Working Paper on TeleAssessment for Childhood Language Disorders

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A Note to our Readers:

This document is considered a work in progress meant to aid your clinical decision making during these unprecedented times. Suggestions for improvements, amendments, or updates to existing documentation, and helpful tips and tricks of teleassessment are welcomed. Comments will be considered and incorporated as received and updates noted at the top of the document.

Please send all collaborative feedback to:
https://docs.google.com/forms/d/e/1FAIpQLSezZBaegXGNyhh81E1AV_QMfSV5CawgfXE1hPjgE_-PcgJVIA/viewform?usp=pp_url

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The use of telepractice by speech-language pathologists has significantly increased as a function of the pandemic. Although the practice has increased as an alternative service delivery model, it is likely to continue and flourish in the future-even after the present pandemic is over.

Speech-Language Pathologists interested in pursuing this mode of service delivery should continue to abide by their professional Code of Ethics which requires ASHA members and individuals under their supervision to:

Hold paramount the person they serve professionally,
Maintain the highest level of professional competence and performance, and
Advocate for the unmet communication and swallowing needs of the public.

These ethical principles should guide us in our decision-making process and require us to provide the highest quality of services to our patients/clients, enhance our professional competence and expertise, and advocate for appropriate services for our clients/patients.

1. Initial referral, assessment, diagnosis

Evidence-Based Practice clearly indicates that the earlier a child is identified, the better the outcome. In order to ensure timely and accurate identification, it is critical that we consider the costs of over and under-identification, the validity of assessments done via tele-practice, and the role that facilitators or altered environments might play on the results and judgements of equivalency . **An SLP has the obligation to weigh the risks of each concern and determine**

which concerns to weigh most highly on a case-by-case basis. We examine each of these concerns in turn.

Delayed diagnosis or Under-diagnosis

The primary cost of delayed/under diagnosis is in terms of lost opportunity for treatment, leading to delayed opportunities to access support. Importantly, this cost increases the longer that the pandemic continues and the longer in-person services are not available if tele-assessment is not offered as an alternative. Long term consequences of speech/language impairments include reduced academic success, limited employment, and increased mental health concerns.

*McGill, N., Crowe, K., & Mcleod, S. (2020). "*Many wasted months": Stakeholders' perspectives about waiting for speech-language pathology services*. International Journal of Speech-Language Pathology, 1-14.* *https://www.tandfonline.com/doi/abs/10.1080/17549507.2020.1747541?journalCode=iasl20*

Arguments have been made for the use of tele-practice to serve clients who have difficulty getting to a provider due to living in rural locations, suggesting that the ethical concerns about over/misdiagnosis are mitigated when access is a barrier to services and the concern about under-diagnosis should be prioritized.

Wilson, L., Lincoln, M., & Onslow, M. (2002). Availability, access, and quality of care: Inequities in rural speech pathology services for children and a model for redress*. Advances in Speech Language Pathology, 4(1), 9-22.* *https://www.tandfonline.com/doi/pdf/10.1080/14417040210001669191?needAccess=true*

There is liability for failure to act under ChildFind https://www.wrightslaw.com/info/child.find.index.htm

Current federal Dept of Education guidance suggests that FAPE applies whether schooling is in person or remote. https://sites.ed.gov/idea/secretary-devos-declines-to-seek-congressional-fape-lre-waivers-to-idea-requirements

Misdiagnosis or Overdiagnosis

The primary costs here are the mental/emotional costs of receiving a diagnosis when typical or being misdiagnosed with the wrong concern and receiving incorrect or unneeded intervention. There is also an economic cost of providing unnecessary services/increased caseload for unnecessary services. One way to mitigate against this would be provisional diagnosis or support until in-person assessment is possible. Over-diagnosis may lead to stigmatization and discrimination. Children rarely leave special education case-loads once on them.

These fears are real, but actual cost is not well documented. A literature search plus a social media call yielded no references to document this cost.

The primary literature that exists on the cost of over-identification is in regards to AAE-speaking and/or bilingual children. As with brick and mortar assessments, part of our clinical competencies as professionals include understanding diverse cultural and linguistic differences when performing evaluations. These children are likely to be both over- and under- diagnosed. It is unclear if this would be any different via telehealth.

Grimm, A., & Schulz, P. (2014). Specific language impairment and early second language acquisition: the risk of over-and underdiagnosis. *Child Indicators Research, 7(4), 821-841.*https://link.springer.com/article/10.1007/s12187-013-9230-6

Robinson, G. C., & Norton, P. C. (2019). A Decade of Disproportionality: A State-Level Analysis of African American Students Enrolled in the Primary Disability Category of Speech or Language Impairment. *Language, Speech, and Hearing Services in Schools, 50(2), 267-282.* https://pubs.asha.org/doi/abs/10.1044/2018_LSHSS-17-0149

2. Assessment selection and administration: TeleAssessment norms, equivalence, validity, reliability

<u>Paper based tests weren't normed for tele-administration.</u>
True! And tests are unlikely to be renormed fast enough to be useful. Re-norming is a massive undertaking. Waiting for new norms may mean a very long wait.

<u>Some tele-administration tools ARE available and are costly.</u>
Yes, BUT… The tests in Pearson Q-Global assessment suite (e.g., CELF5, CELF5 Meta, PLS5 screener & test, CELF4 Spanish, CELFP3 screener & test, GFTA3 Spanish&English, PPVT5, EVT3) have questionable norms for use with AAE speakers anyway - they both over-diagnose (when administered using traditional scores) and under-diagnose (when administered using corrected scores). Thus, the online assessment suite is useful for white, mainstream English speakers . Other tools should be used for speakers of non-mainstream (white) dialects and bilingual speakers. There is a tension between selecting tests with current norms, valid use over telepractice, and culturally appropriate scoring procedures. Problems with any one of these violate the guidelines for culturally appropriate practice but waiting for access to non-telepractice based test causes delay in assessment. Perfect choices that balance all concerns are not present at this time.

Barragan, B., Castilla-Earls, A., Martinez-Nieto, L., Restrepo, M. A., & Gray, S. (2018). Performance of low-income dual language learners attending English-only schools on the Clinical Evaluation of Language Fundamentals–Fourth Edition, Spanish. *Language, Speech, and Hearing Services in Schools, 49(2), 292-305.* https://pubs.asha.org/doi/abs/10.1044/2017_LSHSS-17-0013
Hendricks, A. E., & Adlof, S. M. (2017). Language assessment with children who speak nonmainstream dialects: Examining the effects of scoring modifications in norm-referenced assessment. *Language, Speech, and Hearing Services in Schools, 48(3), 168-182.* https://pubs.asha.org/doi/abs/10.1044/2017_LSHSS-16-0060

Ventris has made the DELV available in a teleassessment version - you have to reach out to them for access. https://www.ventrislearning.com/ventris-learning-login/delv-samples/ The TILLS is pivoting; the QUILS is available. Contact test authors or publishers if you are interested in using tele-versions of the test or want access to pdfs of materials. They will frequently accommodate you for a limited time, particularly if you already own the assessment.

Pearson's most recent statement on the use of their copyrighted materials for teleassessment purposes:
https://www.pearsonassessments.com/content/dam/school/global/clinical/us/assets/telepractice/Letter-of-no-objection.pdf

It is worth noting that language samples CAN BE norm-referenced unbiased standardized assessments and there is evidence for equivalency of language samples between tele-and in-person administration methods. See, for instance, the SALT website for norms and administration procedures. https://www.saltsoftware.com/

Normative assessments are not required under IDEA for identification of children.
If normative assessments aren't required we can use informal assessments via tele-health and not worry about tracking down tele-health specific standardized norm-referenced assessments. Federal guidance does not require norm-referenced standardized scores. These tests should guide our thinking rather than tie our hands. Read the federal law here. https://sites.ed.gov/idea/regs/b/d/300.304

> *"Use a variety of assessment tools and strategies to gather relevant functional, developmental, and academic information about the child, including information provided by the parent, that may assist in determining eligibility"*
> *"Not use any single measure or assessment as the sole criterion for determining whether a child is a child with a disability and for determining an appropriate educational program for the child"*
> *"Use technically sound instruments that may assess the relative contribution of cognitive and behavioral factors, in addition to physical or developmental factors."*

Individual states implement this law in policy and provide more specific guidance - Delaware specific guidance is here. https://regulations.delaware.gov/AdminCode/title14/900/925.shtml DE specific guidance does currently require the use of a *norm-referenced assessment* but it depends on the domain. Please note that this information is under active review by DOE of Delaware and stakeholder groups.

See for example, the language for diagnosis of Developmental Delay. (Section 6.7)

> *6.7.2 Multiple sources and methods of information shall be used in the determination of eligibility for service provision. An assessment **shall include,** but not be limited to, the following sources of information:*
> *6.7.2.1 Developmental and medical history;*
> *6.7.2.2 Interview with the child's parent or primary caregiver;*
> *6.7.2.3 Behavioral observations;*
> *6.7.2.4 **Standardized norm referenced instruments;** and*
> *6.7.2.5 Other assessments which could be used for intervention planning, such as dynamic or criterion referenced assessments, behavior rating scales, or language samples.*

Focus on Equivalency – Can I use the Published Norms anyway?
We would not consider minor changes in situation to invalidate the norms (e.g., giving in a quiet classroom vs. a private clinic vs. a home environment or if given by a man vs. a woman). Equivalency is when you assume that the norms are interpretable because the online and in person testing situations are sufficiently equivalent. In some cases, evidence is available about equivalence.

This is likely true for some types of tests and not others and the SLP should engage in careful task analysis to make this determination in the absence of evidence, taking into account both the type of input to elicit a response and the mode of responding. For instance, parent questionnaires are likely equivalent in person and over videoconference. Showing picture stimuli and eliciting a verbal response is also likely possible with adequate audio input and output. Untimed comprehension measures require adequate audio input to the child and a way to measure the response (see third camera hack below from pearson, consider use of annotate feature for older kids, verbal responses such as Number 1, or the one with a red square around it my work for younger children). Timed assessments and assessments with many small manipulatives or the need to match cards to a visual may be more difficult to convert (though we have been able to develop power points with shared screen control to manage manipulatives, we have not been able to confidently replicate timed assessments). Equivalency for a test may be true for one testing situation and not another and clinical judgement is required. Some examples of where equivalence has been documented are below.

Manning, B., Harpole, A., Harriott, E., Postolowicz, K., & Norton, E. (2020). Taking Language Samples Home: Feasibility, Reliability, and Validity of Child Language Samples Conducted Remotely with Video Chat Versus In-Person.https://psyarxiv.com/23u8a/

Schutte, J. (2013). Usability and reliability of Autism Diagnostic Observation Schedule (ADOS) module 4 remote administration (Doctoral dissertation, University of Pittsburgh). http://d-scholarship.pitt.edu/16920/

Validity & the use of facilitators or what can be done when you feel like the adults are providing the answers?

Threats to validity can come from a variety of sources, but the one raised most often has to do with parents (or siblings or other members of the houshold) providing the answers instead of the child themselves. Pearson suggests minimizing the role of parents or using trained facilitators only. This is likely to be infeasible in the time of COVID-19 when it is risky for a trained facilitator to enter a household. Thus, an evaluator will need to consider how to manage and mitigate against parental/adult interference just as one would for in-person testing with an adult in the room.

What can you do?
- Ask the child, but not the parent, to use a headset so only the child hears the stimuli.
- Third camera support (see section below)
- Use the chat box to direct parents and coach them to minimize interference.
- Use a script to talk about assessment expectations and how that might adversely affect their child's testing outcomes and services.

Some version of this script could work well:

"Thank you for taking the time to log on today and support your child's assessment needs. This part of the evaluation is just a small part of what I take into account when evaluating your child's (speech/language) skills and abilities. Some parents/guardians have expressed the worry that their child is not going to "show what they know." Be assured that if it feels like a really "off" day, we'll discontinue testing and try on another day.

An additional, helpful support you can put in place during this testing is to answer or provide answers *only* when I ask you to help. At times, the audio or video can be problematic and I'll need your help to hear exactly what your child said. This way I'll have the most accurate

understanding of your child's skills and abilities. What questions can I answer for you about this part of the evaluation?"

If you administer live, you can report what level of support parents were providing and factor that into your expert clinical decision making.
https://www.pearsonassessments.com/content/dam/school/global/clinical/us/assets/telepractice/facilitators-role-w-telepractice.pdf

Below is a YouTube video on the Pearson 3rd camera hack (The GAAB lab paper referenced below accomplishes something similar with a smartphone camera and a coffee mug):
With the help of a parent/guardian's smartphone this video will step you through setting up a third camera during your assessment using common household objects, viewing all four corners of your examinee's screen during the assessment.
https://www.youtube.com/watch?time_continue=3&v=yuhY0rjqQw0&feature=emb_logo

Below is a YouTube video rating various document cameras:
https://www.youtube.com/watch?v=46RkUEJwwiU

Below is a YouTube video review of various smartphone tripod mounts:
https://www.youtube.com/watch?v=NtMqniOIkyA

Pearson webinar on assessment via telepractice:
https://www.pearsonassessments.com/professional-assessments/blog-webinars/webinars/2020/05/assessment-via-telepractice--office-hours-for-slps.html

3. Practical Considerations

Tech Check- Check technology prior to bringing children into the interaction
We have found that a 'tech check' has been incredibly helpful prior to telepractice sessions and could be useful for tele assessment sessions. This is a time to go over Zoom features, contact information, and guidelines. Reviewing this without the child present preserves their energy for when the assessment actually begins – possibly on a different day.

Contact Information: It could be helpful to get a parent or guardian's phone number at the time of the assessment in case of technology issues affecting Wi-Fi connectivity or in case of emergency.

Zoom Introduction: Go over features that could be used during the tele assessment and subsequent telepractice therapy sessions such as using meeting links, turning video and audio on/off, chat function, screen-sharing, annotation, etc.

Parent/Guardian Guidelines: If your district or agency requires an adult to be present during telepractice sessions, go over technology helper guidelines prior to starting the tele assessment. See Use of Facilitators section above for additional information. Ensure that everyone is on the same page!

Technology Troubleshooting: New Zoom users might benefit from troubleshooting prior to the start of the tele assessment or telepractice session. Some aspects that we have found useful include:
- Open dialogue to discuss lagging audio, video, etc.
- Moving closer or further away from the computer to help with audio quality

- Turning on lights, moving to well-lit areas, ensuring you see the whole client prior to beginning the session

Coach Families to Provide an Environment that Supports Valid Assessments

We have found it to be helpful to include a statement regarding environmental considerations (i.e., lighting, audio, background noise, distraction-free environment, etc.) prior to conducting tele assessment sessions. The statement can be included in the Zoom meeting invitation. A sample statement is as follows:

"A few brief reminders for our participants:
- A quiet space free from distractions is preferred.
- An overhead light source and a good sturdy chair to sit in is greatly appreciated!
- Please encourage all snacks or food to be delayed until after our time together.
- Headphones are helpful to maintain attention.
- It is important to be within the same general space as your child during the assessments to help with any "tech" troubles that may occur."

Devices- Ask families to use the same device in assessment as in the tech check

It is important to consider the device that the client is using at the time of the assessment. Different features may not be available on different devices (i.e., PC, Mac, Chrome book, iPad, other tablets, phones) or may be accessed in alternative ways. For instance, the annotate feature, which is necessary for certain assessments, may be difficult to access if using an iPad or a chrome book. Features also may be color-coded differently or located in alternate places depending on the device the client is using. It is advised to have a general understanding of what the online meeting platform looks like on a variety of devices to best troubleshoot any tech issues that may arise.

Video

Video quality depends on several factors:
- Speed of internet connection (1.8 Mbps for upload and download speed in 1:1 video session and 3 Mbps in group session)
- Speed of computer processor (quad core processor or faster for screen sharing)
- High-definition (HD 1080p) camera
- Random Access Memory (4 GB)
- Number of users sharing your internet connection
- Number of applications opened
- Proximity to the router

Video quality can be improved by ensuring that you have the recommended speed and equipment. One way to test the speed of your internet is to use Ookla speedtest (www.speedtest.net). If your speed is slower than recommended, boost your signal by moving closer to your wireless router, use a docking station with ethernet/wired connection, and/or ask other users in the household to log off. If your speed is adequate but the video quality is still poor, another way to speed up your computer is to close down unnecessary programs, open screens or connection to any external VPN network (to access files from a secured clinic or school server). Taking steps to improve video quality normally resolves audio issues as well.

<u>Audio</u>

Audio quality depends largely on the speed of internet connection and computer processor. Improvement of audio quality is similar to the steps taken to sharpen the video image. However, if the audio is defective or distorted, alternative options include using headphones, using a phone to dial-in, or turning off the video display.

Sutherland, R., Trembath, D., Hodge, A., Drevensek, S., Lee, S., Silove, N., & Roberts, J. (2017). Telehealth
  language assessments using consumer grade equipment in rural and urban settings: Feasible, reliable
  and well tolerated. *Journal of Telemedicine and Telecare, 23(1), 106-115.*
  https://doi.org/10.1177%2F1357633X15623921

<u>Using Powerpoint/Google Slides to Create Materials</u>

 assessments not available in electronic versions.

- Captured images or photos of test items can be enlarged and labeled with text as another method for the child to respond (e.g., the child is unable to match or point, but could call out numbers or letters). The child can use the annotate function or name the letter, shape, color of the selected item.
- For cases where matching picture cards to the stimulus books is required, the scanned stimulus book can be set as the slide background and the scanned picture card can be an object that can be moved. Be sure to set a 'table' or neutral visual area to present the cards and to maintain the aspect ratios/scale of the stimulus book and the picture cards.
- Also, the slide's note section with assessment instructions can serve as a teleprompter. This is achieved by using the "Advanced Share" option in Zoom (outlined below) to select and display only the portion of the slide above the notes. Under this working mode (i.e. **not** in "Presentation" mode) and "Share screen" option in Zoom, the child can manipulate different images on the screen to match objects or indicate the correct item, provided they are using a PC or Mac.

<u>Zoom Logistics</u>

- ***Screen-Share:*** The screen-sharing feature on Zoom can be found in the middle of the toolbar, in green. Screen-share is arguably the most crucial aspect of teleassessment success and can be used to share stimuli necessary for a myriad of assessments. In some instances, screen share might only be available if you are the host or co-host of the meeting. Ensure that the green screen share icon is an option prior to your sessions by clicking the green screen-share icon. There, you should find multiple potential windows available to share, including your assessment stimuli.
- ***Share Computer Sound:*** If your assessment requires audio, you must check off the "share computer audio" box in the lower left-hand corner of the screen-share page prior to sharing your screen. If it does not work the first time, you will have to stop sharing screen, and then reshare after clicking the box.
- ***Advanced-Screen Share Options:*** For some assessments (if test stimuli are on Powerpoint slides for instance), you might want to share only a portion of the screen. This can be completed using the advanced screen share options on the screen-share page. After clicking the "portion of screen" option, a green or orange box will pop up. Drag this box to the portion of the screen you would like to share.
- ***Annotation:*** The annotation feature on Zoom can be found in the toolbar on the main screen accompanied by a pencil icon. If not directly on the Zoom toolbar, "annotate" can

be found by clicking the "More" tab. While screen sharing, annotation allows some examinees with supporting technology to draw, type out a message, or stamp on the screen. While you are screensharing assessment stimuli, the child or adult facilitator will have to click the "view options" tab at the top of your shared screen and then click "annotate". Some devices, for whatever reason, do not have an option to annotate, so be sure to check in with your client prior to starting the assessment.

- ***For teleassessment activities that require a "pointing" response from the examinee, the draw and stamp annotation options will be useful!***
- ***Draw:*** This will allow children to draw freehandedly on the screen or use a variety of shapes such as arrows to mark a choice. As teleassessment evaluators, we have found the draw option useful in administration of tests such as the GFTA-3, using the arrow feature to "point" in order to adhere as closely as possible to the question prompt demands within the original test. Keep in mind that annotation drawings must be cleared before moving to the next stimulus item and can be achieved by clicking the clear all drawings option.
- ***Stamp:*** The stamp annotate option allows children to choose from different stamps such as an arrow, star, or heart. We found that letting younger children choose their stamp helped to keep them engaged. In terms of teleassessment, we have found the stamp option to be useful for tests of receptive language, such as the PPVT5 and DELV, in which a child must choose the appropriate selection. Some assessments come with numbered or lettered pictures, the child chooses the corresponding number or letter of their choice orally. For some younger students, who might not yet understand the numbers or letters, stamping could be an alternative response mode.
- ***Hide Self-View:*** While working with young examinees, it is a possibility that they might get distracted by seeing themselves on the Zoom screen! Luckily, Zoom offers the "hide self-view" option for each Zoom participant which will turn off the participants' video and minimize the distraction of self. Enabling this feature will require the assistance of a parent/guardian.
- ***Steps for Hiding Self-View on Zoom:***
- Have the child or helper hover over the top right-hand corner of their video screen while you are sharing your screen. ***This will only work if you are already sharing screen!***
- Once hovering, they will see an ellipses (…) icon – have them click that.
- Hide-Self View will be one of the few options – click that and they should not be able to view themselves while the assessment is taking place.

Pearson Q-Global
Overview
Q-Global allows clinicians to administer assessments on-screen, send assessments remotely, input assessments results to determine scoring results, and develop assessment reports from any computer connected to the internet.

Useful Resources on Q-Global:
- **New Examinee**: This section allows the clinician to create profiles for individual clients. Note: It is possible to administer assessments on Q-Global without creating an examinee. This function is useful for clinicians who would like to utilize the assessment

report that is generated by Q-Global. When creating a new examinee, Q-Global will ask for the following information:

- Demographics
- Developmental milestones
- Specific evaluation areas
- Background information

- **Assign New Assessment**: After a new examinee has been created, the next step is to assign a new assessment to a particular client.
- **Create a Group**: This function can be useful in several situations:
  - Analyzing average group scores among clients that have completed the same assessment
  - Keeping all clients organized in one area of Q-Global
- **Resource Library:** This section contains materials necessary for administration. Information is split into two folders: general and restricted. Assessments are listed in alphabetical order.

  General:
  - Administration instructions
  - A file titled "Using your Digital Assets on Q-Global," which provides general tips on using the digital material

  Restricted:
  - Stimulus books
  - Manuals

Navigation Tips

- In most assessments, content is hyperlinked
  - Clicking a specific training item or start point will take you directly to the preferred item
  - Example: clicking on a specific age range (i.e., 2:0-2:11) will take you to the starting point for a client in that age range
  - If you want to return to home, clicking the home button will take you back to the screen with the training items and start points
- Can use the on-screen arrows (when applicable) or computer keyboard arrows to navigate
  - Generally, the right arrow key on the keyboard can be used to advance
  - The on-screen up and down arrows (generally located in the top left corner) can be used to advance or go back
- The annotation feature or mouse movement is useful in instances when the clinician is prompted to point to a specific part of the picture
  - Example: "This is a house, *this* is a door" in the GFTA. The clinician would point to the door with their mouse or with an arrow via the annotation feature.

4. TeleAssessment in the literature – Selected Papers

General recommendations and guidelines for remote assessment of toddlers and children.

King, C. J., Garrisi, K., Hillyer, L., Gaab, N., & Gaab, N. (2020). General recommendations and guidelines for remote assessment of toddlers and children. *OSF Preprints. September, 5.* https://osf.io/wg4ef/

Overview: Essentially similar guidelines as those we provide here. The Gaab lab is a well-known reading research lab. Their reference list may be especially useful for identifying other papers and resources relevant for telepractice.

A review of the efficacy and effectiveness of using telehealth for pediatric speech and language assessment.

Salvo, L.(2013). Efficacy of Using Telepractice Via the Internet to Assess Children's Language Abilities. The William Paterson University of New Jersey, ProQuest Dissertations Publishing. Retrieved from https://search.proquest.com/openview/90e23e8213a2f393250e4aa9808835bb/1?pq-origsite=gscholar&cbl=18750&diss=

Overview: Salvo reported in the master thesis that delivering CELF-4 Screening Test with video conferencing technology (i.e., Skype) produced valid results. Ten children ages 5;1 to 6;5 were assigned in the telepractice group and another ten in the control group (face-to-face assessment). There were similar responses obtained from online screening when compared with in-person sessions. These results indicate that online screening, such as CELF-4 is a possible alternative to use when in-person assessment is not possible. However, the finding of reliability may be more robust if the same set of students were assessed both online and in-person.

Reynolds, A. L., Vick, J. L., & Haak, N. J. (2009). Telehealth applications in speech-language pathology: A modified narrative review. *Journal of Telemedicine and Telecare, 15(6), 310-316. Retrieved from* http://etd.auburn.edu/handle/10415/1044 *doi:10.1258/jtt.2009.081215*

Overview: Reynolds and Haak (2009) conducted a modified narrative review of telepractice in the past 25 years. Evidence-based outcomes varied among 28 articles reviewed. Of the six studies that received a score or 1 or 2 (from a checklist adapted from the Scottish Intercollegiate Guideline Network), only five had a high level of evidence indicating equivalency of telepractice outcomes to those of face-to-face. The other 22 articles support telepractice as well but with low ratings of internal and external validity. Overall, more high-quality research is needed especially, since internet technology and its application have evolved over the past decade.

Taylor, O. D., Armfield, N. R., Dodrill, P., & Smith, A. C. (2014). A review of the efficacy and effectiveness of using telehealth for paediatric speech and language assessment. *Journal of Telemedicine and Telecare, 20(7), 405–412.* https://doi.org/10.1177/1357633X14552388

Overview: Research regarding the efficacy and effectiveness of using telehealth for pediatric speech and language assessment was limited in previous years (2014). However, promising preliminary findings that should be considered included the following:
Preliminary evidence that telepractice can be used to make valid assessments of oral motor function, speech intelligibility and language.

Articulation screening via telepractice platform is judged to be valid, however, more research is needed regarding the effectiveness of comprehensive articulation assessments via telepractice. Intra-rater and inter-rater reliability via telepractice was significant for all speech and language tasks besides assessment of oral motor functioning.

Discrepancies between face-to-face and telepractice assessment were clinically relevant, and included individual oral motor tasks, judgement of individual speech sounds, detection of pluralization, and discrimination between similar sounding words.

Duffy, J. R., Werven, G. W., & Aronson, A. E. (1997, December). Telemedicine and the diagnosis of speech and language disorders*. In Mayo Clinic Proceedings (Vol. 72, No. 12, pp. 1116-1122). Elsevier. Retrieved from* [*https://www.sciencedirect.com/science/article/abs/pii/S0025619611636732*](https://www.sciencedirect.com/science/article/abs/pii/S0025619611636732)

Overview: A review of three Mayo Clinic sites as well as the NASA Advanced Communications Technology Satellite (ACTS project) which included a speech-language pathology "consultation-by-satellite experience" for diagnoses of acquired speech and language disorders. In general, telepractice evaluations of speech and language were deemed appropriate, reliable and beneficial modes of consultation for facilities in rural settings as well as within large multidisciplinary medical settings. The researchers concluded that "telemedicine represents a viable alternative to face-to-face consultation when distance precludes timely and cost-effective service or when specialized expertise is unavailable" (p. 1122).

Jessiman, S. M. (2002). Speech and language services using telehealth technology in remote and underserviced areas. *Journal of Speech Language Pathology and Audiology, 27(1), 45-51. Retrieved from* [*https://www.cjslpa.ca/files/2003_JSLPA_Vol_27/No_01_1-92/Jessiman_JSLPA_2003.pdf*](https://www.cjslpa.ca/files/2003_JSLPA_Vol_27/No_01_1-92/Jessiman_JSLPA_2003.pdf)

Overview: This article examines whether telehealth is an effective and efficient service-delivery method for providing speech and language therapy in remote and underserved areas in northern Alberta. The researchers compared the administration of telehealth and in-person assessments to compare the audio quality and overall efficacy of telehealth. Several technological and logistical problems were noted, although suggestions regarding appropriate equipment, room setup, personnel, and client selection were developed to accommodate for these problems. Despite these challenges, the researchers concluded the telehealth appears to be a promising service-delivery method.

Kelso, G. L., Fiechtl, B. J., Olsen, S. T., & Rule, S. (2009). The feasibility of virtual home visits to provide early intervention: A pilot study*. Infants & Young Children, 22(4), 332-340. Retrieved from* [*https://journals.lww.com/iycjournal/Fulltext/2009/10000/Coaching_Families_and_Colleagues__A_Process_for.9.aspx?casa_token=Y3GIX8O3ZwgAAAAA:dKkTj8zgQqg-SoTfEtMO5mEVyIoGA6UFs8W54DbItv0yQVcd2QtklipugBRTil9UN0d8kUmF9cPXlbnc4YoT4og*](https://journals.lww.com/iycjournal/Fulltext/2009/10000/Coaching_Families_and_Colleagues__A_Process_for.9.aspx?casa_token=Y3GIX8O3ZwgAAAAA:dKkTj8zgQqg-SoTfEtMO5mEVyIoGA6UFs8W54DbItv0yQVcd2QtklipugBRTil9UN0d8kUmF9cPXlbnc4YoT4og)

Overview: Kelso, Fiechtl, Olsen, & Rule (2009) reported that most families that received virtual home visits (VHV) for early intervention were satisfied with the delivery. An average cost-saving of about $500 per year/child from travel time, mileage reimbursement and online session. Although parents had a positive experience with training and coaching sessions, no child

outcome data were collected from these seven families. Therefore, it is difficult to determine if online assessments produce similar results as in-person for the child.

Waite, M. C., Theodoros, D. G., Russell, T. G., & Cahill, L. M. (2010). Internet-based telehealth assessment of language using the CELF-4*. Language, Speech, and Hearing Services in Schools, 41(4), 445-458. doi:10.1044/0161-1461(2009/08-0131)4*

Overview: This article aimed to validate an internet-based telehealth system for assessing childhood language disorders. Researchers explored this using the core language subtests of the Clinical Evaluation of Language Fundamentals-4th Edition (CELF-4). Participants were assessed online and in-person simultaneously and were scored by both the online and in-person speech-language pathologists. Results indicated that there was not a significant difference between the online and in-person scores for each subtest. The researchers concluded that telehealth is a valid and reliable method of administering and scoring the core language subtests of the CELF-4.

Stuart Ekberg, Susan Danby, Maryanne Theobald, Belinda Fisher & Peta Wyeth (2019) Using physical objects with young children in 'face-to-face' and telehealth speech and language therapy*. Disability and Rehabilitation, 41:14, 1664-1675, DOI: 10.1080/09638288.2018.1448464*

Overview: Ekberg and colleagues explore ways speech-language pathologists can integrate physical objects into therapy sessions for young children with speech and language needs, and the differences/ similarities between how it is used via telehealth and face-to-face when implementing play-based therapy. Through the analysis of video recordings, results showed that therapists change the way they use physical objects in therapy depending on the modality being used. Though some objects may be used the same way in various modalities, others may need to be adapted or require an alternative. Further research is needed to better understand how various types of telehealth technologies impact different populations.

Manning, B., Harpole, A., Harriott, E., Postolowicz, K., & Norton, E. (2020). Taking Language Samples Home: Feasibility, Reliability, and Validity of Child Language Samples Conducted Remotely with Video Chat Versus In-Person. https://doi.org/10.31234/osf.io/23u8a

Overview: This study demonstrates feasibility of collecting child language samples via video chat for analysis of language measures. Best practices for maximizing data quality are provided. Employing telehealth or remote data collection via video chat may allow underserved and more diverse children and families to participate in clinical and research activities.

Waite, M. C., Cahill, L. M., Theodoras, D. G., Busuttin, S., & Russell, T. G. (2006). A pilot study of online assessment of childhood speech disorders. *Journal of Telemedicine and Telecare, 12(3_suppl), 92–94. https://doi.org/10.1258/135763306779380048*

Overview: This pilot study conducted in Brisbane, Australia, explores the feasibility of assessing childhood speech sound disorders using an Internet-based system. Six children with a speech sound disorder were assessed in single-word articulation, intelligibility in conversation, and oro-motor structure and function. Results show that assessing children online may be as reliable as assessing them in-person, as evidenced by high inter-and intra-rater reliability

between the two scoring environments across most measures. Overall, Internet-based assessment protocols of pediatric speech sound disorders appear promising though further research is needed.

Chapter on telehealth with kids in SLP. *Everyday Technologies in Healthcare. (2019). United Kingdom: CRC Press.*