“There’s an app for that”:

Clinician perspectives on the iPad as an intervention tool for children

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ABSTRACT

Technology use in assessment and intervention in speech-language pathology is an area of rapid growth. Decisions about what type of device to use should be evidence based and take into account best practice principles (BPPs) within speech-language pathology. This study explored the benefits and limitations of the iPad as an intervention tool for children in speech-language pathology. Three groups of clinicians (students, new graduates, and experienced clinicians) discussed their beliefs about best practice principles in intervention and their views and uses of technology through initial and final focus groups. Ten themes emerged from the focus groups, and will be discussed in detail in this paper. The participants received instruction on the iPad and key applications for use in the profession and evaluated those applications by examining how well the apps align with best practice principles using an "iPad Application Rating Sheet".

This study demonstrated that speech-language pathologist's (SLP) beliefs about BPPs are important when choosing materials. This paper will highlight the clinical implications of iPad use in intervention, the promise of the technology, the value of explicit consideration of BPPs, and the strengths and limitations of current applications. Clinician suggestions for modifications of applications, for desirable qualities in new applications, and for clinical use of applications will also be discussed.

INTRODUCTION

The rapid development in hand-held computers and devices has resulted in increased infiltration of technology into educational contexts. This includes assessment and intervention in speech-language pathology. As with any new tool, it is important to consider evidence of

effectiveness and consistency with best practice principles before including the tool in clinical practice.

This study examined the use of the iPad as a speech and language intervention tool for children and aimed to: 1) explore clinicians' perspectives on technology use in speech-language pathology, 2) identify best practice principles clinicians believe to be important in speech and language intervention and 3) evaluate iPad applications based on best practice principles.

LITERATURE REVIEW

Technology in Intervention

Children today have access to great amounts of technology, therefore prompting its use in various educational and therapeutic contexts (Watt, 2010). Watt (2010) proposed that any form of electronic communication can have a positive effect on language and literacy development in children. Computer technology has been reported to promote social interaction, which is important for the development of language (Watt, 2010). Different types of software can, and are, used to attain different educational goals. These different types of software include drill-practice and tutorial software which can be used to help children develop specific skills, while interactive and exploratory software can help support teachers as they implement curriculum orientated goals (Niederhauser & Stoddard, 2001).

Computer-based programs have also been used with special populations such as children with hearing impairments, augmentative communication disorders, autism, Phonological Disorders, and so forth (George & Gnanayutham, 2010; Sailers, 2010a). Computer-based education has a positive impact the acquisition of knowledge and skill development of an individual (Lewis, 1999). Researchers (Meredith, 1996; Van Biervliet et al., 1995; Wilson,

Foreman, & Stanton, 1997) have concluded that computer-based programs provide users with opportunities for improved social interaction, reduced feelings of isolation, and improved self-esteem. As a result, it is suggested that these types of programs allow children to apply the information learned through the computer-program into real world situations and settings (Lewis, 1999).

Technology has also been used in speech and language intervention. Technology can provide children with high degrees of stimulation (Roberts & Foehr, 2008), and allow them to receive information from multiple sources, such as print, audio, and pictures (Bosseler & Massaro, 2003). Technology can also provide opportunities for automatic feedback and intensive practice (Bosseler & Massaro, 2003).

Computer programs requiring children to perform certain tasks have been developed in order to aid these children in language and communication. One such program, Fast ForWord (Tallal, Merzenich, & Miller, 1998), has been extensively reviewed and highlights some of the limitations of computer-based intervention (Loeb, Gillam, Hoffman, Brandel, & Marqui, 2009). There are questions concerning how closely the use of technology aligns with current beliefs about effective intervention. The use of technology in intervention may lack saliency and meaningfulness to the child because the technology must build on a child's interest and prior knowledge (Gillam, 1999). Cordes and Miller (2000) also express concern about reliance on technology in education and caution that children's use of computers should be minimal and that direct interactions with adults and peers are most beneficial for their social development. This highlights the importance of considering the extent of alignment between the technology being used and important aspects of educational and therapeutic interaction.

New Technology: iPod touch, iPhone and iPad

The iPod touch, iPhone and iPad are multi-touch graphical user interface devices which allow the user to download and use a variety of applications. The iPad is an interesting new technology for use in education and intervention because it is compact, but is large enough to be easily operated by children or adults with disabilities. The touch screen format of the applications is more natural than using an input device such as a mouse. By using one's finger to point and select, the input device is also the output device. Researchers found that children ages six years and greater understand, with little difficulty, how to use touch-screen technology (McKnight & Fitton, 2010), therefore demonstrating how intuitive the use of this technology is for young children.

This new technology could be an innovative way to provide therapy to children and adults with communication disorders because of its simplicity and the continuous advances in the development of educational resources. Agencies and individuals have compiled lists of applications relevant to speech-language pathology and special education (Alberta Health Services, 2010a, 2010b; Cormier, 2010; Sailers, 2010b; Welsford & Kingdon, 2010). However, when adopting new intervention materials or methods, clinicians must consider the availability of evidence to support their choices.

Evidence Based Practice

Clinical decision making and improving the quality of services provided to individuals receiving speech and language intervention should be evidence based. Evidence Based Practice (EBP) is the use of current research evidence when deciding about the care of individual patients (Sackett, Rosenberg, Muir Gray, Haynes, & Richardson, 1996). EBP involves

considering the strongest, most reliable sources of evidence to answer clinical questions. The clinician then determines how the research evidence should be integrated into clinical decisions concerning individual treatment (Sackett et al, 1996).

There are a number of challenges in applying EBP to speech-language pathology as it relies on the existence of relevant, high quality research. Because speech-language pathology is a young profession, there are a limited number of randomized control trials and systematic reviews that have been conducted (Dodd, 2007). In addition to this, people with communication disorders are a heterogeneous group and therefore pose challenges for research of treatment outcomes (Dodd, 2007).

There is currently no research evidence to support or refute the value of the iPad and relevant applications for use in speech-language pathology. Without such evidence, clinicians can consider generally agreed upon "best practice" intervention principles to determine if a new approach is theoretically sound.

General Principles of Intervention

A variety of general intervention principles are discussed in the speech-language pathology literature. These principles convey current beliefs about effective intervention. A review of the intervention literature for pediatric clients generated a variety of principles, which have been organized into categories. “Best practice” intervention for children will be individualized, focused, engaging, provided in a facilitative context, functional, naturalistic and including meaningful communication partners.

Individualized. The group of children requiring speech and language intervention is heterogeneous. Children may require intervention in any combination of the following areas:

articulation and phonology, grammatical morphology, complex syntax, semantics, and/or pragmatics (Cirrin & Gillam, 2008). Intervention may include written, oral, and symbolic language comprehension and expression.

All children differ in the ways in which they are able to learn new information and for this reason, it is important to make language intervention as individualized as possible. SLPs must consider a child's communicative intentions, developmental age rather than chronological age, and specific processing strategies used by each child (Johnston, 2007). These considerations highlight the importance of individualized treatment.

Focus. When planning intervention, it is also important to include strategies that will help the child focus on the target the SLP is trying to teach (Johnston, 2007). These can be strategies such as increasing the frequency, intensity, and duration of the concept that is being taught (Koutsoftas, Harmon, & Gray, 2009). By ensuring the learning targets are the focus of intervention, the SLP will reduce the demands on the child's attention and memory and will therefore increase the likelihood that the target skill will be learned.

Engaging. Activities that are not engaging are not motivating. A study by Culatta, Setzer, and Horn (2005) found that by creating more engaging activities, the child's attention was maximized and motivation was increased. This resulted in more effective intervention. The authors also suggest that more engaging activities may help compensate for poor attention skills.

Facilitative Context. Skills should be taught in a helpful context that aids the child in learning a particular skill (Johnston, 2007). The cognitive load of the activity should be considered during planning as skills will be more readily learned when the task requires fewer mental resources

(Johnston, 2007). Clinicians should ensure that all necessary cues and aids are available to the child in order for learning to occur. For example, intervention components such as direct instruction and modeling of desired behaviours, role-play, and practice of these behaviours should be included in intervention to make learning easier for the child (Timler, Voder-Elias, & McGill, 2007). The clinician's role is to vary the structure of the activity in order for the child to succeed at the highest level possible (Johnston, 2007).

Functional. It is also important to include functionality in language intervention (Johnston, 2007). Functionality refers to providing children with functional language tools they can use in the real world. This includes teaching the target skill in an environment that is meaningful to the child and having the child use a target skill for communicational purposes. Communication-centered instruction is one approach that advocates for goals to be taught in pragmatically appropriate situations. This method states that practice should directly replicate the client's everyday conditions (Creaghead, Neuman, & Secord, 1989), which facilitates functionality.

Naturalistic. Client-centered and hybrid intervention approaches have been found to be the most effective intervention methods as opposed to clinician-directed. These methods integrate natural play activities that are pragmatically appropriate, involve communicative consequences, and do not require the use of tangible reinforcement (Paul, 2007).

Methods that are unnatural and more drill based are less effective as they are neither interesting nor engaging for children. Drill based learning can be tempting as it provides many opportunities to practice, however learning fewer concepts in a meaningful and naturalistic manner is much more effective and leads to greater generalization (Paul, 2007).

Meaningful communication partners. Effective intervention includes the involvement of

communication partners that are meaningful to the client such as parents, teachers, and peers. Peers can be especially effective in teaching pragmatics (Paul 2007). Parents can participate in the treatment and follow structured home programs (Tyler, 2008) or can be coached by the speech-language pathologist to provide intervention through parent-directed therapy. This provides a more natural setting for language learning that allows for practice of language in real-life situations (Butler, 1994). According to Johnston (2007), parent education aids children in the language learning process. It is important for the speech-language pathologist to create materials for the parent that are easy to use (Johnston, 2007).

A variety of principles are seen as important in speech and language interventions with young children. Consideration of these principles will assist in evaluating new treatment methods.

Purpose

The purpose of this study was to explore speech-language pathologists' knowledge and beliefs about best practice principles in the profession and the use of technology in the intervention process. It also examined the benefits and limitations of the iPad as an intervention tool and the extent to which current iPad Apps fit best practice principles. The word 'App' will be used throughout the paper when referring to applications designed for use with the iPad.

METHODS

Participants

Participants in this study were selected based on a convenience sampling strategy. Three groups of speech-language pathology participants were included to provide information

from three distinct levels of experience: 1) experienced speech-language pathologists (n = 8), 2) recent graduates (n = 8), and 3) graduate students (n = 13). The experienced participants were recruited from clinicians who have served as clinical and sessional faculty in the Department of Speech Pathology and Audiology at the University of Alberta. Recent graduates were recruited from the email list of the 2010 graduates from the Department of Speech Pathology and Audiology from the University of Alberta. Graduate students were recruited from the students in the 1st year in the Department. There were no exclusionary criteria for these participants.

Materials

Focus Group Discussion Guides. A discussion guide was developed to guide the initial and final focus groups. The guide was based on information from a review of the current literature regarding best practice principles and technology use in speech-language pathology. General topic areas and open questions were used to direct the focus group. This allowed the researchers to validate the best practice information gleaned from the literature, and to learn which best practice principles clinicians are currently following, as well as why other principles are not used. It also explored the clinician's exposure to, and interest in, computer based intervention materials.

iPad App Rating Sheet. A rating sheet (Appendix C) was developed to allow participants to reflect on how well each specific App fit best practice principles in speech-language pathology. The guide included the best practice principles found in the literature and additional principles derived from participants during the initial focus groups.

iPad Learning Session. Materials for the iPad workshop included 6 iPads and handouts for participants with screen shots and descriptions of the Apps included in the learning session.

Procedure

Participants were involved in three components: 1) initial focus group, 2) learning sessions on iPad use in speech-language pathology, and 3) final focus group.

Initial focus groups were conducted with 4 - 8 participants in each group. The three participant groups were in separate focus groups, which were 45 minutes to one hour in length. The researchers used the discussion guides as a framework for the focus groups. The focus groups were audio-recorded for analysis purposes and to allow the researches to continue conversation and question-asking in a more natural manner.

After the initial focus groups, sessions on the iPad and Apps for speech-language pathology were provided to participants of the initial focus groups. Apps for the learning sessions were selected based on reviews completed by agencies and individuals (Augmentative Communication and Educational Technology Service, 2010a; Augmentative Communication and Educational Technology Service, 2010b; Conley, et al. 2010; Cormier, 2010; Sailers, 2010a, 2010b; Welsford & Kingdon, 2010). Apps were selected if they appeared on at least three of seven lists, or if they were the only App addressing a specific intervention area. The list of Apps discussed in the learning sessions included: *Articulate It, Artic Pix, Phono Pix, Sunny Articulation Test, Doodle Buddy, Speak It, Proloquo2Go, Tap Speak Sequence, WH Questions, iPractice Verbs, Going Places, Bob Book's Magic, Language Builder, Social Skills, and Story Patch.* Three sections of learning sessions were offered, totaling 180 minutes of instruction. Two groups received this in one block; the third group received it in two 90 minute sessions.

The three groups of participants were mixed in the learning sessions. Participants had the opportunity for hands-on practice with the iPad during each session. As they learned about each App, participants completed the iPad App Rating Sheet (Appendix A). Approximately 2 to 7 weeks after the learning sessions, final focus groups were conducted with structure similar to the initial focus groups. Discussion in this group focused on the participants' impressions of the iPad and how it may be used in their practice. Although there was no requirement to utilize the iPad, all participants were provided with access to iPads during the time between the learning sessions and the final focus group. The participants were asked to reflect on their experiences with the tools or to provide their reasons for not trying them.

Analysis

This project used a mixed methods design, with a qualitative description approach to focus group data (Sandelowski, 2000) and descriptive data analysis (means and ranges) used to characterize the information from the iPad App Rating Scale. Data from the focus group were analyzed via summative content analysis (Berg, 2004; Hsieh & Shannon, 2005). The data was analyzed to discover themes which represented a message or idea expressed by the participants. A total of 5 individuals were involved in analysis of the focus group transcripts. Each individual read through the transcripts independently and then used a summative content analysis to develop codes or themes present in the data. Once each analyst had coded the comments thematically, they met to discuss their themes and consolidate their information into a coding structure. Two of the analysts then used this final coding structure to code the entire data set. These two analysts compared their results and worked together until they agreed on the final codes assigned to content from the transcripts. Finally, the researchers

then quantified the data by calculating the frequency with which each theme was discussed by the participants (Chang, Voils, Sandelowski, Hasselblad & Crandell, 2009). This process can increase the information derived from qualitative descriptive studies.

RESULTS

Quantitative Analysis

During the focus groups, participants categorized the Best Practice Principles from the literature into those that were "Extremely Important" (maximum of 3), "Very Important" (maximum of 3) and "Somewhat Important". They also added principles they thought were missing from the original list, but these were not included in the rankings. Table 1 shows the percentage of participants placing each principle in a specific category.

Table 1

Importance of Best Practice Principles expressed in percentages

Best Practice Principles	Students (13)			New graduates (5)*			Experienced clinicians (8)		
	EI	VI	SI	EI	VI	SI	EI	VI	SI
Engaging	39	46	15	20	80	0	40	60	0
Facilitative Context	31	63	8	40	60	0	20	80	0
Functional	85	15	0	80	20	0	40	60	0
Naturalistic	8	77	15	0	0	100	20	20	60
Meaningful Communication Partner	23	46	31	0	20	80	20	40	40
Individualized	77	23	0	60	40	0	80	20	0
Focused	46	23	31	20	40	40	40	0	60

*EI = Extremely Important; VI = Very important; SI = Somewhat Important.) **Note: three Participants from the New Graduate group ranked the importance of the Best Practice Principles in a way that precluded the ability to include the rankings in this table.

These results demonstrate that experienced clinicians, new graduates and students generally agreed upon the importance of each of the best practice principles discussed.

The additional BPPs mentioned across the initial focus groups were: pedagogy (theoretically or developmentally sound), accountability (allows for data collection), safe, efficient and practical. These principles were included in the iPad App Rating Sheet. Participants used a Likert scale to rank how strongly they agreed that each App demonstrated the principle in question, with a rating of 1 indicating "strongly disagree" and 5 indicating "strongly agree". Table 2 demonstrates the number of Apps (out of 14) that were ranked above 3.5, between 3.5-2.5, and below 2.5 on the Likert Scale by each group (NG (New Grads), EC (Experience Clinicians), and SG (Student Group)) for each best practice principle.

Table 2

Number of Apps ranked as Strongly Agree/Agree, Neutral, and Disagree/Strongly Disagree

Best Practice Principles	Strongly Agree/Agree (3.5+)				Neutral (3.5-2.5)				Disagree/ Strongly Disagree (2.5-1)			
	SG	NG	EC	Total	SG	NG	EC	Total	SG	NG	EC	Total
Engaging	12	7	9	28	2	6	5	13	0	1	0	1
Facilitative Context	10	6	8	24	4	6	4	14	0	2	2	4
Functional	11	10	9	30	2	3	0	5	2	5	1	8
Naturalistic	6	3	3	12	6	6	4	16	2	5	7	14
Meaningful Communication Partner	7	5	9	21	5	7	4	16	2	2	1	5
Individualized	9	7	10	26	3	5	2	10	2	2	2	6
Focused	12	13	11	36	2	1	3	6	0	0	0	0
Evidence Based	8	5	3	16	5	7	7	19	1	2	4	7
Accountability	4	4	3	11	2	2	1	5	8	8	10	26
Safe	13	13	10	36	1	1	3	5	0	0	1	1
Effective	13	9	8	30	1	5	5	11	0	0	1	1

Results from this data demonstrate that overall impressions of the apps ranged from neutral to strong. More than half of the participants rated applications as aligning with the following best practice principles in the range of "strongly agree/agree": engaging, facilitative context, functional, meaningful communication partner, individualized, focused, safe and effective.

Codes

Results of the summative content analysis of the initial and final focus groups resulted in 9 themes and 79 subthemes. In general, similar themes were mentioned by each of the participant groups in both the initial and final focus groups. The themes and sub-themes are described below. Any differences by participant group or between the initial and final focus groups are also described.

Reasons for Using the iPad. The first theme focused on participants' *Reasons for Using the iPad*. The most common subthemes within this category from each group in both initial and final focus groups were: Motivating (e.g., "The interest is immediate. As soon as kids see anything digital they're interested in it."), Convenient (e.g., "a lot of different things that we would be able to access and use one device for"), Time Saving , Increased Technology Use (for the child and/or the clinician) (e.g., " We are giving them [children with speech and language difficulties] a heads up in some respects in terms of some accessibility to some of those technological mediums"), Socially Acceptable (e.g., "It [the iPad] is seen very positively instead of the communication system you have to go find because the child has hidden it in their cubby because they don't want to use it."), and Comfort with Technology (both child and adult) (e.g., "Children pick it up easily.")

Positive Features of the iPad. The second theme focused on *Positive Features of the iPad*. The subtheme that appeared most frequently in the initial focus group was Cost (e.g., "It's affordable"). Two subthemes that appeared most frequently in the final focus groups were Ease of Use of the iPad (e.g., "I think it's way more user friendly for kids. It's easier for them to navigate through.") and its Small Size and Portability (e.g., "You can carry it around with you.") Other subthemes mentioned included: Pictures/Videos, Recording Device, and Visual Support. All subthemes occurred in both the initial and final focus groups.

Uses Specific to Speech-language Pathology or Special Populations. Participants discussed *Uses Specific to Speech Language Pathology or Special Populations*. Three subthemes were most frequently mentioned in each participant group: Using the iPad as an Alternative and Augmentative Communication Device (e.g., "…AAC type device it's technologically savvy", as a tool to aid therapy of Articulation and Phonological Difficulties (e.g., "working on some speech treatment"), and as a Reinforcement Tool (e.g., "… more as a reinforcer"). The following subthemes emerged in the final focus groups only: use of the iPad for Auditory Bombardment, using the iPad with children with Autism, Storytelling and Narratives, Drill, Language, Behavior Management, and to promote or reduce Social Interaction.

Potential Uses of the iPad. Participants discussed *Potential Uses for the iPad* and Home Practice emerged as the most common response in the final focus group (e.g., "…the parents would be more interested in incorporating these activities at home"). In the initial focus group the subtheme most discussed was the iPad as an Administrative Tool (e.g., "I would use it more for the purpose of like taking notes"), however in the final focus group this use was not consistently mentioned. Other uses that participants identified for the iPad were:

Individualization, Classroom Practice (e.g., "working on some speech treatment in the classroom in a more enticing and useable way"), as a Supplement to Other Materials (e.g., "Even if I had one of those, I'd only do it for like 5 minutes of the session."), Multiple Uses (e.g., "just to be used with a bunch of different kinds of kids in different ways"), and as Part of a Multidisciplinary approach (e.g., "There are lots of Apps to support cognitive and educational objectives and I know our OT is really excited.") One use that was discussed in the initial focus group but not in the final focus group was the iPad as an Entertainment Device.

Limitations. This theme focused on *Limitations of the iPad*. There were 3 subthemes within this category that emerged frequently from each group and in both initial and final focus groups. The first was Operating the iPad for Those With Disabilities/Delays (e.g., "For kids who have a lot of fine motor concerns with their hands I think it might be tricky."), the second was Fragility (e.g., "You need to find a case or something to put it in.") and the third was Cost (e.g., "They are fairly expensive in terms of getting the product initially.") The subtheme Keypad (e.g., "..they aren't getting familiar with the key board…or with the mouse") occurred frequently only in the final focus groups.

Negative Features. The sixth theme focused on Negative Features of the iPad. The three subthemes that occurred most commonly in the initial focus groups were Lack of Social Interaction (e.g., "You would lose that one on one with the child that you would have if you were, you know, face to face."), Too Much Technology (e.g., "Kids are already spending so much time with technology."), and Potential for Misuse by Parent/Others (e.g., "We've seen that some of the apps aren't ideal so we wouldn't want people to just be using them because they're there.") The two subthemes that occurred most commonly in the final focus group

were Lack of Social Interaction and Distracting/Difficulty with Transitioning (e.g., "All they wanted to do was swipe things and they were talking less.") Other subthemes that occurred in both the initial and final focus groups were Lack of Natural/Functional Activities (e.g., "It takes something that should be more naturalistic and turns it into something a little bit more artificial."), and Limited Generalization (e.g., "Parents often wanted the stories so it was easier for us to create them in different systems or just email it to them as opposed to giving them the iPad to take home.") Other subthemes that were mentioned only in the final focus groups included: Others Not Familiar with Technology (e.g., "Sometimes those who aren't used to touch screens it can get confusing because it's not as universal as using a computer.") The themes of Others Not Familiar with Technology and Intimidating were mentioned only by the student clinicians. Lack of Generalization and Distracting/Difficulty Transitioning were mentioned only by the student clinicians and new grads.

Limitations of Apps. Participants also discussed *Limitations of the Apps*. The subtheme Lack of Flexibility (e.g., "There was little choices, very few usable words, and very few words they would actually care about.") was the only subtheme mentioned in the initial focus groups. The three most common subthemes mentioned in the final focus groups were Lack of Flexibility, No Trial Period (e.g., "Have a trial period because you kind of need to try it out before you buy it."), and Limited Effectiveness (e.g., "They weren't learning as much as I thought they would.") Other subthemes mentioned in the final focus groups included: Feedback (e.g., "It would be nice if it [the feedback] wasn't so immediate."), Engagement Faded (e.g., "After three sessions I didn't find it that engaging anymore."), Not Consistent with Best Practice Principles (e.g., "I was just really saddened by how hard it was to actually incorporate them [best practice principles]

and follow the best practice."), and Difficult to Cue (e.g., "It's kind of hard to step in and give cues with some of the apps.") Engagement Faded and Difficult to Cue were mentioned only by the new grads. Not Consistent with Best Practice Principles was mentioned by only the student clinicians and experienced clinicians. Software was mentioned only by the student clinicians.

Strategies for Successful Use. Another theme was *Strategies for Successful Use*. Two subthemes emerged: one regarding Education of Parents and Teachers, and the other regarding Collaborative and Mediated Use (e.g., "You have to kind of adapt it.") Discussion around Education centered on SLP, parent and teacher instruction and providing parents and teachers with the knowledge they need to effectively use the iPad (e.g., "I think if I explored more apps and became more familiar.") Discussion regarding Collaborative and Mediated Use reflected the idea that the iPad would be used in ways that require interaction with a communication partner.

Benefits and Uses of Best Practice List. Another theme focused on the *Benefits and Uses of the Best Practice List*. The most common subtheme within this category was that this list provides a way to Evaluate and Justify material purchases, choices, and so on (e.g., "That definitely guides how I evaluate it.") Participants also discussed how the Best Practice List allowed them to Reflect on Practice, Increased Awareness of the principles (e.g., "I think it affected it more because they were kind of primed in my head beforehand."), provided Rationale for Use of the device, and Led Participants to Choose Not to Use Specific Apps (e.g., "Not all of the words were great, so we decided not to use it.")

Advice for App Developers. Participants provided *Advice for App Developers* throughout the final focus group sessions. Overwhelmingly the participants requested that app developers

allow for Flexibility and Individualization in the apps (e.g., "Let us be able to enter our own words"). Other sub-themes also included: Incorporating an SLP in Development (e.g., "Get direct consolation from SLPs."); Use Theoretical, Developmental and Evidence Based Information (e.g., "Make sure it's evidence based."), Make Apps Functional, and Put in a Facilitative Context.

DISCUSSION

Technology

The iPad is a new technology that has much promise for clinicians in the field of Speech Language Pathology. There are a number of positive features of the iPad that make it beneficial for clinicians in practice, which were discussed by participants in this study. Some positive features were that the iPad is cost friendly, portable, easy to use, and has a camera and recording device built in. In addition to these positive features, the iPad is also motivating for children, is socially acceptable, and adds convenience for clinicians. Finally, because the iPad is being purchased by many schools, health care settings, and workplaces, it will be a valuable tool for clinicians to utilize. Additionally, all groups in the study demonstrated a keen interest in using technology in their clinical practice. All participants saw the advantages of the use of technology in their clinical work, despite some of the limitations of such technology. The most prominent limitation is that many of the Apps developed for the iPad are not fully consistent with all best practice principles. Participants were provided suggestions of how the Apps could be altered to be more consistent with best practice principles and suit their clinical needs. Lastly, a discussion is presented below on the subject of how the participants see the iPad being used in a clinical setting.

Best Practice Principles

When using the iPad technology, it is important to ensure that one follows current beliefs surrounding best intervention practices. A search of the literature did not reveal a cohesive list of principles, but general principles were extracted from various writings. The focus groups validated the list of principles created by the researchers and added several new items. The following list of best practice principles were considered by participants to be important for intervention: engaging, facilitative context, functional, naturalistic, meaningful communication partner, individualized, focused, theoretically sound, safe, practical and efficient.

Participants' ranking of these principles resulted in generally even rankings across groups. Functional and individualized emerged as the two most highly ranked best practice principles across each group, with more than half of the participants in each group rating both principles as "extremely important". In addition to ranking the best practice principles, participants rated the apps discussed during the learning sessions in terms of how well they aligned with the best practice principles.

Apps

Ratings of how well Apps align with best practice principles (shown in Table 2) were consistent with participant's overall impressions, including readiness and excitement to use this new technology. There were no notable differences across groups of participants and no App fully met participant expectations concerning all best practice principles. Taken as a whole, the selected Apps were rated relatively well in terms of the evident best practice principles, with the majority of Apps receiving ratings in the range of 'Strongly Agree/Agree' and 'Neutral'.

Caution is needed when interpreting this data, as several participants discussed significant reservations regarding the use of the selected Apps. This discussion included modifying the way the App was intended to be used to ensure that it meets clinician's needs and stays in line with best practice principles. For example *Talking Tom* (Outfit7 Ltd., 2011) is not intended as an intervention app for speech pathology, however it can be used a reinforcement tool.

The Principles of *Naturalistic* and *Accountability* were rated as 'Disagree/Strongly Disagree' for many of the Apps. A*ccountability* is an important principle to consider when evaluating Apps because it requires the SLP to be responsible for intervention activities and ability to effectively track and evaluate data. *Naturalistic* was rated as 'Somewhat Important' by New Grads and Experienced Clinicians, however it was rated as 'Very Important' by student clinicians. These two principles were generally ranked in the "Disagree/Strongly Disagree" range indicating that they were least evident among the applications. Awareness of what strengths and challenges exist in Apps and the iPad allows SLPs to be more knowledgeable and prepared when using these Apps. This information is also beneficial to provide to App developers with information regarding what clinicians and other professionals are looking for in such technology and tools.

What Clinicians are Looking for

Themes from the focus groups provide information about what clinicians are looking for when they choose technological tools for intervention. Participants want to be able to individualize their therapy and therefore flexibility in the Apps is a paramount feature. Control of feedback is a specific area clinicians identified as needing more ability to individualize. Apps must also be theoretically based and consistent with best practices, and be made with the input

of the SLPs who will be using them. Functionality and Facilitative Context are also important app qualities for SLPs. App developers should also be conscious of maintaining social interaction ability in therapy materials. A trial period on Apps is important to allow clinicians to try out all the features of an App before considering purchasing it.

In addition to the Apps, clinicians want the iPad to be low in cost, easy to operate and accessible for individuals with various cognitive and physical difficulties.

Suggestions for Use

This study demonstrated that SLPs' beliefs and ideas about best practice principles are an important consideration when choosing material for treatment. Although many Apps on the current market do not fulfill all the requirements that speech-language pathologists have, participants in this study identified numerous ways to adapt this technology to provide speech and language therapy to children in a way that was consistent with best practice principles. There were no differences noted between groups in regard to the suggestion of uses for the iPad in SLP. All three groups believed that the iPad would be a useful home programming tool under the condition that parents and families be educated on how to use the device appropriately. In addition, all three groups reported that the use of Apps not developed for speech and language intervention (e.g., Doodle Buddy [Pinger, Inc., 2011] and Talking Tom Cat [Outfit7 Ltd., 2011]) were very useful as motivational and reinforcing tools.

Many participants stated that they believe that the iPad would be a great supplemental tool for speech and language intervention. That is, many mentioned that they would not use the iPad for the duration of an entire treatment block but see a place for the technology as a supplemental means of speech and language therapy for children. This idea derived from

statements often made by participants about the caution that must be taken in promoting social interaction with others and not only with the iPad. As such, most participants believe it is important to maintain interaction between individuals but also see the importance and benefits of integrating the use of technology into speech and language therapy with young children.

CONCLUSION

The consensus of study participants on the iPad in speech-language pathology is that the device could have a positive impact on the field and has many uses that could be of benefit to SLPs, but Apps must be improved to better reflect the unique needs of clinicians. It is recommended that clinicians critically evaluate Apps on the basis of the best practice principles of speech-language pathology. These evaluations may be used to guide App developers in the development and improvement of Apps for use in intervention.

Results of this study should be cautiously generalized as participants were an insular group from the University of Alberta and Edmonton area. Additionally, voluntary participation was a limiting factor as those who volunteered may have had a pre-existing interest in the iPad.

Future research could focus on client outcomes with appropriate use of the device in therapy. Different App uses may also be examined including adult client Apps, and Apps for productivity. The benefits of the device for clinicians outside of intervention and assessment may also be studied in the future. A broader population of SLPs could be interviewed to generalize the current findings. Participants in this study provided excellent direction for future use of Apps in our profession, the importance of critical assessment of Apps, and the value of SLP involvement in app development.

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Appendix A

Participant group (circle one): Student Clinician New Grad Experienced Clinician.
Application: _____ Please rank this application in the following categories:
Engaging
This application is very engaging for the target population.

SD D N A SA Not Applicable

Facilitative Context

This application provides a context that facilitates acquisition of the target skills or allows the clinician to incorporate facilitative cues.

SD D N A SA Not Applicable

Functional

The application can be used to teach functional skills.

SD D N A SA Not Applicable

Naturalistic

The application can expose the client to the target skills in a naturalistic communicative or social interaction

SD D N A SA Not Applicable

Communication partner

The application can incorporate interaction with a meaningful communication partner.

SD D N A SA Not Applicable

Individualized

The application can be modified or adapted to meet the needs of individual clients.

SD D N A SA Not Applicable

Focused

The application can focus on a specific skills or skills and allows for concentrated practice with that skill.

SD D N A SA Not Applicable

Evidence/theory/developmentally based

The application is based on evidence or generally accepted theoretical or developmental principles.

SD D N A SA Not Applicable

Accountabity

The application facilitates collection of outcome measures of client progress.

SD D N A SA Not Applicable

Safe

The application poses no risks to the emotional or physical well-being of the target audience,

SD D N A SA Not Applicable

Efficient/practical

The application is set up for efficient and easy application to the target group.

SD D N A SA Not Applicable

Strength	Limitation	Suggestion for Use