvantages of telehealth question (*n*=194) were determined to have nine major content themes. At least 25% of respondents identified a client’s lack of connectivity (42%), lack of family involvement or appropriate environment in which to receive therapy services (37%), client behaviors (35%), and unsuitable substitution for in-person care (33%) as the most common disadvantages to telehealth speech and language therapy services.

The future of telehealth question (*n*=172) was determined to have eight major content themes. The majority of respondents reported that telehealth services will persist or increase (86%) and at least 25% of respondents identified that telehealth will be a permanent delivery option and widely accepted (44%).

The question about needs to optimize the use of telehealth (*n*=172) was determined to have nine major content themes. At least 25% of respondents identified needing improvements in access and funding for telehealth connectivity (47%), access and funding for telehealth technology (35%), and in training for clinicians (26%) as the most common needs to optimize telehealth speech and language therapy services.
Discussion

Prior to March 2020, the use of telehealth by pediatric SLPs was minimal due in part to regulatory, reimbursement, and technology hurdles as well as barriers to care such as limited connectivity and negative clinician attitudes toward telehealth (ASHA, 2002; Fong et al., 2020; Hill & Miller, 2012; Lustig & Institute of Medicine (U.S.), 2012; McClellan et al., 2020; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Although some aspects of telehealth have remained the same, many others have changed. The results of this study reveal how remote delivery of speech-language pathology services has evolved as a result of the exponential growth in telehealth use caused by the pandemic.

Before COVID-19, the use of telehealth often was perceived to have a narrow application, such as providing services to children who resided in rural locations (Edwards et. al., 2012; Fairweather et al., 2016; Jessiman, 2003). This survey revealed that providers and families in all locations (i.e., rural, suburban, urban) experienced telehealth therapy services during the pandemic. For example, children were able to receive vital therapy services in the safety of their own home, staying with a caregiver, or visiting a family member. For many families, it was the only option they had if they were going to continue services during the pandemic. Fortunately, changes in regulation and medical insurance coverage allowed children from varying socioeconomic backgrounds access to telehealth who previously may have not been granted access.

Survey respondents reported that families had reservations about telehealth, even if it meant their child might go without services. Speech-language clinicians indicated that the most common concerns families had were their child’s lack of willingness to participate in therapy sessions and the parent’s comfort level with videoconferencing. To exacerbate the problem,
respondents reported that even when parents wanted to participate in telehealth, there were families who did not have the resources to do so. Therefore, common telehealth barriers identified prior to March 2020 (COVID-19) continue to persist, such as lack of internet access in rural areas or lack of funding to provide children with technology (i.e., appropriate devices) or affordable internet access (Benda et al., 2020). These ongoing technology and connectivity barriers are continuing to prevent willing families and children from accessing vital speech and language services.

Clinicians’ attitudes toward telehealth that existed prior to the pandemic, such as questioning the efficacy of telehealth services and concerns about client comfort and willingness to participate in remote services, continued even with the widespread use (Keck & Doarn, 2014; Lustig & Institute of Medicine (U.S.), 2012; Freckmann et al., 2017). SLPs perceived their professional organizations’ expressed hesitancy about supporting remote delivery of evaluation or diagnostic services of particular concern (ASHA, 2020). ASHA has acknowledged that several pediatric assessments lack validity and reliability for remote administration (ASHA, 2020; Farmer et al., 2020). Aligning with ASHA, the clinicians’ lower ratings on questions about reliability and validity of telehealth assessments revealed the uncertainty many speech-language pathology providers had about the administration of teleassessments. Likewise, clinicians’ responses about the ease of telehealth test administration indicated that speech-language clinicians opted to choose an assessment that was easily administered remotely in contrast to modifying test administration. Consequently, it was not surprising that only half of the survey participants reported they had performed teleassessments.

Survey participants who performed remote evaluations reported that they typically evaluated children between the ages 3 to 11 years, but expressed most difficulty evaluating
younger children remotely. Additionally, clinicians reported the most difficulty when performing evaluations of speech sound production and swallowing/feeding. As expected, bachelor level participants \((n=12)\) responded with similar ratings to evaluation questions in areas, such as speech sounds and receptive and expressive language, but did not respond to questions in other areas, such as swallowing and hearing, for which they likely lacked competency. In general, speech-language clinicians judged conditions, such as the social aspects of communication, communication modalities (i.e., AAC training), and speech sound production, as more challenging when taught remotely. Considering the prevalence of children with speech sound disorders and children with autism on a typical pediatric SLP’s caseload, it is not surprising that ASHA’s May 2020 survey reported that 56\% of SLPs considered the telehealth experience challenging (ASHA 2020).

Addressing interpersonal skills through a computer screen or determining the accuracy of speech production over a device’s speaker may not be optimal to achieve effective outcomes. Clinicians’ responses comparing telehealth use to in-person care reveals the uncertainty that some clinicians have about the effectiveness of telehealth when compared to in-person care. Yet, for many children the benefit of having access to services far outweighs the option of no services at all. Therefore, research will need to be conducted to investigate the future viability of telehealth long after COVID-19 restrictions are gone. Researchers will need to investigate technology that mirrors current, real-world conditions to assess their application in everyday practice (Benda et al., 2020; Sutherland et al., 2016; Taylor et al., 2014).

Historically, speech-language clinicians most often used desktop computers during research studies and to provide telehealth therapy services (e.g., Coufal et al., 2018; Grogan-Johnson et al., 2013). However, one-quarter of survey participants reported using multiple devices during therapy sessions. Children, in contrast to clinicians, used more portable devices, such as tablets and cellphones, with almost half of the children using multiple devices (i.e., a computer for one session, a cell phone for another). Researchers such as Isaki and Ferrall (2015) and Langbecker et al. (2019) already began to recognize this transition to portable, commercial-
grade hardware (i.e., iPads) when investigating telehealth therapy services. However, data on the use of cell phones to provide telehealth services is limited, which is significant considering the number of clients and clinicians who used cell phones for telehealth. Elevated ratings for hardware and software connectivity choices acknowledges the importance of technology choices and their ability to affect therapy outcomes positively or negatively.

The high ratings for audio-visual and connectivity quality indicates an awareness that the audio-visual signal can affect the quality of a therapy session. Considering the importance of the audio signal clinicians receive from their clients, the use of device speakers, in contrast to headphones or external speakers, may not be sufficient. The importance of a clinician’s ability to hear and understand a child’s speech and articulation compels clinicians and researchers to consider their choice of hardware, as it could positively or negatively affect the reliability of evaluations, the outcomes of treatment, or the validity of a study. Although portable and affordable technology is used by many families, allowing them access to telehealth services in varied environments, the effectiveness of services provided to clients with less-than-optimal technology (e.g., cellphones, device’s built-in microphone) is unknown. If future research determines that consumer-grade enhancements result in significant improvements, it could be that modestly priced ancillary hardware may be recommended (e.g., gaming headphones with microphones).

In the past, many researchers have used custom-built videoconferencing platforms or specialized software to investigate the remote delivery of therapy services in comparison to in-person intervention (Coufal et al., 2018; Grogan-Johnson et al., 2013). During the pandemic, participants identified a vast array of consumer-grade, videoconferencing options available. Some platforms’ unique features, such as screensharing, make providing remote services easier. Not all software options meet HIPAA or FERPA privacy standards, however. For regulations such as HIPAA, a client’s personal identifiable information would need to have a Business Associate’s Agreement (BAA) in place by the organization or company responsible for storing the data (Bhate et al., 2020). Yet, platforms such as Apple’s FaceTime will not enter into such an
agreement. Zoom Healthcare and Zoom for Education have a BAA in place; however, the free and regular paid versions of Zoom do not. This is disconcerting considering that four out of five clinicians reported using Zoom. Although the Office of Civil Rights allowed flexibility during the Public Health Emergency, providers were encouraged to avoid several applications due to privacy risks (“Notification,” 2020). Therefore, clinicians must consider the privacy and security of children receiving remote services as they continue to provide therapy via telehealth post-pandemic.

Speech-language clinicians reported many advantages and disadvantages of speech-language services delivered remotely. Benefits of telehealth include improving access to services, involving families in children’s therapy, providing safety from the COVID-19 virus, and greater convenience and flexibility. The majority of clinicians were supportive of this delivery model, with over 86% predicting it will continue into the future. As noted in the Campbell and Goldstein (in press) study, clinicians stated telehealth would become a permanent delivery option, even increasing in use as it becomes more widely accepted. However, some clinicians reported struggling to provide remote therapy services to children during this unprecedented time, with children lacking family support, lacking an environment conducive to telehealth services, or demonstrating behaviors that were difficult to manage remotely. Despite the barriers clinicians identified and struggles clinicians reported, the future of telehealth therapy services still appears bright. Speech-language clinicians do not see the remote delivery of their services replacing in-person care altogether. They recognize it as a viable option, and now, to more children than ever before.

Implications
The current state of telehealth is no longer reflective of its pre-Covid-19 use. Therefore, the results of this study reflect current, real-world practices and help speech-language pathology providers understand how telehealth has evolved, informing clinical practice and future telehealth research and development. For example, survey respondents admitted to providing care to children in settings that were not always conducive to therapy. Some clinicians
experienced increased parental involvement and others stated that parent support was lacking or even nonexistent. Although clinicians may have tolerated less than ideal telehealth environments during the pandemic, these findings demonstrate the need for a baseline requirement for children to participate in post-pandemic telehealth services. This threshold may include a quiet setting with limited distractions and adult participation as a requirement.

The range of hardware and software options used by both clinician and client revealed the varying combinations of technology that can potentially be used during a telehealth session. Currently, there is no standard telehealth infrastructure required for therapy services to be rendered. However, respondents recognized that choice of technology can affect the outcome of service delivery and lack of technology was an often-reported barrier to even accessing care. Therefore, a conventional telehealth framework that maintains ecological validity should be established for providing essential services. For example, providers could adopt a minimum device standard (i.e., at least a ten-inch device screen) and bandwidth as well as external hardware requirement (i.e., headphones) for a child to participate in their services.

Survey respondents noted materials needed to provide therapy services remotely were lacking. Clinicians would hold up testing manuals to a device’s camera or retrofit paper materials to adapt to virtual instruction. There is potential for growth in the development of telehealth-based tools that would enable therapy delivered remotely to be easier and more efficient. Clinicians preferred platforms with screensharing capabilities and that were easy for families to use. Advancements in telehealth-based technology could include cost-effective platforms with features clinicians find essential to providing services remotely.

Survey participants’ concerns over the lack of telehealth research was prominent throughout the survey. For example, clinicians reported difficulty remotely evaluating younger children and clients with speech sound disorders. AAC interventions were reported to be the least effective when using telehealth. However, it is unknown if the difficulties clinicians experienced or the perceived lack of effectiveness they reported are correlated to a child’s
condition, age, or services type. Therefore, the results of this survey support the urgent need for telehealth research.

Limitations

Limitations should be considered when interpreting the results of this study. The sample size of 259 is relatively small in relation to the population of pediatric speech-language providers. Additionally, due to the nature of distributing the survey through social media and ASHA’s special interest groups, a rate of return could not be calculated. Finally, 33% of the respondents came from the Southeast, which could bias results.

Unfortunately, information on the type of certification or licensure for each survey participant was not collected, but the vast majority (93%) of survey participants had at least a master’s degree. Consequently, it is unknown whether views may differ as a function of educational level. However, Campbell and Goldstein (2021) found no differences in current and predicted future use of telehealth as a function of years of experience.

Finally, the responses to this survey were taken at a single time-point and thus may not be reflective of the evolving nature of this topic. Moreover, we do not know how well this self-report survey reflects actual practices. Although clinicians’ perceptions allow us to generate practical implications, such as the need for minimal standards for telehealth, those implications require empirical investigation.

Conclusions

The unprecedented challenges brought on by the COVID-19 pandemic forced many providers in healthcare and education settings to immediately consider and implement teleassessments and the delivery of their pediatric speech-language therapy services through synchronous videoconferencing. This survey helps us understand the effect of this sudden, widespread use of remote therapy services on the provision of speech-language services using a telehealth delivery model.

Many survey respondents expressed the opinion that telehealth services were not going to replace in-person care. Yet, they acknowledged the benefits of having the option of remote
delivery of services. However, the ability of some children to participate in telehealth services continues to be limited due to persistent barriers, many of which existed before the dramatic increase in telehealth services associated with a pandemic. Future studies should address ways to overcome identified barriers to telehealth, such as limited connectivity, access to technology, and families’ comfort level with videoconferencing. Research could investigate and analyze the characteristics of successful telehealth therapy sessions post-pandemic, both from the provider and client perspective, to inform future development of a successful telehealth framework.

Perceptions of the effectiveness of evaluation and intervention services administered via synchronous videoconferencing were nuanced. For example, speech-language clinicians had less reservations about providing therapy treatment via synchronous videoconferencing than they did performing evaluations; their reluctance to do teleassessments was notable. Many clinicians reported that future research on telehealth, especially the reliability of standardized assessments, is needed to optimize future telehealth use. Clinicians expressed the need for studies comparing face-to-face and remote delivery of services, including what factors are responsible for differences between the two delivery models. Additionally, speech-language therapy intervention studies should investigate the efficacy of other forms of telehealth content, such as online stimulus materials or asynchronous treatment programs. Both evaluation and treatment research using current telehealth infrastructure is needed to judge its adequacy and sustainability in delivering services remotely beyond the COVID-19 pandemic. The future of regulation and reimbursement is likely to be heavily influenced by the availability of research in this area.

Survey respondents reported the current, real-world technology being used in therapy practice (i.e., hardware and software) and their perceived adequacy when providing telehealth services. Even though speech-language clinicians continue to mainly use computers to deliver remote therapy services, the use of portable devices (i.e., tablets, cellphones) was prevalent among both providers and pediatric clients. Zoom was the most used platform to deliver services in both medical and education settings. This a potentially viable platform if using the HIPAA and FERPA compliant version of Zoom software. Furthermore, both the speech-language clinicians
and their clients frequently used the device’s built-in microphones and speakers in contrast to external hardware (e.g., headphones). These findings should be taken into consideration as researchers design studies and establish the ecological validity to make research outcomes applicable to daily therapy practice.

Results of this study provide a glimpse of how speech-language pathology services have evolved as a result of the increase in services being provided remotely. As clinicians were forced to reconsider the scope and utility of telehealth, they have discovered unanticipated benefits of its use, and plan to continue providing care using synchronous videoconferencing. Speech-language clinicians are optimistic that therapy services via telehealth are here to stay. (Campbell & Goldstein, in press; Tohidast et al., 2020). The COVID-19 pandemic most likely has changed the landscape of healthcare and education forever.

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Table 2.1

Participant Demographic Information

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<th>Location</th>
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<th>Setting</th>
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<th>%</th>
<th>Education</th>
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The regions are as follows: Northeast (ME, MA, RI, CT, NH, VT, NY, PA, NJ, DE, MD); Midwest (OH, MI, IN, IA, WI, IL, MN, MO, ND, SD, NE, KS); Southeast (VA, WV, KY, NC, SC, TN, GA, FL, AL, MS, AR, LA); Southwest (AZ, TX, OK, NM); West (ID, CO, NM, AZ, UT, NV, CA, OR, WA, AK, WY).

Table 2.2

Client Demographic Information

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<thead>
<tr>
<th>Client Location</th>
<th>%</th>
<th>Client’s Telehealth Setting</th>
<th>%</th>
<th>Socio-Economic</th>
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<tr>
<td>Rural</td>
<td>36%</td>
<td>Client’s home</td>
<td>97.3%</td>
<td>Low</td>
<td>57%</td>
</tr>
<tr>
<td>Suburban</td>
<td>69.4%</td>
<td>Family member’s home</td>
<td>32%</td>
<td>Middle</td>
<td>67%</td>
</tr>
<tr>
<td>Urban</td>
<td>35.7%</td>
<td>Daycare</td>
<td>13.5%</td>
<td>High</td>
<td>17.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School</td>
<td>13.1%</td>
<td>Unknown</td>
<td>13.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car</td>
<td>12.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parent’s workplace</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other (i.e., shelter)</td>
<td>1.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2.3

**Families’ Reservations about the Use of Telehealth**

<table>
<thead>
<tr>
<th>Family Reservations</th>
<th>n=246</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness of child to participate in sessions via telehealth</td>
<td>77.0%</td>
</tr>
<tr>
<td>Comfort level with videoconferencing</td>
<td>61.0%</td>
</tr>
<tr>
<td>Access to connectivity (i.e., affordable, available access to internet)</td>
<td>58.1%</td>
</tr>
<tr>
<td>Age of the client</td>
<td>55.7%</td>
</tr>
<tr>
<td>Access to technology (i.e., hardware)</td>
<td>53.3%</td>
</tr>
<tr>
<td>Client's diagnosis</td>
<td>39.0%</td>
</tr>
<tr>
<td>Home environment can be distracting/interfering with compliance</td>
<td>39.0%</td>
</tr>
<tr>
<td>Care for siblings during therapy session</td>
<td>34.1%</td>
</tr>
<tr>
<td>Use of a computer or tablet is distracting</td>
<td>26.0%</td>
</tr>
<tr>
<td>Level of caregiver education</td>
<td>22.4%</td>
</tr>
<tr>
<td>Socio-economic status</td>
<td>16.7%</td>
</tr>
<tr>
<td>Language barriers</td>
<td>14.6%</td>
</tr>
<tr>
<td>Cultural background</td>
<td>7.7%</td>
</tr>
<tr>
<td>Other (e.g., not as effective as if seen in person)</td>
<td>6.9%</td>
</tr>
<tr>
<td>Cost/reimbursement of services</td>
<td>6.5%</td>
</tr>
<tr>
<td>Age of the caregiver</td>
<td>5.7%</td>
</tr>
<tr>
<td>Religious beliefs</td>
<td>.4%</td>
</tr>
</tbody>
</table>
### Table 2.4

**Telehealth Evaluations and Treatment:**
**Self-Reported Ratings of Level of Difficulty and Level of Effectiveness by Condition**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Evaluation: Level of Difficulty</th>
<th>Treatment: Level of Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>Mean (( SD ))</td>
</tr>
<tr>
<td>Receptive/Expressive Language</td>
<td>111</td>
<td>55.3% (29.93)</td>
</tr>
<tr>
<td>Speech Sound Production</td>
<td>99</td>
<td>63.5% (29.93)</td>
</tr>
<tr>
<td>Social Aspects of Communication</td>
<td>63</td>
<td>58.7% (27.46)</td>
</tr>
<tr>
<td>Cognitive Aspects of Communication</td>
<td>37</td>
<td>51.7% (29.14)</td>
</tr>
<tr>
<td>Fluency</td>
<td>35</td>
<td>38.6% (29.11)</td>
</tr>
<tr>
<td>Literacy, Written Language</td>
<td>33</td>
<td>53.1% (32.55)</td>
</tr>
<tr>
<td>Communication Modalities (i.e., AAC)</td>
<td>24</td>
<td>62.3% (33.34)</td>
</tr>
<tr>
<td>Dual Language Learners</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Swallowing, Feeding</td>
<td>17</td>
<td>74.6% (23.28)</td>
</tr>
<tr>
<td>Voice and Resonance</td>
<td>14</td>
<td>52.4% (25.96)</td>
</tr>
<tr>
<td>Hearing</td>
<td>9</td>
<td>60.6% (35.98)</td>
</tr>
</tbody>
</table>

*Note: \( SD \) = standard deviation*

### Table 2.5

**Content Analysis: Speech-Language Pathology Clinicians’ Views on Telehealth**

<table>
<thead>
<tr>
<th>Advantages of Telehealth (( n = 190 ) respondents)</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>accessibility (for client to services, experts)</td>
<td>44.2%</td>
</tr>
<tr>
<td>family involvement</td>
<td>40.0%</td>
</tr>
<tr>
<td>safety (for client, clinician)</td>
<td>32.6%</td>
</tr>
<tr>
<td>convenience (for client, clinician)</td>
<td>30.5%</td>
</tr>
<tr>
<td>flexibility (scheduling for client and clinician, for attendance)</td>
<td>30.5%</td>
</tr>
<tr>
<td>reduced travel (for client, clinician)</td>
<td>22.6%</td>
</tr>
<tr>
<td>efficiency (clinician)</td>
<td>13.2%</td>
</tr>
<tr>
<td>cost effectiveness (for telehealth services)</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disadvantages of Telehealth (( n = 194 ))</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>connectivity</td>
<td>41.8%</td>
</tr>
<tr>
<td>lack of family support or appropriate environment</td>
<td>36.6%</td>
</tr>
<tr>
<td>client behaviors</td>
<td>35.1%</td>
</tr>
<tr>
<td>not substitute for in-person/services needs in-person</td>
<td>32.5%</td>
</tr>
<tr>
<td>reliability, validity, accuracy of responses</td>
<td>24.2%</td>
</tr>
<tr>
<td>lack of hardware/software</td>
<td>20.6%</td>
</tr>
</tbody>
</table>
Table 2.5 (continued)

<table>
<thead>
<tr>
<th>Issue</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>audio-visual quality</td>
<td>16.5%</td>
</tr>
<tr>
<td>lack of infrastructure clinician</td>
<td>9.8%</td>
</tr>
<tr>
<td>client access to materials</td>
<td>6.2%</td>
</tr>
<tr>
<td>Future of Telehealth ($n = 172$)</td>
<td></td>
</tr>
<tr>
<td>use will continue, increase</td>
<td>86.1%</td>
</tr>
<tr>
<td>become a permanent delivery option, widely accepted</td>
<td>44.2%</td>
</tr>
<tr>
<td>will not replace in-person services</td>
<td>15.1%</td>
</tr>
<tr>
<td>needs more research</td>
<td>8.1%</td>
</tr>
<tr>
<td>regulation, insurance coverage continues</td>
<td>7.0%</td>
</tr>
<tr>
<td>will continue to improve over time</td>
<td>7.0%</td>
</tr>
<tr>
<td>unknown, questionable, to be determined</td>
<td>2.9%</td>
</tr>
<tr>
<td>may negatively impact our field</td>
<td>2.3%</td>
</tr>
<tr>
<td>Optimization of Telehealth ($n = 172$)</td>
<td></td>
</tr>
<tr>
<td>improvement, access, and funding for connectivity</td>
<td>46.5%</td>
</tr>
<tr>
<td>improvement, access, and funding for technology</td>
<td>34.9%</td>
</tr>
<tr>
<td>speech-language clinician training</td>
<td>25.6%</td>
</tr>
<tr>
<td>more telehealth research</td>
<td>15.7%</td>
</tr>
<tr>
<td>increase in telehealth materials, affordability</td>
<td>15.1%</td>
</tr>
<tr>
<td>parent involvement and education</td>
<td>13.4%</td>
</tr>
<tr>
<td>HIPPA complaint, speech pathology specific platform</td>
<td>12.2%</td>
</tr>
<tr>
<td>Improvement in regulation, reimbursement and standards of practice</td>
<td>12.2%</td>
</tr>
<tr>
<td>clinician’s attitudes towards telehealth</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
### Mean Ratings and Standard Deviations for Views on Telehealth Organized Thematically

#### Views on Telehealth

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TELEHEALTH INFRASTRUCTURE</strong></td>
<td></td>
</tr>
<tr>
<td>Audio quality is important to telehealth services.</td>
<td>70.9%</td>
</tr>
<tr>
<td>Videoconferencing connection affects service outcomes.</td>
<td>90.4%</td>
</tr>
<tr>
<td>Video quality is important to telehealth services.</td>
<td>90.0%</td>
</tr>
<tr>
<td>Client's technology and connectivity during assessments affect test results.</td>
<td>87.3%</td>
</tr>
<tr>
<td>Client's device (i.e., desktop, tablet) affect service outcomes.</td>
<td>79.5%</td>
</tr>
<tr>
<td>Platform choice (e.g., Zoom, Doxy) affects therapy effectiveness.</td>
<td>79.1%</td>
</tr>
<tr>
<td>Not all clients have devices appropriate for telehealth use.</td>
<td>69.4%</td>
</tr>
<tr>
<td>Client's use of headphones affects service outcomes.</td>
<td>63.7%</td>
</tr>
<tr>
<td><strong>TELEASSESSMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Choice of assessments considers ease of telehealth administration.</td>
<td>71.7%</td>
</tr>
<tr>
<td>Standardized assessments in-person if not validated for telehealth.</td>
<td>60.0%</td>
</tr>
<tr>
<td>Standardized assessments must have research to validate telehealth administration.</td>
<td>57.1%</td>
</tr>
<tr>
<td>Test administration modified for telehealth delivery.</td>
<td>44.8%</td>
</tr>
<tr>
<td><strong>TELEHEALTH USE</strong></td>
<td></td>
</tr>
<tr>
<td>Telehealth substitute for in-person care.</td>
<td>61.4%</td>
</tr>
<tr>
<td>Telehealth equally as effective as in-person care.</td>
<td>59.3%</td>
</tr>
</tbody>
</table>

**Note:** 0% = strongly disagree; 100% = strongly agree

Mean Question Scores
CHAPTER FOUR:
THE RELIABILITY AND VALIDITY OF TELEHEALTH SPEECH SOUND ASSESSMENTS ADMINISTERED IN REAL-WORLD SCENARIOS

Abstract

**Purpose:** COVID-19 caused a worldwide conversion from in-person therapy to telehealth; however, limited evidence to support the efficacy of remotely delivering standardized tests puts the future of widespread telehealth use at risk. The aim of this study is to investigate the reliability and validity of a speech sound assessment administered in real-world scenarios.

**Method:** A total of 39 three- to eight-year-olds were administered the Goldman Fristoe Test of Articulation-3rd Edition (GFTA3). Licensed speech-language pathologists (SLPs) concurrently scored children’s responses in person, and in two telehealth conditions considered typical and enhanced. Mean composite scores and interrater reliability results were compared among the three conditions. Descriptive statistics were used to summarize technology and behavior disruptions and the results of an SLP post-assessment survey.

**Results:** All scoring conditions were found to be highly correlated, with mean differences revealing no significant systematic differences of one condition over- or under-estimating another. Although response agreement was high (85-87%), final sounds in words or sounds that were difficult to observe tended to attenuate reliability. Reported child and technology disruptions did not affect a SLPs ability to score responses. Despite no significant differences
between conditions on scoring reliability, SLP participants reported they continued to prefer in-person over remote delivery of speech sound assessments.

**Conclusion:** This study supports the provision of a pediatric speech sound assessment using consumer-grade equipment as in-person, typical telehealth, and enhanced telehealth scoring conditions produced similar results. However, SLP participants’ skeptical attitudes toward remote delivery of standardized tests reveal an ongoing barrier to widespread telehealth use.

**Introduction**

In March 2020, the COVID-19 pandemic caused a massive, worldwide conversion from in-person care to telehealth (also known as telemedicine, telepractice, teletherapy, telespeech, teleassessment, and telerehabilitation; American Speech-Language-Hearing Association, 2016a, b; Bashshur et al., 2020; Cason & Cohn, 2014; Freckman et al., 2017; Keck & Doarn, 2014; Kichloo et al., 2020; Smith et al., 2020; Tohidast et al., 2020). Prior to this transition, there was evidence supporting the use of synchronous videoconferencing to provide many of the services people use every day, including speech and language therapy sessions (Coufal, 2018; Grogan-Johnson et al., 2013; Isaki & Ferrall, 2015; Langbecker et al., 2019). Yet, several barriers to providing care through this approach limited its widespread use, including reimbursement, regulations, and technology as well as clinician attitudes toward and acceptance of telehealth (Lustig & Institute of Medicine (U.S.), 2012; McClellan et al., 2020). Those speech-language pathologists (SLPs) who did provide telehealth services used remote delivery to allow clients access to care that was otherwise inaccessible. Other SLPs provided telehealth due to its efficiencies and convenience, such as minimizing traveling as they worked from their office or home (Freckmann et al., 2017; Tohidast et al., 2020). Then, COVID-19 changed the landscape of healthcare and education, forcing many to consider telehealth beyond what was initially perceived as a limited scope of utility (Campbell & Goldstein, in press).
SLP perceptions of telehealth evolved during the coronavirus pandemic. Most SLPs experienced remote delivery for the first time, learning and then quickly adopting telecommunication services (Campbell & Goldstein, in press; Tohidast et al., 2020). In the Campbell and Goldstein (in press) study, almost half of all survey participants reported that initially telehealth was the only option they had if they were going to continue providing direct therapy services during the pandemic. Government agencies assisted in making this use of telehealth viable by allowing for interstate licensing, removing regulatory restrictions and most importantly, providing reimbursement for care (Bashshur et al., 2020). However, as time went on, many SLPs discovered the benefits of offering services remotely. Speech-language pathology clinicians self-reported that they planned to continue to use telehealth well into the future, thus creating a whole new generation of telepractitioners (Campbell & Goldstein, in press; Tohidast et al., 2020). Unfortunately, the future of telehealth use remains in question. Although many of the barriers that existed prior to COVID-19 have been eliminated, others remain. For example, there are disparities in the resources needed to provide adequate connectively for a clinical session (i.e., affordable broadband, hardware, and software) and negative attitudes toward remote delivery of therapy services (Smith et al., 2020; Sutherland et al., 2017; Taylor et al., 2014; Tohidast et al., 2020).

During COVID-19, telehealth therapy providers discovered children were using a range of equipment and software variations, such as a smart phone connected to a mobile broadband connection or a tablet with ear buds connected to a public hotspot (“School services, interrupted,” 2020). SLPs realized they rarely had an option other than using the technology a child’s family had readily available to provide direct patient care during the pandemic (Tohidast et al., 2020; Wang et al., 2020). Additionally, SLPs employed varying types of technology to
provide their services remotely (Tohidast et al., 2020). In Campbell and Goldstein’s (2021) *Telehealth Services: Pediatric Provider Survey*, speech-language pathology clinicians self-reported the typical technological parameters that were being used to deliver telehealth therapy services during COVID-19. The majority of clinicians reported using a computer, desktop or laptop, to provide telehealth services with just over half of clinicians using the additional hardware of headphones. Even though children were using cellphones to receive therapy services, more often children used computers and tablets with the device’s built-in speakers and microphone. When an external component was used, it was most often headphones. Survey respondents affirmed that the platform a provider chooses is important if the services are to be effective. The platform reported to be used most often was Zoom. Providers acknowledged that these experiences were not typical telehealth delivery models nor ideal conditions, as they sought to respond to unprecedented circumstances (Tohidast et al., 2020).

The American Speech-Language-Hearing Association (ASHA) also recognized that therapy offered via telehealth during the pandemic may not be ideal (ASHA, 2020). ASHA expressed hesitancy about broadly supporting remote delivery of evaluative or diagnostic services, which was a particular area of concern (ASHA, 2020). ASHA acknowledged the deficiency, noting that several pediatric assessments lack the validity and reliability for administration remotely (ASHA, 2020; Farmer et al., 2020). ASHA advised standardized evaluations conducted with deviations, such as prompting or modifications to delivery, may impact interpretation of scores or require the child be reassessed in the future through in person administration to acquire valid results (ASHA, 2020; Farmer et al., 2020). ASHA continued to encourage clinicians to adhere to their guidelines and Code of Ethics to ensure SLPs were providing services of the highest quality when delivering therapy remotely (ASHA, 2016a, b).
ASHA’s position remained that telepractice must be consistent with the quality of care offered in person (ASHA, 2020).

This threshold was difficult for many clinicians to achieve during the pandemic. For example, Taylor et al.’s (2014) systematic review of articles from January 2004 through July 2014 investigated the reliability and validity of speech and language assessments administered to children through synchronous videoconferencing. Out of 180 articles identified, only five met the inclusion criteria: peer-reviewed comparison studies of children administered speech and language assessments remotely and in person. Overall, the five studies indicated valid clinical use of assessments for articulation screening (i.e., 100% agreement pass/fail), language (i.e., agreement in subtest and core scores), oral-motor function (i.e., rating agreement), and overall speech intelligibility agreement. Yet, the findings revealed inadequate evidence to support overall remote administration of standardized testing (Taylor et al., 2014). Most notably, standardized assessments to evaluate speech sound disorders were problematic. Comparisons of in person to remote administrations yielded reliability discrepancies in judgments of speech sounds and pluralization (Taylor et al., 2014). Additionally, studies did not report on clinician satisfaction, an important component to address as SLPs confidence in teleassessments have been associated with telehealth use (Taylor et al., 2014). Sutherland et al. (2017) also noted there were few studies examining teleassessments, an integral component to the diagnosis, care plan development, and progress monitoring of children with speech and language deficits. More so, Sutherland et al. (2017) suggested that teleassessment investigations need to be performed using consumer-grade equipment to reflect the real-world application of findings. Since the Taylor et al. (2014) review, there has been minimal research on teleassessments for children with communication disorders.
Due to the limited evidence to support teleassessments, many school- and clinic-based pediatric SLPs initially opted to defer evaluating children with standardized assessments in lieu of offering them remotely during the pandemic (“School services, interrupted,” 2020). Campbell and Goldstein (2021) reported that only half of speech-language pathology survey participants administered speech sound production assessments via telehealth during the coronavirus. Moreover, speech-language clinicians reported that standardized assessments for speech disorders were one of the most difficult to administer remotely, second only to swallowing evaluations. Despite some evidence of comparable remote vs. in person administration, most current pediatric assessments have not been evaluated (Sutherland et al., 2017). Some standardized tests that were previously investigated are now outdated (i.e., Clinical Evaluation of Language Fundamentals- 4th Edition; Goldman Fristoe Test of Articulation-2nd Edition). Others were conducted with inadequate samples or performed under ideal laboratory conditions i.e., high-end, custom-built computers (Eriks-Brophy et al., 2008; Sutherland et al., 2017; Taylor et al., 2014; Waite et al., 2010). Not surprisingly, SLPs remain wary about the appropriateness of performing assessments that are inconsistent with standardization conditions, which may compromise the fidelity of administration (ASHA, 2020).

Despite the low incidence of telehealth use prior to COVID-19, telehealth researchers did continue to develop innovative studies and advanced our knowledge about this delivery method (ASHA, 2002, 2020b; Fong et al., 2020; Hill & Miller, 2012; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Coufal et al. (2018) used the ASHA Functional Communication Measure (FCM) and National Outcome Measurement System (NOMS) to investigate the difference between therapy provided for speech sound disorders delivered remotely in contrast to the traditional, in-person setting. Their results found no significant difference between treatment
outcomes, thus supporting the use of telehealth for children with speech sound deficits (Coufal et al., 2018). Hodge et al. (2019) and Wright (2020) provided validity information for a cognitive assessment for children, the Wechsler Intelligence Scale for Children – Fifth Edition (WISC-5). Although the WISC-5 is not a speech and language assessment, the study provided evidence for a reliable and feasible method for delivering a pediatric cognitive assessment remotely.

Moreover, they also reported that psychologists and parents rated telehealth positively. Dekhtyar et al. (2020) recognized the increased growth in telehealth in both research and clinical settings. Therefore, they set out to validate the synchronous videoconference administration of a widely used assessment for aphasia, Western Aphasia Battery – Revised (WAB-R). Dekhtyar et al. found that in person and remote delivery methods were highly correlated, with no differences in domain scores. Additionally, most study participants reported being satisfied with the telehealth administration. Importantly, they encouraged participants to use their own technology, maintaining ecological validity, and provided guidelines with their telehealth administration modifications to ensure feasibility of replication.

Technological infrastructure with ecological validity is a critical component for replication of telehealth studies (Dekhtyar et al., 2020). Taylor et al. (2014) noted that studying telehealth under ideal research parameters in contrast to real-world scenarios is a limitation to this line of research. Research investigating the effectiveness of telehealth services, must mirror current, real-world conditions to apply the findings to everyday use (Benda et al., 2020; Dekhtyar et al., 2020; Sutherland et al., 2015; Taylor et. al., 2014). The importance of ecological validity and technology choice has become apparent in telehealth studies performed in the last 20 years. Wales et al. (2017) conducted a systematic review of speech and language therapy services for school-aged children and reported widespread use of custom-built hardware and
software for studies in the early 2000s, such as Jessiman (2003). By 2017, Snodgrass et al. (2017) listed a computer as well as tablets and smartphones as common equipment being used to provide pediatric speech and language therapy via telehealth and, as such, used mobile devices to investigate remote delivery of speech and language services. Pioneering studies from researchers like Snodgrass et al. (2017) and Dekhtyar et al. (2020) were integral to creating the foundation for mainstream acceptance of telehealth into clinical practice during the COVID-19 pandemic.

Given that speech sound production disorders are prevalent among SLP’s pediatric caseloads, the need for a validated, articulation test delivered remotely is apparent if telehealth use is going to be a viable option to provide diagnostic services. (Grogan-Johnson et al., 2013; “School Survey,” 2016). ASHA (2008b) reported 75% of a typical school-based SLP’s students consist of children with articulation impairments. In the US, estimates of school-aged children with a speech sound disorder or delay range from 2.3% to almost 25% (ASHA, 2020; NIDCD, 2016). Thus, effective assessments of children’s speech sound production are critical for SLPs to reliably identify children with speech disorders. However, the task of scoring speech sound production depends on an SLP’s ability to clearly identify how a child articulates individual speech sounds, which can be challenging when implemented through synchronous videoconferencing. SLPs must be able to ensure factors such as audio and video quality do not negatively affect their ability to accurately record children’s responses. Barriers such as inconsistent broadband connections and technology failures could potentially call into question the feasibility of conducting speech sound assessments with valid results (Freckman et al., Hines & Lincoln, 2014). Thus, it is important to investigate whether widely used articulation assessments can be delivered reliably via telehealth (Taylor et al., 2014, ASHA, 2020).
Speech language pathologists commonly use picture-based tests to evaluate children’s articulation skills (Madison et al., 1982). Unfortunately, there is inadequate evidence demonstrating the validity and reliability of a standardized speech assessment administered remotely (Taylor et al., 2014). For example, Waite et al. (2006) compared the scoring of the single word articulation test (SWAT) in videoconferencing and face-to-face scoring conditions. Even though this study reported a high level of agreement, they only had two assessors who used custom-built telehealth platforms to evaluate six children. Eriks-Brophy et al. (2008) compared remote- to on-site scoring agreement on the Goldman-Fristoe Test of Articulation-2nd edition. In contrast to Waite et al., their findings revealed high levels of scoring disagreement. However, in the Eriks-Brophy et al. (2008) study, they lacked a description of the telehealth equipment used and had a small sample size \( (n = 5) \). Moreover, the authors questioned how their difficulty with acoustic transmission and the absence of headphone and microphone use could have affected the outcome of their scoring agreements. Notably, these studies did not investigate SLP satisfaction, a crucial component of investigations of telehealth assessments, as an SLPs reduced confidence in teleassessments have been associated with reduced telehealth use (Taylor et al., 2014).

The lack of validity of telehealth administered evaluations, such as standardized speech sound assessments, may be perceived as short-term issue. However, it has long-term implications. Due to the high prevalence of speech sound disorders on SLPs’ pediatric caseloads, it is important to be able to identify and diagnose speech sound disorders accurately to avoid jeopardizing the long-term viability of offering diagnostic and treatment telehealth services for speech sound disorders.
**Purpose**

The ability to implement and accurately score a standardized speech sound assessment is integral to ensuring administration will produce reliable and valid results (Dekhtyar et al., 2020; Sutherland et al., 2017; Taylor et al., 2014). The results of standardized tests are used as part of the diagnostic procedure to identify speech and language disorders, inform the development of interventions, and monitor progress of the services a child receives. Even though there is research to support therapy interventions delivered through synchronous videoconferencing, the lack of evidence to support remote delivery of standardized speech and language assessments represents a significant deterrent to implementing diagnostic services, putting the future of widespread speech-language telehealth use at risk.

Research is needed to determine the conditions under which teleassessment results are valid. Moreover, we need to evaluate conditions that mimic the parameters that are feasible for practicing SLPs (Rauwerdink et. al., 2019; Sutherland et al., 2016, 2017; Taylor et al., 2014). To be able to apply findings in the real-world, the technological infrastructure must be accessible to both clinicians and clients to maintain ecological validity; custom-built equipment in ideal research conditions will limit applicability (Rauwerdink et al., 2019; Sutherland et al., 2016, 2017; Taylor et al., 2014).

Lastly, a potential barrier to care is clinicians’ opinions and perceptions towards using telehealth (Orlando et al., 2019; Sutherland et al., 2016, 2017). Negative attitudes have prevented clinicians in the past from accepting remote delivery of speech and language therapy services as a viable option (Fong et al., 2020; McClellan et al., 2020). Although the coronavirus pandemic resulted in a widespread transition from in-person care to therapy services being delivered via
synchronous videoconferencing, long-term sustainability of telehealth services depends on the attitudes of SLPs towards remote delivery of their services.

The aim of this study is to evaluate the validity, inter-rater agreement, and feasibility of administering a standardized speech sound assessment in three conditions. In addition to a traditional, in-person delivery and scoring of the Goldman-Fristoe Test of Articulation 3rd Edition (GFTA3; 2015), concurrent scoring will be done by one SLP via teleassessment using WiFi connections and standard tablet transmission and another SLP via an enhanced teleassessment (i.e., receiving client speech sound production from an external mic input). Thus, traditional in-person assessment, typical teleassessment, and teleassessment with mic enhancement will be compared to address the following research questions:

1) Do the mean inter-rater agreement percentages differ for scoring in the typical teleassessment condition and the enhanced teleassessment condition versus the in-person condition?

2) Do composite scores of a speech sound assessment differ when scored in-person, in a typical teleassessment condition, and in an enhanced teleassessment condition?

3) To what extent is scoring speech sounds influence by child behavior or technical disruptions?

4) Do SLPs’ opinions or consumer satisfaction about the three conditions differ?

**Method**

**Participants**

**Speech-language pathologists.** Six speech-language pathologists were recruited for this study. To be included, they were required to have a minimum of a master’s degree, and either be licensed or hold a teaching certification in speech-language pathology in the state of Florida.
Even though SLPs were only required to have a minimum of five years of experience in providing pediatric therapy services, inclusive of children with speech sound disorders, SLP participants experience ranged from 10 to 43 years, inclusive of extensive experience evaluating children with speech sound disorders. The SLPs needed to be familiar with the technology to provide pediatric telehealth services. Even though they were only required to have a minimum of six months of experience providing remote services, all SLP participants had a minimum of one year experience providing therapy using telehealth technology. However, all six clinicians had no more than one-year experience administering a standardized speech sound assessment via synchronous videoconferencing. SLP participants signed an informed consent prior to participation. Lastly, each SLP participant was required to be fully vaccinated for COVID-19 at least three weeks prior to participation.

**Children.** Children between ages three and eight were recruited. Fliers were distributed on social media and at speech-language therapy clinics in Citrus and Hernando County, Florida. Child participants included typically developing children and children with speech sound deficits, inclusive of childhood apraxia of speech, dysarthria, developmental phonological disorder, and delayed articulation. Children both with and without hearing impairments could be included; however, none of the children had reported hearing loss. Both male and female children from different socio-economic backgrounds were included. Children were included even if they were receiving speech-language therapy and were previously diagnosed with a speech disorder. Child participants were excluded if they were under the age of three or were age nine or older. Children were excluded if they had a limited lexicon as the assessment required the child to spontaneously name presented pictures.
A total of 39 children, 14 females and 25 males, participated in the speech sound assessments. They were between ages three and eight, with a mean of 5 years, 10 months (SD 1 year, 7 months). The participants’ parents were provided an optional in-take form to self-report information, such as demographics and socio-economic status. Parents reported their child’s race/ethnicity as White/Caucasian (84.6%), Black/African American (10%), Hispanic (3%), or more than one race (3%). There were 3 children who were dual language learners. Parents classified their income level as low-socio-economic (79%) or middle/high (21%). Of the 39 children in the study, 92% had been formally diagnosed with a speech sound disorder, with 90% of the children currently receiving speech-language services. Co-morbid conditions included autism spectrum disorder (18%), childhood apraxia of speech (10%) and cerebral palsy (5%). None of the children had been diagnosed with a hearing loss. A signed, IRB parental permission and child assent form was required prior to participation.

**Telehealth Speech Sound Disorder Evaluation**

**Speech Sound Assessment.** The Goldman Fristoe Test of Articulation – 3rd Edition (GFTA; 2015) is a standardized test used for the clinical assessment of speech sound production of individuals ages 2 through 21 years, 11 months. For the purpose of this study, the Sounds-in-Words test was used. The picture stimuli, which includes both cartoon and realistic style pictures of 60 target words, contains the initial, medial and final sound positions in words of 23 consonants as well as 15 consonant blends. The GFTA3 is designed to elicit the speech sound patterns necessary to identify and then analyze and categorize errors that can guide SLPs in making clinical decisions and plan interventions. Per the GFTA3 (2015) manual, the test takes approximately 12 minutes, on average, to administer. The 3rd edition of the test is offered in both digital and print formats. However, the development of the GFTA3 did not include remote
delivery when establishing its validity and reliability, which calls into question the option of
digital administration and scoring.

**Experimental Design.** The current study was a within-subject group design with SLPs
scoring children’s speech production responses under three conditions: (1) in person, (2)
synchronous videoconferencing with the child using a tablet device’s built-in microphone, (3)
synchronous videoconferencing with the child using a tablet device with an external microphone.
Thus, one in person SLP participant and two SLP participants via Wi-Fi connections at remote
locations concurrently scored child participants. The SLP evaluators were randomly assigned and
responsible for scoring children in each of the three conditions. Table 3.1 summarizes the
frequency of the SLP participants in each scoring condition.

**Ecological Validity.** Data from Campbell and Goldstein’s (2021) *Telehealth Services:*
*Pediatric Provider Survey* was used to establish the current, real-world technology speech-
language pathology clinicians and their clients use to receive therapy services remotely.
Campbell and Goldstein (2021) reported computers with a broadband, Wi-Fi connection were
used frequently by most clinicians whereas children used computers almost as often as mobile
devices (i.e., tablet, smartphone) with a broadband, Wi-Fi connection. Both clients and clinicians
reported the typical telehealth setup consists of using the device’s built-in speakers and
microphone for their audio component. The most common hardware upgrades added to enhance
sound quality were headphones with built-in microphones, with clinicians more likely to use
headphones than clients. Based on the findings of the survey, the technological infrastructure for
remote data collection was established.
Settings and Equipment

Clinic setting. In-person assessments were conducted in a standard (3 x 3 m) clinic room with the client and clinician sitting across from one another at a table. The in-person SLP wore a level 1 disposable face mask, and sat behind a 24-inch, tri-fold plexiglass barrier (Appendix P/picture of setup). Except for one child, all children did not wear a mask. The child who did initially start the testing wearing a mask opted to take it off early on during the testing. On the child’s side of the barrier, two 5th generation Wi-Fi enabled iPads (side by side) running IOS version 14.5.1 were situated for simultaneously transmitting audio and video signals to the remote SLPs. The two iPads were placed in front of the child at a 120-degree angle with the cameras on, but also allowing an unobstructed view of the child’s face for the in person SLP. Children wore low-cost gaming headphones (Anivia AH28 Gaming Headset with Mic) during the testing and if requested, were allowed to take breaks from wearing them. The headphones were plugged into one of the two iPads. The GFTA3 stimulus book was in front of the child at the top of the plexiglass, allowing the in person SLP to turn the pages. The scoring sheet was on the clinician’s side of the plexiglass as well as a smart phone that enabled the in-person SLP to communicate with the remote SLPs.

Teleassessment settings. Each remote SLP used a desktop or laptop computer connected to Wi-Fi at their remote location (i.e., at home, clinic). Both remote SLPs were wearing the same set of low-cost gaming headphones (Anivia AH28 Gaming Headset with Mic) throughout the testing.

For the two SLPs who scored the GFTA3 via synchronous teleconferencing, the client’s and SLP’s devices were connected via Wi-Fi using the Zoom for Healthcare platform (Zoom Video Communications, 2021). Zoom for Healthcare is a HIPAA compliant version of Zoom.
that works in low-bandwidth environments while providing high quality video. Before the child’s testing was begun, Wi-Fi speeds were verified and recorded on both the client and SLPs side using an online speed test (https://www.speedtest.net). The minimum requirement for connectivity using the Zoom platform is 600 kbps/1.5 Mbps (up/down), but the minimum internet speed of 20 Mbps was required for this study to minimize the occurrences of potential connectivity loss (Zoom Video Communications, 2021). Each iPad’s microphone sound enhancements were disabled (i.e., “original sound” setting) before connecting to the platform and the telehealth SLPs muted their microphones prior to testing starting. Each remote SLP had a smartphone with a chat feature application open to provide a means of communicating with the in-person SLP during the telehealth assessment.

**Procedures**

**SLP Training.** The principal investigator held two online group as well as individual training sessions with SLP participants. The purpose of these sessions was to review GFTA3 testing administration and scoring requirements as well as narrow International Phonetic Alphabet transcription for consonant sounds. Additionally, SLPs reviewed all procedures to implement the assessment tool both in-person and via remote delivery.

The first step in the training process required the SLP participants to demonstrate adequate phonetic transcription skills. GFTA3 scoring guidelines as well as narrow IPA transcription were used which included the following diacritics commonly noted in children: nasalization, lateralization, and dentalization. After reviewing these narrow IPA and GFTA conventions, a phonetic transcription calibration test was given to all six SLPs. The purpose of the calibration test was to determine a baseline level of transcription agreement that was consistent within and across SLP participants using the same recorded samples. While wearing
headphones using their own computers, SLPs listened to a video recording of two children with speech disorders each respond to an assessment tool that targeted 34 consonant sounds. The assessment, created with words following the Moving Across Syllables: Articulatory Sound Movement Sequence (Kirkpatrick et al., 1990), included only one-syllable words. SLPs transcribed the children’s speech production responses and transcriptions were scored as correct or incorrect, based on exact agreement with the child’s in-person score. To be eligible to participate in this study, SLP participants were required to obtain a combined exact agreement score of 90% or higher for the total consonant sounds recorded between both children (68). All six SLP participants met the participation criterion, obtaining a score of either 61/68 (90%) or 62/68 (91%).

Second, SLP participants reviewed GFTA3 test administration procedures. Procedures specified in the GFTA3 manual’s instructions were reviewed and SLPs were instructed how to clearly document any deviations from the test administrations procedures. The SLPs also reviewed a data sheet that was used for scoring. In addition to scoring the phonemes in the GFTA3, they were asked to note any child behavior and technology disruptions for each test item (described below).

Third, because the SLPs were taking turns administering the GFTA3 in person, they needed to follow a specific protocol for setting up the test environment in the clinic setting. The training covered safety procedures, including use of personal protective equipment (PPE) and barrier, as well as cleaning procedures. The SLP who was in the same room as the child wore a level 1 disposable face mask and sat behind a 24-inch, tri-fold plexiglass barrier. The face masks were changed between clients and all items were sanitized.
The in-person SLP was with the child during the assessment and was responsible for facilitating the entire evaluation. This SLP was responsible for setting up the devices, logging into the Zoom for Healthcare telehealth platform, placing the headphones on the child, and checking and documenting the audio, video, and broadband connections including verification of broadband speed on the client’s side. Thus, all the SLPs learned to set up the equipment and telehealth platform. The training sessions detailed procedures for turning on the devices, checking the broadband connection, logging into and setting up the teleconferencing platform, positioning the devices and the picture stimuli book, and troubleshooting technology difficulties.

**GFTA3 administration.** The in person scoring condition was the traditional execution with fidelity of the standardized assessment. The testing for each child was completed in a single visit using standard procedures specified in the GFTA3 manual, such as the Sound-in-Words General Directions for the verbal stimuli needed to administer the test (Goldman & Fristoe, 2015). The child was sitting across the table from the in-person SLP. The in-person SLP presented the target pictures to elicit speech production. If the child was unable to name target item, or if the in-person SLP’s prompting did not elicit target word, the in-person SLP provided the verbal stimuli provided in the GFTA3 picture book. Additionally, in-person SLP managed any child disruptions and addressed technical disruptions. The in-person SLP had a smartphone available for the remote SLPs to communicate during the assessment. This allowed the in-person SLP to verify the telehealth SLPs were ready to begin scoring, report technical issues on the client’s side, and receive feedback at the end of testing for any items that needed to be readministered.

Both telehealth SLPs wore gaming headphones connected to a laptop computer. However, one remote SLP received the child’s responses directly from the child’s microphone.
connected to the child’s headset and the other remote SLP received the child’s responses through the iPad’s built-in microphone. They were blind to the condition they were in, as they were not able to see if their audio signal came from the external or built-in microphone. The remote SLPs had a smart phone available to communicate with the in-person SLP during the assessment, reporting any technical issues or a need to repeat an assessment item.

**GFTA3 scoring.** The child was sitting directly in front of two iPads, and thus in view of the telehealth SLPs as well as the in-person SLP. The in-person SLP provided the verbal stimuli for each test item, whereas the remote SLPs only scored the child’s responses, thus, the three SLPs were each concurrently scoring the same child participant’s speech sound production during the GFTA3 administration. Each SLP recorded and phonetically transcribed the attempts at test item responses, even if one was considered unscorable due to technical issues. Upon completion of the test, the SLPs scoring in the telehealth condition were able to request from the in-person SLP any test items that needed to be readministered. This could be due to a child behavior disruption, technology disruption, or difficulty scoring the item upon its presentation. Only final responses provided by the child were used to score the test item.

**Data Collection**

Prior to beginning the administration of the GFTA3, each SLP recorded the computer they were using and their internet speed on their data sheet. SLP participants’ computers included: three MacBook Airs, a Lenovo desktop, a Lenovo Flex laptop, and a Hewlett Packard laptop. Before the evaluation began, the telehealth SLPs reported to the in-person SLP if there were any difficulties with setting up the session from the telehealth side, such as difficulty logging in, inadequate connectivity or audio/visual difficulties. All technology deficiencies were resolved before testing could be initiated. Once the assessment began, the SLP participants
recorded each sound production as correct, incorrect, or not scored on the GFTA3 data collection protocol form. Incorrect responses were transcribed phonetically, ensuring each SLP participant identified the error type produced by the child participant. Because children were sometimes asked to repeat a response, only the child’s final responses for each test item were scored. This ensured all three SLPs recorded the same child responses for the final error analysis.

During the assessment, the data collection protocol form was also used to record child and technology disruptions: (a) child moved face or whole body from camera view, (b) child moved from or touched microphone, or otherwise compromised the audio signal, (c) video signal was delayed, froze, or cut out, (d) audio signal was garbled, noisy, or cut out, and (e) there was a pause or disruption in the digital transmission (less than 5 seconds), (f) there was a pause or disruption in the digital transmission (more than 5 seconds), (g) response item needed to be repeated or (h) the child was unable to label the test item (unscorable).

Upon completion of a child’s testing session, each SLP transferred their phonetic transcription from the data collection protocol form to the Sounds-in-Words section of the GFTA3 protocol. SLPs hand scored the total target speech sound errors to obtain an overall raw score. SLP provided the completed GFTA3 protocol and data collection tool to the author. The author then re-tallied all GFTA3 protocols for verification of calculated results. The author reviewed any identified discrepancies with the SLP participant and then the agreed upon total was used for extrapolating the composite score. As an additional procedure to verify the accuracy of testing results, the Q-global (https://qglobal.pearsonclinical.com) web-based, HIPPA complaint scoring program was used. The author manually entered the de-identified speech sound error data, and the Q-global program extrapolated the raw score totals and composite score. Results that yielded disagreements between the hand and electronic scoring
were checked for data entry errors in Q-global and calculation errors from hand-scoring. Identified errors were corrected before advancing to the final score validation step. The de-identified speech sound error data were entered into an excel spreadsheet created to evaluate the individual item agreement between scoring conditions. Any disagreements between tallied scores in excel and electronic raw scores were checked for data entry errors, with all disagreements corrected. The final, verified raw and composite scores were used for data analysis.

**Social Validity Questionnaire**

At the end of the study, SLP participants completed a post-assessment questionnaire. SLPs reflected on their experiences and general satisfaction with scoring a speech sound assessment via telehealth. Additional questions included SLP participants’ awareness of the differences in the audio quality in the telehealth conditions, the degree to which their judgments of speech sounds were affected by telehealth use, and when sources of audio differences were evident. The evaluators rated ten questions on an analog scale, ranging from strongly disagree to strongly agree reflected in a 0 - 100 numerical representation. Additionally, one yes/no question and three open-ended questions were asked.

**Data Analysis**

**GFTA:3 – Inter-rater Reliability.** Interrater reliability was calculated for all speech sound data. Reliability was calculated by dividing the number of agreements by the total number of ratings. The average item agreement percent between the three scoring conditions were reported. Additionally, composites scores were classified based on severity rating (i.e., average, mild, moderate, severe). Severity ratings were then compared to determine severity rating agreement between scoring conditions.
GFTA:3 – Composite Scoring. A repeated measures analysis of variance (ANOVA) was conducted to compare the mean GFTA3 composites scores for the three scoring conditions. In addition, a post-hoc t-test test was completed to check if the means of each condition were significantly different from each other, comparing 1) in person vs. telehealth with built-in microphone, 2) in person vs. telehealth with external microphone, and 3) telehealth with built-in microphone vs. telehealth with external microphone. Finally, a Bland-Altman analysis was used to evaluate agreement among scores on GFTA3 for the three scoring conditions. Because face-to-face scoring is the gold standard, this analysis was used to determine if responses differed reliably among the scoring conditions. The confidence intervals from the GFTA3 established the a priori confidence interval to determine if the mean differences in the composite scores were within the interval limits. Results were graphed to display any differences that existed. The mean differences between the three scoring conditions were assessed for skewness to verify the assumption of normality.

Disruption Scoring. Descriptive statistics were used to summarize the data collected for child-related disruptions and technology-related disruptions. This included the percentage of test items that were complete without any participant or technology (i.e., hardware or platform) issues or problems with connectivity (i.e., broadband connection, Wi-Fi connection). Results were classified as technology or child-related disruptions and were summarized using descriptive statistics. Child-related disruptions were examined by age and disorder classification (i.e., apraxia).

Social Validity Questionnaire. The SLP participants rated the questions on the Social Validity Questionnaire using an analog scale, ranging from strongly disagree to strongly agree reflected in a 0 - 100 numerical representation. Ratings were converted into percent and mean
scores calculated for each item. Open-ended questions were reported using content analysis, summarized qualitatively.

Results

Telehealth Scoring Results

Inter-rater Agreement: Individual Speech Sounds. All 39 children were administered the GFTA3 Sounds-in-Words test in person, with scoring accomplished simultaneously in three conditions [i.e., in person (Live), typical teleassessment (Typ), and teleassessment enhanced (Enh)]. The GFTA3 Sounds-in-Words test evaluates 141 sounds-in-words, with multiple chances for the child to produce each target speech sound. Each sounds-in-words raw score item was analyzed for inter-rater agreement or disagreement. Percentage of agreement between the three scoring conditions was calculated. Mean and standard deviations were derived for item agreement among the 141 items between all three scoring conditions. The mean item agreement for Live/Typ was 86.3% (SD 5.65), Live/Enh was 86.7% (SD 5.56) and Typ/Enh was 85.2% (SD 5.58).

The author reviewed child participants’ GFTA3 results and identified SLP participants’ scoring disagreements. Twenty-one of the 141 total items had less than 80% agreement among all three scoring conditions. However, those sound scoring disagreements occurred for only eight sounds, many of which were assessed multiple times in the same position of a word, such as the final /l/ (five times). Table 3.2 includes all speech sounds that had less than 80% agreement and the position the sound occurred within the word.

Inter-rater Agreement: Composite Scores. The Bland-Altman (1983, 2010) analysis was used to measure the continuous variable agreement of GFTA3 composite scores across the three scoring conditions (see Figures 3.2). A score of zero indicates perfect agreement between
two conditions and a larger number for each plot point indicates greater disagreement between the scoring conditions. A calculation of 95% limits of agreement (LoAs; mean difference ±1.96 SD of the difference) were derived for each set of comparisons with confidence limits for upper and lower LoAs considered as a pair. These confidence limits have been included as shaded areas around the LoAs in each Figure. LoA confidence intervals demonstrate a 95% probability that at least 95% of population differences lie inside the limits \( \bar{d} \pm c_{t0.025} s_{diff} \) and outside the limits \( \bar{d} \pm c_{t0.975} s_{diff} \) (Zou, 2013). The Bland Altman plot did not demonstrate a trend in the difference (\( \bar{d} \)) between the scoring conditions, with mean bias ranging from only -1.79 to 1 (The results are reported in Table 3.1). The line of equality for each scoring condition fell within the 95% confidence interval of the mean differences, indicating there is not a significant systematic difference of one condition over- or under-estimating the second condition. Skewness of composite score mean differences ranged from -.57 to .08, indicating a normal distribution (George & Mallery, 2016). Because the differences were normally distributed, approximately 95% of the composite scoring differences should fall between these limits. A histogram of mean composite scoring differences by condition is provided in Figure 3.3.

**GFTA3 Composite Scores Differences.** GFTA3 scoring results were analyzed using JMP 15.2 statistical software. The composite score distributions for each scoring condition were normally distributed. The GFTA3 mean composite scores by scoring condition were 62.64 (SD 19.21) for Live, 61.64 (SD 18.53) for Typ and 63.44 (SD 18.68) for Enh. All scoring conditions were found to be highly correlated, ranging from .87 to .90. GFTA3 composite score correlation information can be found in Figure 3.1. A repeated measures MANOVA was performed to evaluate mean differences between the three scoring conditions. Results demonstrated no significant main effect by scoring condition \([F(2, 37) = .69, p = .51]\). Likewise, paired-sample t
tests showed no significant difference between composite scores for Live and Typ $t(38) = -.56, p = .58$, Live and Enh $t(38) = .72, p = .47$, and Enh and Typ $t(38) = -1.18, p = .24$.

To further evaluate equivalence of the scoring conditions, the derived $p$ values from the $t$-tests and calculated Cohen’s $d$ were used. According to Cohen (1988), the standard for equivalence is a $p > .05$ and a $d < 0.2$. Cohen’s $d$ was calculated using the difference between mean composite scores divided by the pooled standard deviation of each set of scoring conditions. All $p$ scores were well above the .05 threshold and Cohen’s $d$ ranged from 0.09 to 0.19, suggesting there were no significant effects among scoring conditions.

**Speech Sound Disorder Composite Score Severity Classification.** Composite scores of Live/Typ and Live/Enh scoring conditions were compared to identify incidences of study participants whose composite scores would result in different severity classifications. The GFTA3 (Goldman & Fristoe, 2015) classifies severity ratings based on standard scores as: average/above average above 85, mild/at-risk -1SD (between 78 to 85), moderate -1.5SD (between 71 to 77) and severe -2SD or lower (70 or below). The distribution of severity of classifications for the scoring conditions is presented in Table 3.3. A Chi Square analysis (see Table 3.4) with a Fischer’s Exact Test suggested there was no association between scoring condition and speech sound severity classification ($p = .922$). There was almost perfect agreement for moderate and severe speech sound disorder classifications for the Live/Typ and Live/Enh scoring conditions. However, there were more discrepancies for mild and average speech sound disorder classifications for both Live/Typ and Live/Enh scoring conditions.

To assess if the telehealth scoring conditions could accurately identify a speech sound disorder in agreement with the in person scoring condition, scores of one standard deviation or more below the mean were compared. This in person vs. teleassessment comparison would
indicate if the telehealth scoring conditions were able to identify children who demonstrated speech sound production that was below what was expected of a child of the same sex and age, potentially affecting overall speech intelligibility (Goldman & Fristoe, 2015). When comparing the identification of speech sound disorders between conditions, the Live vs. Typical scoring conditions resulted in agreements for 38 of the 39 children (97%) and the Live vs. Enhanced scoring conditions resulted in agreements for 36 of the 39 children (92%).

**Technical and Child Behavior Disruptions**

**Child Disruptions.** Of the 39 child participants, the in-person SLPs had to come out from behind the plexiglass barrier to manage the child’s behavior (i.e., climbing out of their chair, touching the iPad screens, not attending to picture book) for 21% of the child participants. Additionally, a parent or caregiver participated in the speech sound assessment for 15% of child participants to assist the SLP during test administration. During the testing procedure, SLPs documented when a child’s behavior impeded their ability to score a test item. Children with behaviors impeding sound scoring occurred across all ages and disorder types. Half of all participants (n=19) were reported as having at least one incident where the child's behavior impeded the SLPs’ ability to score one or more test items. Even though the in-person SLP often noticed behavior disruptions during testing and prompted the child to repeat their response, the telehealth SLPs had the option of requesting compromised responses to be repeated at the end of the assessment.

**Technology Disruptions.** During the testing procedure, the three SLPs documented when the telehealth technology impeded their ability to score a test item. Of the 39 assessments, 18 of them (45%), were impacted, at least minimally, by the technology used to perform them. Technology disruptions included screen freezing for less than 5 seconds (6/39; 15%), audio
compromised (e.g., intermittent buzzing sounds; 6/39; 15%), and complete loss of transmission (6/39; 15%). Six assessments had their starts delayed due to technology issues at their onset: signal strength was under the study protocol, complete audio/visual loss, or total transmission loss. These technology issues were able to be resolved except for one assessment. For that assessment, the telehealth SLP had to be changed due to the telehealth SLP being unable to establish a stable connection to participate.

At the end of each assessment, the telehealth SLPs were given the opportunity to contact the in-person SLP via text messaging and request test items be readministered. This would allow the telehealth SLPs the opportunities to score items that may have been previously marked unscorable during the test administration due to child behavior or technology disruptions. On average, six items were asked to be repeated by each telehealth SLP, with a minimum of 2 items and a maximum of 15 having been requested.

**Social Validity Questionnaire**

Upon completion of the speech sound assessments, the six SLPs were asked to reflect on their experiences in each of the three scoring conditions. The six SLPs rated the directions for using, scoring, and administering a speech sound disorder assessment remotely high, with mean percentages of 92% and 98%, respectively. However, SLP participants’ mean ratings were only 41% and 42%, respectively, when asked about their enthusiasm and motivation for administering and scoring a standardized speech assessment remotely. SLP participants reported their preferred method of delivering a speech sound assessment as in person, with a mean percentage of 85%. Reasons SLP participants reported that they do not prefer remote administration of a standardized speech assessment were lack of client’s telehealth infrastructure, more response repetitions needed for accurate scoring, difficulty managing a child’s behaviors remotely, lack of
family support, and home environments not conducive to telehealth. Results of the post-assessment survey are in Table 3.5.

**Discussion**

The purpose of this study was to determine if the scoring conditions, typical and enhanced telehealth, yielded results that could be deemed valid and reliable when compared to a in person scoring. The mean GFTA3 composite scores of all three scoring conditions had mean differences of two or less, demonstrating that there was not a significant systematic difference of one scoring condition over- or under-estimating the second scoring condition. In addition, all scoring conditions were found to be highly correlated, demonstrating a strong relationship between in person and telehealth administration, both in the typical and enhanced scenarios. Both telehealth scoring conditions, the child using a device’s own audio input or the child using external headphones with a built-in microphone, allowed SLPs to evaluate a child’s speech sound production and derive results that were similar to in person. Though limited, previous research that compared in person scoring of a speech sound assessment to remote delivery also found the two scoring conditions to yield virtually equivalent test results (Waite et al., 2010; Taylor et al., 2014). This study’s findings are consistent with prior findings and add to information contrasting in person scoring with commonly-available, consumer grade technology.

The overall SLP participants’ scoring agreement for individual speech sounds among scoring conditions was high, when compared to baseline calibration scoring agreement, which ranged from 90-91%. In contrast, the scoring agreement comparing the three conditions ranged from 85-87%, indicating that the variation associated with the different acoustic conditions amounted to a 3-6% attenuation in scoring agreement. Moreover, telehealth scoring conditions yielded reliable results (>80% agreement between in-person and telehealth scoring conditions)
for all but eight speech sounds (i.e., l, r, η, z, d, g, t, p). As the GFTA3 provides multiple chances for the child to produce each target item, these eight sounds resulted in 21 out of the 141 target items with less than 80% agreement. It is worth noting that final sounds and liquids are especially difficult to score reliably. As a result, SLPs administering a telehealth assessment will need to pay particular attention when scoring these individual speech sounds to verify correct production, and, most likely, require the child to repeat production of words containing these sounds to score the items accurately. The disagreement among scoring specific, individual sounds via telehealth found in this study are consistent with previous telehealth literature reviews, noting SLPs have difficulties identifying correct speech production for sounds involving articulators that are difficult to see (e.g., r, g) and cognate pairs (e.g., t, d) (Eriks-Brophy et al., 2008; Taylor et al., 2014).

Further, a closer examination of composite score severity classifications were virtually identical across conditions for severe and moderate speech sound disorders. Even though the Live Typ scoring condition was more consistent in identifying the severity of the speech sound disorder compared to the Live Enh, the Live Enh scoring condition had a slightly higher percentage at detecting the overall presence of a speech sound disorder. The discrepancies seen were mainly in distinguishing average vs. mild disorders. These results were consistent with the Bland-Altman plots, with the difference between the Live Typ scoring conditions scattered around the bias line across all severities whereas the difference between the Live Enh scoring conditions were scattered more around the bias line for children classified as mild or average. However, the bias for both sets of scoring conditions was small (between -.79 and 1) and not clinically significant, indicating that the in-person and telehealth scoring conditions produced virtually identical results.
Importantly, speech-language pathologists do not rely on severity classifications alone or a single test score when determining if a child has a speech sound disorder. An SLP’s clinical judgment must be considered. For example, a difference in severity classification (e.g., mild vs moderate) or GFTA3 composite score above 85 does not imply that a child would not be identified as having speech sound disorder. To the contrary, when a telehealth SLP uses the GFTA3’s test administration guidelines to derive a composite score, the additional consideration of a SLP’s own clinical judgement would influence clinical decision making when determining the presence of a speech sound disorder. For example, if a child’s composite score falls in the average range on the GFTA3 but they are lateralizing /s/ or /ʃ/, a SLP recognizes these types of errors are not part of typical speech sound development. As these articulation errors typically do not self-correct, a SLP could recommend speech therapy despite the child’s composite score severity rating.

Speech-language pathologists have expressed concerns that teleassessments were difficult to administer. Reason provided were young children and children with behaviors were difficult to manage remotely, and that the technology needed to implement assessments often caused disruptions that could impede the scoring of test items (Campbell & Goldstein, 2021). Therefore, this study investigated the frequency of child and technology disruptions and how they related to an SLPs ability to score a child’s speech sound production.

The SLPs needed to come out from behind the plexiglass barrier to manage child behavior or required parent assistance during the test administration for about one third of child participants. Even with the in-person SLP and parent to address any behaviors that arose during testing, half of all child participants had at least one incident where the child’s behavior impeded the SLPs’ ability to score one or more test items. Yet, these incidences of child behavior during
speech sound teleassessments did not mean that the overall ability for an SLP to accurately score speech sound items was compromised. It did, however, mean that the compromised test items needed to be readministered, often more than three times, for the SLP(s) to reliably score the prompted item. It should be noted, though, that having children repeat a test item, even three times or more, is not exclusive to a telehealth delivery method. The GFTA3 scoring manual notes that children may not pay attention intermittently during in person test administrations. Therefore, creating positive testing environments is of utmost importance no matter the speech assessment delivery method (i.e., quiet room that is well-lit with minimal distractions, adult physically present for the duration of the test administration).

This study adhered to the ecological validity consistent with a typical telehealth session (Campbell & Goldstein, 2021). Therefore, it was not surprising to the SLP participants that almost half of the 39 assessments were impacted, at least minimally, by technology. Technological disruptions, such as a screen freezing or complete loss of transmission is not uncommon during speech-language telehealth sessions (Campbell & Goldstein, 2021). The ability to resolve technology barriers can be frustrating and can even prevent a session from occurring at all. Six of the 39 assessments were at risk of cancelation due to technology disruptions. Fortunately, 5 of 6 were able to be resolved at the onset of the teleassessment and the sixth one proceeded with a telehealth SLP replacement at a different location who had connectivity conducive to the study’s bandwidth parameters. The technology disruptions experienced during this study demonstrated an ongoing barrier experienced with telehealth use (Campbell & Goldstein, 2021). Stable telehealth infrastructure is imperative for telehealth sessions, including teleassessments, to be successful.
Among the areas investigated in this study, the one that cannot be overlooked is the SLP participants’ attitudes toward teleassessments, a critical component of future telehealth use. As SLPs’ confidence in teleassessments have been associated with use, an SLP’s general satisfaction with scoring a speech sound assessment via telehealth could affect the SLP’s overall view of the teleassessment’s administration (Taylor et al., 2014). The SLPs’ responses on the post-assessment questionnaire positively rated (76% or higher) clarity of the directions and ability to administer remotely a speech sound assessment as well as the time needed to administer and score a teleassessment. However, despite these positive ratings and the positive findings of this study, SLP participants did not perceive telehealth assessments to be a replacement for face-to-face administration. They rated their enthusiasm and motivation for teleassessments poorly (42% or lower). SLP participants’ responses to the open-ended questions revealed how their previous and current experiences influenced their answers to the questionnaire. Concerns about client telehealth infrastructure, lack of family support, and difficulty managing client’s behaviors as well as the current need for more advancements in telehealth research illustrated the ongoing barrier to widespread telehealth use – provider acceptance. The SLP participants acknowledged the value of teleassessments, even stating the use of telehealth will grow; however, their perceptions remained that telehealth is only for certain populations and prefer face-to-face administration of assessment. Even though in person administration may be their preference, the findings of this study indicate that speech sound teleassessments are a viable, alternative method of service delivery for children.

**Limitations**

Limitations should be considered when interpreting the results of this study. The study was performed with seasoned clinicians who had no less than ten years of experience
administering face-to-face speech sound assessments, but only one year of experience with
teleassessments. The post-assessment survey with opinions about remote delivery of a speech
sound assessment may have been different if SLP study participants included early career
professionals (less than five years of professional experience). Many current graduate students’,
CFs’, and early career SLPs’ experiences delivering speech sound assessments have been
different compared to more seasoned pediatric providers, gaining much of their evaluative
experience during COVID-19. Early career SLPs’ opinions about telehealth may be more
accepting of widespread use. However, this study’s SLP participants acknowledged the value of
a remote delivery option but expressed that it continues to have a limited the scope of use (e.g.,
providing therapy to children in rural areas).

Children were tested within a clinical setting while the SLP participants were at home. Yet,
most children receive remote therapy services in varying testing environments, such as a
home or daycare. SLP participants also vary their environments, such as providing services from
a clinic or school setting. Therefore, the outcomes of this study may not truly reflect outcomes
for children evaluated within their natural setting or SLPs providing services in changing work
environments. Moreover, children were tested using the Zoom Healthcare platform on Apple
iPads and computers; however, the findings of this study may not generalize to other devices,
such as cellphones, or platforms, such as doxy.me.

Lastly, even though children were tested in-person, the clinical setting was still different
than what was considered typical prior to the COVID-19 pandemic. SLP participants had a
plexiglass barrier between them and the child participant. They were also sitting a distance that
was further back from the child than would be a typical distance between child and SLP pre-
pandemic. It is unknown how the presence of the plexiglass barrier or the distance between SLP
and child participant affected the in-person SLP’s ability to score the child’s speech sound production.

Conclusions and Future Research

The COVID-19 pandemic created a whole new generation of pediatric telehealth speech-language pathology providers (Campbell & Goldstein, in press). These SLPs discovered the benefits of telehealth, clinically managing speech and language disorders without compromising their health or the health of their clients. Even though there was broad support for remote delivery of services during the pandemic, there existed significant skepticism among clinicians and policymakers about the use of telehealth to deliver evaluative or diagnostic services. Given the limited research on this topic, this study sought to add to the body of research into the reliability and validity of teleassessments.

Each telehealth scoring condition had some perceived strengths and weaknesses. Nonetheless, given the real-world scenarios examined the overall results were not affected in any systematic fashion. In fact, exact agreement percentages were negligibly worse than the calibration exact agreement percentages, 85-87% vs. 90-91%. The in person compared to typical telehealth scoring condition classified a child’s severity of speech disorder more consistently.

The in person compared to the enhanced telehealth scoring condition had a slightly higher percentage of agreement classifying the overall presence of a speech sound disorder. Overall, though, the findings of this study demonstrate that the in person, typical telehealth, and enhanced telehealth scoring conditions systematically produce similar results. Nevertheless, this does not discount the need for clinical judgment to factor into final decisions about whether a child has with a speech sound disorder.
This study evaluated children as young as age 3 and children who demonstrated behaviors that required adult intervention. In addition, the teleassessment procedure used commercial grade equipment to provide the speech sound assessment remotely. As such, both child behaviors and technology disruptions were reported as to their effect on item scoring. Even though half of all assessments reported at least one incidence of child behavior and/or technology disruption impeding the SLPs’ ability to score one or more items, individual agreement among test items was high, with only eight sounds demonstrating scoring agreements below 80% across all three conditions. Not surprisingly, these were sounds mostly in the final position of words (e.g., /l/), that were difficult to see (e.g., /g/) or required voicing (e.g., /z/) or absence of (e.g., /p/) for scoring. However, the GFTA3 (Goldman & Fristoe, 2015) Sounds-in-Words test administration has allowances for test items to be repeated. With the ability to repeat test items and provide additional verbal stimuli to elicit a child’s response, an SLP is afforded ample opportunities to score a response item accurately, no matter if impeded by a child’s behavior, technology disruption, or difficulty scoring specific speech sounds remotely.

This study supports the scoring of pediatric speech sound assessments using real-world scenarios, helping to fill a gap in previous research on the remote delivery of evaluative services. Unfortunately, further research deficiencies exist. This study evaluated an SLPs ability to score a speech sound assessment remotely, but not an SLPs ability to administer one. A follow-up study should examine the validity of remote administration of a speech sound assessment. Additionally, future studies are needed to evaluate current pediatric teleassessments for a variety of conditions, such as pediatric language disorders and deficits in phonological awareness. The SLP participants, despite their involvement in this study, reported attitudes that continued to question the use of telehealth for evaluative and diagnostic services. The SLP participants’
telehealth views demonstrate an ongoing barrier of widespread telehealth use. Until more studies are completed demonstrating the reliability of teleassessments comparable to in person administration, the attitudes and views of speech-language pathologists may remain unchanged. For this reason, it would behoove current and future developers of pediatric speech-language assessments to include both delivery modalities – in-person and remote – when establishing test validity, reliability, and effectiveness.

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Table 3.1

SLP Participation in Each Scoring Condition

<table>
<thead>
<tr>
<th>SLP Participant</th>
<th>Live</th>
<th>Typ</th>
<th>Enh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Live=in person, Typ=typical telehealth, Enh=enhanced telehealth
### Table 3.2

**Scoring Agreement Across All Three Scoring Conditions**

<table>
<thead>
<tr>
<th>Speech Sound</th>
<th>Position</th>
<th>Live/Typ</th>
<th>Live/Enh</th>
<th>Enh/Typ</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>final</td>
<td>0.64</td>
<td>0.69</td>
<td>0.49</td>
</tr>
<tr>
<td>l</td>
<td>final</td>
<td>0.64</td>
<td>0.62</td>
<td>0.56</td>
</tr>
<tr>
<td>l</td>
<td>final</td>
<td>0.75</td>
<td>0.62</td>
<td>0.62</td>
</tr>
<tr>
<td>l</td>
<td>final</td>
<td>0.49</td>
<td>0.69</td>
<td>0.54</td>
</tr>
<tr>
<td>l</td>
<td>final</td>
<td>0.67</td>
<td>0.74</td>
<td>0.77</td>
</tr>
<tr>
<td>l</td>
<td>medial</td>
<td>0.69</td>
<td>0.80</td>
<td>0.69</td>
</tr>
<tr>
<td>p</td>
<td>initial</td>
<td>0.77</td>
<td>0.72</td>
<td>0.80</td>
</tr>
<tr>
<td>d</td>
<td>final</td>
<td>0.72</td>
<td>0.80</td>
<td>0.67</td>
</tr>
<tr>
<td>ñ</td>
<td>final</td>
<td>0.56</td>
<td>0.49</td>
<td>0.54</td>
</tr>
<tr>
<td>ñ</td>
<td>final</td>
<td>0.69</td>
<td>0.69</td>
<td>0.59</td>
</tr>
<tr>
<td>ñ</td>
<td>final</td>
<td>0.77</td>
<td>0.77</td>
<td>0.69</td>
</tr>
<tr>
<td>tr</td>
<td>initial</td>
<td>0.77</td>
<td>0.80</td>
<td>0.77</td>
</tr>
<tr>
<td>fr</td>
<td>initial</td>
<td>0.77</td>
<td>0.74</td>
<td>0.77</td>
</tr>
<tr>
<td>gr</td>
<td>initial</td>
<td>0.77</td>
<td>0.80</td>
<td>0.77</td>
</tr>
<tr>
<td>r</td>
<td>initial</td>
<td>0.72</td>
<td>0.80</td>
<td>0.67</td>
</tr>
<tr>
<td>r</td>
<td>medial</td>
<td>0.69</td>
<td>0.74</td>
<td>0.74</td>
</tr>
<tr>
<td>g</td>
<td>final</td>
<td>0.72</td>
<td>0.72</td>
<td>0.63</td>
</tr>
<tr>
<td>t</td>
<td>final</td>
<td>0.67</td>
<td>0.54</td>
<td>0.56</td>
</tr>
<tr>
<td>z</td>
<td>final</td>
<td>0.62</td>
<td>0.56</td>
<td>0.74</td>
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<tr>
<td>z</td>
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<td>0.56</td>
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<td>0.67</td>
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<tr>
<td>z</td>
<td>final</td>
<td>0.77</td>
<td>0.51</td>
<td>0.69</td>
</tr>
</tbody>
</table>

### Table 3.3

**Speech Sound Disorder Severity Classification by Scoring Condition**

<table>
<thead>
<tr>
<th>Scoring Condition</th>
<th>Average</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td>Typ</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>24</td>
<td>39</td>
</tr>
<tr>
<td>Enh</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>25</td>
<td>39</td>
</tr>
</tbody>
</table>

Note: composite scores severity classifications - average/above average above 85, mild/at-risk -1SD (between 78 to 85), moderate -1.5SD (between 71 to 77) and severe -2SD or lower (70 or below).
Table 3.4
Analysis of Severity Classification by Scoring Condition

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>5.66667</td>
<td>4.33333</td>
<td>4.33333</td>
<td>24.6667</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0196</td>
<td>0.0256</td>
<td>0.0256</td>
<td>0.0045</td>
<td></td>
</tr>
<tr>
<td>Typ</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>24</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>5.66667</td>
<td>4.33333</td>
<td>4.33333</td>
<td>24.6667</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.3137</td>
<td>0.4103</td>
<td>0.1026</td>
<td>0.0180</td>
<td></td>
</tr>
<tr>
<td>Enh</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>5.66667</td>
<td>4.33333</td>
<td>4.33333</td>
<td>24.6667</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.4902</td>
<td>0.6410</td>
<td>0.0256</td>
<td>0.0045</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>13</td>
<td>13</td>
<td>74</td>
<td>117</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>ChiSquare</th>
<th>Prob&gt;ChiSq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood Ratio</td>
<td>2.094</td>
<td>0.9109</td>
</tr>
<tr>
<td>Pearson</td>
<td>2.081</td>
<td>0.9121</td>
</tr>
</tbody>
</table>
**Table 3.5**

*Speech-Language Pathologist Post-Assessment Questionnaire*

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>Mean (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would be enthusiastic to use telehealth to complete a standardized speech assessment.</td>
<td>41%</td>
</tr>
<tr>
<td>I understand how to administer a speech sound disorder evaluation remotely.</td>
<td>98%</td>
</tr>
<tr>
<td>Remote delivery is a reliable way to administer speech sound disorder evaluations.</td>
<td>50%</td>
</tr>
<tr>
<td>I am motivated to use this delivery method for speech sound evaluations.</td>
<td>42%</td>
</tr>
<tr>
<td>My preferred method of administering a speech sound assessment is:</td>
<td></td>
</tr>
<tr>
<td>a. Typical: in-person</td>
<td>85%</td>
</tr>
<tr>
<td>b. Remote delivery</td>
<td>15%</td>
</tr>
<tr>
<td>Telehealth is an effective choice for evaluating children with speech sound disorders.</td>
<td>39%</td>
</tr>
<tr>
<td>The directions for using remote delivery of a standardized speech sound assessment are clear to me.</td>
<td>92%</td>
</tr>
<tr>
<td>The amount of time required to perform a speech sound assessment remotely is reasonable.</td>
<td>82%</td>
</tr>
<tr>
<td>The amount of time required for record-keeping with this evaluation format is reasonable.</td>
<td>76%</td>
</tr>
<tr>
<td>Implementation of an evaluation delivered remotely would require support from family members.</td>
<td>95%</td>
</tr>
<tr>
<td>Were you aware of the differences in the audio quality in the telehealth scoring conditions?</td>
<td>Yes 17% No 83%</td>
</tr>
</tbody>
</table>

Reasons I would prefer to administer a speech sound assessment remotely:

*Illness, distance and if in-person assessments were not an option*

Reasons I would not prefer to administer a speech sound assessment remotely:

*Child’s behaviors, lack of client telehealth infrastructure, more response repetitions needed, lack of family support, home environments not conducive to telehealth*

The future of teleassessments:

*Will continue to grow, will be contingent upon SLP attitudes and advancements in research demonstrating the validity and reliability of evaluations delivered remotely*

Note: rating percentages reflected in a 0-100 numeric representation, ranging from strongly disagree (0) to strongly agree (100)
Figure 3.1

Correlation of Scoring Conditions

LiveSS $r=0.8919$

TypSS $r=0.8701$

EnhSS $r=0.8958$
Figure 3.2

Bland-Altman Plot Analysis by Scoring Conditions: Live/Typical

Note: Live= in person; Typ= typical teleassessment
Figure 3.2 (continued)

Bland-Altman Plot Analysis by Scoring Conditions: Live/Enhanced

Note: Live=in person; Enh-Enhanced teleassessment
Figure 3.2 (continued)

Bland-Altman Plot Analysis by Scoring Conditions: Enhanced/Typical

Note: Enh=enhanced teleassessment; Typ=typical teleassessment
Figure 3.3

Mean Differences by Scoring Condition

Note: box=25th-75th percentile; diamond=mean; circle=outlier; red bracket=shorted half of data (densest region); Live=in person; Enh=enhanced teleassessment; Typ=typical teleassessment
CHAPTER FIVE:
CONCLUDING DISCUSSION

Prior to March 2020, pediatric speech-language therapy provided via telehealth was limited. Less than 10% of SLPs worldwide provided their therapy services remotely (ASHA, 2002, 2020b; Fong et al., 2020; Hill & Miller, 2012; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Universal adoption of telehealth was impeded by infrastructure barriers that hampered the viability of remote service delivery. Reimbursement, training, licensure, and lack of access to technology hampered the demand and growth of telehealth (Coufal et al., 2018; Dekhtyar et al., 2020; Houston et al., 2012; Martinez et al., 2020; Mechanic & Kimball, 2020; Mohapatra et al., 2015). SLPs’ concerns about efficacy exacerbated by limited evidence to support remote delivery of services deterred providers from venturing into the telehealth domain (Coufal et al., 2018; Freckmann et al., 2017, Taylor et al., 2014). What was known about telehealth use could have potentially evolved and changed as a result of increasing use over a sustained period of time.

But instead, COVID-19 brought the world of telehealth from the periphery into the mainstream for many SLPs. Sweeping government changes that allowed interstate licensing, removed regulatory restrictions, and provided reimbursement for care established the conventional feasibility of telehealth use (Keck & Doarn, 2014; Lustig & Institute of Medicine (U.S.), 2012; Freckmann et al., 2017). Pediatric clinicians’ experiences during the COVID-19
pandemic were unprecedented. SLPs had to navigate a mostly unfamiliar therapy world that was reliant on technology to provide services.

The purpose of this multi-manuscript dissertation was to investigate clinicians’ experiences with telehealth during the worldwide pandemic and contribute to the body of literature on teleassessment and the breadth of appropriate usage. To identify the impact of the sudden widespread use telehealth, the Telehealth Services: Pediatric Provider Survey was developed to gather self-reported responses from SLPs in a variety of employment settings who were serving primarily pediatric clients. To evaluate the reliability and validity of a speech sound assessment delivered remotely, a study was conducted to compare three scoring conditions: traditional in person, typical telehealth, and enhanced telehealth.

The first study reported clinicians’ increase of telehealth over four time periods (before, immediately after, during the survey period, and predictions after COVID-19). Prior to the pandemic, approximately 15% of survey respondents had previous experience in providing their services remotely with clinicians self-reporting high levels of proficiency in its use. However, SLPs providing services rose to 86% immediately after the pandemic, though with much lower self-reported proficiency, as most were new to this delivery model. Yet, clinician’s self-reported use and proficiency rose over time. Although clinicians’ attitudes toward telehealth had been an ongoing barrier to widespread use historically, it was notable that survey respondents plan to continue to use a remote delivery model post-pandemic. Previous studies attempted to identify causes for lack of use and growth of telehealth, often reporting use was hindered by reimbursement, technology and regulatory barriers. Findings from these studies, however, indicate the significance influence of a human component on widespread use of telehealth services.
The second study examined the evolution in the technology, connectivity, and the extent of implementation of evaluation and treatment services before, during, and predictions after the COVID-19 pandemic. Survey respondents reported that families from varied locations (i.e., rural, suburban, urban) and socioeconomic backgrounds were receiving therapy services remotely. This is in stark contrast to its previous narrow application, such as a delivery model only for children in rural locations (Edwards et. al., 2012; Fairweather et al., 2016; Jessiman, 2003). Sadly, common telehealth barriers identified prior to March 2020 (COVID-19) continued to persist, as survey participants reported children not having access to the technology to participate in remote services or lacking internet access (Benda et al., 2020). Of the children who received services, almost two out of ten were using cell phones to receive therapy. Results of this study revealed how the real-world technology used for telehealth has evolved, changing how researchers may view the ecological validity of future studies.

The second study also identified concerns clinicians had about remote service delivery. Even though the future of telehealth is promising, one-third of survey respondents reported it is not a replacement for in-person care. The lack of evidence to support telehealth use continues to be of major concern for SLPs. Considering that some areas of telehealth research are nonexistent, such as evidence to support remote delivery of standardized speech sound teleassessment, there was a sense of urgency for reliability and validity studies to performed. The results of these first two studies provided an impetus for the final study, the reliability and validity of a speech sound assessment administered in real-world scenarios.

The GFTA3 is a commonly use picture-based test to evaluate children’s articulation skills (Madison et al., 1982). Prior to this study, there was inadequate evidence demonstrating the validity and reliability of the GFTA3 administered remotely (Eriks-Brophy et al., 2008; Taylor et
Additionally, child behaviors and technology disruptions were suspected to impede acoustic transmission, making it difficult to score children’s responses (Eriks-Brophy et al., 2008). Therefore, a headphone with built-in microphone was compared to using a device’s built-in microphone and speaker to assess scoring agreement. Notably, information on SLP satisfaction, a crucial component of telehealth investigations, also was collected.

Results revealed that all scoring conditions were highly correlated, with mean differences revealing no significant systematic difference of one condition over- or under-estimating scores of another. Scoring disagreements were related to the manner and placement of sound production, i.e., final position in a word (e.g., /l/), or difficult to see (/g/). Yet, SLPs still averaged 85-87% agreement between conditions. SLPs reported child behavior and technology disruptions did not affect their ability to score responses, mainly because of the GFTA3’s administration procedures that allow target items to be prompted or repeated. Therefore, this study supports the provision of a pediatric speech sound assessment using real-world scenarios. However, the seasoned SLP participants’ post-assessment survey results revealed an ongoing barrier to widespread telehealth use: skeptical attitudes toward remote delivery of standardized tests.

**Future Directions**

Future research should examine how SLPs’ views of telehealth continue to evolve. Do their predictions of continued use of telehealth come to fruition or does it wane over time? Families were receptive to the use of telehealth, especially if was the only option they had to access therapy services. Convenience, reduced costs, or efficiency are among the factors that could results in an increasing demand for telehealth services.
A remote delivery model is not new, but its prevalence is. As such, questions about the efficacy of telehealth remain. This study used a mobile device (i.e., iPad) but many children were using cell phones to access services during the pandemic. Even though the results from the second study informed the technology for the speech sounds disorder assessment’s design, more research is needed to establish the validity of technology used to perform vital therapy services.

The research deficiencies in telehealth are an urgent matter. When the public health emergency ends, SLPs may no longer be willing to provide remote services for disorders and conditions that are lacking validity studies. More so, the assessments in which SLPs rely should include both delivery modalities – in-person and remote – when establishing test procedures, validity, reliability and effectiveness. The pandemic allowed SLPs to discover that telehealth is a feasible and beneficial alternative to in-person care, and it will continue to be so well into the foreseeable future. Now it is time for the science to catch-up.

Finally, there is a whole new generation of providers, especially early career professionals, who have advanced or acquired their clinical skills dually, in person and via telehealth, over the past year. It will be interesting how experiences with technology, training, and proficiency influence the future of how therapy services are provided. Speech-language pathology is truly in a new age of telehealth.

References


Appendix A: Telehealth Services: Pediatric Provider Survey: Part 1

Telehealth Services: Pediatric Provider Survey

Overview:

In March 2020, the COVID-19 pandemic caused a massive, worldwide conversion from in-person care to Telehealth. Prior to this transition, there were several barriers to providing care through this approach, including reimbursement, regulations, and technology as well as clinician attitudes toward and acceptance of Telehealth. Currently, government agencies have assisted in making the use of Telehealth viable by allowing for interstate licensing, removing regulatory restrictions and most importantly, providing reimbursement for care. Yet, while many of the barriers that existed prior to COVID-19 have since been eliminated, many still remain. This survey is designed to measure the utilization, effectiveness, and appropriateness of speech-language therapy services delivered via Telehealth in the pediatric population prior to March 2020 to the current use of this method of service delivery.

<table>
<thead>
<tr>
<th>Informed Consent to Participate in Research</th>
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</thead>
<tbody>
<tr>
<td>Information to Consider Before Taking Part in this Research Study</td>
</tr>
<tr>
<td>Title: Telehealth Services: Pediatric Provider Survey</td>
</tr>
<tr>
<td>Study IRB# 001191</td>
</tr>
</tbody>
</table>
Appendix A: (continued)

CONSENT

You are being asked to take part in a research study. The information in this document should help you to decide if you would like to participate.

Study Staff:

This study is being led by Deborah R. Campbell, M.A., CCC-SLP, a PhD candidate at the University of South Florida. This person is called the Principal Investigator. She is being guided in this research by Dr. Howard Goldstein. Other approved research staff may act on behalf of the Principal Investigator.

Study Details:

The study being conducted is an online survey and is supported by the University of South Florida. The purpose of the study is to investigate the utilization and appropriateness of Telehealth speech, language, and literacy-based therapy as well as clinicians’ experiences with the technology needed to perform these vital services.

Why are you being asked to take part?

You are being asked to take part because you are a pediatric provider in the field of speech-language pathology. Pediatric speech-language pathologists and speech-language pathology assistants have the unique knowledge about how their client population was impacted during the pandemic. The transition from in-person therapy services to Telehealth that occurred starting in March 2020. Respondents participating in this survey will be aware that their participation in this study will help further our knowledge of the impact of this conversion for both clinicians and their clients.

Study Procedures:

If you take part in this study, you will be asked to complete an online survey. This survey is comprised of 13 domains, with each domain consisting of 2-14 questions. The questions are multiple-choice, sliders, short answer and open-ended questions. It is anticipated that the survey will take 15-30 minutes to complete. The average is 20 minutes. The survey will be made available for 30 calendar days before it is closed.

Alternatives / Voluntary Participation / Withdrawal:

You do not have to participate in this research study.

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

Benefits and Risks:

We are unsure if you will receive any benefits by taking part in this research study. This research is considered to be minimal risk. Minimal risk means that study risks are the same as the risks you face in daily life.

Compensation:

Respondents will not receive any payments or other compensation for taking part in this survey.
Appendix A: (continued)

We will do our best to keep your records private and confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Certain people may need to see your study records. Anyone with the authority to look at your records must keep them confidential. The only people who will be allowed to see these records are: Deborah R. Campbell, M.A., CCC-SLP, Principal Investigator, faculty advisor, Dr. Howard Goldstein and The University of South Florida Institutional Review Board (IRB).

It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. Confidentiality will be maintained to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet. However, your participation in this online survey involves risks similar to a person’s everyday use of the Internet. If you complete and submit an anonymous survey and later request your data be withdrawn, this may or may not be possible as the researcher may be unable to extract anonymous data from the database.

Contact Information:

If you have any questions, concerns or complaints about this study, call Deborah R. Campbell, at 352-795-7006. If you have questions about your rights, complaints, or issues as a person taking part in this study, call the USF IRB at (813) 974-5638 or contact the IRB by email at rschri-irb@usf.edu.

We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. You can print a copy of this consent form for your records.

I freely give my consent to take part in this study. I understand that by proceeding with this survey, I am agreeing to take part in research and I am 18 years of age or older.

**Instructions:**

This survey is designed for pediatric speech-language pathologists (SLPs) and speech-language pathology assistants (SLPAs) who have previous and/or current experience providing services via Telehealth.

Telehealth is defined as the means of providing speech-language therapy services through telecommunication technology (i.e., videconferencing, synchronous communication: real-time, audiovisual connection between client and clinician). Terms synonymous with Telehealth in the field of speech pathology may include telepractice, telespeech, teletherapy and telerehabilitation.

This evaluative instrument is organized into 13 domains and contains 2 to 14 questions per domain:

(I) Employment and Experience
(II) Telehealth Services: Previous (prior to March 2020)
(III) Telehealth Services: Recent (March 2020 to June 2020)
(IV) Telehealth Services: Current (June 2020 to current)
(V) Telehealth Services: Future (2021 and beyond)
(VI) Reasons for Telehealth Usage
(VII) Client/Student Setting
(VIII) Telehealth: Hardware, Software
(IX) Use and Perceptions of Technology
(X) Evaluations Administered via Telehealth
(XI) Direct Therapy Services via Telehealth: Effectiveness of Treatment
(XII) Telehealth: Viewpoint
(XIII) Advantages/Disadvantages of Telehealth Therapy Delivery

Survey questions will collect information/measure the utilization, effectiveness, and appropriateness of speech/language services performed using Telehealth.

**If you chose the “Save & Return Later” button at any point during the survey, you MUST have the return code provided to you right before you exit in order to return to the survey later to begin where you left off. Please write it down prior to exiting the survey to save your information.

Thank you for your participation!
Appendix A: (continued)

Part I: Employment and Experience

The following questions will gather information pertaining to your employment and experience.
### Appendix A: (continued)

#### Part I

1. In what state do you currently reside?

   - Outside of the United States
   - Alabama - AL
   - Alaska - AK
   - Arizona - AZ
   - Arkansas - AR
   - California - CA
   - Colorado - CO
   - Connecticut - CT
   - Delaware - DE
   - Florida - FL
   - Georgia - GA
   - Hawaii - HI
   - Idaho - ID
   - Illinois - IL
   - Indiana - IN
   - Iowa - IA
   - Kansas - KS
   - Kentucky - KY
   - Louisiana - LA
   - Maine - ME
   - Maryland - MD
   - Massachusetts - MA
   - Michigan - MI
   - Minnesota - MN
   - Mississippi - MS
   - Missouri - MO
   - Montana - MT
   - Nebraska - NE
   - Nevada - NV
   - New Hampshire - NH
   - New Jersey - NJ
   - New Mexico - NM
   - New York - NY
   - North Carolina - NC
   - North Dakota - ND
   - Ohio - OH
   - Oklahoma - OK
   - Oregon - OR
   - Pennsylvania - PA
   - Rhode Island - RI
   - South Carolina - SC
   - South Dakota - SD
   - Tennessee - TN
   - Texas - TX
   - Utah - UT
   - Vermont - VT
   - Virginia - VA
   - Washington - WA
   - West Virginia - WV
   - Wisconsin - WI
   - Wyoming - WY
   - American Samoa - AS
   - District of Columbia - DC
   - Federated States of Micronesia - FM
   - Guam - GU
   - Marshall Islands - MH
   - Northern Mariana Islands - MP
   - Palau - PW
   - Puerto Rico - PR
   - Virgin Islands - VI
Appendix A: (continued)

Part I

2. Which of the following best describes your primary employment setting?

☐ Outpatient clinic
☐ School (public/private)
☐ Hospital/in-patient
☐ Homecare Agency
☐ Part C Early Intervention (i.e., homebased birth to three)
☐ Private practice
☐ Skilled nursing facility
☐ University setting
☐ Prescribed Pediatric Extended Care (PPEC)
☐ Daycare
☐ Independent contractor
☐ Clinician’s home
☐ Other:

Please list employment setting: __________________________

Part II

3. Which of the follow best describes the location of your primary employment setting?

Definitions

Urban: More dense, large population, built up, close together

Suburban: Moderate density and population, area on the edge of a large town or city where people who work in the town or city often live

Rural: Less dense, sparse population, not built up, at a distance

☐ Rural
☐ Suburban
☐ Urban

Part III

4. What is the highest degree or level of schooling you have completed?

☐ Associate
☐ Bachelor’s
☐ Master’s
☐ Professional Degree
☐ Doctorate
☐ Other:

Please list highest degree or level of schooling you have completed __________________________

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Appendix A: (continued)

Part I

5. How many years of experiences do you have in the field of speech-language pathology? (if less than one year, enter one (1))

Part I

6. How many years of experiences do you have in the field of speech-language pathology via Telehealth? Enter number only (if less than one year, enter one (1))

Part I

7. Have you completed any courses or trainings on providing direct therapy services via Telehealth?

☐ Yes
☐ No

Part I

Please mark the types of courses or training you completed

☐ I completed at least one course on the topic of Telehealth.
☐ I completed several courses on the topic of Telehealth.
☐ I trained using simulations of Telehealth therapy services.
☐ I trained by performing mock therapy sessions with a peer or coworker.
☐ I trained by performing mock therapy sessions with a client.
☐ I did a form of Telehealth training not listed (please specify)

Please specify the form of Telehealth training you completed.
Appendix A: (continued)

Part II: Telehealth Services: Previous (prior to March 2020)

The following questions will gather information pertaining to your utilization and proficiency of Telehealth prior to March 2020.

Part II

1. Prior to Covid-19 (March 2020), did you provide Telehealth direct therapy services?  
   ○ Yes  
   ○ No

Part II

2. In thinking about your ability to provide direct therapy services, please indicate your level of proficiency in delivering therapy via Telehealth prior to March 2020.  

<table>
<thead>
<tr>
<th>Not proficient</th>
<th>Very proficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(Place a mark on the scale above)</td>
<td></td>
</tr>
</tbody>
</table>

Part II

3. In considering the direct therapy services you provided in a typical week from prior to March 2020 (Covid 19), please indicate the approximate percentage of services that were administered via Telehealth.  

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Place a mark on the scale above)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part II

4. In thinking about the direct therapy services you provided via Telehealth prior to March 2020, please indicate the setting(s)/where YOU were located: (mark all that apply)  
   □ home  □ office  □ school  □ car  □ other:  

Please indicate the other setting/where YOU were located when you provided services via Telehealth  

   

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Appendix A: (continued)

<table>
<thead>
<tr>
<th>Part III: Telehealth Services: Recent (March 2020 to July 2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following questions will gather information pertaining to your utilization and proficiency of telehealth from the period of March 2020 to July 2020</td>
</tr>
</tbody>
</table>

1. From March 2020 to July 2020, did you provide Telehealth direct therapy services?
   - [ ] Yes
   - [x] No

2. During the period of time March 2020 to July 2020, my primary employer (mark all that apply):
   - [ ] temporarily closed
   - [ ] furloughed therapy staff
   - [ ] allowed therapy staff to work off-site (i.e., travel to homes) to provide services
   - [ ] allowed therapy staff to work on-site to provide direct therapy services
   - [ ] allowed therapy staff to provide Telehealth therapy services
   - [ ] allowed therapy staff to provide therapy services through alternative methods of delivery (i.e., paper packets, parent consultation)
   - [ ] employer provided paid time-off due to temporary closure

3. In thinking about your ability to provide direct therapy services, please indicate your level of proficiency in delivering therapy via Telehealth from March 2020 to July 2020.

<table>
<thead>
<tr>
<th>Not proficient</th>
<th>Very proficient</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tbody>
</table>

   (Place a mark on the scale above)

4. In considering the direct therapy services you provided in a typical week, please indicate the approximate percentage of direct therapy services provided via the Telehealth delivery method by the end of July 2020:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   (Place a mark on the scale above)

5. In thinking about the direct therapy services you provided via Telehealth March 2020 to July 2020, please indicate the setting/where you were located (mark all that apply)
   - [ ] home
   - [ ] office
   - [ ] school
   - [ ] car
   - [ ] other

   Please indicate the other setting/where YOU were located when you provided services via Telehealth

   ________________________________
Appendix A: (continued)

Part III

6. During the time period March 2020 to July 2020, were direct therapy services via Telehealth optional for your clients (they had the choice of in-person care or Telehealth):

☐ Yes
☐ No

What was the willingness to participate in therapy utilizing the Telehealth delivery method for the clients on your caseload? (mark all that apply)

☐ Clients only wanted to participate in Telehealth
☐ Clients only wanted "in-person" therapy services
☐ Client were open to Telehealth or "in-person" therapy services
☐ Clients chose to not receive any therapy services during this time period (services were withheld)
☐ I do not know

Part III

7. Clients who attended therapy through Telehealth, what was the impact on their attendance, in contrast to when they were receiving in-person care?
   (i.e., 50% of clients’ attendance declined, 25% attendance improved, 25% stayed the same)

Please enter the percent of your caseload who had a decline in attendance as a result of transitioning to Telehealth

|  || 50 | 100 |
|---|---|---|

(Place a mark on the scale above)

Please enter the percent of your caseload who demonstrated an improvement in attendance as a result of transitioning to Telehealth

|  || 50 | 100 |
|---|---|---|

(Place a mark on the scale above)

Please enter the percent of your caseload who stayed the same in their attendance as a result of transitioning to Telehealth

|  || 50 | 100 |
|---|---|---|

(Place a mark on the scale above)
Appendix A: (continued)

Part IV: Telehealth Services: Current (August 2020 to current)

The following questions will gather information pertaining to your utilization and proficiency of telehealth from the period of August 2020 to now.

Part IV

1. From August 2020 to current, did you provide Telehealth direct therapy services?
   - [ ] Yes
   - [ ] No

Part IV

2. During the period of time August 2020 to current, my primary employer (mark all that apply):
   - [ ] temporarily closed
   - [ ] furloughed therapy staff
   - [ ] allowed therapy staff to work off-site (i.e., travel to homes) to provide services
   - [ ] allowed therapy staff to work on-site to provide direct therapy services
   - [ ] allowed therapy staff to provide Telehealth therapy services
   - [ ] allowed therapy staff to provide therapy services through alternative methods of delivery (i.e., paper packets, parent consultation)
   - [ ] employer provided paid time-off due to temporary closure

Part IV

3. In thinking about your ability to provide direct therapy services, please indicate your level of proficiency in delivering therapy via Telehealth from August 2020 to current:

   Not proficient
   
   Very proficient

   (Place a mark on the scale above)

Part IV

4. In considering the direct therapy services you provided in a typical week from August 2020 to current, please indicate the approximate percentage of services provided via the Telehealth delivery method:

   0  50  100

   (Place a mark on the scale above)

Part IV

5. In thinking about the direct therapy services you provided via Telehealth August 2020 to current, please indicate the setting/where you were located:
   - [ ] home
   - [ ] office
   - [ ] school
   - [ ] car
   - [ ] other:

   Please indicate the other setting/where YOU were located when you provided services via Telehealth

   

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### Part V: Telehealth Services: Future (2021 and beyond)

The following questions will gather information pertaining to your utilization and proficiency of telehealth from the period of August 2020 to now.

#### Part V

1. In the future (2021 and beyond), do you predict you will be providing direct therapy services via Telehealth?
   - [ ] Yes
   - [ ] No

2. In considering the direct therapy services you will be providing in the future (2021 and beyond), please indicate the approximate percentage of services you will provide via Telehealth:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

   [Place a mark on the scale above]
Appendix A: (continued)

Part VI: Reasons for Telehealth Usage

The following questions will investigate reasons you may have chosen to provide services via
Telehealth, both before and after March 2020

Part VI

1. Please indicate, by selecting all appropriate boxes, reasons you may have chosen to provide telehealth direct
therapy services prior to Covid-19 (March 2020); (mark all that apply)

☐ I was not providing Telehealth services
☐ Ability to provide therapy services for clients who travel long distances for in-person care
☐ Ability to provide therapy services to rural areas
☐ Convenience of client
☐ Convenience of clinician
☐ Lower the exposure risk for medically fragile children
☐ Lower the exposure risk for illness: clinician
☐ Lower the exposure risk for illness: client
☐ Ability for client to have access to experts
☐ Ability of clinician to work from home
☐ Cost effective means of providing services
☐ Reduce clinician exposure to sick clients
☐ Ability to provide therapy services to clients who may have otherwise canceled appointments
☐ Other(s), (please list)

Please indicate the other reasons you were providing
Telehealth:

Part VI

2. Please indicate, by selecting all appropriate boxes, reasons you are currently providing Telehealth services; (mark
all that apply)

☐ I am not providing Telehealth services
☐ It is required/mandated by my employer
☐ Ability to provide therapy services for clients who travel long distances for in-person care
☐ Ability to provide therapy services to rural areas
☐ Convenience of client
☐ Convenience of clinician
☐ Lower the exposure risk to medically fragile clients
☐ Lower the exposure risk for illness: clinician
☐ Lower the exposure risk for illness: client
☐ Ability for client to have access to experts
☐ Ability of clinician to work from home
☐ Cost effective means of providing services
☐ Reduce clinician exposure to sick clients
☐ Ability to provide therapy services to clients who may have otherwise canceled appointments
☐ Ability to provide services while lowering potential exposure risk to SLP and client to Covid-19
☐ Other(s):

Please indicate the other reasons you are providing
Telehealth:

__
Appendix A: (continued)

Part VI

3. Please indicate, by selecting all appropriate boxes, reasons you predict you will be providing direct therapy services via Telehealth in the future (2021 and beyond): (mark all that apply)

☐ I am will not provide Telehealth services
☐ It is required/mandated by my employer
☐ Ability to provide therapy services for clients who travel long distances for in-person care
☐ Ability to provide therapy services to rural areas
☐ Convenience of client
☐ Convenience of clinician
☐ Lower the exposure risk to medically fragile clients
☐ Lower the exposure risk for illness: clinician
☐ Lower the exposure risk for illness: client
☐ Ability for client to have access to experts
☐ Ability of clinician to work from home
☐ Cost effective means of providing services
☐ Reduce clinician exposure to sick clients
☐ Ability to provide therapy services to clients who may have otherwise canceled appointments
☐ Other(s):

Please indicate the other reasons you are providing Telehealth:

________________________________________
Appendix B:
Pediatric Provider Survey: Part 2

Telehealth Services: Pediatric Provider Survey

Overview:

In March 2020, the COVID-19 pandemic caused a massive, worldwide conversion from in-person care to Telehealth. Prior to this transition, there were several barriers to providing care through this approach, including reimbursement, regulations, and technology as well as clinician attitudes toward and acceptance of Telehealth. Currently, government agencies have assisted in making the use of Telehealth viable by allowing for interstate licensing, removing regulatory restrictions and most importantly, providing reimbursement for care. Yet, while many of the barriers that existed prior to COVID-19 have since been eliminated, many still remain. This survey is designed to measure the utilization, effectiveness, and appropriateness of speech-language therapy services delivered via Telehealth in the pediatric population prior to March 2020 to the current use of this method of service delivery.

Informed Consent to Participate in Research

Information to Consider Before Taking Part in this Research Study

Title: Telehealth Services: Pediatric Provider Survey

Study IRB# 001191
Appendix B: (continued)

CONSENT

You are being asked to take part in a research study. The information in this document should help you to decide if you would like to participate.

Study Staff:

This study is being led by Deborah R. Campbell, M.A., CCC-SLP, a PhD candidate at the University of South Florida. This person is called the Principal Investigator. She is being guided in this research by Dr. Howard Goldstein. Other approved research staff may act on behalf of the Principal Investigator.

Study Details:

The study is being conducted as an online survey and is supported by the University of South Florida. The purpose of the study is to investigate the utilization and appropriateness of Telehealth speech, language, and literacy-based therapy as well as clinicians’ experiences with the technology needed to perform these vital services.

Why are you being asked to take part?

You are being asked to take part because you are a pediatric provider in the field of speech-language pathology. Pediatric speech-language pathologists and speech-language pathology assistants have the unique knowledge about how their client population was impacted during the transition from in-person therapy services pre-COVID-19, to the dramatic increase in the use of Telehealth that occurred starting in March 2020. Respondents participating in this survey will be aware that their participation in this study will help further our knowledge of the impact of this conversion for both clinicians and their clients.

Study Procedures:

If you take part in this study, you will be asked to complete an online survey. This survey is comprised of 13 domains, with each domain consisting of 2-14 questions. The questions are multiple-choice, sliders, short answer and open-ended questions. It is anticipated that the survey will take 15-30 minutes to complete. The average is 20 minutes. The survey will be made available for 30 calendar days before it is closed.

Alternatives / Voluntary Participation / Withdrawal:

You do not have to participate in this research study.

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We are unsure if you will receive any benefits by taking part in this research study. This research is considered to be minimal risk. Minimal risk means that study risks are the same as the risks you face in daily life.

Compensation:

Respondents will not receive any payments or other compensation for taking part in this survey.

Research and Confidentiality:

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Appendix B: (continued)

We will do our best to keep your records private and confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Certain people may need to see your study records. Anyone with the authority to look at your records must keep them confidential. The only people who will be allowed to see these records are: Deborah R. Campbell, M.A., CCC-SLP, Principal Investigator, faculty advisor, Dr. Howard Goldstein and The University of South Florida Institutional Review Board (IRB).

It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. Confidentiality will be maintained to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet. However, your participation in this online survey involves risks similar to a person’s everyday use of the Internet. If you complete and submit an anonymous survey and later request your data be withdrawn, this may or may not be possible as the researcher may be unable to extract anonymous data from the database.

Contact Information:

If you have any questions, concerns or complaints about this study, call Deborah R. Campbell, at 352-795-7006. If you have questions about your rights, complaints, or issues as a person taking part in this study, call the USF IRB at (813) 974-5638 or contact the IRB by email at R5CRI-IRB@usf.edu.

We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. You can print a copy of this consent form for your records.

I freely give my consent to take part in this study. I understand that by proceeding with this survey, I am agreeing to take part in research and I am 18 years of age or older.

Instructions:

This survey is designed for pediatric speech-language pathologists (SLPs) and speech-language pathology assistants (SLPAs) who have previous and/or current experience providing services via Telehealth.

Telehealth is defined as the means of providing speech-language therapy services through telecommunication technology (i.e., videoconferencing, synchronous communication: real-time, audiovisual connection between client and clinician). Terms synonymous with Telehealth in the field of speech pathology may include telepractice, telespeech, teletherapy and telerehabilitation.

This evaluative instrument is organized into 13 domains and contains 2 to 14 questions per domain:

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(V) Telehealth Services: Future (2021 and beyond)
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Thank you for your participation!
Appendix B: (continued)

Part I: Employment and Experience

The following questions will gather information pertaining to your employment and experience.
### Appendix B: (continued)

**Part I**

1. In what state do you currently reside?

- Outside of the United States
- Alabama - AL
- Alaska - AK
- Arizona - AZ
- Arkansas - AR
- California - CA
- Colorado - CO
- Connecticut - CT
- Delaware - DE
- Florida - FL
- Georgia - GA
- Hawaii - HI
- Idaho - ID
- Illinois - IL
- Indiana - IN
- Iowa - IA
- Kansas - KS
- Kentucky - KY
- Louisiana - LA
- Maine - ME
- Maryland - MD
- Massachusetts - MA
- Michigan - MI
- Minnesota - MN
- Mississippi - MS
- Missouri - MO
- Montana - MT
- Nebraska - NE
- Nevada - NV
- New Hampshire - NH
- New Jersey - NJ
- New Mexico - NM
- New York - NY
- North Carolina - NC
- North Dakota - ND
- Ohio - OH
- Oklahoma - OK
- Oregon - OR
- Pennsylvania - PA
- Rhode Island - RI
- South Carolina - SC
- South Dakota - SD
- Tennessee - TN
- Texas - TX
- Utah - UT
- Vermont - VT
- Virginia - VA
- Washington - WA
- West Virginia - WV
- Wisconsin - WI
- Wyoming - WY
- American Samoa - AS
- District of Columbia - DC
- Federated States of Micronesia - FM
- Guam - GU
- Marshall Islands - MH
- Northern Mariana Islands - MP
- Palau - PW
- Puerto Rico - PR
- Virgin Islands - VI
Appendix B: (continued)

Part I

2. Which of the following best describes your primary employment setting?

☐ Outpatient clinic  ☐ School (public/private)
☐ Hospital/in-patient  ☐ Homecare Agency
☐ Part C Early Intervention (i.e., homebased birth to three)
☐ Private practice  ☐ Skilled nursing facility
☐ University setting
☐ Prescribed Pediatric Extended Care (PPEC)
☐ Daycare
☐ Independent contractor
☐ Clinician’s home
☐ Other:

Please list employment setting: ______________________________________________________

Part I

3. Which of the follow best describes the location of your primary employment setting?

☐ Rural
☐ Suburban
☐ Urban

Definitions

Urban: More dense, large population, built up, close together

Suburban: Moderate density and population, area on the edge of a large town or city where people who work in the town or city often live

Rural: less dense, sparse population, not built up, at a distance

Part I

4. What is the highest degree or level of schooling you have completed?

☐ Associate
☐ Bachelor’s
☐ Master’s
☐ Professional Degree
☐ Doctorate
☐ Other:

Please list highest degree or level of schooling you have completed ____________________________________________________________
Appendix B: (continued)

Part I

5. How many years of experience do you have in the field of speech-language pathology? (If less than one year, enter one (1))

Part I

6. How many years of experience do you have in the field of speech-language pathology via Telehealth? Enter number only (if less than one year, enter one (1))

Part I

7. Have you completed any courses or trainings on providing direct therapy services via Telehealth?

- [ ] Yes
- [x] No

Part I

Please mark the types of courses or training you completed.

- [ ] I completed at least one course on the topic of Telehealth.
- [ ] I completed several courses on the topic of Telehealth.
- [ ] I trained using simulations of Telehealth therapy services.
- [ ] I trained by performing mock therapy sessions with a peer or coworker.
- [ ] I trained by performing mock therapy sessions with a client.
- [ ] I did a form of Telehealth training not listed (please specify)

Please specify the form of Telehealth training you completed.
Part II  Clientele/Student Setting

The following questions will gather information pertaining to the client’s/student’s location.

1. Which of the following best describes the location where your clients reside? (mark all that apply)
   □ Rural  □ Suburban  □ Urban  □ Location where clients reside is unknown

   Please indicate the percent that reside in a rural location:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)

   Please indicate the percent that reside in a suburban location:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)

   Please indicate the percent that reside in an urban location:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)

2. Which of the following best describes your clients’ socioeconomic status?

   Definition for purpose of this survey:
   LOW: Income less than 40K per year for family of 4, may have a state insurance program such as Medicaid or no insurance
   MIDDLE: Income between 40K and 250K per year for a family of 4, may have a state insurance program (i.e., Children’s Health Insurance Program (CHIP)), have commercial insurance coverage or no insurance
   HIGH: Income above 250K per year for a family of 4, may have commercial insurance coverage or no insurance

   □ Low  □ Middle  □ High  □ Unknown

   Please indicate the percent of clients within the ‘low’ SES category:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)

   Please indicate the percent of clients within the ‘middle’ SES category:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)

   Please indicate the percent of clients within the ‘high’ SES category:
   0  50  100
   (+-----------------------------------------------)
   (Place a mark on the scale above)
Appendix B: (continued)

3. Which of the following best describes your clients’ location when Telehealth is provided to them? (mark all that apply)

- [ ] Home
- [ ] Family Member’s Residence
- [ ] School
- [ ] Car
- [ ] Public Place (i.e., library)
- [ ] Parent’s Workplace
- [ ] Childcare
- [ ] Other (please specify)

Please indicate your clients’ other locations when Telehealth is provided to them: ____________________________
Appendix B: (continued)

Part III Utilization of Telehealth Services: Hardware and Software

The following questions will collect information on your use of hardware and software to provide direct therapy services via Telehealth.

1. While providing Telehealth therapy services, please indicate which of the following platforms you may have used? (mark all that apply)
   - Doxy
   - Zoom
   - Facetime
   - Google Classroom
   - Microsoft Teams
   - Skype
   - Google Hangouts
   - What’s App
   - Facebook Messenger
   - Presence Learning
   - Blink Session
   - Theraplay
   - Therav
   - ReadySetConnect
   - Microsoft Live Meeting
   - Facebook Messenger
   - Other(s) (please list)

Please indicate the other platforms you may have used:

________________________________________________________________________

2. While providing Telehealth direct therapy services, please indicate the devices you use for videoconferencing/audiovisual connection (mark all that apply)
   - Tablet    
   - Computer/Laptop
   - Cellphone
   - Multiple devices at a time

Please indicate the approximate frequency you use a tablet to provide Telehealth. (i.e., 30% of time you use a tablet)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

(Place a mark on the scale above)

Please indicate the approximate frequency you use a computer to provide Telehealth. (i.e., 30% of time you use a computer)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Place a mark on the scale above)

Please indicate the approximate frequency you use a cellphone to provide Telehealth. (i.e., 30% of time you use a cellphone)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tbody>
</table>

(Place a mark on the scale above)
Appendix B: (continued)

Please indicate the approximate frequency you use multiple devices to provide Telehealth. (i.e., 30% of the time you use a multiple devices) 

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

3. For your current caseload, please indicate the audio component of the audiovisual connection you use for videconferencing. (Mark all that apply)

☐ Headphones  ☐ Device's Speakers  ☐ External Speakers  ☐ Other  ☐ Unknown

Please indicate the approximate frequency that you use headphones. (i.e., 50% of you use headphones)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate frequency that you use the device’s speakers. (i.e., 50% of you use device’s speakers)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate frequency that you use an external speaker. (i.e., 50% of you use an external speaker)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the other audio components you may have used:

Please indicate the approximate frequency that you use other audio components. (i.e., 50% of you use other audio components)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

4. While providing Telehealth direct therapy services, please indicate additional hardware that you have utilized during your session. (Mark all that apply)

☐ None
☐ Document camera
☐ Headphones (over the ears)
☐ Ear buds (in the ears)
☐ External webcam
☐ External speaker
☐ Augmentative Alternative Communication device (AAC)
☐ Additional computer screen
☐ Additional computer or tablet
☐ Cellphone
☐ External Microphone
☐ Other(s): (please specify)

Please indicate the additional hardware you may have used:

09/21/2020 12:14pm  projectredcap.org
Appendix B: (continued)

Part IV Use and Perceptions of Technology

The following questions will collect information about your perceptions of client accessibility of technology and the connectivity needed to participate in Telehealth.

1. In your opinion, what have been clients/family’s reservations about the use of Telehealth for direct therapy services? (mark all that apply)
   - Comfort level with videoconferencing technology
   - Access to technology (i.e., hardware)
   - Access to connectivity (i.e., affordable, available access to internet)
   - Age of the client
   - Client’s diagnosis
   - Level of caregiver education
   - Religious beliefs
   - Age of the caregiver
   - Socio-economic status
   - Cultural background
   - Cost/reimbursement of services
   - Care for siblings during therapy session
   - Services provided in the home environment can be distracting/interferes with compliance
   - Use of a computer or tablet is distracting
   - Willingness of child to participate in sessions via Telehealth
   - Language barriers
   - Other(s): (please specify)

Please indicate other reservations clients/families have about the use of Telehealth for direct therapy services:

2. In your opinion, what percentage of clients want to do Telehealth but do not have the resources to do so?

   - 0
   - 50
   - 100

(Place a mark on the scale above)

3. In your opinion, what resources are lacking that create barriers for willing clients to do Telehealth?
   - Lack of technology (i.e., appropriate device)
   - Lack of connectivity: availability of internet access
   - Lack of connectivity: affordable internet access
   - Lack of data plan
   - Lack of access to software
   - Financial limitations
   - There are no barriers for those willing to do Telehealth
   - Other(s): (please specify)

Please indicate other resources that are lacking which create barriers for willing clients to do Telehealth:

09/21/2020 12:14pm
Appendix B: (continued)

4. For your current caseload, please indicate the devices your clients use for videoconferencing/audiovisual connection to receive Telehealth direct therapy services. (mark all that apply)

☐ Tablet  ☐ Computer (desktop, laptop)  ☐ Cellphone  ☐ Combination of devices (varies from session to session)  ☐ I don't know  ☐ Other(s): (please specify)

Please indicate the approximate percentage of clients using a tablet to access Telehealth:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate percentage of clients using a computer (desktop, laptop) to access Telehealth:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate percentage of clients using a cellphone to access Telehealth:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate percentage of clients using a combination of devices to access Telehealth:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

Please indicate the other devices your clients use for videoconferencing/audiovisual connection:

Please indicate the approximate percentage of clients using other devices to access Telehealth:

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
</table>

(Place a mark on the scale above)

5. For your current caseload, if known, please indicate the audio component of the audiovisual connection your client uses for Telehealth (mark all that apply)

☐ Headphones  ☐ Device's Speakers  ☐ External Speakers  ☐ Other  ☐ Unknown

Please indicate the approximate frequency that your clients use headphones. (i.e., 50% of your clients use headphones)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
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</thead>
</table>

(Place a mark on the scale above)

Please indicate the approximate frequency that your clients use the device's speakers. (i.e., 50% of your clients use the device's speakers)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
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(Place a mark on the scale above)
Appendix B: (continued)

Please indicate the approximate frequency that your clients use an external speaker. (i.e., 50% of your clients use an external speaker)

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
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</thead>
</table>

(Place a mark on the scale above)

Please indicate the other audio components your clients may have used:

Please indicate the approximate frequency that your clients use other audio components. (i.e., 50% of your clients use other audio components)

<table>
<thead>
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<th>0</th>
<th>50</th>
<th>100</th>
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(Place a mark on the scale above)

6. When providing Telehealth services for the first time, what is the percent of families who require instructional assistance in learning how to videoconference.

<table>
<thead>
<tr>
<th>0</th>
<th>50</th>
<th>100</th>
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</thead>
</table>

(Place a mark on the scale above)

7. When providing direct therapy services via Telehealth, how do your clients access your Telehealth therapy materials? (Mark all that apply)

- [ ] Provide materials to client in advance
- [ ] Screen share
- [ ] File sharing
- [ ] Use of materials that are in the client's natural environment
- [ ] Materials are held up to the camera for client to view
- [ ] Use of document camera
- [ ] Online materials accessed during sessions
- [ ] Use of therapy applications (apps) accessed during session
- [ ] Other(s): (please specify)

Please indicate the other methods you use to provide your clients access to your Telehealth therapy materials:
### Part V Evaluations Administered via Telehealth

The following questions will collect information about your opinions of when Telehealth is appropriate and effective in the evaluation of children with speech and language disorders, including questions about a child's age, disorder.

1. I have performed standardized assessment or evaluations via Telehealth.

2. What age groups have you performed standardized assessments or evaluations through Telehealth?

<table>
<thead>
<tr>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
</tr>
<tr>
<td>3-5</td>
</tr>
<tr>
<td>6-8</td>
</tr>
<tr>
<td>9-11</td>
</tr>
<tr>
<td>12-16</td>
</tr>
<tr>
<td>17 and up</td>
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</tbody>
</table>

In my experience, administering standardized assessments or evaluations to the age 0-2 via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Neither disagree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations to the age 3-5 via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Neither disagree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations to the age 6-8 via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Neither disagree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations to the age 9-11 via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Neither disagree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations to the age 12-16 via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Neither disagree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)
Appendix B: (continued)

In my experience, administering standardized assessments or evaluations to the age 17 and up via Telehealth is more difficult than administering the same assessments or evaluations "in-person".

<table>
<thead>
<tr>
<th>strongly disagree</th>
<th>or agree</th>
<th>strongly agree</th>
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(Place a mark on the scale above)

3. Please indicate the areas that you have experience in administering standardized assessments or evaluations via Telehealth. (mark all that apply)

- Speech Sound Production
- Fluency
- Voice and Resonance
- Expressive and Receptive Language
- Literacy, Written Expression
- Hearing (including the impact on speech and language)
- Swallowing (oral, pharyngeal, esophageal, and related functions, including oral function for feeding; oral function for feeding; orofacial myofunction)
- Cognitive aspects of communication (attention, memory, sequencing, problem-solving, executive functioning)
- Social aspects of communication (challenging behavior, ineffective social skills, lack of communication opportunities)
- Communication modalities (including oral, manual, augmentative and alternative communication techniques, and assistive technologies)

In my experience, administering standardized assessments or evaluations in the area of speech sound production via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
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<th>or agree</th>
<th>strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of fluency via Telehealth is more difficult than administered the same assessment or evaluation in-person.

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<th>strongly disagree</th>
<th>or agree</th>
<th>strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of voice and resonance via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
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<th>or agree</th>
<th>strongly agree</th>
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In my experience, administering standardized assessments or evaluations in the area of expressive and receptive language via Telehealth is more difficult than administered the same assessment or evaluation in-person.

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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of literacy, written expression via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
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<tr>
<th>strongly disagree</th>
<th>or agree</th>
<th>strongly agree</th>
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(Place a mark on the scale above)
Appendix B: (continued)

In my experience, administering standardized assessments or evaluations in the area of hearing (including the impact on speech and language) via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
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(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of swallowing (oral, pharyngeal, esophageal, and related functions, including oral function for feeding; oral function for feeding; orofacial myofunction) via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
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</table>

(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of the cognitive aspects of communication (attention, memory, sequencing, problem-solving, executive functioning) via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
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</table>

(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of social aspects of communication (challenging behavior, ineffective social skills, lack of communication opportunities) via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
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</table>

(Place a mark on the scale above)

In my experience, administering standardized assessments or evaluations in the area of communication modalities (including oral, manual, augmentative and alternative communication techniques, and assistive technologies) via Telehealth is more difficult than administered the same assessment or evaluation in-person.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
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</table>

(Place a mark on the scale above)

4. When providing standardized assessments or evaluations via Telehealth, how do your clients access your Telehealth assessment materials? (mark all that apply)

- [ ] Provide materials to client in advance
- [ ] Screen share
- [ ] File sharing
- [ ] Use of materials that are in the client's natural environment
- [ ] Materials are held up to the camera for client to view
- [ ] Use of document camera
- [ ] Other(s): (please specify)

Please indicate the other methods you use to provide your clients access to your standardized assessments or evaluation materials via Telehealth.
Appendix B: (continued)

Part VI  Direct Therapy Services via Telehealth: Effectiveness of Treatment

The following questions will collect information about your opinions of when Telehealth is appropriate and effective in the treatment of children with speech and language disorders, including questions about a child’s age, disorder.

1. What age groups are you currently providing direct therapy services through Telehealth?
   - [ ] 0-2
   - [ ] 3-5
   - [ ] 6-8
   - [ ] 9-11
   - [ ] 12-16
   - [ ] 17 and up

2. Based on your clinical experience, please indicate the minimum age you believe a client must be to benefit from Telehealth direct therapy services.

From the following list, please indicate all areas that you have provided direct therapy services via Telehealth. (mark all that apply)

- [ ] Speech Sound Production
- [ ] Fluency
- [ ] Voice and Resonance
- [ ] Expressive and Receptive Language
- [ ] Literacy, Written Expression
- [ ] Hearing (including the impact on speech and language)
- [ ] Swallowing (oral, pharyngeal, esophageal, and related functions, including oral function for feeding; oral function for feeding; orofacial myofunction)
- [ ] Cognitive aspects of communication (attention, memory, sequencing, problem-solving, executive functioning)
- [ ] Social aspects of communication (challenging behavior, ineffective social skills, lack of communication opportunities)
- [ ] Communication modalities (including oral, manual, augmentative and alternative communication techniques, and assistive technologies)
- [ ] Dual language learners
- [ ] Other(s): (please specify)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of speech sound production via Telehealth.

[ ] ineffective  [ ] effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of fluency via Telehealth.

[ ] ineffective  [ ] effective

(Place a mark on the scale above)
Appendix B: (continued)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of voice and resonance via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of expressive and receptive language via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of literacy, written expression via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of hearing (including the impact on speech and language) via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of swallowing (oral, pharyngeal, esophageal, and related functions, including oral function for feeding; oral function for feeding; orofacial myofunction) via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of cognitive aspects of communication (attention, memory; sequencing, problem-solving, executive functioning) via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of social aspects of communication (challenging behavior, ineffective social skills, lack of communication opportunities) via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of communication modalities (including oral, manual, augmentative and alternative communication techniques, and assistive technologies) via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Based on your clinical experience, please indicate the level of effectiveness for those services provided in the area of dual language learners via Telehealth.

**ineffective**  effective

(Place a mark on the scale above)

Please indicate the other area(s) that you have provided direct therapy services via Telehealth:

---

09/29/2020 12:14pm  projectredcap.org
Based on your clinical experience, please indicate the level of effectiveness for those services provided in the other area(s) via Telehealth:

<table>
<thead>
<tr>
<th>ineffective</th>
<th>effective</th>
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(Place a mark on the scale above)
Appendix B: (continued)

Part VII  Telehealth: Viewpoint

The following questions will gather information on your overall view of direct therapy services provided via Telehealth.

Based on your clinical experience, using the sliders below, please indicate the degree to which you disagree or agree with the following statements:

---

1. Telehealth services are equally as effective than in-person care.

   strongly disagree  neither disagree  strongly agree
   
   (Place a mark on the scale above)

---

2. Telehealth should not be used as a substitution for in-person care.

   strongly disagree  neither disagree  strongly agree
   
   (Place a mark on the scale above)

---

3. Not all clients have videoconferencing devices at home that are appropriate for Telehealth use.

   strongly disagree  neither disagree  strongly agree
   
   (Place a mark on the scale above)

---

4. The platform a provider chooses (e.g., Zoom, Doxy) is important if the direct therapy services provided are to be effective.

   strongly disagree  neither disagree  strongly agree
   
   (Place a mark on the scale above)

---

5. It is important for providers to consider video quality when choosing to provide direct therapy services via Telehealth.
Appendix B: (continued)

6. It is important for providers to consider audio quality when choosing to provide direct therapy services via Telehealth.

7. The type of device (i.e., desktop, tablet) a client uses can positively affect the outcome of Telehealth services.

8. The client’s use of headphones positively affects the outcome of Telehealth services.

9. The quality of the videoconferencing connection positively affects the outcome of Telehealth services.

10. Standardized therapy assessments or evaluations should only be administered in-person if they have not been validated for Telehealth administration.

11. Standardized therapy assessments or evaluations must have research that validates their usage for Telehealth administration.
Appendix B: (continued)

12. Technology (i.e., device) and connectivity (i.e., broadband connection) utilized by the client/student during standardized therapy assessments or evaluations can negatively impact the outcome of the testing results.

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(Place a mark on the scale above)

13. Providers may modify how a standardized test is administered to compensate for it being delivered via Telehealth.

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(Place a mark on the scale above)

14. When doing an evaluation, providers will choose one standardized assessment over another because the one they are choosing is more easily administered via Telehealth.

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(Place a mark on the scale above)
Appendix B: (continued)

Part VIII. Advantages/Disadvantages of Telehealth Therapy Delivery

The following open-ended questions will collect information on your overall impression of Telehealth.

My overall view of the use of Telehealth to provide therapy services is:

1. In your opinion, what are some of the advantages (if any) of Telehealth?

2. In your opinion, what are some of the disadvantages (if any) of Telehealth?

3. Please describe your ideas regarding the future of Telehealth.

4. In your opinion, what is needed to optimize the use of Telehealth?

Please provide any additional information and your overall impression of this survey instrument.
Appendix C:  
IRB Approval – Survey

EXEMPT DETERMINATION

September 9, 2020

Deborah Campbell  
14 Drypetes ct w  
Homosassa, FL 34446

Dear Mrs. Campbell:

On 9/8/2020, the IRB reviewed and approved the following protocol:

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<th>Initial Study</th>
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<tr>
<td>Review Type:</td>
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<tr>
<td>Title:</td>
<td>Telehealth Services: Pediatric Provider Survey</td>
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<td>Funding:</td>
<td>None</td>
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<tr>
<td>Protocol:</td>
<td>• Protocol, Version #1, 6.24.20.docx;</td>
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The IRB determined that this protocol meets the criteria for exemption from IRB review.

In conducting this protocol, you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Please note, as per USF policy, once the exempt determination is made, the application is closed in BullsIRB. This does not limit your ability to conduct the research. Any proposed or anticipated change to the study design that was previously declared exempt from IRB oversight must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant a modification or new application.

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a new request to the IRB for a determination.
Appendix C: (continued)

Sincerely,

Various Menzel
IRB Research Compliance Administrator
Appendix D:
IRB Approval – Speech Sound Assessment

APPROVAL

April 2, 2021

Deborah Campbell
14 Drypetes ct w
Homosassa, FL 34446

Dear Mrs. Deborah Campbell:

On 4/2/2021, the IRB reviewed and approved the following protocol:

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<td>THE RELIABILITY AND VALIDITY OF TELEHEALTH SPEECH SOUND ASSESSMENTS ADMINISTERED IN REAL-WORLD SCENARIOS</td>
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| Approved Protocol and Consent(s)/Assent(s): | • Telehealth speech sound assessment protocol 3.29.2021.docx  
• HRP-502b Social-Behavioral Adult Consent 3.27.21.pdf  
• HRP-502b(2) Social Behavioral Assent 3.27.21.pdf  
• HRP-502b(5) Social Behavioral Parental Permission Speech Sound Assessment 3.27.21.pdf |

Approved study documents can be found under the ‘Documents’ tab in the main study workspace. Use the stamped consent found under the ‘Last Finalized’ column under the ‘Documents’ tab.

Within 30 days of the anniversary date of study approval, confirm your research is ongoing by clicking Confirm Ongoing Research in BullsIRB, or if your research is complete, submit a study closure request in BullsIRB by clicking Create Modification/CR.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).
Appendix D: (continued)

This research involving children as participants was approved under 45 CFR 46.404/21 CFR 50.51: Research not involving greater than minimal risk to children is presented.

Sincerely,

Katrina Johnson
IRB Research Compliance Administrator
Appendix E:
Data Collection – Cover Sheet

Participant SLP Name: ______________________ Test Start Time: __________ Test Finish Time: __________

Participant SLP Role:
[ ] Live administrator
[ ] Telehealth Zoom PW: __________

Participant: Child

Date: __________

1) Prior to Starting Testing: Test connection at: speedtest.net
2) Device being used by Telehealth SLP: _____________________________
   Record DOWNload speed: _____________________________
   ** notify LIVE SLP if download speed is less than 20
4) iPad 1 PW: __________ Record DOWNload speed: __________
5) iPad 2 PW: __________ Record DOWNload speed: __________
6) LIVE SLP: set up a group text with the telehealth SLPs [ ]
7) SLP Headphones tested: [ ] audio
   ** bottom left, MUTE, arrow UP: “Test Speakers and Microphone…”
   OR
8) Child Participant Headphones tested [ ] microphone
   Have child talk into microphone and both SLPs respond they can hear the child

9) LIVE SLP iPads are set at USE ORIGINAL SOUND (before logging in,
   Settings>Meeting Settings> Use Original Sound [ ] iPad 1 [ ] iPad 2

10) Additional adult participant for the live administration [ ] yes [ ] no

11) LIVE SLP administrator plugged child participant’s headphones into iPad with Zoom
    pin# __________
    Username: debbiere@tampabay.rr.com
    Password: Boomer63
    
    Telehealth SLP 1 will use:
    Join Zoom Meeting
    https://us04web.zoom.us/j/8208367539?pwd=TW0rblpDgdBZHBwamZsbjA3YktOUT09
    Meeting ID: 820 836 7539
    Passcode(PW): 6RiNwV
    
    Username: superiortherapyCR@tampabay.rr.com
    Password: Boomer63
    
    Telehealth SLP 2 will use:
    Join Zoom Meeting
    https://us02web.zoom.us/j/3377908889?pwd=cDI0dXBPtdW1vTzB3YzIvUUtWe1Zz09
    Meeting ID: 337 790 8889
    Passcode(PW): 473670

    LIVE SLP had to come out behind the barrier during administration to manage child behaviors:
    [ ] yes [ ] no
## Appendix F:
Data Collection for Tool GFTA3 Administration

### Sounds-in-Words: All Ages

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<th>Less Than 5 Sec Total Transmission Loss</th>
<th>Child Compromised Visual Signal</th>
<th>More Than 5 Sec Total Transmission Loss</th>
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<td>hammer</td>
<td>h œ m œ</td>
<td>repeat</td>
<td>video loss, brief</td>
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<td></td>
<td>correct</td>
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<td>verbal stimuli prompt</td>
<td>audio loss, brief</td>
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<td>child compromised audio signal</td>
<td>less than 5 sec total transmission loss</td>
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<td></td>
<td>child compromised visual signal</td>
<td>more than 5 sec total transmission loss</td>
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</tbody>
</table>

**Items 1-2 (p.1)**
- What is this?
- This is a house. It is where some people live. What is this?
- What is this?
- This is a door. You can see it go in and out. What is this?

**Item 3 (p.7)**
- What is this?
- This is a pig. It says oink. What is this?

**Item 4 (p.7)**
- What is this?
- This is an apple. It is red and crunchy. What fruit is this?

**Item 5 (p.7)**
- What is this?
- This is a boy. He is not a girl. What is he?

**Item 6 (p.7)**
- What is this?
- This is a red means stop and green means go. What means to start moving? Red means stop and green means what do you say?

**Item 7 (p.7)**
- What is this?
- This is a duck. It swims in the water. What is this?

**Item 8 (p.7)**
- What sound does a duck make?
- A duck says quack. It’s a funny sound. What does a duck say?

**Item 9 (p.7)**
- What is this?
- This is a table. You can eat here. What is this?

**Item 10 (p.7)**
- What is this?
- This is a monkey. It is furry. What is this?

**Item 11 (p.7)**
- What is this?
- This is a hammer. You use it to pound things. What is this?
## Appendix F: (continued)

### Sounds-in-Words: All Ages

<table>
<thead>
<tr>
<th>Item</th>
<th>What is this?</th>
<th>Correct</th>
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<tbody>
<tr>
<td>Item 13 (p. 11)</td>
<td>What is this?</td>
<td>fish</td>
<td>r i f</td>
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<tr>
<td>Item 14 (p. 12)</td>
<td>What is this?</td>
<td>watch</td>
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<td>Item 15-16 (p. 13)</td>
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<td>What is this?</td>
<td>drum</td>
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<td>Item 20 (p. 16)</td>
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<td>What is this?</td>
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<td>What is this?</td>
<td>guitar</td>
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<td>Item 27 (p. 19)</td>
<td>What is this?</td>
<td>lion</td>
<td>l o n</td>
<td>repeat</td>
<td>video loss, brief</td>
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### Sounds-in-Words: All Ages

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<tr>
<th>Item 25 (p. 20)</th>
<th>What is this?</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a chair. You sit on it.</td>
<td>What is this?</td>
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<tr>
<th>Item 26 (p. 21)</th>
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</thead>
<tbody>
<tr>
<td>This is soap. You wash your hands with it.</td>
<td>What is this?</td>
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<table>
<thead>
<tr>
<th>Item 27 (p. 22)</th>
<th>What are these?</th>
</tr>
</thead>
<tbody>
<tr>
<td>These are glasses. They help some people see better.</td>
<td>What are these?</td>
</tr>
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<table>
<thead>
<tr>
<th>Item 28 (p. 23)</th>
<th>What is this?</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a tiger. It is orange with black stripes.</td>
<td>What is this?</td>
</tr>
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<thead>
<tr>
<th>Item 29 (p. 24)</th>
<th>What is this?</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a puzzle. It is fun to put together.</td>
<td>What is this?</td>
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<table>
<thead>
<tr>
<th>Item 30-32 (p. 25)</th>
<th>What is this?</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a ring. It is shiny.</td>
<td>What is this?</td>
</tr>
</tbody>
</table>

**Appendix F: (continued)**

- **Item 33 (p. 26)**
  - What is this?
  - This is an elephant. It has a long nose. What is this?

- **Item 34 (p. 27)**
  - What is this?
  - This is a vacuum. It is used to clean floors. What is this?

- **Item 35 (p. 28)**
  - What is this?
  - This is a shovel. You use it to scoop dirt. What is this?

- **Item 36 (p. 29)**
  - This person teaches. A person who teaches is a ______.
    - She is a teacher. She has many students. A person who teaches is a ______.
### Appendix F: (continued)

#### Sounds-in-Words: All Ages

<table>
<thead>
<tr>
<th>Item</th>
<th>Stems</th>
<th>All Ages</th>
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<th>Repeatability</th>
<th>Annotation Descriptions</th>
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<td>What is this?</td>
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<tr>
<td>This is a zebra. It is white with black stripes. What is this?</td>
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<tr>
<td><strong>Item 38</strong> (p. 31)</td>
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<td>What is this?</td>
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<tr>
<td>This is a giraffe. It has a long neck. What is this?</td>
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<td><strong>Item 39</strong> (p. 32)</td>
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<tr>
<td>An apple is a fruit. A carrot is a... ?</td>
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<td>A carrot is a vegetable. It is a healthy food. What is this?</td>
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<tr>
<td>What is she doing?</td>
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<tr>
<td>She is brushing her hair. She is making her hair look neat. What is she doing?</td>
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<td><strong>Item 41</strong> (p. 34)</td>
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<tr>
<td>This crayon is red and this crayon is... ?</td>
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<tr>
<td>This crayon is blue. It’s the same color as the sky. What color is this?</td>
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<td>and this crayon is... ?</td>
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<tr>
<td>This crayon is yellow. It’s the same color as the sun. What color is this?</td>
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<td><strong>Item 43</strong> (p. 35)</td>
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<td>Look at the family. She is the sister and he is the... ?</td>
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<tr>
<td>He is the brother. He is sitting with his family. Who is he?</td>
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<td><strong>Item 44</strong> (p. 36)</td>
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<tr>
<td>This is a frog. It hops and says ribbit. What is this?</td>
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<tr>
<td>What is this?</td>
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<tr>
<td>The frog is green. It is the same color as grass. What color is it?</td>
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<td><strong>Item 46</strong> (p. 37)</td>
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<tr>
<td>Look at the children as they pick the books. The girl says, I don’t want this book. I want...</td>
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<tr>
<td>The girl wants that book. She is pointing over there. What book does the girl want?</td>
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<td><strong>Item 47</strong> (p. 38)</td>
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<tr>
<td>What is this?</td>
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<tr>
<td>This is a leaf. It is part of a tree. What is this?</td>
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<tr>
<td><strong>Item 48</strong> (p. 39)</td>
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<tr>
<td>What is this?</td>
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<tr>
<td>This is a cookie. It is a sweet treat. What is this?</td>
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</tbody>
</table>
### Appendix F: (continued)

**Sounds-in-Words: All Ages**

<table>
<thead>
<tr>
<th>Item</th>
<th>What is this?</th>
<th>This is cheese. The mouse likes eating it. What is this?</th>
<th>cheese</th>
<th>u</th>
<th>i</th>
<th>z</th>
<th>repeat</th>
<th>video loss, brief</th>
<th>correct</th>
<th>unscorable</th>
<th>verbal stimuli prompt</th>
<th>audio loss, brief</th>
<th>child compromised audio signal</th>
<th>less than 5 sec total transmission loss</th>
<th>child compromised visual signal</th>
<th>more than 5 sec total transmission loss</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>What are these?</th>
<th>These are teeth. You brush them to keep them clean. What are these?</th>
<th>teeth</th>
<th>t</th>
<th>i</th>
<th>θ</th>
<th>repeat</th>
<th>video loss, brief</th>
<th>correct</th>
<th>unscorable</th>
<th>verbal stimuli prompt</th>
<th>audio loss, brief</th>
<th>child compromised audio signal</th>
<th>less than 5 sec total transmission loss</th>
<th>child compromised visual signal</th>
<th>more than 5 sec total transmission loss</th>
</tr>
</thead>
</table>

| Item | What is this? | This is a crown. It is made from gold. What is this? | crown | k | r | a | n | repeat | video loss, brief | correct | unscorable | verbal stimuli prompt | audio loss, brief | child compromised audio signal | less than 5 sec total transmission loss | child compromised visual signal | more than 5 sec total transmission loss |
|------|----------------|-------------------------------------------------------------------|--------|---|---|---|--------|-------------------|--------|-------------|-------------------------------|----------------|------------------------|-----------------------------|--------------------------|----------------------------------|

| Item | What is this? | This is a truck. You can drive it. What is this? | truck | t | r | a | k | repeat | video loss, brief | correct | unscorable | verbal stimuli prompt | audio loss, brief | child compromised audio signal | less than 5 sec total transmission loss | child compromised visual signal | more than 5 sec total transmission loss |
|------|----------------|-------------------------------------------------------------------|--------|---|---|---|--------|-------------------|--------|-------------|-------------------------------|----------------|------------------------|-----------------------------|--------------------------|----------------------------------|

<table>
<thead>
<tr>
<th>Item</th>
<th>What color is it?</th>
<th>The truck is red. It is the same color as a strawberry. What color is it?</th>
<th>red</th>
<th>r</th>
<th>e</th>
<th>d</th>
<th>repeat</th>
<th>video loss, brief</th>
<th>correct</th>
<th>unscorable</th>
<th>verbal stimuli prompt</th>
<th>audio loss, brief</th>
<th>child compromised audio signal</th>
<th>less than 5 sec total transmission loss</th>
<th>child compromised visual signal</th>
<th>more than 5 sec total transmission loss</th>
</tr>
</thead>
</table>

| Item | What is inside this container? | It is juice. You can drink it when you are thirsty. What is inside the container? | juice | d | j | a | n | repeat | video loss, brief | correct | unscorable | verbal stimuli prompt | audio loss, brief | child compromised audio signal | less than 5 sec total transmission loss | child compromised visual signal | more than 5 sec total transmission loss |
|------|----------------|-------------------------------------------------------------------|--------|---|---|---|--------|-------------------|--------|-------------|-------------------------------|----------------|------------------------|-----------------------------|--------------------------|----------------------------------|

| Item | What is this place? | This is the zoo. You can see lots of animals here. What is this place? | zoo | z | u | repeat | video loss, brief | correct | unscorable | verbal stimuli prompt | audio loss, brief | child compromised audio signal | less than 5 sec total transmission loss | child compromised visual signal | more than 5 sec total transmission loss |
|------|----------------|-------------------------------------------------------------------|--------|---|---|---|--------|-------------------|--------|-------------|-------------------------------|----------------|------------------------|-----------------------------|--------------------------|----------------------------------|

| Item | What is this? | This is a star. It shines in the sky at night. What is this? | star | s | t | a | r | repeat | video loss, brief | correct | unscorable | verbal stimuli prompt | audio loss, brief | child compromised audio signal | less than 5 sec total transmission loss | child compromised visual signal | more than 5 sec total transmission loss |
|------|----------------|-------------------------------------------------------------------|--------|---|---|---|--------|-------------------|--------|-------------|-------------------------------|----------------|------------------------|-----------------------------|--------------------------|----------------------------------|

<table>
<thead>
<tr>
<th>Item</th>
<th>Let’s count the stars. 1, 2, 3, 4, 5, 6, 7. That’s a lot of stars. Now you count.</th>
<th>five</th>
<th>f</th>
<th>a</th>
<th>v</th>
<th>repeat</th>
<th>video loss, brief</th>
<th>correct</th>
<th>unscorable</th>
<th>verbal stimuli prompt</th>
<th>audio loss, brief</th>
<th>child compromised audio signal</th>
<th>less than 5 sec total transmission loss</th>
<th>child compromised visual signal</th>
<th>more than 5 sec total transmission loss</th>
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<tr>
<th>Item</th>
<th>Additional Notes:</th>
</tr>
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</table>
Appendix G:
Photo: GFTA Administration Set-Up
Appendix H:
GFTA3 SLP Post-Assessment Questionnaire

GFTA3 Post-Assessment Questionnaire

Please reflect on your experience in each of the three conditions: in-person, teleassessment, enhanced teleassessment.

Rate the following questions, ranging from strongly disagree (0) to strongly agree (100).

1. I would be enthusiastic to use telehealth to complete a standardized speech assessment.
   
<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<td>3</td>
<td>4</td>
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<td>6</td>
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<td>100</td>
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</tbody>
</table>

2. I understand how to administer a speech sound disorder evaluation remotely.
   
<table>
<thead>
<tr>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<th>100</th>
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<tbody>
<tr>
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<td>2</td>
<td>3</td>
<td>4</td>
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<td>6</td>
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<td>100</td>
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</table>

3. Remote delivery is a reliable way to administer speech sound disorder evaluations.
   
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</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>

4. I am motivated to use this delivery method for speech sound evaluations.
   
<table>
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<tr>
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<th>7</th>
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<th>100</th>
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<tbody>
<tr>
<td>0</td>
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<td>8</td>
<td>9</td>
<td>100</td>
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</tbody>
</table>

5. My preferred method of administering a SSD assessment for a child with speech deficits is:
   a. Typical: in-person
      
      | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 100 |
      |---|---|---|---|---|---|---|---|---|---|-----|
      | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 100 |
   b. Remote delivery
      
      | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 100 |
      |---|---|---|---|---|---|---|---|---|---|-----|
      | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 100 |

6. Telehealth is an effective choice for evaluating children with speech sound disorders.
   
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7. The directions for using remote delivery of a standardized speech sound assessment are clear to me.
   
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8. The amount of time required to perform a speech sound assessment remotely is reasonable.
   
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9. The amount of time required for record-keeping with this evaluation format is reasonable.
   
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Appendix H: (continued)

10. Implementation of an evaluation delivered remotely would require support from family members.

| 0 | | | | | | | | | | | | | | | | | | | | | 100 |

**Please answer the following questions:**

11. Were you aware of the differences in the audio quality in the telehealth scoring conditions?
   [ ] yes    [ ] no

   *If you answered yes, please answer the following additional questions:*

   a. When were the sources of audio differences evident?

   b. On a scale from 0 to 100, please indicate the degree to which your judgement of speech sounds was affected by the telehealth scoring condition – built-in microphone:

   | 0 | | | | | | | | | | | | | | | | | | | | | 100 |

   c. On a scale from 0 to 100, please indicate the degree to which your judgement of speech sounds was affected by the telehealth scoring condition – external microphone

   | 0 | | | | | | | | | | | | | | | | | | | | | 100 |

12. Reasons I would prefer to administer a speech sound assessment remotely:

_____________________________________________________________________________

13. Reasons I would not prefer to administer a speech sound assessment remotely:

_____________________________________________________________________________

14. The future of teleassessments is:

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

15.
Appendix I:
Copyright Permission

From: Permissions Asha Permissions@asha.org
Subject: Re: Dissertation article titles
Date: June 10, 2021 at 3:04 PM
To: Campbell, Deborah drcampbell1@usf.edu

Dear Deborah:

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 Provisional permission is granted to reprint *Evolution of Telehealth Technology, Evaluations, and Therapy: Effects of the COVID-19 Pandemic on Pediatric Speech-Language Pathology Services* in your forthcoming dissertation. If the article is not accepted by AJSLP, then ASHA’s permission to reprint is null and void.

Best regards,

Libby

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From: Campbell, Deborah <drcampbell1@usf.edu>
Sent: Thursday, June 10, 2021 2:59 PM
To: Permissions Asha <Permissions@asha.org>
Subject: Re: Dissertation article titles

Hi Libby,

Here is the first one:

(In press)
Ref.: Ms. No. AJSLP-21-00013R2
Genesis of a New Generation of Telepractitioners: Effects of the COVID-19 Pandemic on Pediatric Speech-Language Pathology Services
American Journal of Speech-Language Pathology

(Under review)
Ref.: Ms. No. AJSLP-21-00069R1
Evolution of Telehealth Technology, Evaluations, and Therapy: Effects of the COVID-19 Pandemic on Pediatric Speech-Language Pathology Services
American Journal of Speech-Language Pathology

I really appreciate you helping me!
Thank you!!!

**Deborah R. Campbell, M.A., CCC-SLP**
Owner/President, Superior Therapy Services, Inc.
Licensed and Certified Speech/Language Pathologist
Early Interventionist
Swallowing Specialist
Certified Dyslexia Testing and Treatment Specialist
Educational Therapist

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On Jun 10, 2021, at 2:55 PM, Permissions Asha <Permissions@asha.org> wrote:

Dear Deborah:

It was a pleasure speaking with you earlier. Please send me the titles of the two article that will appear in your dissertation, and I will send back the permission to reprint.

Best regards,

Libby

Libby Bauer
Pronouns: She/her/hers
Director of Operations & Product Management
Serial Publications
American Speech-Language-Hearing Association