Tablet Use by Occupational Therapists for Preliteracy Learning with Preschool Children

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Abstract

Purpose: Tablet technologies are being used in pediatric occupational therapy (OT) despite a dearth of literature supporting their use. The purpose of this study was to investigate key strategies and decision-making considerations occupational therapists are using with tablet technologies to develop preliteracy skills with preschool aged children.

Method: An ethnographic study of three pediatric occupational therapists (one school-based; one private clinic; and one school-based/private clinic) was conducted through semi-structured interviews and observations of the participants using the tablet.

Results: One central theme, that tablets are "just a tool," and three subthemes, that tablets are versatile, motivating, and fun, were identified. Results indicated that participants in this study are using tablets purposefully as a tool and as an alternative to traditional preliteracy activities.

Conclusion: It is becoming more important for therapists to integrate the tablet and other mainstream technology into their practice in order to assist children in learning how to navigate an increasingly digital world. Further research regarding the efficacy of using tablet technology in pediatric occupational therapy is recommended.

Keywords: occupational therapy, preliteracy, early literacy, tablet computer, iPad

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The rapid development of mobile technologies in recent years has led many to hypothesize how educational and clinical settings may benefit from the convenience, accessibility, and portability of these resources. Tablet technologies, such as the Apple iPad and Windows Surface, and concurrent applications (apps) are examples of widely accessible technological resources that may be used in education or therapy. With these changes, it is important for children, as students and future members of the workforce, to be competent in an ever-changing technological environment. Pediatric occupational therapists are in a unique position to incorporate tablets into their practice in order to support development of a variety of skills, such as literacy skills. Literacy researchers agree that it is important to explore how tablet technology can be best utilized to facilitate learning in the classroom (Hutchinson, Beschorner, & Schmidt-Crawford, 2012). Pediatric occupational therapists may also contribute to the learning and use of technology in the everyday life of their clients.

Tablet technologies have so far proven to be versatile tools, including in the realm of assistive technology (AT). However, Aftel, Freeman, Lynn, and Mercer (2011) suggested that, "without evaluation, assessment, training, and follow-up from an occupational therapist, even the most revolutionary and attractive piece of assistive technology is likely to end up on a shelf in the closet" (p. 8). Some therapists have started using the iPad in pediatric OT for motor, sensory, visual perception, and social participation related goals (Hoesterey & Chappelle, 2012), however, it is unknown which applications occupational therapists find most useful with their clients and how they use them in treatment.

While it has been documented that occupational therapists have begun to use tablets in therapy (Hoesterey, & Chappelle, 2012; Waite, 2012), there is a dearth of literature concerning

the clinical reasoning surrounding the use of tablets in occupational therapy (OT) practice. More research is needed to explore how occupational therapists are using tablets in clinical and educational practice settings and to determine how to best utilize the tablet as a therapeutic tool. Unanswered questions include how therapists determine who they use tablet technologies with, when they use tablets in therapy, and what activities they find most useful. Specifically, more investigation is needed to explore the use of the tablet in pediatric OT with preliteracy learning.

Occupational Therapy with Children and Youth

Centennial Vision. In 2007, the American Occupational Therapy Association (AOTA) published a Centennial Vision summarizing the goals, strengths, and barriers that the profession of OT encompasses as it strives to build and maintain a productive role in the healthcare community. The Centennial Vision helps to guide future research, emphasizing the use of evidence-based practice when providing care, as well as establishing a connection between education, research, and practice (AOTA, 2007). This encourages occupational therapists to conduct a wide range of research studies to continue to build on the current foundation of knowledge and evidence-based decision-making.

The future "strategic directions" that AOTA's Centennial Vision outlines includes an increased focus on technology in research and on information access and learning. OT's role in the preparation of a diverse workforce is also emphasized, which focuses on providing the most effective, individualized, and client-centered services that best meet a diverse society's needs (AOTA, 2007). The workforce is prepared over years of education and experience, including in childhood. As outlined in the AOTA OT Scope of Practice, occupational therapists are prepared for, among other subjects, intervention through the promotion of play (2010a). Play encourages the development of physical, cognitive, neuromuscular, sensory function, and behavioral skills

(AOTA, 2010a) to improve performance in all aspects of daily life. This justifies the place of OT in pediatrics, whether that be in the schools, an outpatient clinic, or an inpatient hospital.

Occupation of kids. Playing and learning are the primary occupations of a child. Pediatric occupational therapists work to develop the underlying skills that will enable children to successfully participate in their role as a child. A child's developmental level, along with social norms and expectations, work in concert to influence his or her role fulfillment as students and members of their community. The school environment is influential in developing a child's role as a student. Participation in other environments, such as at home, also provide vital experiences to develop a child's roles outside of school. Both physiological and psychological characteristics shape a child's interests and abilities. These factors are important when preparing for the role of a student, and subsequently as a member of the workforce. Physical and cognitive disabilities may interrupt and sometimes delay this natural progression. Some children may need extra support within or outside of the school setting to facilitate continued development. That support may come from an occupational therapist, as the child ages and transitions into spending more time in an educationally-focused school setting, to assist in continued development of knowledge, skills, and role participation.

Occupational Therapy with Preschool Aged Children

Prospective and preventative medicine is emphasized in AOTA's Centennial Vision (2007), which calls attention to early education and therapeutic support services, such as OT. For example, No Child Left Behind (NCLB), also known as the Elementary and Secondary Education Act of 2001, an education policy enacted in 2001 that continues to influence educational services provided to children nationwide, includes preschool services to children aged three to five. The overarching goal of NCLB is to improve the public education system and

concurrently increase achievement of every child within it, ensuring that "all children have a fair, equal, and significant opportunity to obtain a high-quality education" (NCLB, 2001a, Sec. 1001). School-based occupational therapists serve diverse populations and are in a unique position to contribute to the achievement of this goal. Clinic-based occupational therapists may also work on preschool-age appropriate goals related to a child's ability to participate in tasks, when related to medically relevant concerns.

School-based occupational therapists provide supportive services to children with disabilities who qualify for services in addition to the general education classroom, as indicated by the Individuals with Disabilities Education Improvement Act of 2004 (IDEA; sec. 632[4][E][iv]; sec. 602[26][A]). This involves the pediatric occupational therapist's participation in the development of the preschool child's Individual Family Service Plan (IFSP) if the child is under three or Individualized Education Program (IEP) if the child is three or older, which is mandated by IDEA 2004 for students who are eligible for services. IFSP and IEP goals help to determine modifications an individual child receives in his or her preschool education. It is within an occupational therapist's scope of practice to work on goals related to preliteracy (AOTA, 2010b), as these skills are applicable in a child's role as a student as well as a member of their community.

Entire classrooms may also benefit from OT intervention services, no matter their disability status. In an integrated kindergarten curriculum that included OT in collaboration with the general education curriculum, Bazyk et al. (2009) found that children with and without diagnosed disabilities made statistically significant improvements beyond maturation over the course of the school year in skills related to writing and emergent literacy skills. Furthermore,

the outcomes of Bazyk et al. (2009) suggest that OT services within an integrated classroom may benefit children with or without identified disabilities.

Due to the focus on preparing children for elementary school demands, OT with preschool aged children tends to focus on building a foundation for success in school, as well as in home and community environments, by utilizing therapy approaches similar to the ones used in schools. For example, many school-based occupational therapists are treating their students in general education classrooms in compliance with the IDEA 2004, which requires service provision in the least restrictive environment (Sec. 612.a.5). IDEA 2004 also encourages use of Early Intervening Services (EIS) and Response to Intervention (RtI), which are "preventative, proactive strategies aimed at minimizing the occurrence of behavior and learning problems as early as possible" (AOTA, 2011, p. S52), which supports OT services for a larger population earlier in their education. This approach to intervention coincides with a philosophy of early support, before a child has fallen behind. One role of any occupational therapist working with preschool aged children is to prepare them for future academic demands, such as literacy curriculum, through the development of preliteracy skills.

Occupational Therapy's Role in Preliteracy and Literacy Learning

According to AOTA, pediatric occupational therapists working with preschool aged children support many academic and nonacademic outcomes related to their role as a student as well as a child. These outcomes include skills directly related to school success, such as reading, writing (i.e., literacy), and math, as well as other skills necessary to succeed in the school setting, such as social skills, behavior management, participation in extracurricular activities, self-help and self-care, and prevocational/vocational education (AOTA, 2010b). Literacy education is a central component of the high-quality education that NCLB aims to provide all students.

Literacy. A popular or common definition of literacy can be simply summarized as "the ability to read and write" ("Literacy", n.d.). However, the development of literacy skills involves a more complex web of experiences and knowledge that lead to being considered "literate" in our society. McLane and McNamee (1990) identified literacy as "both an individual intellectual achievement and a form of cultural knowledge that enables people to participate in a range of groups and activities that in some way involve writing and reading" (p. 3). Areas of knowledge that must be developed and refined to become literate include print, sound, language, semantics, and contextual recognition and understanding. This means that a person must be able to recognize and understand the shape of a letter on a page, the sound it represents, the way multiple sounds combine to construct a word, how words represent concepts, and how multiple successive concepts develop into a narrative (Whitehurst & Lonigan, 2001). The environment in which young children learn, including the physical, social, and temporal contexts, must be understood when teaching literacy skills. This includes who is involved in the teaching, how the information is presented, what materials are used, and what literacy means to the people involved (McLane & McNamee, 1990).

Preliteracy. The impact of cultural and environmental contexts is especially important when discussing preliteracy. Preliteracy is also commonly referred to as emergent literacy or early literacy, however, for this study the term preliteracy will be used. Preliteracy is defined as "the developmental precursors of formal reading that have their origins early in the life of a child" (Whitehurst & Lonigan, 2001, p. 12). Preliteracy learning often happens prior to the organized school-based literacy curriculum. Skills needed for preliteracy learning include visual scanning and motor planning, as well as the cognitive skills of understanding alphabetic principle, using joint and divided attention, short term, long term, and working memory, and

executive functions such as problem solving and decision making (Frolek Clark & Schlabach, 2013, p. 429). Preschool is the ideal time for the development of the rudimentary skills, as these skills begin to develop before a child reaches school-age (Whitehurst & Lonigan, 2001). The development of preliteracy skills that occurs during the preschool ages of three to five years old is important in preparation for the child's next steps toward the intellectual and cultural development during their school-aged years.

The NCLB Part B program entitled "Early Reading First" states that the overall purpose is "to prepare young children to enter kindergarten with the necessary language, cognitive, and early reading skills to prevent reading difficulties and ensure school success" (NCLB, 2001b). Concurrent with this goal, occupational therapists take a holistic view when examining the needs of a child and are able to consider many factors related to developing preliteracy skills beyond the traditional focus on reading and writing within the classroom. The role of the occupational therapist in the school system then includes facilitation of preliteracy and literacy skill acquisition to support reading and writing outcomes later in their academic career (AOTA, 2010a, p. 1).

AOTA's Occupational Therapy Scope of Practice identifies performance skills vital to the development of preliteracy and literacy knowledge including sensory perceptual, cognitive, motor, and praxis skills (AOTA, 2010a). Bazyk et. al. (2009) found that a preliteracy "curriculum with embedded occupational therapy services was effective in yielding accelerated change in emergent literacy and fine motor development" (p. 168) in a kindergarten setting. Case-Smith (2002) compared two groups of students with poor handwriting skills: one group received school-based OT services while the other was the control. The intervention was focused on visual-motor skills and handwriting practice. Students who received the intervention achieved

significantly greater gains in legibility of letters than those who did not receive occupational therapy services. The students in the intervention group also made significant improvements beyond expected maturation in specific skills such as visual-motor control and position in space (Case-Smith, 2002). As these cases demonstrate, OT may be beneficial for children with or without identified disabilities in the development of performance skills related to literacy and preliteracy.

Digital literacy. AOTA's Centennial Vision (2007) emphasizes preparing occupational therapists and their clients for the ever-changing demands of the 21st century. As today's culture continues to become more driven by technology, the concept of becoming digitally literate, beyond just literate on paper, has become increasingly important. Digital literacy is not a stand-alone skill and is instead a component within literacy (Chase & Laufenberg, 2011) that combines the knowledge, understanding, and ability to utilize digital technologies to interact with the world around us (Bawden, 2001).

Bawden (2001) argued that digital literacy, including a multitude of components with a variety of definitions, is increasingly becoming more central to our daily lives. Popular opinion would indicate that this change in focus is related to increased availability, affordability, and usability of portable technologies. An individual's digital literacy skills facilitate their interaction with both the technology itself as well as with others who are using similar technologies. It has been hypothesized that the ability to communicate through digital media can be as important as traditional reading and writing skills that are taught in the classroom (Cetta, 2013). Hutchison et al. (2012) examined how tablets can be used to teach print-based literacy skills. Technologies such as tablets present an opportunity for teachers to simultaneously work on paper and pencil goals as well as introduce modern technology to their students in a way that increases their

interaction with school materials (Hutchison et al., 2012). The knowledge and skills of digital literacy are developed over time, and development may be facilitated by use of technologies, such as tablets, from an early age.

Use of Technology in Occupational Therapy

Historically, occupational therapists have used technology in therapy in many ways, which has increased as the use of technology has become more prevalent in society. Smith (2002), a proponent of universal design, argued that because occupational therapists serve people with disabilities, all services provided by OT should be realistic about the real life strengths and challenges of possible clients, including services connected to technology. Occupational therapists, long time experts in providing services that incorporate technology into treatment, have specialized knowledge in many different technologies, including assistive technology (AT) devices as well as the "selection and adaptation of computers and software to support education and work" (AOTA, 2010c, S45).

One of NCLB's primary goals, as stated in the Enhancing Education Through Technology Act of 2001, is to "improve student academic achievement through the use of technology in elementary schools and secondary schools" (NCLB, 2001c, sec. 2402). In preparation for these expectations, using technology with preschool aged children who qualify for support services may assist them in preparation for technological demands in the future. That same legislation is applicable to the populations who are often served by occupational therapists, with the additional goal "to assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's . . . disability" (NCLB, 2001c, sec. 2402). Clinic-based pediatric occupational therapists also participate in preparing their clients for the technological demands of

society, as interacting with technology becomes increasingly important to participate in the demands of the daily life of a child, including at home and in the community.

Assistive Technology. AT was defined by the Assistive Technology Act of 2004 as "any item, piece of equipment, or product system . . . used to increase, maintain, or improve functional capabilities of individuals with disabilities" (p. 1710). While this statement may refer to the general student population, it is the responsibility of the occupational therapist to facilitate use of technologies that are accessible to everyone and promote participation and learning for all children. Long et al. (2007) agreed that the role of the occupational therapist includes identification and education of students who may benefit from the use of AT due to the field of OT's strength in activity analysis and experience in providing functional adaptations. A central focus of OT, and a primary goal of using AT, is to provide support to children with disabilities in an effort to increase participation. Active participation is essential for a child's continued success in school (Hemmingsson, Lidström, & Nygård, 2009), at home, and in the community.

Adaptations and accommodations. Adaptations and accommodations are ways in which therapists modify a task or environment in order to promote a child's functional performance. An accommodation may change the method of delivery of academic content but does not change the expectations or standards for a task. An adaptation may change the demand or expectation of a task while still allowing a child to participate in the least restrictive environment. Technology may be utilized to help modify the environmental or curricular demands on a child, in order to support components that need to be supported or target the use of specific skills that can be utilized in multiple ways. Adaptations and accommodations may vary from very low or no technology options, all the way to very highly specialized technology.

The concept of universal design for learning (UDL), which encourages development of educational curriculum in a way that is accessible for all students (AOTA, 2010d), is a way to provide options for adaptations or accommodations without requiring specialized services. UDL argues for the use of mainstream technology in occupational therapy, which may also allow clients to develop skills that could be transferable to real life situations (Waite, 2012) such as interacting with computers, touch screens, and other modern technologies. Tablet technology is one example of a high tech AT/adaptation/accommodation option, also mainstream and widely available, which may be used to promote a child's functional performance.

Skill development. AOTA's Centennial Vision (2007) identified information access and learning, as well as universal design, as relevant drivers of change in the provision of OT services. Occupational therapists play a fundamental role in the learning and development of literacy skills through cognitive, motor planning, and fine motor training (AOTA, 2011). Existing literature demonstrates that technology can be successfully used in skill development with children. Anderson, Anderson, and Cherup (2009) conducted a meta-analysis and found using technology as a learning tool was beneficial for students with mild disabilities. Their review included the use of technology for acquiring skills in both reading and writing, and found the learning environment was generally improved by technology use, leading to superior skill acquisition (Anderson et al., 2009). Plowman and Stephen (2003) suggested that information and communication technology, such as tablets, could be particularly useful when working with young children because it encourages enjoyment in the discovery that comes from learning. This encourages further investigation into the use of tablets in skill development.

Development of Preliteracy Skills using Tablet Technologies

Tablets allow for immediate access to seemingly endless information while providing a mobile and interactive interface, which are qualities identified by the AOTA Centennial Vision (2007) as significant in OT practice. Through interactive apps and immediate feedback, tablets can create a collaborative platform for occupational therapists to enhance literacy skills training, including fine motor and visual perception, which may improve an individual's ability to develop written language. Flores et al. (2012) identified a special education teacher preference toward the iPad over traditional picture cards, citing ease of use, less preparation time, fewer required materials, and increased speed in students' communication as reasons for their preference. Simultaneously, the production of immediate cause and effect of the tablet technology can be highly motivating for many preschool and school-aged children (Hoesterey & Chappelle, 2012). Tablets provide supplemental literacy support in a way that teachers can individualize curriculum, with the ability to give immediate "real time" feedback.

The ubiquity of tablet technology may help clients feel comfortable in their learning environments. It may allow a client to enjoy the "cool factor" associated with using an in-demand technology (Waite, 2012), while removing the stigma that can be associated with receiving disability services. In a qualitative study of students who use AT devices, Hemmingsson et al. (2009) found one of the greatest barriers to use was the unwanted attention that traditional AT attracted. Many students avoided using AT if it made them feel isolated from their classmates. Additionally, many students reported that their AT devices were broken and not properly maintained, which created more problems than solutions. These types of barriers and complications with technology in therapy could be mitigated through the use of mainstream

technology, such as tablets, in a supported and deliberate way with children or students receiving OT services.

Beschorner and Hutchison (2013) argued that "exploring the integration of technology for literacy in preschool is a valuable exercise" (p. 17) to prepare children for the demands they will encounter in the future, as technology plays an important role in both written and verbal communication in today's world. As tablets continue to become more common, it is only logical to utilize this technology to its fullest potential. Currently, there is a dearth of literature concerning occupational therapists' use of tablets in preliteracy skill development. Therefore, the purpose of this study is to investigate key strategies and decision-making considerations occupational therapists are using with tablet technologies to develop preliteracy skills with preschool aged children.

Method

Design

An ethnographic study with participant observation was conducted to examine key strategies and decision-making considerations of occupational therapists' using tablets in pediatric preliteracy skill development. Ethnography "focuses on social cultural interpretation" (Merriam, 2009, p. 37), using data collected during semi-structured interviews and participant observation from a small number of cases or participants, with a focus on "explicit interpretation of the meanings and functions of human actions" (Atkinson & Hammersley, 1998, p. 111). Ethnography was especially applicable for the purpose of this study, as the investigators sought to describe behaviors of the participants, as well as explain reasonings behind the choices and behaviors of the participants. The participants may be influenced by their own culture through education, experience, societal expectations, employer policy, or personal preference. The

research design included several procedures to enhance the trustworthiness including triangulation, audit trail, member checking, and peer review, which will be described in more detail in the following sections.

Participants

This study involved three participants who, at the time of the study, were currently practicing pediatric occupational therapists who work with clients between the ages of two years and four years, 11 months, and 29 days old. Participants were found using a snowball sampling technique. According to Merriam (2009), non-probability sampling is beneficial when used to gain a greater understanding of a subject, and therefore the investigators recruited participants from whom the most meaningful information could be learned. In order to volunteer for this study, participants were required to be licensed occupational therapists with more than two years of experience, including the equivalent of at least one-year full time experience working in pediatrics, with children between the ages of two and five years of age. Occupational therapists who identified themselves as using tablets in preliteracy skill development were considered potential participants. Pseudonyms are used to differentiate between participants while also protecting their privacy. For more information about the participants refer to Table 1.

Procedures

Following approval from the university Institutional Review Board, participants were recruited through snowball sampling by asking full time and adjunct faculty from the university OT department to send out a recruitment letter constructed by the investigators to colleagues and/or organizations who may have been eligible for the study. Recruitment information identified aspects of preliteracy, which the occupational therapists may work on with their clients, including fine motor, cognitive, and visual motor skills. Potential participants

volunteered by contacting the first two authors via email and then were screened for eligibility by the investigators. Finally, the first two authors contacted the participants to schedule an interview.

Participants were fully informed about the purpose of the study and were allowed to withdraw from the study at any time. Informed consent was obtained prior to data collection and written permission was acquired from the participant's facility if observations were to be conducted on site. Data were collected through a combination of interview and participant observation and taken until saturation of data occurred.

A semi-structured interview was conducted with each participant, lasting approximately one hour. The interview began with each participant's demographic and basic OT-related experience, and then addressed the participant's ideas, experiences, and opinions surrounding the use of tablets in preliteracy skill building. In order to ensure a common understanding of preliteracy among investigators and participants, a hard copy of the operational definition of preliteracy, noted in the background section of this paper, was provided for the participants to refer to throughout the interview. Each interview was based on a set of guiding questions predetermined by the investigators, however, the interviewers allowed for deviation from the structured questions if additional pertinent topics arose. Guiding interview questions can be found in the Appendix. A semi-structured approach was ideal for this topic as it allowed for the participants to organically describe their experience using the tablet. All three interviews took place in person and in a mutually agreed upon private setting, such as an office or conference room. Interviews were audio-recorded and transcribed verbatim to assist in data analysis.

Field observations were conducted with two of the participants in an effort to gain a better understanding of how they used tablets in practice. Field observations involved watching

the participants use a tablet in therapy one-on-one with a client and were focused on the therapy activities related to preliteracy skill building. Observations of Mary Anne were conducted in the OT room at her school during the school day, while she worked in a large room with lots of therapy tools and toys, as well as a table and chairs. Observations of Dawn were conducted from behind two-way glass while she worked in a small, individual treatment room at the private clinic where she works.

An audit trail was maintained by the investigators throughout data collection and analysis to allow for transparency of the research process. This included a log of contacts with participants, a record of meetings between the researchers and what was discussed, field notes taken during and immediately following data collection sessions, and organized records of collected data. Additionally, a report of biases and assumptions of the investigators was documented and reflected upon throughout the data collection and analysis process, as deemed relevant by the concept of reflexivity (Merriam, 2009). Confidentiality of the participants was assured by storing all data that contained identifying information under password protection for digital files and all hardcopy materials were kept private.

Member checking was used to allow for the participants to ensure that their opinions and ideas were properly interpreted and to prevent misunderstandings based on possible bias of the researchers. Member checking was conducted with each participant via follow up conversations by phone, and lasted no longer than 30 minutes. During member checking, the researchers reviewed the key strategies and decision-making considerations identified in the results section and asked the participants for feedback, including if the outline matched what they had tried to convey in the interview and if they had any additional comments.

The third author conducted a peer review of the data collected and initial key strategies and identified decision-making considerations in an effort to evaluate if the themes discovered were credible and valid. Feedback from the third author was incorporated into the results and discussion sections, to increase clarity of the results and implications for OT.

Data Analysis

The combination of data collected from interviews, participant observation, audit trail, journaling, member checking, and peer review allowed the authors to triangulate and search for common themes among varied sources of numbers. After collecting interview data, an independent party transcribed the audio recordings of the interviews verbatim. The interview and observation data were then separately reviewed and coded by the first two authors of this study, by listening to each recording, journaling on impressions of recordings, reviewing the transcripts, and extracting important units of information. The first two authors then independently identified common and recurring themes. Next, the first two authors collaborated to identify commonalities in their data analysis and themes identified, and began to agree upon themes for final analysis. After the first two authors identified themes, they were sent to the third author for review. Edits were made according to feedback from the third author. These themes were then reviewed with each participant over the phone to complete member checking and changes were made accordingly, as detailed in the Procedures section.

The authors looked for dependability and consistency within the data, increasing the credibility and transferability of the results, as allowed by the triangulation of data. Within-case analysis and cross-case analysis of the data were conducted in order to identify possible generalizations (Merriam, 2009). While generalizations can be limited with ethnographic research, rich description of the participants and their environments, coupled with the discussion

of themes allow readers to make professional judgments regarding the applicability of findings to their work.

Results

Key Strategies

It was discovered that the key strategies used by the participants during preliteracy skill building fell into two categories, preparation and intervention. Preparation strategies include actions taken by the therapist prior to using the tablet in a therapy session, while intervention strategies incorporate actions taken during the session.

Preparation. Two central preparation strategies involved deciding on a tablet and then learning how to use the tablet.

The Apple iPad: Everyone's choice. Each participant stated that they chose the iPad because it was the most universal tablet available and that it had the most available apps. The participants each used a personally owned iPad. In deciding whether to use an employer owned tablet or purchasing their own, the participants measured the pros and cons of each option. They each expressed that, for their practice, owning their own device allowed for the most freedom and flexibility. Factors that went into this decision included whether their employer owned or supported tablet use, logistical requirements of acquiring a device, and the flexibility of being able to add and update apps.

For example, Mary Anne's school district had a limited number of iPads and required several steps to acquire one. Mary Anne's school district and Dawn's clinic offered iPad(s) the occupational therapists could use, however, both stated that they found using their own easier and more time efficient. Kristy's school district did not offer or own tablets for therapists to use. Mary Anne reported attending a workshop on iPads specifically (as opposed to general tablet

platforms), and that she continues to attend workshops given by occupational therapists focused on the iPad. Kristy began using the iPad because of an employer's interest in the technology when it was first released, while Dawn was given the iPad as a personal gift. Among the participants, the decision to use the iPad was made early in their use of tablet technology and continues to influence their continued education and training in using it in therapy.

Experimenting with the tablet before using it in therapy. The consensus among the therapists was that each spent their own time learning the tool before introducing it into a therapy session. Whether through formal training, such as continue education classes, or informal collaboration with other therapists, each participant described a learning curve involved with figuring out how to effectively use the tablet in their therapy sessions. Each participant talked about methods they used to pick the best apps for their treatment sessions. The participants often mentioned cost as a factor, but that apps tend to be reasonably priced. All of the therapists mentioned using free trials and promotions of applications, such as "Free App Friday", in order to test out which apps might be worth the cost. Spending time getting to know the apps, as well as the iPad itself, in advance seemed to be a common way to prepare for using the iPad in a therapy session.

Intervention. The therapists mentioned a variety of considerations that affect their decision to use the tablet when discussing how they incorporate it into their intervention. The demands of the preschool curriculum, the needs of the child, and OT-based clinical reasoning were mentioned by all three therapists as they described their interventions. See Table 2 for a list of common apps mentioned by the participants.

Consider the preschool curriculum. The participants agreed that their approach to therapy is based around the preschool curriculum, whether or not they are using the iPad during a

session. All three therapists talked about using the iPad in short spurts and choosing activities with the purpose of scaffolding future curricular demands, explaining that this is similar to the typical demands of a preschool classroom. The accessories that the participants chose were also based on preschool curriculum. Kristy discussed using two different stylus designs with preschool aged children, including a longer stylus, as well as a shorter, thicker stylus. She said that the longer stylus, which looks more like a pencil, can be used as is or with a pencil grip. The shorter, thicker stylus is similar to using a broken crayon, which many occupational therapists use to encourage a tripod grasp.

Remaining client centered. When discussing how they decide which children to use the iPad with, and which apps to use, the response among the participants was that it depends on the child. In general, the participants all mentioned how they think about what would be best for each individual child and their goals before diving into an activity. The participants described adjusting their approach depending on the needs of the child and the goal of the activity. Mary Anne discussed adjusting what she does during the activity based on the child's goals, such as increasing cues if a child is having a hard time following directions, but continuing to have the child do the motor task to work on finger isolation or pinch. In general, considering each child's individual strengths, challenges, and goals when using the iPad is just as important as when planning other, more traditional therapy activities.

Using the iPad in a session. All three participants talked about how they primarily use the iPad as a one-on-one tool, particularly when working on goals related to preliteracy. Kristy stated that she tends to use it at a table with a supportive chair. Mary Anne was observed to also use it at a table. Dawn also discussed positioning the iPad itself in an upright position to reinforce wrist extension, which can be assisted by using a case with an easel. She described

putting Velcro on the back of the tablet and on the wall, so that the child can use it while standing.

Always incorporate OT-based clinical reasoning. The participants, each a knowledgeable and experienced occupational therapists in her own way, discussed using many aspects of OT-based clinical reasoning when deciding on intervention activities using the iPad with their clients. Kristy explained, "Everything I choose is based on what I know as an OT [Occupational Therapist]. Do I think it would be beneficial? Is it meeting the goals and the components that I need to work on to reach the ultimate goal?" Similarly Dawn explained she chooses to not use it if the child isn't interested or if they get frustrated by it. All of these decisions are made using sound clinical reasoning, based on knowledge, experience, and therapeutic use of self, which is important to successful OT.

Decision-Making Considerations

Using the iPad as a tool arose as a central, underlying theme throughout the data analysis process. In delving deeper into how the tool is effective, three subthemes were identified: the iPad is versatile, motivating, and just plain fun. These themes are evident when teasing out key decision-making strategies.

"It's just a tool." A consistently stated belief among all three participants was that the iPad is merely another tool in a therapist's toolbox. While it can be motivating and versatile for both the therapist and the clients, as Kristy stated, "It's just a tool." Kristy compared it to performing tasks on a white board or writing in shaving cream. Dawn also explained, "I think it is a tool and it needs to be treated that way . . . when we have kiddos with five-plus hours of screen time, no, that's not okay." All three therapists agreed that balance is key and in order to use the iPad effectively, it needs to be used in a purposeful manner. While it is often used as a

means to develop the skills of preliteracy, the end goal is to transfer these skills into more traditional literacy knowledge. Mary Anne explained "it's a therapy tool . . . just like we might have a swing here but we don't expect the parents to have a swing at home. Or we might have a rice table here, but we don't expect them to have a rice table at home."

Versatile. All of the therapists agreed that one of the greatest benefits of using the iPad is how versatile it is when working on a variety of preliteracy skills. Each of the therapists explained how the versatility of the iPad makes it an excellent tool for therapy. With one piece of equipment, a therapist can address multiple areas with little to no set up or clean up. That being said, they described how, without purposeful guidance from a skilled occupational therapist, it can just become more screen time. It was emphasized that the iPad isn't a shortcut; it is instead a tool that needs to be used with deliberate clinical reasoning.

Motivational. All of the therapists agreed that nearly all of their clients find the iPad to be motivating. The novelty, as well as the multisensory experience, entices their clients and allows them to perform in ways that they might not with more traditional methods. Each of the therapists described how the iPad can keep their client's interest longer, so it can be used as a supplemental tool to promote engagement and facilitate achievement of goals. All three therapists mentioned using it as a reward at the end of a therapy session when warranted. Dawn explained that she likes to, save the screen time towards the end so it can be used as incentive. When justifying using the iPad as a reward, Mary Anne explained she picks apps that still work on skills related to the child's goals. Kristy had a different view when it came to using the iPad as a reward. She stated, "It is either a tool or a reward, not both" and that she keeps apps for skill development separate from those that are used as a reward.

Three out of three therapists agree: "It's fun!" The consensus among the three participants was that using the iPad in therapy is fun. Dawn explained, "Everybody wants to play with the screen, so we get this done, and then we get screen time. The kids love it." When demonstrating Dexteria Jr., a favorite app among all three therapists, Kristy exclaimed, "Fun, fun, fun!" while squishing squash. Mary Anne laughed when describing how her preschool students respond to one of her favorite apps, Alien Buddies. She went on to explain, "You know, how some kids have a melt down if they make a mistake? Well, the 'Oh, no!' is so cute that you have to watch out because sometimes they want to make a mistake so they will go, 'Oh, no!' " Ultimately, all the participants agreed that the iPad is a valuable therapeutic tool. Dawn stated, "I have to say coming into therapy around this time with all of these technological advances has been awesome, and really beneficial for therapy, because there is so much that [the iPad] does have to offer…the benefits are huge and a lot of families have been able to really make gains."

Discussion

Given AOTA's Centennial Vision (2007), with an emphasis on the influx of technology in everyday life, the results of this study encourage continued use of tablets by pediatric occupational therapists. The use of tablets by school based occupational therapists also fits within the structure of IDEA and can help therapists support teachers in meeting the goals of NCLB. It appears regardless of setting, by using a tablet in therapy, occupational therapists working with children and youth can adhere to the Centennial Vision's (2007) guidance regarding information access and learning and technology in research.

Key Strategies

Therapists described a variety of key strategies within the areas of preparation and intervention for using the iPad in therapy. The preparation and intervention aspects were both

integral components to the effective use of the iPad in therapy.

Preparation. While the literature confirms that pediatric occupational therapists are starting to use tablets with their clients, preparation for using an iPad in therapy has many facets and has yet to be described in the literature. Preparation includes: whose tablet to use, how it's set up, and navigating logistical roadblocks some employers may have to using the technology. In order to maintain productivity standards and ensure that time during intervention sessions was focused on the client, each participant described how she had to spend her own time outside of work in order to become familiar with the iPad. All three participants described learning how to use the interface and trouble shooting problems in advance, as they incorporated the iPad into their therapy repertoire.

All participants owned their own iPad and discussed the benefits as well as the drawbacks of using their own equipment. Mary Anne reported using an iPad owned by her school district in the past, but that the district had certain logistical requirements concerning training and filling out paperwork to apply to use it, which motivated her to get her own. Now that she owns her own iPad, she is able to manage it herself. However, that means that she no longer has access to the district apps, so she must pay for apps herself as well as pay for any updates or repairs out of pocket. Kristy's school district does not own or use any tablet technology, therefore Kristy is also responsible for her own device. Dawn owned an iPad when she came to her clinic and after introducing it to her facility, they decided to purchase one because of prior positive experiences.

While the therapists had to spend their own money and time preparing to use the equipment in treatment, the payoff was substantial. Once the therapists became familiar with the platform, the iPad provided newfound convenience for the therapist when preparing for a therapy session. For example, Mary Anne stated:

> The other thing I like about the iPad . . . is that it has got a lot of things built in so I can easily--you know, if I want to take over a bunch of activities and pull them out in the hallway or pull them to the side of the classroom, and I am trying to Lite Brite or play a game, and there is a zillion pieces or have a bucket of crayons--you know, it is just a lot of stuff, and sometimes that doesn't work out really well, because they [the teachers] have their stuff and I don't want to be in their way. And so, I can do a lot of things without having to carry a bunch of stuff in and have it potentially be a big mess and stuff.

Given productivity standards for today's therapists, this idea suggests that while it may require time outside of work to become familiar with using the tablet, it can help be a time saving tool in the long run.

Intervention. Using the iPad with preschool aged children works well because it is novel to many of their clients and can capture their attention for at least a short period of time. Due to the preschool curriculum, many of the apps designed for children of this age use single step instructions, cause and effect tasks, and have an unstructured platform that allows for exploration and creativity. This approach fits with the preschool curriculum, which tends to only require short spans of sitting.

Discussing when she uses the iPad in her session, Mary Anne explained that she will use it as a warm-up activity "to get their muscles going and kind of get them in the mode, like a tracing app, and then move to doing it on paper and pencil." However, she also may use it to "break up the repetition, because I want a lot of repetition . . . I can get a lot more repetitions because I am doing it in a variety of ways," specifically for fine motor skills. She went on to explain, "I say, 'Okay, we are going to trace five letters here [on the iPad], and then we are going to do it on paper, or we are going to do it on the chalkboard, and then we are going do it on paper.' " This was confirmed during observation of Mary Anne.

When asked about a typical session incorporating the iPad, Kristy reported using it later in her session, especially if transitioning away from it could be difficult for a specific child. If

transitions are challenging, she is especially deliberate about where she schedules it into the session so they can continue to get work done. All three participants also discussed sometimes using the iPad as a reward, at the end of a productive session. Kristy explained that, as all of her intervention decisions are made using OT-based clinical reasoning, this is the same with choosing "educationally based rewards" that still address therapy goals. Similarly, Dawn discussed using the iPad to her advantage because the children find it motivating and engaging. She explained "Strategically using [the iPad] to bring them to me, so having the screen here [next to my face] . . . changing the placement of it to gain their acknowledgement of me and their engagement with me."

Mary Anne chooses the tablet when she thinks a child "might have more potential than I am seeing with other tools" and therefore the child may benefit from a new, more motivating approach. She also talked about only using it when she sees a clinical reason to use it. She explained that she uses the iPad if it "is supporting development of the visual motor integration, the hand strength, and all those different components, then I would use it. But if it is letting them out of that [development], then I wouldn't as much." Many of these key strategies are closely related to the decision making that happens with the day-to-day use of the iPad.

Decision-Making Considerations

Knowledge concerning the preschool curriculum influences the occupational therapist's decision-making about the types of activities and support that the therapist provides for his or her clients. Mary Anne discussed that she considers the preschool curriculum and since the children are young, she doesn't want to provide a compensatory tool too soon. Kristy also explained how the apps that an occupational therapist chooses should also be guided by the preschool curriculum. When asked about what makes her choose certain learning apps over others, she

discussed fitting her app choices with the preschool curriculum, such as learning letters and focusing on pinch because "That is just what you do in preschool." Mary Anne talked about tying in preschool related skills, such as colors and shapes, as well as letters and numbers, and using tracing apps that are more forgiving (like 'I Write Words') than she would with older kids. She went on to talk about phasing the iPad out with children who are getting closer to Kindergarten because in "kindergarten you have to write on paper and pencil."

The iPad offers many options for grading the motor, sensory, and cognitive demands of tasks up and down, depending on the therapist's approach to constructing the task. The participants discussed using the iPad for a wide variety of fine motor tasks requiring varied amounts of muscle strength, endurance, pressure modulation, finger extension, and pincer grasp. On the sensory side, tactile, visual, and auditory senses may all be considered and incorporated. Dawn stated, "The resistance that pen and paper, or pencil and paper, or crayon and paper has with paper is greater than it would be on the iPad." In the same vein, Kristy explained, "A marker is more powerful than a crayon, and a pen is more powerful than a marker...but [the iPad] is probably the most powerful because it has the visual component. So that visual piece really draws them in." Tasks can also require different cognitive skills depending on how the therapist structures the activity or their support, including attention, sequencing, and following directions. For example, Dawn explained that she can grade the cognitive demand up and down, such as reading the instructions with increased or decreased number or complexity of steps, based on what the child may need to progress.

Both Mary Anne and Dawn discussed how the iPad is an effective tool for scaffolding and encouraging transfer of skills. When discussing the difference between using the iPad in preschool children versus with older children, Mary Anne explained that "In preschool . . . I am

really trying to teach sub skills or foundational skills and [the preschool children] are applying [them] in different contexts within the classroom" but that it isn't as crucial for a teacher is who using the same technology. She continued by explaining that it's different from assistive technology with older children, because "they need that consistency to really master . . . or be able to use [technology] in a functional way for their writing," which isn't as much of a focus yet with preschool aged children.

Kristy described how using the iPad is just another layer than can be added to a developmental sequence when working on preliteracy skills. "[The iPad] will play a part in teaching them a component to reach the ultimate goal". For example, teaching a child to perform a task on the iPad can help children with transferability, because once they learn that they can perform a task on the iPad, they start to see that they can do it on paper as well.

Kristy discussed choosing it specifically when she thinks it will be beneficial for a child, not just because she thinks it may be possible. She explained, "My focus is motor… I want the motor response" and that the goal of using the iPad is to tap into the potential for transfer so the child eventually does more on paper. She went on to explain, "I tend to use it with kids who are hard to motivate." Mary Anne explained that since "kids are really hooked on technology," so she tries to use that to her advantage when trying to engage them. Dawn explained that she will use it where ever she thinks the child would be most successful, stating "If I am using it to work on upright seating posture, then we are going to use it at the table, but if I know that we have been working hard and they are extremely fatigued, then we can go down onto the floor and be in a less gravity depending position."

During evaluation, the therapist may be able to observe a child perform in ways that might not be as obvious while using more traditional testing measures. Mary Anne described a

time where a child was able to demonstrate a higher cognitive level than they had previously realized:

> One of our students . . . (who) didn't have much language and had a lot of physical disabilities was, I didn't think had the motor to even do a tablet. I day I had my tablet out when I was working with somebody end and he got his finger over it and the next thing I know he is doing Angry Birds, and I'm like, 'oh my goodness, there is more in there than we realize.' He could isolate his finger . . . all of a sudden we discovered he could do matching that he had never shown in the classroom, he had some cognitive stuff he wasn't showing, and wasn't able to show in some ways, with the tablet. We had even tried a little bit with switches on the computer and we did not get the same results as I did with the iPad. So, it is interesting how sometimes using it as tool you find out things that they can do that you didn't find out any other way.

When asked why she believed he was able to perform on the iPad as opposed to other media, she explained "I don't think he was motivated in the other kinds of ways we presented things . . . there was something about doing it on the iPad that was more engaging to him . . . so [he demonstrated a] much higher level cognitive than we realized he had."

When to not use the iPad. The participants also identified some situations in which they would not use the iPad in therapy. For example, you can not cut on an iPad, which eliminates as a possible activity if cutting is the main focus of that session. They also talked about how some children can get hyper focused on the iPad, which makes it less useful. Dawn extrapolated on that point, explaining that if a child gets hyper focused and "if that hyper focus completely eliminates me and my goals, then [the iPad] is not going to be an effective tool." Mary Anne also pointed out that she doesn't use the iPad with students with low or cortical vision impairment, because the screen isn't big enough and there are other, more appropriate options that will facilitate achievement of the child's goals.

Digital Literacy

The ability to understand and use technology in our current society is becoming more important, as technology becomes increasingly entwined into our daily lives. The daily demands of technology go beyond the ability to use a desktop computer, and instead are rooted in countless everyday activities, such as buying a parking pass from a kiosk, withdrawing money from an automated teller machine, checking in at the airport, or buying a ticket to a movie. The skills and knowledge necessary to complete these and countless other functional tasks now includes digital literacy.

All three participants verbalized support for using technology with their students or clients, including the introduction to technology that it provides for the child. However, using technology for the sake of learning about technology has not affected their OT goal writing thus far. Kristy discussed using technology only when it fits into her student's identified goals, and acknowledged that sometimes she will instead see the use of technology contribute more towards the teacher or speech therapist's goals. Dawn also talked about how the concept of digital literacy hasn't come into her goal writing just yet, but she recognized the increase in importance of digital literacy, and mentioned that she foresees it developing more of a focus in her practice in the future.

Mary Anne identified technology as part of her school district's mission statement and explained that they emphasize the concept of universal design for learning, with the understanding that "technology can benefit everybody." With that support, it seems natural that she would utilize the iPad, a mainstream technology that can be used for learning. Her district's view is similar to AOTA's Centennial Vision (2007), which emphasizes meeting society's increasing technological and skill-driven occupational needs. Mary Anne explained that she

actively considers the future needs and functioning of a child before deciding what technology to use, and when to use it.

Though the idea of digital literacy was not a primary focus among the participants of this study, each acknowledged the influence of digital literacy in society, which contributes to similar importance in OT. A person's ability to navigate the digital world in parallel with their lived world will be important to academic, social, and personal satisfaction. In order to help children navigate the digital world, the concept of digital literacy will need to become more of a focus of pediatric occupational therapists.

Play and technology. Play is the primary occupation of a child and children learn through play. A child's role is to play and OT should fit within the role of a child. Exposing children to technology through play allows them to interact with media that will eventually become part of their everyday lives. Research from Ackermann, Gauntlett, Whitebread, Wolbers, and Weckström via the Lego® Learning Institute (2012) suggests that a changing technology landscape is one of several "global mega-trends driving societal change in the 21st century" that will have an impact on play and learning (pp. 43-44). The report goes on to state, "A global technology revolution is gaining pace, crossing national borders and scientific disciplines" (p. 44). Technology should be integrated in the play of a child in order to help them keep up with a changing technological landscape. The Lego Learning Institute goes on to argue:

> Growing connectivity and the changing technology landscape may lead to a greater social and technological dimension to play, whilst rapid urbanization and mobility means traditional social structures are fragmenting and being replaced by communities of like minds online, who may never have met physically but are strongly connected virtually. This will likely change the ways we play and who we play with." (Lego Learning Institute, 2013, p. 44).

By merging technology into children's play and learning, building the foundations for digital literacy can allow children to successfully navigate through the rapidly changing technological

landscape. Pediatric occupational therapists are in a unique position to integrate these factors into their treatment to best serve their clients and prepare them for the future.

Implications for Occupational Therapy

In efforts to fulfill AOTA's Centennial Vision (2007), therapists who are working with children and youth should consider using tablets in treatment to help support preliteracy skill development as well as other academic skills. Tablets, including but not limited to the iPad, are a dynamic tool that can be used with minimal set up and quick clean up, which can benefit occupational therapists who are pressed for time. While the focus of this research was on preliteracy skill development, the major themes identified by this research, including that tablet technologies are "just a tool" and highly motivating, can be applied in any area of skill development. Furthermore, tablets may be used with other subject matter, depending on the experience of the therapist, as well as the goals of his or her client. The availability of new, versatile tools for treatment provides occupational therapists with additional resources to provide their clients with increasingly client-centered, occupation-based treatment.

Limitations

This study was limited in its depth and breadth due to time and financial constraints. The researchers only spoke with three therapists, while including more participants may have increased the scope, detail, and generalizability of the results. Additionally, the focus on preliteracy skill development eliminated additional worthwhile topics (such as turn-taking, peer interactions, and social skills) that were revealed in interviews with all three participants. This narrow focus limited the researcher's ability to delve deeper into these topics for additional themes. Last, the restriction to preschool aged children limits the generalizability of the results to therapists working with children outside of the age range specified by our research.

Future Research

These researchers believe that more research regarding therapeutic use of the iPad and the decision-making regarding its use needs to be done in order to encourage occupational therapists to provide evidence-based therapy while using the iPad. Given the exponential growth and advances in everyday technology, it is important that best practices are determined by research as opposed to popular opinion. There are a wide range of additional research topics that could remediate the current dearth in evidence-based research on tablet technologies and further inform how the iPad can be used in occupational therapy.

Additional research into the development of a wider variety of skills may also be appropriate as the iPad continues to be used as a tool to work towards various goals. It is recommended that additional research be conducted to investigate key strategies that occupational therapists are using with a more diverse age group and who work on different skills, especially concerning social stories, turn-taking, and social skills. Additional research should also be conducted to include possible methods of data collection on the iPad, to eventually demonstrate quantifiable gains made when the iPad is used as a tool in treatment.

These researchers are also interested in the topic of screen time with young children. Our research guidelines were based on the American Academy of Pediatrics' recommendation that children not be exposed to any screen before the age of two (American Academy of Pediatrics, n.d.). However, recently the popular media has been brought attention to the topic of limiting screen time of all children under 12 years old, including the opinion of pediatric occupational therapist and Huffington Post author, Cris Rowan (2014). Additional research into the use of iPad in therapy, including the benefits and drawbacks, will help to guide practitioners and assist

them in making developmentally and medically sound therapeutic treatment choices and recommendations to parents, caregivers, and client's themselves.

Conclusion

Pediatric occupational therapists are deliberately using tablet technology in treatment to develop preliteracy skills. The tablet is used as a tool to help children engage in otherwise repetitive or less motivating tasks. In addition to being motivational for the client, it can also be convenient for the therapist once they have spent time learning the platform. The occupational therapists interviewed for this study identified OT-based clinical reasoning as vital to helping their clients attain goals through the use of the technology. With a rapidly changing and developing technological landscape, it may become increasingly important for therapists to integrate technology into their practice in order to help their clients develop digital literacy skills needed to navigate an increasingly digital world.

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Appendix

Guiding Questions

- Who - Who are you? Who are your clients?
  - Tell us about your facility and your role there.
  - Tell us about your current job.
  - Tell us about the clients that you see.
- (After reviewing definition of preliteracy for the purpose of the study.) How does that definition fit with what you think of as prelitercy?
- What - What are you using the tablets for?
  - What do you like about tablets?
  - What kind of tablet do you use and why?
  - What accessories do you use with the tablet?
- When - When do you choose to use the tablet?
  - How did you begin to use tablet technology in therapy?
- Where - Where do you choose to use the tablet?
  - What environment do you use the tablet in?
- Why - Why do you use the tablet instead of other methods?
  - Why did you start using the tablet? Continue to use it?
  - What aspects of the tablet technology do you find most helpful? Most challenging?
- How - How do you use the tablets in therapy?
  - How does using a tablet compare to using traditional methods in working on preliteracy goals?
  - What preliteracy skills specifically are you working on with the tablet?

- How do you pick which apps to use for preliteracy skill development?
  - Which apps do you regularly use?
  - What do you wish the tablet could do that it doesn't?
  - If you were to design an app, what would it do/how would it be used?
- Tell us about how using tablets affects or does not affect goal writing for preliteracy.
  - We've been reading a lot about the concept of digital literacy. How does that play into your goal writing or decision to use the tablet in therapy?
- Can you give us some specific examples where you found a tablet especially effective in working with a child on pre-lit skills? How about when it didn't work?

- Closing - Is there anything else that you would like to talk about regarding tablet technology and preliteracy skills?

Table 1

Participant Demographics

Participant	Setting	Years OT Experience	Tablet	Observed?	Member Checking?
Dawn	Clinic	3	iPad	Yes	Yes
Kristy	Clinic and school	10	iPad	No	Yes
Mary Anne	School	27	iPad	Yes	Yes

Table 2

iPad Applications for Preschool Preliteracy Learning

iPad Application	Copyright	Cost	Description	Intervention or Reward Activity?
ABC Tracing	Critical Matter, Inc.	Free	A handwriting app that focuses on upper and lower case letter formation.	Intervention
Alien Buddies	Artgig, LLC	$1.99	Four activities in one app designed around early learning, such as matching and tracing.	Both
Angry Birds	Rovio Mobile	$2.99	Cause-and-effect game play that stimulates motor and visual engagement.	Reward
Cake Doodle	Shoe the Goose, LLC	$0.99	Follow a cognitive and motor recipe sequence to create a wide variety of virtual baked goods.	Reward
Dexteria Jr.	Binary Labs, Inc.	$0.99	Activities structured around hand and finger movements to promote handwriting readiness.	Intervention
I Write Words	Giggle Lab	$2.99	Teaches handwriting through an interactive game.	Intervention
Little Writer	Alligator Apps	Free	A tracing app that includes letters, numbers and basic shapes.	Intervention
Toko Kitchen Monster	Toca Boca	Free	A simple, non-sequential free play game that promotes imagination.	Reward
Pocket Pond	John Moffett	Free	A quiet, cause-and-effect artificial pond that responds to touch.	Intervention

Note: Information concerning apps was supplemented by the iTunes Application Store via Mac OS X (Version 11.1.4).

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