SPEECH-LANGUAGE PATHOLOGISTS' USE OF IPAD TECHNOLOGIES FOR PERSONS WITH APHASIA

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The following faculty members have examined the final copy of this thesis for form and content, and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Arts with a major in Communication Sciences and Disorders.

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DEDICATION

To my beloved grandparents, Vernon & Louise Ecton

ABSTRACT

A variety of therapy tools as well as augmentative alternative communication (AAC) devices and strategies exist to aid in the communication enhancement of persons with aphasia. As technology continues to evolve, personal computing tablets (PCTs) such as the iPad have joined the race in finding the solution to this often devastating communication disorder with the development of apps that address the therapy needs of this population as well as potential AAC strategies. Because of the novelty of this technology, little evidence exists supporting the efficacy of such apps. Additionally, little is known about the decision making process in which speech-language pathologists engage before determining if a given app is an appropriate therapy option for a patient.

The purpose of this study is to determine how medically-based speech-language pathologists are making a variety of clinical decisions regarding appropriate iPad applications to be used as therapy tools as well as AAC options for their patients with aphasia.

Keywords: augmentative alternative communication, AAC, aphasia, speech-language pathologist, personal computing tablets, apps

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

Introduction

It is estimated that approximately 1 million people are currently living with various forms of aphasia in the United States (NIDCD, 2010). Aphasia is defined as a neurogenic communication disorder that is characterized by deficits in receptive and expressive language that occur as a result of damage to the language dominant hemisphere of the brain (Brookshire, 2007). More specifically, aphasia is commonly caused by cerebral vascular accidents (CVAs) that occur in the cortical centers of the brain responsible for language comprehension and production (Brookshire, 2007). Due to the extreme heterogeneity in the ways in which the human brain can sustain, repair, and compensate for damage, a variety of complex language deficits can occur as a result of a CVA. For example, an individual can develop speech that is extremely effortful to produce making efficient and timely communication an impossibility. Conversely, speech could be fluent but lacking in meaningful content rendering the intended message incomprehensible. These characteristics generally are not mutually exclusive and typically occur simultaneously with issues such as impaired comprehension of written and spoken language.

A variety of rehabilitation strategies exist that address the complex communication needs of persons with aphasia, but a full recovery is often unrealistic. Therefore, speech and language therapy for this population often includes facilitating the development of a skill set that is largely compensatory based upon the unique and varying language deficits of the individual. One such strategy that is frequently used to address the specific communication challenges that exist in persons with aphasia is the use of augmentative alternative communication (AAC) devices or systems. AAC has been defined as "an area of research, clinical, and educational practice that

involves attempts to study and compensate for temporary or permanent impairments, activity limitations, and participation restrictions individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication" (Beukelman, Mirenda, Garrett, & Light, 2013, p. 4). Although many different types of AAC exist and have proven to be a successful means of communication enhancement in persons with aphasia, the development of iPad applications has provided an additional challenge in terms of determining what should be considered best practice for clinicians as they make treatment, including AAC, selections for their clients.

Relative affordability, accessibility, and social acceptability are advantages of the iPad that have quickly made it an attractive option for both persons with aphasia as well as speech-language pathologists (Alliano, Herriger, Koutsoftas, & Bartolotta, 2012). However, due to the limited amount of research available regarding the efficacy of apps as a viable form of intervention, it is the responsibility of the clinician to determine the appropriateness of particular applications for individual clients. The purpose of this study is to determine how speech-language pathologists are making clinical decisions regarding appropriate iPad applications to be used as AAC or other treatment strategies for their clients with aphasia. More specifically, are researched and published rubrics that have been designed to guide the decision making process being utilized? How are clinicians assessing a patient's ability to use or not use apps? Additionally, how are clinicians recording and using data in order to determine the degree of success of a chosen app? Are clinicians satisfied with the range of apps available for this population? And, finally, what do clinicians find appealing and/or questionable about using apps with persons with aphasia?

CHAPTER II

Review of the Literature

This chapter will discuss augmentative and alternative communication (AAC) technology in general and the utilization of iPad apps as therapy tools. This discussion will include the AAC assessment process as it relates to iPad apps that should consider many variables including specific language deficits, feature mapping, the World Health Organization- International Classification of Functioning framework, evidence-based practice, and the influence of clinician expertise on AAC selection. Finally, researched iPad apps recommended as therapy tools for persons with aphasia and their specific design characteristics and challenges will be considered.

The evolution of alternative and augmentative communication

The use of computer technology was introduced as an aid to speech and language therapy services for patients with aphasia more than 30 years ago. Upon its implementation, many debated the efficacy and value of technology use as it pertained to a patient's recovery. It was believed that such technology could potentially interfere with the process of aphasia therapy instead of enhance its development (Mieke & Van De Sandt-Koenderman, 2011). However, as technology advanced over time, the quality of computer programs and applications significantly increased. In fact, many computer programs have been developed as therapy tools to aid specifically with aphasia rehabilitation and are now believed to be accepted forms of AAC, as well. McGrenere, Davies, Findlater, Graf, Klawe, Moffatt, Purves, & Yang (2002) emphasize that regardless of the obvious potential that exists regarding electronic assistive technology as it relates to AAC, there is limited research published in this specific area that investigates its efficacy.

Symbol-based portable systems such as Maestro, a speech generating device developed by DynaVox, have been developed for persons with aphasia that exploit the commonly retained skill of being able to recognize image-based representations that exists within this population. The disadvantages of such systems include their expense, and the increased length of time required to communicate a message using symbols alone. Fortunately, McGrenere et al. (2002) are certain that a lack of knowledge regarding advanced technology is not as much of a barrier as it was ten years ago. It has been observed that more and more individuals with aphasia have at least a basic level of computer literacy and are somewhat familiar with and open to using specialized software. These observations are promising as SLPs explore the possibilities of using apps as therapy tools and potential AAC strategies with their clients with aphasia.

Over the past 30 to 40 years, there has been a noticeable shift in the awareness and acceptance of AAC across all age groups as a communication solution to a variety of disorders. According to Light & McNaughton (2012), it has been shown that the use of AAC strategies does not hinder language development, and there are not necessarily specific cognitive abilities required of AAC users. Debunking such myths has contributed to the positive professional and public awareness of the potential benefits of AAC. Additionally, it is becoming recognized that the population that could feasibly benefit from AAC, as well as the environments in which AAC could be utilized, is extremely diverse and ever expanding. Historically, AAC was used strictly as a means of communicating wants and needs. However, over the past four decades, it has been recognized that the scope of communication provided by AAC must be vastly more inclusive in order for its users to fully participate in our social world.

Kane, Linam-Church, Althoff, & McCall (2012) explained that, in their original form, AAC devices were designed specifically as separate entities from other forms of technology.

However, as the development and design of such devices has progressed, AAC systems have made the transition into being incorporated into mainstream mobile devices such as tablets and personal computers. These authors note several benefits about this transition including affordability, convenience, and the reduction of social stigma. Additionally, advantages of utilizing these forms of technology include the inherent mobile device features such as network connectivity and embedded sensors. These features have the potential to drastically enhance the usability of AAC applications by eliminating the need to navigate a series of hierarchical menu options in order to construct a sentence or phrase. Instead, these technological features will be able to identify the user's location and, based on the context of his/her surroundings, select a menu of appropriate conversational options. The advantages of such technology in the form of apps accessible via iPads and other similar devices are intuitive to even the untrained eye. However, the disadvantages to the accessibility and marketability of such applications lie in the lack of proven efficacy.

Apps and the World Health Organization International Classification of Functioning

Mieke & Van De Sandt-Koenderman (2011) discussed aphasia rehabilitation programs as they were constructed within the conceptual framework of the World Health Organization International Classification of Functioning model (World Health Organization [WHO], 2001). By and large, there are three specific types of therapy that correspond to this specific framework that are implemented when working with individuals with aphasia: 1) disorder-oriented-treatment, 2) functional treatment, and 3) participation-oriented treatment. Disorder-oriented treatment primarily addresses the *Body Functions and Structures* piece of the ICF model and aims to focus on rehabilitating linguistic skills using semantic, phonological, and syntactic tasks. Functional Treatment targets the *Activities* portion of the ICF model and stresses the importance

of an individual's successful communicative interactions while s/he participates in activities during everyday life. Participation-Oriented Treatment is specifically directed at enhancing the patient's *social participation* while s/he attempts to functionally live with the consequences of aphasia. It is understood that the application of computer technology in the treatment of aphasia is separated into these three domains of the ICF. However, it should be noted that these three domains are not mutually exclusive, but rather, should be overlapping in terms of clinical decision making regarding AAC implementation.

In general, AAC technology has been implemented most successfully in the area of Disorder-Oriented Treatment. For example, Lingraphica® The Aphasia Company™, a company founded in 1990 that is dedicated to providing technological pathways from which persons with complex communication needs can functionally communicate, has created an extensive and intensive therapy program designed specifically to be "disorder-oriented". "A large majority of participants have shown significant improvement in both language impairment and communicative function regardless of time post-onset" (Mieke & Van De Sandt-Koenderman, 2011, p. 23) when using these programs. Disorder-Oriented treatment traditionally utilizes a variety of "drill and practice" tasks that target the rehabilitation of such linguistic skills as semantics, phonology, and syntax. Numerous apps have been developed to target these skills in this manner and are considered to be effective and efficient therapy tools for a variety of clients, including those with aphasia. However, significant challenges arise when attempting to use computer technology in the domains of Functional and Participation-Oriented Treatment. Issues such as the heterogeneous characteristics of persons with aphasia make developing a one-size-fits-all application a near impossibility. Additionally, due to limitations in speed that are partially attributable to the construction of the device as well as the specific language constraint of the

individual with aphasia, the functional role of computer technology in a fast paced conversational exchange is often called into question.

AAC and therapy tools in the form of personal computing tablets and mobile devices

Alliano, Herriger, Koutsoftas, & Bartolotta, (2012) argue that the growing popularity and availability of personal computing tablets (PCTs) such as iPads are forcing speech-language pathologists to face unique challenges in utilizing this technology as a therapy tool as well as a form of AAC. Unfortunately, with the rapid development of this technology, there is a considerable lag between using PCTs and mobile devices as therapy options and empirical evidence supporting their efficacy. Light & McNaughton (2012) take this argument a step further by insisting that the development of mobile devices such as iPads has "democratized" AAC system development as well as acquisition. Rather than being professionally evaluated for an AAC system that might meet one's individual needs, mobile devices can be purchased and apps can be downloaded with little to no researched evidence behind their efficacy. However, even considering these drawbacks, PCTs and mobile devices such as iPads are said to address the two main challenges associated with implementing AAC: device abandonment and social acceptability (Alliano, Herriger, Koutsoftas, & Bartolotta, 2012). Because of the sleek and functional design of the iPad and other similar PCTs, device abandonment is said to be less prevalent. Additionally, using a form of technology with which the general public is familiar increases the social acceptability of a PCT as a potential AAC strategy. Although there are obvious advantages to using PCTs as an AAC system or other such therapy tool, it is recommended that a specific clinical approach be utilized when determining the appropriateness of apps as they relate to individual clients. Gosnell (2011) advise implementing a framework that includes: 1) identifying the client's strengths and needs via clinical assessment, 2) self-awareness

of one's clinical knowledge of available apps and ability to compare them, 3) feature matching based on client needs vs. app capabilities, and 4) conducting a clinical trial with the client to asses appropriateness of the app (Gosnell, Costello, & Shane, 2011). Additionally, Gosnell and colleagues (2011) suggest that 11 clinical features be considered when evaluating an app (See Appendix A). These features include: purpose of use, output, speech settings, representation, display, feedback features, rate enhancement, access, required motor skills, competencies support, and miscellaneous (e.g., any additional options that are available with the app).

The role of the speech-language pathologist

In addition to considering the individual characteristics of the patient as well as the form of technology or app being considered as a potential AAC strategy or therapy tool, it is equally imperative to understand the specific role the speech-language pathologist can play in this intricate process. Crema & Moran (2012) note that the swift implementation of AAC, when appropriate, is vital in the rehabilitation of individuals with chronic neurological impairments such as those experienced by persons with aphasia. It is important that these individuals are able to participate communicatively in the occupational, physical, and other such therapies that are common post stroke in order for them to reap the full benefits of treatment. Additionally, it is equally as important for these individuals to convey practical and emotional information to their family members and friends. However, these authors explain that many SLP's feel unprepared and have little practice with AAC before entering the workforce. Therefore, the need for SLPs to be knowledgeable in the area of AAC as well as the assessment process is more important now than ever before in this technological age.

As previously mentioned, it is understood that for persons with complex communication needs to fully benefit from various types of AAC, a comprehensive evaluation and assessment of

individual needs and strengths must first be conducted in order to create an optimal match between the "individual" and the "technology". The research states that this process of comprehensive assessment is a critical factor in the success of a specific AAC intervention. "A poor match between technology and an individual's needs is most often related to rejection of AAC systems" (Dietz, Quach, Lund, & Mckelvey, 2012, p. 149). It seems imperative, then, that SLPs receive training in such evaluative processes during their educational preparation. However, according to a survey conducted by Marvin, Montano, Fusco, & Gould (2003), 83% of 71 SLPs surveyed rated their educational training in providing AAC services as fair to poor. Additionally, the lack of evidence that exists in the area of clinical decision making in regards to AAC further compounds the difficulty in providing clients with the best technological match based on their individual needs.

Dietz, Quach, Lund, and McKelvey (2012) explained that other professions, such as physical therapy, have developed supports such as decision trees, rubrics, and the like to aid clinicians through the assessment process as they are determining potential avenues of therapy or treatment for their patients. These decision matrices are often systematic, standardized, and collectively accepted within the realm of these professions as valuable tools to be utilized in order to maximize the quality of patient outcomes. However, SLPs are making similar decisions in a variety of ways that lack continuity and consistency across professionals. Decisions regarding app selection are often made based on personal experience, colleague recommendations, continuing education development activities, research, or a combination of factors. This lack of standardization in assessment makes gathering evidence to support the use of apps as therapy tools as well as potential AAC strategies a difficult task. Moreover, the absence of specific guidelines regarding AAC assessment and implementation lends itself to the

dangerous temptation of matching a specific device to a patient rather than vice versa. Gosnell (2011) emphasized the importance of feature mapping by stating that "we should always first focus on matching a client's needs, strengths, and skills to the most appropriate tools and strategies" (p. 11). Gosnell continued by saying that "solid clinical judgment and knowledge are required to assess and monitor the efficacy of an app as a clinical tool" (p. 12). It seems intuitive, then, that SLPs utilize tools such as rubrics as aids in the decision making process regarding app selection and clinical implementation. However, little evidence exists that suggests that professionals in this field are, in fact, taking advantage of such resources. Regardless of this lack of evidence, however, the development of rubrics and other similar evaluative tools in response to the app explosion has taken place. Companies such as AAC TechConnect, Inc., and Global Augmentative Communication Innovators, as well as individuals such as King-DeBaun (2012), Vincent (2012) and Van Houten (2011) have contributed valuable evaluative rubrics that can be publicly accessed and utilized by SLPs. These rubrics consider app features such as relevance, customization, usability, setting differentiation, data collection capabilities, communicator preferences, and client to app feature mapping.

In response to the limited amount of information about how clinicians are making decisions regarding AAC, Dietz, Quach, Lund, and McKelvey (2012) asked the question: "How do clinicians with varying levels of expertise approach the AAC assessment process?" (p. 149). 25 English speaking SLP's were recruited for this study based on their individual experience with AAC. The authors used the Personnel Framework for AAC Assessment (Binger et al., in press) to define the groupings of the SLPs. The groups included General Practice SLPs (GP-SLPs), AAC Clinical Specialists (AAC-CS), and AAC research/policy specialists (AAC-RS). Each of the four authors interviewed the participants using a set of guiding questions with the

goal of identifying emergent themes to "describe the differences and/or similarities of how the three groups of practitioners approach the AAC assessment process" (Dietz, Quach, Lund, & Mckelvey, 2012, p. 150). The results of the survey revealed two predominant themes: pre-assessment procedures and assessment procedures. In general, the GP-SLP's approached both pre-assessment and assessment in a linear fashion, while the AAC-CS and AAC-RS clinicians approached these tasks in a more holistic manner. Additionally, the GP-SLP's tended to make decisions based on the individual's level of impairment while the AAC-CS and AAC-RS clinicians were more apt to consider the daily communication needs faced by the individual seeking to utilize AAC. This information is valuable as we consider how rubrics are being developed to aid in the decision making process when implementing AAC with clients with complex communication needs, such as those experiencing aphasia.

Specific app design

Although a lack of continuity in the AAC decision-making process continues to be an issue among speech-language pathologists, an equally pressing concern is the way in which apps themselves are being designed for use in therapy with persons with aphasia. Developing computer programs and applications for individuals with aphasia and other disabilities is a task in which the design challenges are often underestimated. In order for this kind of technology to be not only effective, but also "usable", one must consider a variety of characteristics specific to the disorder itself (Steele & Woronoff, 2011). For example, persons with aphasia often experience symptoms such as visual field deficits, slower cognitive processing and a host of other language and non-language deficits. Additionally, individuals without communication disorders use a variety of means to communicate in our ever-advancing technological society. Light & McNaughton (2012) explained that this poses a challenge to AAC designers to create a

seamlessly integrated system that is capable of supporting such scenarios as face-to-face interactions, writing, Internet use, multimedia, texting, and social media. Researchers have realized the need to provide AAC systems that enable users to be more active participants in society.

Dr. Richard Steele, chief scientist responsible for designing and researching the efficacy of treatment technology for Lingraphica® The Aphasia Company™, and Pamela Woronoff, a Lingraphica® Support Specialist, have discussed the process of creating a successful interface design that provides maximum benefit to their consumers as they utilize their products as therapy tools. According to these specialists, the first step in this process is to be well informed about the users of the particular program that is being created. It is not enough to know only about the acquired deficits of aphasia. Characteristics ranging from emotional health, personal preferences, financial circumstances and social issues, to name a few, should all be considered as the first piece of the puzzle. Additionally, each of these factors should remain relevant throughout each phase of the field-testing process. Consumer feedback should then be considered at all levels; however, training should be provided to ensure that nonverbal communicative responses and reactions are closely monitored as these are important forms of expressive language in individuals with aphasia. Steele & Woronoff (2011) explain that by utilizing feedback from persons with aphasia, subsequently conducting appropriate field testing, and "exploiting the residual strengths" common among this population, applications may be designed and developed that will appropriately meet the wants and needs of its users. Although the smaller platform of mobile devices presents numerous design challenges, the creation of these applications will extend proven rehabilitation while introducing new functionality to Lingraphica therapy tools and others. It is important that these challenges be overcome in this area as it is explained that a

poor interface design inevitably leads to the discontinuation of the use of the device by the consumer. Conversely, a good interface design facilitates an enjoyable experience by the user that promotes the retention of functional skills for longer periods of time.

Evidence-Based Practice and apps

Finally, and perhaps most importantly, the unifying theme of evidence-based practice should be considered as a vital piece to the puzzle in the consideration of the implementation of apps as therapy tools as well as potential AAC strategies. The triad of applicable research, clinician expertise, and client preferences should be the basis from which any quality intervention strategy is built. However, the relative lack of research in the area of app efficacy poses a challenge to SLPs as they attempt to make decisions regarding this form of technology. Helling and Rush (2012) asserted that evidenced-based practice in AAC requires three types of information: 1) knowledge about the client, 2) knowledge about best practices, and 3) knowledge about devices, technology, and systems. It is imperative that SLPs consider and contribute to these criteria as they move forward in the assessment of apps as therapy tools and AAC options for their patients with aphasia.

Purpose of the study

Speech-language pathologists bear the responsibility of determining and implementing the most effective therapy strategies for their patients. Several variables including, but not limited to, specific language deficits, motor skills, personal preferences and financial concerns must be taken into consideration during this process. Although the use of AAC systems has been a viable therapy option for persons with aphasia for several decades, the implementation of AAC in the form of an iPad application as well as utilizing this type of technology as a therapy tool, in

general, is still a relatively new concept. As such, there is not only limited evidence behind the efficacy of using these specific applications for therapeutic purposes, little is known about how speech-language pathologists are making clinical decisions regarding their implementation with persons with aphasia.

This study was designed to answer the following questions:

1. How are speech-language pathologists working in a medical setting determining a patient's ability to use or not use apps?
2. Are speech-language pathologists using published rubrics to aid in the decision making process when determining app quality before implementation of said app in therapy with clients?
3. How are clinicians recording and using data in order to determine the degree of success of a chosen app?
4. What do clinicians find appealing and/or questionable about using apps with persons with aphasia?

CHAPTER III

Methodology

Survey Tool

A survey was developed to gather information relative to practicing SLPs use of PCTs or similar technology as therapy tools and/or AAC systems for persons with aphasia. The survey was designed to be relatively short but to address pertinent areas of concern (See Appendix B). The survey was constructed using Survey Monkey.

Participants

A convenience sample of members of the American Speech-Language-Hearing Association (ASHA) Special Interest Group 2 (Neurophysiology and Neurogenic Speech Language Disorders) were invited to participate in this study. This SIG was selected in an effort to obtain findings from SLPs who were providing services specifically to persons with aphasia, a neurogenic speech and language disorder.

Procedures

Potential participants were contacted via an e-mail posted to the SIG 12 Community website. The participants were asked to complete the survey regarding their use of apps as AAC strategies, the ways in which they clinically evaluated these apps, and how these apps were deemed appropriate AAC matches for a given patient. They were told that completing the survey would take approximately 10 minutes. Additionally, the e-mail included an embedded link that connected them with SurveyMonkey.com, an Internet based survey engine.

The survey link was active on the Survey Monkey site for data collection purposes for three weeks. After 10 days of the initial post on the SIG 12 Community website, a second notice was posted asking for additional participation.

Data analysis

Each question was analyzed by frequency of responses and/or qualitative responses. Trends in responses to open-ended questions were determined by instances of three or more similar responses within a given category.

No statistical analysis measures were necessary for these data.

CHAPTER IV

Results

Descriptive analysis

The results of the data obtained from the completed survey questions are presented in this chapter. The purpose of this study was to investigate how medically based speech-language pathologists are making a variety of decisions regarding the use of apps as therapy tools as well as for AAC purposes. Additionally, a specific list of apps used for these purposes was obtained, as well as general themes regarding clinician's opinions and questions concerning the use of apps in a medical setting. The link to the survey was posted on the ASHA Special Interest Group 2 Community site for a 3-week period. After approximately 10 days, a reminder was sent to request additional participation. Although there are many members of this community, only 38 members responded during this time interval. Survey participation is always voluntary. Incentives for participation were not included. The questions included in the given survey as well as a summary of responses are included in table 1.

Table 1

Summary of survey questions and responses

Survey Question	Response Summary
1. Do you use an iPad as a therapy tool in a clinical setting?	Yes = 89.2% No = 10.8%
2. Do you use iPads as a therapy tool for clients with aphasia? If so, how?	Yes, Drill and Practice = 83.8% Yes, as AAC support = 67.6%
3. How comfortable are you with using apps for this purpose?	Very uncomfortable 0% Uncomfortable 7.9% Neither 7.8% Comfortable 31.6% Very comfortable 52.6%
4. How comfortable are your patients with using apps for this purpose?	Very uncomfortable 2.6% Uncomfortable 13.2%

Table 1 (continued)

	Neither 18.4% Comfortable 39.5% Very Comfortable 26.3%
5. In general, how well do your patient's navigate the iPad?	Not well 23.7% Adequately 48.4% Well 15.8% Very well 10.5% Not applicable 2.6%
6. Please list apps that you use for Drill and Practice purposes with persons with aphasia.	The top 5 apps chosen by surveyed clinicians include: Tactus TherAppy apps Lingraphica apps Constant Therapy Speak in Motion Speech Sounds on Cue
7. Please list apps that you use for AAC purposes with persons with aphasia.	The top 9 apps chosen by surveyed clinicians include: Verbally Lingraphica aoos Tap to Talk CommunicAide Proloquo2Go Sounding board Locabulary Whiteboard Pictello
8. How do you assess the patient's ability to use or not use these apps? (choose all that apply)	Feature mapping analysis: 27.8% Colleague recommendation: 25% Decision tree: 13.9% Rubric: 5.6% Trial and error with patient 91.7%
9. What kind of data do you take on the patient's use of the app for therapy purposes?	In-app feature: 43.4% Accuracy 94.4% Time to complete task: 60.5% Patient satisfaction: 71%
10. Do you utilize any specific rubric to determine the quality of a specific app before you implement its use with a patient?	Yes = 10.5% No = 89.5%
11. Which features do you consider before selecting an app for use with patients	Visual acuity: 92.1% Hearing acuity: 57.9%

Table 1 (continued)

with aphasia? (check all that apply)	Severity of aphasia: 89.5% Language deficits: 89.5% Fine and gross motor skills: 76.3%
12. If you use apps for patients with aphasia, how satisfied are you with the range of apps available for this population?	Very satisfied: 5.3% Satisfied: 36. 8% Neither: 34. 2% Unsatisfied: 21% Very unsatisfied: 0% Not applicable: 2.6%
13. What ONE thing do you find appealing about using apps with patients with aphasia?	Identified themes among surveyed SLPs include: Ease of access for patient and clinician Social acceptability Affordability Technological appeals to patient
14. What ONE thing do you question about using apps with patients with aphasia?	Identified themes among surveyed SLPs include: Generalization of skills outside of therapy Functionality Efficacy Decreasing quality of services Patient interest/appropriateness Cost

CHAPTER V

Discussion

This study examined how medically-based speech-language pathologists make clinical decisions regarding appropriate iPad applications to be used as therapy tools or AAC options for patients with aphasia. Due to the exponential growth in computer technology over the past 3 decades, there have been significant technological contributions made to the rehabilitations of individuals who experience aphasia secondary to a cerebral vascular accident. Companies such as Lingraphica® and The Aphasia Company™, among others, have developed on the premise that computer technology can effectively provide therapy options for this specific population. Today, this technology translates into apps that can be found on smartphones or personal computing tablets such as the iPad. Because of the relative novelty of such technology, little evidence exists supporting the efficacy of using apps as therapy tools and/or AAC options for persons with aphasia. The survey used in this study served to provide insights into many areas in which there are still questions about the use of this technology with this population.

Explanation of findings

The results of the survey showed that the vast majority (89.2%) of the medically-based SLPs who participated in this study were, in fact, using iPads as therapy tools in a clinical setting. Not surprisingly, nearly the same percentage of SLPs who reported that they used iPads in a clinical capacity also reported feeling *comfortable* to *very comfortable* using apps for therapy purposes. When asked to discuss how their patients responded to using iPads as a part of their therapy, the SLPs surveyed reported that only about 16% of their patients were *uncomfortable* to *very uncomfortable* using this form of technology as part of their treatment. Given that many persons with aphasia are older, it came as a surprise that the surveyed clinicians

reported the vast majority of their patients with this disorder to not only be comfortable using an iPad, but also to be at least adequate in their navigation of this form of technology. The implications of these findings are two-fold. First, this information might imply that various levels of technology, including smart technology, are becoming more pervasive across all generations. This information is important to understand in that more than just the younger generations may be actively utilizing the latest technological advancements. Second, this information may specifically speak to the usability of iPads. If a variety of age groups, including the elderly, are easily navigating this form of technology, it could be safe to assume that the iPad is user friendly.

The results of the survey revealed 5 specific apps to be the most frequently used for drill and practice purposes among the participating SLPs. These apps include: Constant Therapy, Speak-in-Motion, Speech Sounds on Cue, Tactus TherAppy apps, as well as several apps published by Lingraphica. A simple search of the Apple Store revealed a variety of similarities between these apps regarding marketing. Each app is described as a therapy option for adults with communication deficits secondary to either a stroke, traumatic brain injury, or dementia. It seems likely, then, that an SLP searching iTunes might use these key words in order to find an app for a patient experiencing a language deficit as a result of the disorders listed above. Additionally, a search of iTunes revealed that each of these apps are not only affordable, many of them can be downloaded for free. The combination of marketing, pricing, as well as the reputable standing that Tactus TherAppy and Lingraphica have among the surveyed SLPs (as evidenced via survey responses), makes it no surprise that these 5 apps were the top chosen apps by the survey participants. Other trends in the types of apps chosen for drill and practice were apps designed to target building sentences, the use of functional phrases and words,

confrontational naming tasks, word retrieval, general articulation, oral motor exercises, auditory comprehension, and visual attention. Additionally, SLPs reported modifying apps that were designed for use by the general public (e.g., notepad, calendar, maps, reminders etc. . .) for therapy use with persons with aphasia. The functionality of implementing apps such as these into therapy sessions with this population is noteworthy. Due to the nature as well as the cause of aphasia, these individuals will likely need extra help to live independently while managing increased medications, more frequent appointments for therapy, and decreased cognitive skills such as memory. SLPs are likely using and modifying these apps that are intended for the general public as a means of providing resources and strategies to this population as they continue to adapt to life post-stroke.

In addition to apps used for drill and practice, the survey also identified 9 apps commonly used for AAC purposes among the participating SLPs. These apps include: Verbally, Tap-to-Talk, CommunicAide, Proloquo2Go, Sounding Board, Locabulary, Whiteboard, Pictello, as well as a variety of apps published by Lingraphica. Again, common themes regarding pricing and marketing were revealed upon a search of iTunes for these apps. With the exception of Whitebaord and Pictello, each of the other apps listed were marketed specifically as either assisted communication, supported communication, or AAC options. Moreover, each of these apps are relatively inexpensive and often have "lite" versions that are significantly less expensive than the original version, or even free. Because cost is always a concern when making decisions about appropriate therapy materials, it is likely that having the option to "test out" the lite versions of these apps with patients before committing to paying full price increases the appeal of these apps, making them more popular among the surveyed SLPs. Although Pictello and Whiteboard are not specifically marketed to aid in therapy with persons with aphasia, the

functional use of these apps with this population lies within their use of visuals. Due to the specific language deficits experienced by these patients, it seems intuitive to utilize technology that capitalizes on the use of pictures as a therapy option. The visual capabilities of these apps likely make them top contenders for the surveyed SLPs as they search for AAC options for their patients.

When asked to discuss clinical decisions regarding the implementation of apps in therapy, nearly 92% of the SLPs surveyed reported that they used "trial and error" in order to assess the patient's ability to successfully use the app. This information is significant as we consider the caseload as well as the productivity demands of the medically-based SLP. It is unlikely that the SLPs surveyed are allotted time in their schedules to complete research, fill out a rubric, or conduct a feature mapping analysis as they make decisions about appropriate apps to use with their patients. In fact, 89.5% of respondents reported *not* using rubrics during their decision making process. However, the majority of SLPs surveyed claimed to consider a variety of patient characteristics such as visual/hearing acuity, the severity of the patient's aphasia, as well as specific language deficits when considering appropriate apps. This information is valuable in that it shows that the surveyed SLPs are deeming apps appropriate as therapy options based on the individual characteristics of their patients.

Four common themes were identified when participants were asked to discuss what s/he found to be appealing about using apps with patients with aphasia. These themes include the overall ease of access for patients and the clinician, general social acceptability, relative affordability, as well as this form of technology being appealing to the patient. Moreover, clinicians reported that using apps helps to facilitate more intensive, aggressive practice/therapy because patients can have access to these apps at home. Consequently, apps tend to promote

independence as patients seek to practice outside of their individual therapy sessions. Also, some surveyed SLPs reported that incorporating apps into their sessions helps to improve the variety of therapy tools available which generally results in a "more engaged" patient. Other clinicians stated that using apps as therapy tools capitalizes on the procedural memory of patients who have prior iPad/iPhone knowledge. These findings are consistent with the current research regarding the increasing popularity of the iPad as a therapy tool.

Conversely, the participants in this survey identified several questions about using apps with patients with aphasia. These questions included overall generalization of skills outside of therapy, the functionality of the technology, the clinical implications of using apps for therapy purposes with little evidence to support their efficacy, the overall cost, and the potential of decreasing the quality of services by replacing patient-clinician interaction with technology. Other concerns included whether or not technology would, in fact, hinder verbal output, the inability to tailor many apps to the specific needs of the patient, and inefficient data collection. Many of these concerns are valid as we consider incorporating such novel technology into therapy with persons with aphasia. Because of the general lack of evidence regarding the use of apps, it is not surprising that the surveyed SLPs mentioned having concerns about overall cost. For example, it would be impractical and inefficient to purchase an app that claimed to be a valuable therapy option for this population only to find out that its design did not consider the specific language deficits of aphasia upon implementation with a patient. It is also understandable to question the consistent use of apps as therapy tools vs. the incorporation of other mediums. Because the world operates with a variety of different modes of communication, it will be the responsibility of the clinician to encourage other communication strategies that their patients with aphasia can utilize in order to functionally communicate in a variety of settings. It

is likely that the novelty of using apps, as well as the lack of evidence to support the use of apps as therapy tools contributed to the lack of overall satisfaction among the surveyed SLPs regarding the apps available for persons with aphasia.

Clinical implications

The medically-based SLPs who participated in this survey reported that they are, in fact, using iPads and apps as therapy tools in a variety of ways with patients with aphasia and they feel comfortable doing so. However, an overwhelming majority of these SLPs are relying on trial and error tactics in order to assess their patient's ability to use or not use apps therapeutically. Although there is much to be said for professional judgment and experience, this method of implementation leaves much to be desired in regards to the consistency of professional decision-making. As mentioned previously, systematic, standardized, and collectively accepted decision matrices such as rubrics, decision trees, and the like are commonplace among other professionals, such as physical therapists. The implementation of such strategies within the realm of speech-language pathology regarding the use of apps could lend itself well to the collection of evidence that is needed to support the use of apps as therapy tools as well as potential AAC strategies.

Fortunately, rubrics and other similar evaluative tools exist as resources for SLPs looking to guide their decisions when choosing apps for therapy purposes. In fact, many of these rubrics address the concerns mentioned by the surveyed SLPs regarding app relevance, customization, usability, data collection capabilities, and client to app feature mapping. The accepted implementation of such evaluative tools across our profession not only has the potential to promote the compilation of evidence regarding the therapeutic use of apps, but such a

standardized tool could be useful in guiding new clinicians as they are making these decisions for the first time. As previously mentioned, 83% of 71 SLPs surveyed rated their educational training in providing AAC services as fair to poor (Marvin, Montano, Fusco, & Gould, 2003). Although graduate programs are expanding and preparing future SLPs to work competently with AAC, it is clear that there is still much to be desired in the realm of training students in the area systematic decision making regarding AAC implementation (Beukelman & Mirenda, 2010). Moreover, with the explosion of the "app world" into the AAC market, there is suddenly much more to consider when making decisions that are considered "best practice" for one's patients.

Strengths and limitations

A major limitation of this study was the small sample size. The population of this survey was limited to a convenience sample of one professional special interest group. Even SLPs who are members of this special interest group may not routinely access the community website to learn about the research and other information found there. As the survey was only completed by members of this special interest group, the results may not be generalized to other speech-language pathologists, particularly those whose special interests lie outside of the areas of neurophysiology and neurogenic speech and language disorders.

By wording survey questions to specifically examine iPad use, the questions may have been interpreted to exclude the use of other personal computing tablets (PCTs) such as the Microsoft Surface or the Dell Venue. By appearing to focus on the iPad only, some questions may have excluded responses from those who use other available PCTs.

Conclusion and future research

In conclusion, it appears as though medically-based SLPs utilize apps in a variety of ways during therapy with patients with aphasia. Not only are apps being used as alternatives to traditional drill and practice materials, it appears that they are being utilized for AAC purposes with this population, as well. However, it appears that SLPs are not utilizing available evaluative resources, such as rubrics, prior to their implantation of these apps with their patients. Because clinicians are reportedly relying on trial and error tactics to determine a patient's ability to use or not use an app, it is important to consider the valuable therapy minutes that could potentially be rendered useless if a specific app reveals to be ineffective.

Further research is needed with a larger sample size of SLPs in order to gain a greater understanding of how apps are being used as therapy tools as well as AAC strategies. Additionally, a larger sample size is needed in order to determine exactly how/if SLPs are evaluating apps as well as the specific needs of their patients prior to the implementation of the app during therapy. The decisions medically-based SLPs are making before deciding to use apps with their patients with aphasia may be affected by multiple factors and more research is needed in order to determine the efficacy of apps, in general, as well as to aid in the decision making process of future clinicians as they begin to work with this form of AAC.

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APPENDICES

APPENDIX A

Clinical Features Considered in the Selections of Apps
(Alliano, Herriger, Koutsoftas, & Bartolotta, 2012, p. 64)

Clinical Feature	**Definition**
Purpose of Use	Description of the app's purpose including receptive or expressive language needs
Output	The type of output provided by the device, for example, speech, text, or both
Speech Settings	The supralinguistic features of speech output (pitch, volume, rate) as well as whether the device will speak after a word or phrase
Representation	The symbol types available for the app including the ability to import and modify icons
Display	The layout of the app including the ability to import and modify icons
Feedback Features	Whether the icon highlights, zooms, enlarges, or vibrates and also the extent to which these can be modified
Rate Enhancement	The features that improve the rate of communication output of the app and to what extent these are customizable
Access	How the user interacts with the device in terms of selection of items (scanning, pointer) and whether this can be customized
Required Motor	The motor abilities the user must possess in order to access the device
Competencies Support	Support provided by the app publisher mostly for resolving technical issues
Miscellaneous	Any additional options that are available with the app.

APPENDIX B

The Clinical Use of Apps as Therapy Tools and/or AAC Survey

1. Do you use an iPad as a therapy tool in a clinical setting?

2. Do you use iPad apps as a therapy tool for clients with aphasia? If so, how?

3. How comfortable are you with using apps for this purpose?

   1) Very uncomfortable 2) Uncomfortable 3) Neither 4) Comfortable 5) Very comfortable

4. How comfortable are your patients with using apps for this purpose?

   1) Very uncomfortable 2) Uncomfortable 3) Neither 4) Comfortable 5) Very Comfortable

5. In general, how well do your patient's navigate the iPad?

   1) Not well 2) Adequately 3) Well 4) Very well 5) Not applicable

6. Please list apps that you use for Drill and Practice purposes with persons with aphasia.

7. Please list apps that you use for AAC purposes with persons with aphasia.

8. How do you assess the patient's ability to use or not use these apps? (choose all that apply)

   Feature mapping analysis
   Colleague recommendation
   Decision tree
   Rubric
   Trial and error with patient

9. What kind of data do you take on the patient's use of the app for therapy purposes?

   In-app feature
   Accuracy
   Time to complete task
   Patient satisfaction

10. Do you utilize any specific rubric to determine the quality of a specific app before you implement its use with a patient?

11. Which features do you consider before selecting an app for use with patients with aphasia? (check all that apply)

    Visual acuity
    Hearing acuity
    Severity of aphasia
    Language deficits
    Fine and gross motor skills

12. If you use apps for patients with aphasia, how satisfied are you with the range of apps available for this population?

    1) Very satisfied 2) Satisfied 3) Neither 4) Very unsatisfied 5) Not applicable

13. What ONE thing do you find appealing about using apps with patients with aphasia?

14. What ONE thing do you question most about using apps with patients with aphasia?