"HEAR HERE, HEAR THERE, HEAR EVERYWHERE":

SUCCESSFUL CHARACTERISTICS FOR HEARING

SCREENING APPS USED FOR TELEPRACTICE

by

Eric Ryan Rodriguez

HONORS THESIS

Submitted to Texas State University
in partial fulfillment
of the requirements for
graduation in the Honors College
May 2019

Thesis Supervisor:

    Maria D. Reséndiz

Second Reader:

    Emilie A. Galemore

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

This work is protected by the Copyright Laws of the United States (Public Law 94-553, section 107). Consistent with fair use as defined in the Copyright Laws, brief quotations from this material are allowed with proper acknowledgement. Use of this material for financial gain without the author's express written permission is not allowed.

Duplication Permission

As the copyright holder of this work I, Eric R. Rodriguez, authorize duplication of this work, in whole or in part, for educational or scholarly purposes only.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Description

ASHA – American Speech-Language-Hearing Association

EBP – Evidence-Based Practice

SIG – Special Interest Group

SLH – Speech-Language-Hearing

ABSTRACT

Clients who receive speech-language intervention via telepractice must have a hearing screening prior to any intervention. This study investigates which characteristics are essential for a successful hearing screening smart device app. The study also evaluates which characteristics in apps strengthen or weaken the app's user-friendliness, accuracy, or explanation of results.

The American Speech-Language-Hearing Association (ASHA) considers "best practice" to have certified personnel perform a hearing screening before intervention. Access to appropriate personnel is limited in rural domestic areas and internationally. The use of hearing screening apps has been researched, but more research is necessary to test the efficacy and accuracy of currently available apps.

Evidence-based practice evaluates published research, client perspectives, and perspectives of professionals. Following the framework of evidence-based practice, responses of two groups of participants were analyzed to determine characteristics for successful apps: professionals and potential clients. Both groups of participants self-administered all three hearing screening apps and were surveyed over the apps' user-friendliness, accuracy, and explanation of results. Additionally, professional participants were interviewed to gather additional information about specific features and characteristics that strengthen or weaken the app.

Professionals' and potential clients' survey results indicated that both groups identified what constitutes user-friendliness and accuracy but were unable to identify what constitutes a good explanation of results. The professionals identified what specific characteristics strengthen or weaken an app's user-friendliness, accuracy, or explanation of results.

I. INTRODUCTION

Telepractice is an option available for people who might not otherwise have access to speech, language, or hearing services (ASHA, 2020d). This allows the speech-language-hearing (SLH) professionals to meet with the client via video conferencing or other means to achieve the same goals as in-person therapy. SLH professionals include speech-language pathologists, audiologists, and researchers (ASHA, 2020b). Although telepractice is a valid manner to administer therapy, the American Speech-Language-Hearing Association (ASHA) mandates that "the use of telepractice must be equivalent to the quality of services provided in person" (2020d). Equal quality of services includes a hearing screening prior to any form of assessment or intervention.

ASHA's Standards for Screening and Telepractice

Prior to performing any treatment or assessment for speech therapy, a SLH professional must perform a hearing screening to determine if hearing is within normal limits (ASHA, 2004, 2006). This first step is critical in determining the course of (re)habilitation. If the client cannot hear the phoneme (the sound that is being produced), no amount of clinical work will correct the communication error (Bauman-Waengler, 2016).

For clients participating in a speech-language evaluation via telepractice, the hearing screening is still a requirement (ASHA, 2016). However, in some rural areas and developing countries, hearing screenings are not easily accessible (Lancaster et al., 2008; Goulios & Patuzzi, 2008). SLH professionals must maintain best practices even when individuals may lack access to the personnel who perform hearing screenings.

Basis of Evidence-Based Practice

When determining the most appropriate form of assessment or treatment, evidence-based practice (EBP) requires that professionals consider three core components: best research evidence, client values and preferences, and clinical expertise (ASHA, 2020a; Dolloghan, 2007). EBP is the framework for this study. The literature review of the application of hearing screenings in rural areas and developing countries will contribute to the external scientific evidence that drives current practice. The survey given to the student participants serves as the client perspective. The survey and interviews with the SLH professionals serve as the clinical expertise.
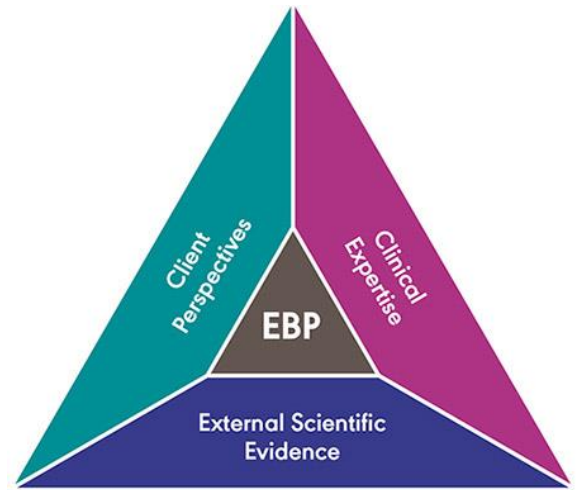
Figure 1: Components of evidence-based practice (ASHA, 2020a)

Previous Research and Literature

The literature that is currently published regarding hearing screening applications is limited in scope. While most research focuses on the opinions and draws upon the clinical expertise of SLH professionals when evaluating hearing screening technology, there is limited research about the client's perspectives. There is even less research that compares the perspectives of professionals and clients mandated by EBP. Previous research typically evaluated the accuracy of hearing screening technology. However, there is a lack of research regarding what specific characteristics constitute a successful app.

Swanepoel & Hall (2010) completed a systematic review of telehealth

2

applications in audiology. Twenty-five articles were carefully studied for the systematic review; only five were related to hearing screenings. Three of the studies used self-screening procedures to determine the presence of a hearing loss. Swanepoel & Hall (2010) concluded that there is technology available to effectively administer a hearing screening. However, poor client participation and a lack of control over environmental variables (background noise, no access to headphones, etc.) in the studies mandated the need for further research to establish the reliability and accuracy of the technology.

Similar to Swanepoel & Hall (2010), another study conducted by Abu-Ghanem et al. (2016) analyzed the application of technology to perform hearing screenings. The study tested a single hearing screening app on elderly clients to determine the role of a smartphone-based hearing test as a screening tool. The app had 100% sensitivity; it accurately identified 21 clients with hearing loss. However, two clients with normal hearing were falsely identified with a hearing loss. There was low participation from the elderly participants due to lack of access to technology, familiarity with smartphones, and knowledge or interest in the task. The app was a useful screening tool that was widely accessible and portable, but not user-friendly.

Batasso et. al (2015) explored using a teleaudiology screening program in remote areas as an alternative to an in-person screening. School-age children in Brazil were screened using a screening software. The results were compared to sweep audiometry and finding a pure tone threshold in an acoustically treated sound booth. Results found the software to be user-friendly but it under-identified children with hearing loss.

There is a shortage of literature in using smart device apps to determine the presence of a hearing loss. The studies that use hearing screening apps have a small

population sample and show that the apps can be effective but cannot replace a hearing screening entirely. For people in rural areas and international locations, there is a need for a reliable hearing screening app because of a lack of access to SLH services (Goulios & Patuzzi, 2008). In addition, apps can be updated and changed periodically. If the app was changed, the outcomes of a single study could become outdated. There needs to be more research to determine what constitutes a successful hearing screening app.

Summary and Research Question

The aim of the study was to answer the following research questions:

1. Will professionals and potential clients agree on rankings (i.e., scale of 1 to 3) of user-friendliness, accuracy, and explanation of results when evaluating three hearing screening apps?

2. What are important characteristics mentioned by the professionals in the first analysis when evaluating the hearing screening apps?

Data for analysis was gathered by asking each professional and potential client to complete all three hearing screenings using smart device apps. Afterward, the potential clients participated in a brief survey. Likewise, the SLH professionals participated in the same survey and participated in a follow-up interview with the researcher. The professionals were asked their opinion about each individual application and to provide additional information regarding the user-friendliness, accuracy, and explanation of results for each app.

II. METHOD

Characteristics of a successful app were determined using a survey for two groups of participants, SLH professionals and potential clients. To gain additional information about characteristics of a successful app, an interview was conducted with SLH professionals after they completed the survey. Professionals identified strengths and weaknesses of the apps evaluated.

The apps used in the study underwent a stringent selection process using criteria determined necessary for domestic and international telepractice use. The survey provided ranked scores that were used to determine intergroup agreement of the apps' characteristics. Interviews were conducted by the student researcher, coded for themes, and analyzed to determine strengths and weaknesses of the characteristics in the apps that could not be elicited using the survey.
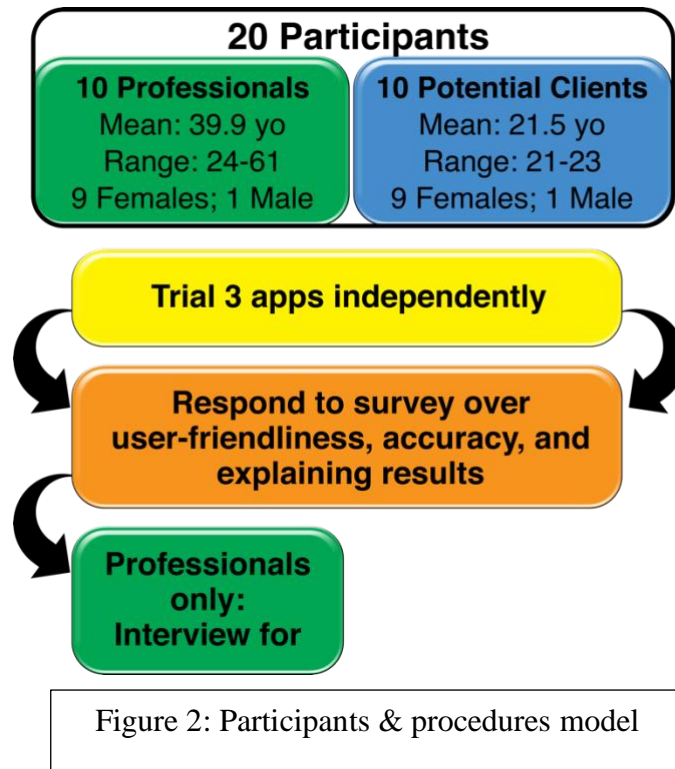
Participant Selection and Procedures

There were two groups of participants in this study to mirror the perspectives required for EBP: SLH professionals and potential clients. Professionals were recruited using a flyer posted on several ASHA SIGs followed by an email sent to the potential participants with directions (*see Appendix A and Appendix C*). Potential clients were recruited from the Texas State University Communication Disorders department via an email sent by the student researcher (*see Appendix B*).

Speech-Language-Hearing Professionals

Ten licensed SLH professionals, with varying degrees of telepractice experience, were recruited to participate in the study. Nine participants were female, and one participant was male. This is representative of the gender gap of professionals in the SLH

sciences (ASHA, 2020). Ninety percent of the participants had experience with telepractice, although none had administered a hearing screening via telepractice prior to the study. All participants had a master's or doctorate degree and were licensed in the state in which they were practicing. Each

20 Participants

10 Professionals	10 Potential Clients
Mean: 39.9 yo	Mean: 21.5 yo
Range: 24-61	Range: 21-23
9 Females; 1 Male	9 Females; 1 Male

Trial 3 apps independently

Respond to survey over user-friendliness, accuracy, and explaining results

Professionals only: Interview for

Figure 2: Participants & procedures model

professional also held the Certificate of Clinical Competence through ASHA. The mean age of this group of participants was 39.9 years old (SD=12.4).

Professional participants downloaded three hearing screening apps on their own smart devices and self-administered the screenings. Upon completion of the screenings, the professionals were asked to take a brief survey regarding the apps' user-friendliness, accuracy, and explanation of results.

Upon completion of the survey, an interview was conducted by the student researcher in-person, on the phone, or via teleconference to gain additional information from professionals on specific themes that strengthen or weaken an apps' user-friendliness, accuracy, and explanation of results. All recruited professionals completed the study in its entirety and were compensated for their participation.

Potential Clients

Ten undergraduate and graduate students were recruited to participate in the study as the "potential clients" group. Nine participants were female with one participant was male. Seven participants had some college experience, one completed an associate's degree, and two students held a bachelor's degree. The mean age for the potential clients group of participants was 21.5 years old (SD=0.7).

The potential clients were surveyed in a manner similar to the professionals using the same three hearing screening apps and survey. The potential clients did not participate in an interview for the current study. All recruited student participants completed the study in its entirety and were compensated for their participation.

Survey

The survey was given to both groups of participants. The survey was created on Qualtrics, the recommended survey generator of Texas State University. Participants were asked a total of ten questions: three regarding demographic information (age, gender, and highest level of education), one regarding what device was used to complete the screenings, and three questions regarding characteristics of the hearing screening applications (user-friendliness, accuracy, explanation of results). Qualtrics provided aggregate data for each survey question (see Appendix D).

Interview

Upon completion of the survey portion of the study, professional participants scheduled an interview with the student researcher via in-person, phone call, or video chat. Professionals were asked to explain their prior experience with telepractice. Prior experience included administering hearing screenings using telepractice and describing

the applications used as a screening. Professionals were provided the opportunity to discuss any other themes not elicited or described in the survey (*see Appendix E)*. The interview results were consolidated and coded for themes that the professionals agreed strengthened or weakened the apps' user-friendliness, accuracy, and explanation of results.

Hearing Screening App Selection

The hearing screening apps underwent a stringent selection process using three phases (*refer to Figure 3*). Initially, there were 25 hearing screening apps found by searching the Google Play store and the iOS app stores. The first phase ensured that all of the apps were free in the Google Play and iOS App Store, had a 3.5 rating or higher, and were accessible on multiple devices. Fourteen apps were removed from the selection process during the first phase.

Nine apps were piloted by the student researcher. During the second phase, apps that required a specific type of headphones (e.g., circumaural wired headphones, official Apple headphones) were disqualified from the selection process. Apps that required logins to take the hearing screenings or did not function uniformly across operating systems were also disqualified from the selection process. In the second phase, six apps were removed.

The last phase was to ensure that the apps had a functional and audiological basis. Several apps that were previously disqualified were "prank apps" or apps that were intended to be used recreationally (e.g., "What is the lowest frequency you can hear?"). No apps were disqualified in this phase, leaving the three apps that were used for the study. All three of the apps were updated within two years of the beginning of the study.

Two of the applications, Mimi Hearing Test and Petralex by IT4YOU, used pure tone audiometry to screen for hearing loss, which involves responding to a pure tone frequency for a duration of time. The user would acknowledge hearing the tone by using the apps' instructions (e.g., pressing and releasing, pressing a single response button). The third application, hearScreen USA, used a speech-in-noise task to screen for hearing loss. This involved playing numbers over background noise in varying degrees of loudness. The user would listen for the numbers being played and then input the numbers using a number pad on the device.

The goal of the current study was to determine what characteristics are required for a successful app. Because apps are updated and change over time, the current study does not identify a specific app as the best. Instead, the aim of the current study is to determine which characteristics are required for a successful app. The results of this study can be used in the future to evaluate hearing screening apps that have yet to be developed.
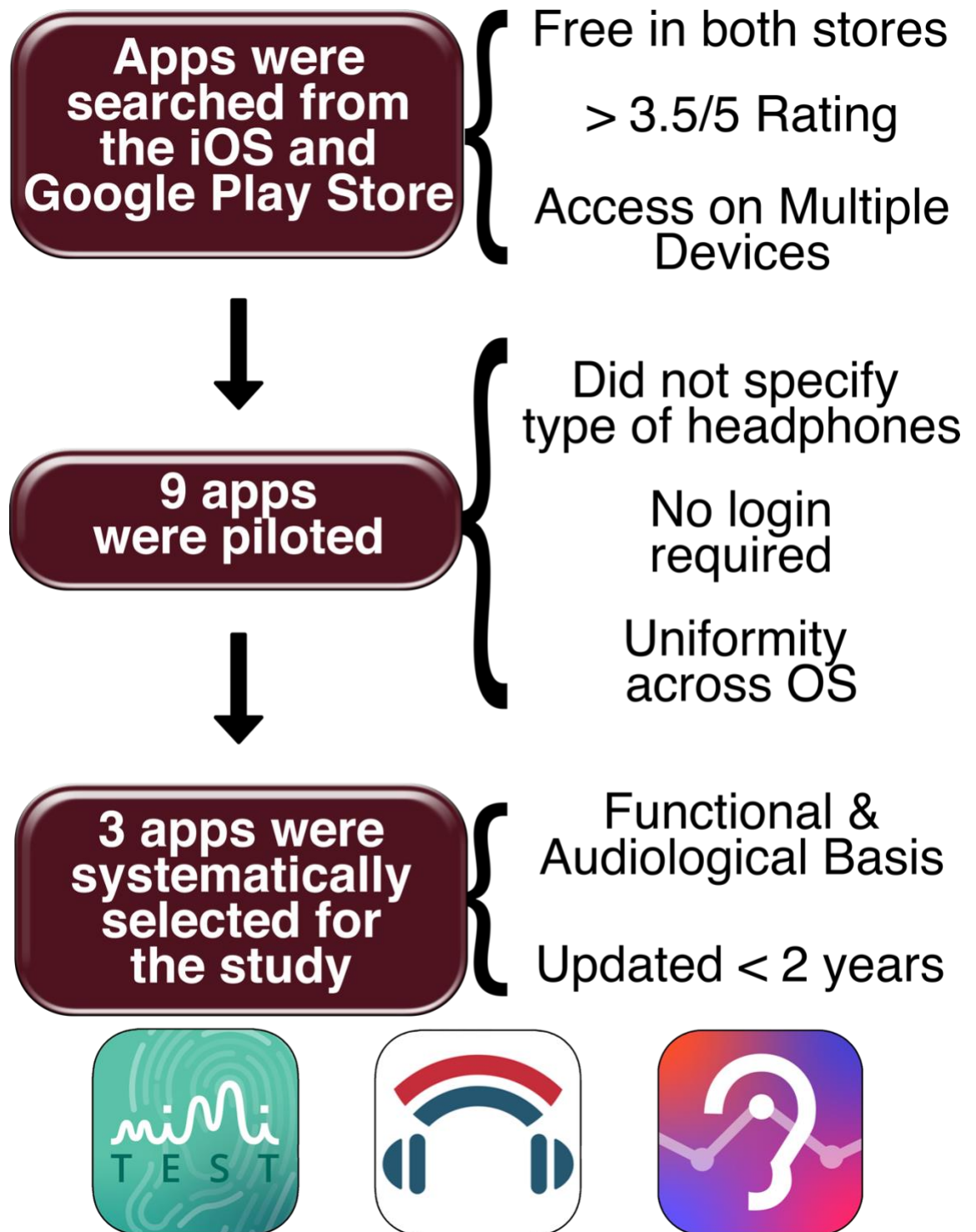
Figure 3: Hearing screening apps selection process

III. RESULTS

Participants answered questions regarding which application was the best when considering the following characteristics: user-friendliness, accuracy, and explanation of results. The users ranked each application on a scale ranging from 1, the best of the three apps, to 3, the worst of the three apps (*refer to Figure 4*). Qualtrics provided aggregate data on each of the characteristics of the apps. During the interview portion, professionals elaborated on the characteristics of each app and how specific themes strengthened or weakened the app.

Figure 4: Intergroup agreement in app rankings

User-Friendliness

Participants were asked to rank user-friendliness of all the hearing screening apps. User-friendliness is important because clients who require hearing screenings need to be able to finish the screening without feeling frustrated and wanting to intermittently quit the screening. Quitting and resuming the screening can affect the results and accuracy of the screening.

Both groups of participants agreed on the highest-ranking app for user-friendliness. By agreeing on the highest-ranking app, the results indicate that both groups of participants agreed on what constituted a user-friendly app.

Accuracy

All participants were asked to rank accuracy of all the hearing screening apps because of their educational experiences. The professionals and the students in the "potential clients" group have experience administering a hearing screening and have a general idea of their "true hearing". It is important to note that most clients do not have this perspective prior to receiving their first screening in person or when using a hearing screening app.

Both groups of participants agreed on the ranking of all apps regarding their accuracy. The clear inter-group agreement for the three apps demonstrates that both groups of participants agreed on what constituted an accurate app.

Explanation of Results

All participants in the study had a background in SLH sciences and had administered a hearing screening in their professional careers. Clients, in most cases, do not have the in-depth knowledge of the auditory system nor the effects that hearing loss has on ability to interpret speech sounds. The hearing screening apps must communicate the effects of hearing loss and how the results affect the client's ability to understand speech. The professionals and potential clients did not agree on the rankings for any of the apps.

Professionals Interview Results

Interviews were conducted with professionals to gain additional input regarding the characteristics that make an app successful. Twenty-five characteristics were extracted from the interview transcripts: thirteen were considered strengths that could make an app successful and twelve were considered weaknesses that could make app not successful. Of the twenty-five total characteristics, the majority of professionals mentioned four strengths that make an app successful. Two weaknesses were identified by the majority of professionals (*refer to Figure 5*).
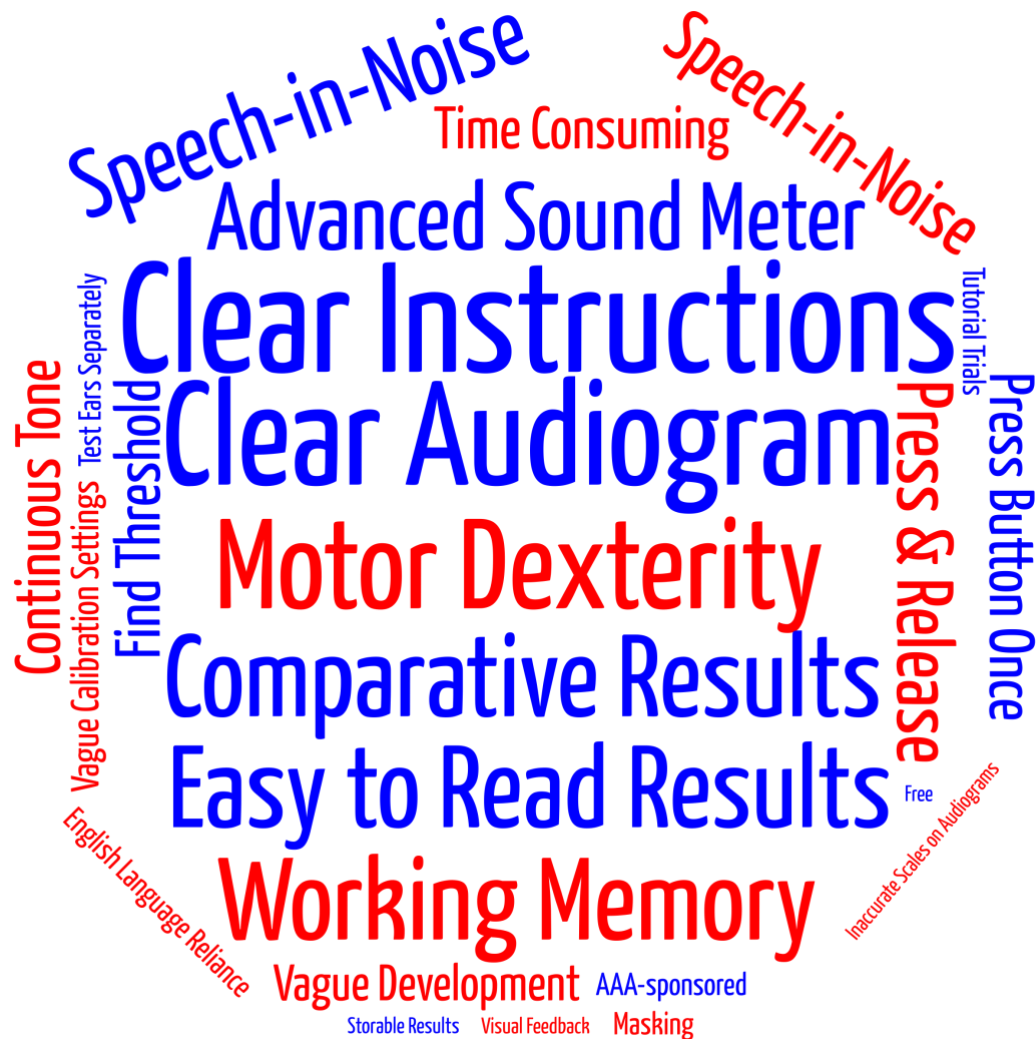

Figure 5: Word cloud of themes collected from professionals' interviews

Strengths that make an app successful included: clear instructions, a graph or audiogram explaining results at the end, easy-to-read results, and results provide examples of speech sounds or environmental sounds (*refer to Figure 5*).

Clear instructions were reported by 90% of professional participants as a strength that made apps successful. Hearing screening apps need to describe the task and type of acceptable responses as clearly and concisely as possible to avoid misunderstanding. Two participants suggested implementing a tutorial or instructional activity prior to starting the screening activity.

Eighty percent of professional participants indicated that a graph or audiogram explaining results at the end of the hearing screening was a successful characteristic for the apps. The professionals agreed that having an audiogram would be helpful for the audiologist, but a graph or chart that shows how hearing loss could affect the perception of speech understanding or environmental noise would be more beneficial for clients without the educational background of SLH professionals.

Apps that explicitly explained results without the use of technical or complex terms were deemed successful by 50% of professionals. Three professionals suggested the need to mention if the client passed or failed the hearing screening without the use of technical terms (e.g., moderate-severe hearing loss). Two professionals argued that the use of technical terms to describe the hearing loss are necessary to counsel clients on their hearing loss without confusing them. Even within the group of professionals, there was disagreement on the amount of technical terms needed in the apps.

Another strength identified was an explanation of results that provided real-world examples of various environmental sounds that would be difficult to hear based on the clients' results. These types of examples were made available in one of the apps. Fifty percent of professionals agreed that a chart or graph that compared a client's hearing to their age group or environmental sounds (e.g., birds chirping, a train horn, leaves rustling) would be a beneficial counseling tool to use when utilizing telepractice to treat a client with a hearing loss.

Weaknesses

Weaknesses that could make an app unsuccessful included features that required advanced motor dexterity and advanced working memory skills. App features that required advanced motor dexterity were deemed weaknesses that made the hearing screening apps unsuccessful. Sixty percent of professionals agreed that features such as pressing and releasing a button on a touchscreen may not be accessible for clients with motor impairments, thereby limiting the amount of people who could use the app. Results of the hearing screening would be skewed by a client's motor impairment, not their hearing abilities.

The use of working memory was deemed a weakness by 50% of professionals. Individuals with working memory or attention deficits could have difficulty performing well on hearing tasks that require the client to use their impaired abilities. Tasks such as memorizing and reciting numbers in English require the client to retain language information long enough to process speech and motor movement to respond on the app in a timely manner. This could skew the client's results due to their working memory or attention deficits, not their hearing ability, thereby making an app unsuccessful.

IV. DISCUSSION

This study investigated how user-friendliness, accuracy, and explanation of results for three hearing screening apps were rated by professionals and potential clients. Additionally, characteristics were identified that make the hearing screening apps more successful. Previous studies on telepractice have seen hearing screening technology as being accurate but not user-friendly (Abu-Ghanem et al., 2016), or user-friendly but not as accurate as in-person screenings (Batasso et al., 2015). The survey conducted in our study discovered that professionals and potential clients agreed on what constituted user-friendliness and accuracy but disagreed regarding what accounts for a good explanation of results.

Clear instructions can make an app more user-friendly by providing a strong understanding of how to use the app. Minimizing features that require motor dexterity or working memory will allow app users to minimize mistakes on the screening and give accurate results about hearing ability, while not producing incorrect results due to other disabilities. By having clear audiograms, easy-to-read results, and comparing the results to common environmental or speech noises the explanation of results to users could be improved.

Limitations and Future Directions

All participants in the study were typically developing, educated in the SLH sciences, had intact cognition, no motor deficits, or hearing loss. The mean age for all participants is 31.1 years old. For the study to be more inclusive and holistic, future studies will need to involve participants younger than 20 years old and more participants

16

older than 60 years old. Including individuals with motor or cognition deficits would further explore how accurate the apps are for people with disabilities.

The use of three hearing screening apps was determined to be the most time-efficient way for professionals and potential clients to trial each app and take notes about the characteristics and themes that strengthen or weaken an app. However, the apps included in this study utilize continuous pure tones, warble tones, and speech-in-noise. More research is needed to determine which method is the most sensitive for detecting hearing loss using a smart device.

In future studies, researchers should interview the professionals and the potential clients. While the study made an effort to have inclusion of all facets of evidence-based practice, the study was not able to conduct an interview with the potential clients due to time constraints and funding

Conclusion

Telepractice is an increasingly common practice within the speech-language pathology and audiology fields, especially as technology continues to evolve. Telepractice provides individuals who would otherwise not have access to SLH health services the opportunity to participate in these services. In doing so, it is possible to close the gap of hearing service to rural areas in the United States (Lancaster et al, 2008) and the developed-developing country gap of hearing health services (Goulios & Patuzzi, 2008).

APPENDIX SECTION

A. Recruitment Email – SLH Professionals

B. Recruitment Email – Potential Clients

C. Flyer to Recruit Professional Participants

D. Survey for Professionals and Potential Clients

E. Flyer to Recruit Professional Participants

A. RECRUITMENT EMAIL – PROFESSIONALS

EMAIL RECRUITMENT MESSAGE FORMATTING REQUIREMENTS AND TEMPLATE

1. If your planned recruitment process involves emailing Texas State students, staff, faculty or other individuals using their active Texas State email address, the IRB will require a draft of your recruitment email, using the below template and formatted as illustrated in the example in this document,
2. If you plan to distribute a survey/email to collect information directly from individuals who comprise a significant proportion of one or more Texas State affiliation groups, as defined in Section 04 of UPPS No. 04.01.02, Information Resources Identity and Access Management, you must follow the review and approval procedures outlined in UPPS No. 01.03.05, Administrative Surveys.

Formatting Requirements

1. **Address Line.** The Principal Investigator (PI) should employ measures to avoid disclosing the email addresses of potential research subjects to others. Common techniques include the use of:
   * Individually targeted messages (only one address in 'TO:' line) per message
   * Group targeted messages with all recipient addresses in the 'BCC:' line

2. **Subject Line**. The PI shall use a standard subject line formatted as follows:
   'Subject: Research Participation Invitation: <Project Topic or Key Words>'
   Thus, the 'Subject:' line always begins with the phrase 'Research Participation Invitation' and ends with a phrase or key words describing the nature of the research.

3. **Email Message Body**. The email message body should be free of special font effects such as color, bolding, or highlighting. The PI should include all pertinent information in the message body, but if supplemental information is necessary, hyperlinks (to the supplemental information) are preferred over attachments.

This email message is an approved request for participation in research that has been approved or declared exempt by the Texas State Institutional Review Board (IRB).

    The bulk of the message body should describe the purpose of the research project and the anticipated value of the findings.
    The body **must close** with the following paragraph:

To participate in this research or ask questions about this research please contact Dr. Maria Resendiz at mr54@txstate.edu or (512-716-2617)

This project #6541 was approved by the Texas State IRB on 09/17/2019. Pertinent questions or concerns about the research, research participants' rights, and/or research-related injuries to participants should be directed to the IRB chair, Dr. Denise Gobert 512-245-8351 – (dgobert@txstate.edu) or to Monica Gonzales, IRB Regulatory Manager 512-245-2334 - (meg201@txstate.edu

Recruitment Email Message Template

Replace the red and bracketed [ ] text below, with text appropriate for your approved research.

To: err89@txstate.edu
From: Dr. Maria Resendiz, Eric Rodriguez
BCC: [Speech-Language-Hearing Professionals]
Subject: Research Participation Invitation: Hearing Screening App Preferences for Teleaudiology

This email message is an approved request for participation in research that has been approved by the Texas State Institutional Review Board (IRB)
.
Dear Professionals in the Speech-Language-Hearing Sciences,

Dr. Maria Resendiz, an associate professor in the Department of Communication Disorders, and Eric Rodriguez, an Undergraduate Texas State student are conducting a research study to explore different smart device applications to preform hearing screenings for telepractice. You are being asked to complete this survey because you are part of the speech-language-hearing professional community.

Performing a hearing screening prior to any speech therapy is an essential step in our practice. However, in telepractice, this step is often the first barrier for treatment. This study will help evaluate different smart device applications for accuracy, interface friendliness, and the manner in which results are delivered to the client.

Participation in this study will take approximately 60 minutes and is completely voluntary. There are no long-term risks associated with participating in this study. All risks are no higher than downloading three different applications on your smart device. Professional participants will be compensated $60 for their time doing the survey and interview.

Participating in this study includes the following: downloading three separate applications on your smart device, taking three separate hearing screenings, and completing the survey attached to this email. After doing the survey, please contact the undergraduate researcher to set up an appointment for an interview regarding the applications in more detail.

If you wish to participate in the study, please download the following applications on your smart device and take all three assessments prior to clicking on the survey link.

   App #1: Mimi Hearing Screening
       iOS: https://itunes.apple.com/us/app/mimi-hearing-test/id932496645?mt=8
       Google Play: https://play.google.com/store/apps/details?id=io.mimi.ht&rdid=io.mimi.ht

   App #2: hearScreen USA
        iOS: https://itunes.apple.com/us/app/hearscreen-usa-hearing app/id1437892805?mt=8
       Google Play: https://play.google.com/store/apps/details?id=com.hearxgroup.hearscreenusa

   App #3: Dectone Hearing Test by IT4YOU (iOS) / Petralex (Android OS)
       iOS: https://itunes.apple.com/us/app/dectone-hearing-test/id1368396053?mt=8
       Google Play: https://play.google.com/store/apps/details?id=com.it4you.dectone.gui.hearingtest

Your participation is completely voluntary and your responses will remain anonymous. If you volunteer to participate in this study, you may withdraw from it at any time without consequences of any kind. By clicking the survey link below, you are consenting to participate in this study. This survey will take approximately 25 mins to complete.

Survey Link: https://txstate.co1.qualtrics.com/jfe/form/SV_1NRxxC3hTjYAdBH

To participate in this research or ask questions about this research, please contact either Dr. Resendiz at mr54 and (512-716-2617), or Eric Rodriguez at err89@txstate.edu.

B. RECRUITMENT EMAIL – POTENTIAL CLIENTS

EMAIL RECRUITMENT MESSAGE FORMATTING REQUIREMENTS AND TEMPLATE

3. If your planned recruitment process involves emailing Texas State students, staff, faculty or other individuals using their active Texas State email address, the IRB will require a draft of your recruitment email, using the below template and formatted as illustrated in the example in this document,

4. If you plan to distribute a survey/email to collect information directly from individuals who comprise a significant proportion of one or more Texas State affiliation groups, as defined in Section 04 of UPPS No. 04.01.02, Information Resources Identity and Access Management, you must follow the review and approval procedures outlined in UPPS No. 01.03.05, Administrative Surveys.

Formatting Requirements

4. **Address Line.** The Principal Investigator (PI) should employ measures to avoid disclosing the email addresses of potential research subjects to others. Common techniques include the use of:
    *   Individually targeted messages (only one address in 'TO:' line) per message
    *   Group targeted messages with all recipient addresses in the 'BCC:' line

5. **Subject Line**. The PI shall use a standard subject line formatted as follows:
    > 'Subject: Research Participation Invitation: <Project Topic or Key Words>'

    Thus, the 'Subject:' line always begins with the phrase 'Research Participation Invitation' and ends with a phrase or key words describing the nature of the research.

6. **Email Message Body**. The email message body should be free of special font effects such as color, bolding, or highlighting. The PI should include all pertinent information in the message body, but if supplemental information is necessary, hyperlinks (to the supplemental information) are preferred over attachments.

This email message is an approved request for participation in research that has been approved or declared exempt by the Texas State Institutional Review Board (IRB).

The bulk of the message body should describe the purpose of the research project and the anticipated value of the findings.
The body **must close** with the following paragraph:

To participate in this research or ask questions about this research please contact Dr. Maria Resendiz at mr54@txstate.edu or (512-716-2617)

This project #6541 was approved by the Texas State IRB on 09/17/2019. Pertinent questions or concerns about the research, research participants' rights, and/or research-related injuries to participants should be directed to the IRB chair, Dr. Denise Gobert 512-245-8351 – (dgobert@txstate.edu) or to Monica Gonzales, IRB Regulatory Manager 512-245-2334 - (meg201@txstate.edu

Recruitment Email Message Template

Replace the red and bracketed [ ] text below, with text appropriate for your approved research.

To: err89@txstate.edu
From: Dr. Maria Resendiz, Eric Rodriguez
BCC: [Students of the CDIS Department]
Subject: Research Participation Invitation: Hearing Screening App Preferences for Teleaudiology

This email message is an approved request for participation in research that has been approved by the Texas State Institutional Review Board (IRB).

Dear Students,

Dr. Maria Resendiz, an associate professor in the Department of Communication Disorders, and Eric Rodriguez, an Undergraduate Texas State student are conducting a research study to explore different smart device applications to preform hearing screenings for tele practice. You are being asked to complete this survey because you are part of the Department of Communication Disorders.

Performing a hearing screening prior to any speech therapy is an essential step in our practice. However, in telepractice, this step is often the first barrier for treatment. This study will help evaluate different smart device applications for accuracy, interface friendliness, and the manner in which results are delivered to the client.

Participation in this study will take approximately 45 minutes and is completely voluntary. There are no long-term risks associated with participating in this study. All risks are no higher than downloading three different applications on your smart device. There is no compensation for participating in this study, however you will receive three (3) free hearing screening via the applications being tested.

Participating in this study includes the following: downloading three separate applications on your smart device, taking three separate hearing screenings, and completing the survey attached to this email.

If you wish to participate in the study, please download the following applications on your smart device and take all three assessments prior to clicking on the survey link.

     App #1: Mimi Hearing Screening

          iOS: https://itunes.apple.com/us/app/mimi-hearing-test/id932496645?mt=8

          Google Play: https://play.google.com/store/apps/details?id=io.mimi.ht&rdid=io.mimi.ht

     App #2: hearScreen USA

          iOS: https://itunes.apple.com/us/app/hearscreen-usa-hearing app/id1437892805?mt=8

          Google Play: https://play.google.com/store/apps/details?id=com.hearxgroup.hearscreenusa

     App #3: Dectone Hearing Test by IT4YOU (iOS) / Petralex (Android OS)

          iOS: https://itunes.apple.com/us/app/dectone-hearing-test/id1368396053?mt=8

          Google Play: https://play.google.com/store/apps/details?id=com.it4you.dectone.gui.hearingtest

Your participation is completely voluntary and your responses will remain anonymous. If you volunteer to participate in this study, you may withdraw from it at any time without consequences of any kind. By clicking the survey link below, you are consenting to participate in this study. This study will take approximately 45 mins to complete.

Survey Link: https://txstate.co1.qualtrics.com/jfe/form/SV_1NRxxC3hTjYAdBH

To participate in this research or ask questions about this research, please contact either Dr. Resendiz at mr54 and (512-716-2617), or Eric Rodriguez at err89@txstate.edu.

This project #6541 was approved by the Texas State IRB on 09/17/2019.
Pertinent questions or concerns about the research, research participants' rights,
and/or research-related injuries to participants should be directed to the IRB
chair, Dr. Denise Gobert 512-716-2652 – (dgobert@txstate.edu) or to Monica
Gonzales, IRB Regulatory Manager 512-245-2334 - (meg201@txstate.edu).

D. SURVEY FOR PROFESSIONALS AND POTENTIAL CLIENTS

TEXAS ★ STATE
UNIVERSITY ®
The rising STAR of Texas

Pre-Screening Questions

Age:

[   ]

Gender: (Pick one)

Male
Female
Other
Prefer not to answer

What is the highest level of education you have completed?

High School Diploma/Equivalent
Some College
Associate's Degree
Bachelor's Degree
Master's/Doctoral Degree

Device Questions

Are you using the same device in which you completed the hearing screenings?

Yes
No

What is the operating system on the device used to complete the hearing screenings?

iOS (Apple Devices)

Android OS

I do not know

Ranking Questions

Rank the following apps in order from most user-friendly (1) to least user-friendly (3):

Mimi Hearing Test

Petralex (Android)
Hearing Screenings (iOS) by IT4YOU

hearScreen USA

Ranking Questions 2

Rank the following apps in order from most accurate (1) to least accurate (3):

[____] Mimi Hearing Test

Petralex (Android)
Hearing Screenings (iOS) by IT4YOU

[____]

[____] hearScreen USA

Ranking Questions 3

Rank the following apps in order of best at explaining results (1) to worst at explaining results (3):

[____] Mimi Hearing Test

Petralex (Android)
Hearing Screenings (iOS) by IT4YOU

hearScreen USA

Satisfaction Questions

Were you satisfied with one app more than the others? If so, which one?:

No, I was satisfied/dissatisfied with each app equally

hearScreen USA

Mimi Hearing Test

E. INTERVIEW QUESTIONS FOR PROFESSIONALS

Interview Questions for Audiologist/SLPs/etc.

1. **What is your name and professional credentials?**
2. **Do you have experience with telepractice, if so explain?**
   a. **Have you needed to perform a hearing screening over telepractice?**
   b. **What are some problems that occur with telepractice that are preventable by you, the clinician?**
3. **Prior to showing the applications, how would you have dealt with a telepractice client that needed a hearing screening?**
4. **Do you feel that the applications I have shown you are sufficient enough to call a hearing screening?**
   a. **What did you like?**
   b. **Didn't like?**
   c. **Change?**
5. **Would you recommend the use of these application for telepractice clients.**
   a. **If no, explain**
6. **What factors did you like in one application that you would have liked to see in the others? Explain.**

REFERENCES

Abu-Ghanem, S., Handzel, O., Ness, L., Ben-Artzi-Blima, M., Fair-Ghelbendorf, K., &

    Himmelfarb, M. (2016). Smartphone-based audiometric test for screening hearing

    loss in the elderly. *Eur Arch Otorhinolaryngology*. 273, 333-339.

    https://doi.org/10.1007/s00405-015-3533-9

American Speech-Language-Hearing Association. (2004). *Preferred practice patterns for*

    the profession of speech-language pathology.

    https://www.asha.org/policy/PP2004-00191/

American Speech-Language-Hearing Association. (2006). *Preferred practice patterns for*

    the profession of audiology. https://www.asha.org/policy/PP2006-00274/

American Speech-Language-Hearing Associations (2020a). *Evidence-based practice*

    (EBP). https://www.asha.org/research/ebp/evidence-based-practice/

American Speech-Language-Hearing Associations (2020b). *Learn about the CSD*

    professions. https://www.asha.org/Students/Learn-About-the-CSD-Professions/

American Speech-Language-Hearing Associations (2020c). *Profile of ASHA members*

    and affiliates, year-end 2019. https://www.asha.org/uploadedFiles/2019-Member-

    Counts.pdf

American Speech-Language-Hearing Associations (2020d). *Telepractice.*

    https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934956&section=

    overview

Batasso, M., Gandolfi-Sanches, S. G., Ferreira-Bento, R. & Giannella-Samelli, A. (2015).

    Teleaudiometry as a screening method in school children. *Clinics, 70*(4), 283-288.

    https://doi.org/10.6061/clinics/2015(04)11

Bauman-Waengler, J. (2016). *Articulation and phonology in speech sound disorders: A clinical focus (5th ed.).* Pearson Education, Inc.

Dolloghan, C. A. (2007). The handbook for evidence-based practice in communication Disorders (4th ed.). Paul H. Brookes Publishing Co.

Goulios, H. & Patuzzi, R.B (2008). Audiology education and practice from an international perspective. *International Journal of Audiology, 47*(10), 647-664. https://doi.org/ 10.1080/14992020802203322

Lancaster, P., Krumm, M., Ribera, J., Klich, R. (2008). Remote hearing screenings via telehealth in a rural elementary school. *American Journal of Audiology, 17*, 114-122. https://doi.org/1059-0889/08/1702-0114

Swanepoel, D. W. & Hall, J. W. (2010). A systematic review of telehealth applications in audiology. *Telemedicine and e-Health, 16*(2). https://doi.org/10/1089/tmj.2009.011