Apps in therapy : occupational therapists' use and opinions

Anna Kyaio

Apps in Therapy: Occupational Therapists' Use and Opinions

Anna M. Kyaio

Faculty Mentor: Alexia E. Metz, Ph.D., OTR/L

Department of Rehabilitation Sciences

Occupational Therapy Doctorate Program

University of Toledo

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Abstract

Apps and technology have expanded in prevalence and influence on everyday life including integration into health care and therapy settings, however little research is available to guide practitioners in the search for or implementation of apps into occupational therapy. An online survey was created and distributed to all licensed occupational therapist and occupational therapy assistants in the state of Ohio with a valid email on file with the licensing board in order to gather information on occupational therapy practitioners' opinions and current app usage in therapeutic settings. Survey questions sought information regarding targeted populations and skill areas, barriers of use, recommended apps, feature preferences, and opinions to guide practitioners in their search for and implementation of apps in therapy. Results were compiled and analyzed to assess trends in this emerging area of practice.

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Introduction

The world of technology grows exponentially each year. With this growth, comes easier sharing of ideas, transfer of knowledge, and faster, more efficient ways of doing many everyday tasks. According to Pew Research Center (2015) as of January 2014, 58% of American adults report owning a smartphone, 32% an e-reader, and 42% a tablet, with more than half of these smart device users downloading and using apps. An *app*, short for application, refers to a computer program that runs on a website, a small computing device, or a cell phone (Bucki, 2015). With over one million apps available on each of the two leading market places (Google and Apple Markets), the global app revenue is expected to grow from 18.56 billion US dollars in 2012 to 76.52 billion US dollars by 2017 (Statistics and facts about mobile app usage, 2014). Even children are using apps on an increasingly regular basis. Survey results have found that 50% of children 0-8 have used mobile apps sometimes or often, with 43% report using apps for educational games (Common Sense Media, 2013).

The health care system has also adopted apps and their use in practice. *Electronic health* (e-Health) and the more narrow *mobile health* (m-Health) are terms that have recently emerged to refer to technology and mobile applications for health services, respectively. M-Health apps are largely available for individuals with chronic conditions to improve self-management in order to decrease healthcare costs. Examples include apps to encourage youth to monitor their Type I diabetes in order to increase compliance, incorporating telehealth apps into discharge planning to decrease readmissions, and providing patient-specific exercise programs for patients with chronic obstructive pulmonary disorder (American Association of Critical-Care Nurses,

2014; Cafazzo, Casselman, Hamming, Katzman, & Palmert, 2012; Marshall, Medvedev, & Antonov, 2008).

Apps are also quickly becoming integrated into rehabilitation therapy settings across populations as intervention tools and education aides, as well as for support purposes. Apple Technology, in particular, has been praised since its debut due to its intrinsic accessibility features to bring access to individuals with disabilities. Built into the iPhone, iPad, and iPod are features to assist individuals who are blind or have low vision, deaf or hard of hearing, have physical or motor challenges, and cognitive, attention, or learning disabilities to engage with the smart devices (Apple Inc., 2015). The number and quality of built in features makes Apple a leader in mobile technology for individuals with disabilities. App developers have noticed this niche market. In addition to the built in features, the therapeutic app market includes apps to improve handwriting, fine motor skills, and visual perception, to act as augmentative communication devices, to guide users through exercise and stretching routines, and to create and read social stories, for example.

This versatility has led to smart devices and apps being incorporated into different therapeutic disciplines in a multitude of ways. Speech Language Pathologists are integrating iPads and apps into intensive therapy for individuals with aphasia, as augmentative communication boards for individuals with Autism and speech delays, and in traumatic brain injury (TBI) recovery (Hoover & Carney, 2014; Sutton, 2012). In interviews of twelve occupational therapists, Waite (2012) found that practitioners find apps to be engaging and effective for many reasons including the immediate cause and effect, amount of sensory input, and *cool factor*. Apps can also allow for continuation of therapeutic interventions outside of therapy appointments, affording increased independence and social acceptance. Occupational

therapists report using apps for video modeling, sequencing, and social stories to increase independence with activities of daily living (ADLs) and instrumental activities of daily living (IADLs), voice-to-text and PDF writer apps to increase independence in the classroom, and apps for emotional regulation (Brown, 2010; Olson, 2012; Waite, 2012; Williamson, Casey, Robertson, & Buggey, 2013). Many apps also address deficits in the areas of fine motor, visual perception, cognition and attention, and patient education (Pro, LeBlanc, Wasjutin & Williams, 2015). The statistic that over half of the U.S. population owns and uses smart devices and apps, suggests that clients may find meaning and purpose in these small screens.

The use of apps as intervention tools can be integrated into the underlying theories and models of practice in occupational therapy. In fact, the breadth of apps available means that apps can be incorporated into treatment for a vast variety of reasons and can assist with many goals. This versatility allows apps to be used with many models of practice. For example, a therapist could use an app to address fine motor dexterity and movement with a biomechanical model of practice. The same app could be used seamlessly with the play model of practice. The most important thing to remember; however, is that the technology, device, and app must all have meaning to the patient. For that reason, the model of practice chosen for emphasis in this research was the Canadian Client Centered Model (Law, 1998).

The key components of the Canadian Client-Centered model of practice include a heavy emphasis on client and family centered treatment, individualization, and choices, facilitation of the client's participation, client education, enabling the client to solve issues, and a focus on the person-environment-occupation relationship (Law, 1998). In addition to confirming the app has meaning to the client, when attempting to integrate apps into treatment a practitioner must ensure that the client understands the purpose and goal of the technology. Many individuals may be

unable to independently make the connection between app based interventions and the cognitive, physical, or emotional goal the practitioner is addressing. With the goals in mind, apps may be able to offer supports to the client in order to facilitate the best person-environment-occupation fit and afford success.

Beyond the *cool factor* many aspects need to be taken into consideration when implementing apps as therapeutic intervention. The American Occupational Therapy Association (AOTA) Code of Ethics and Ethics Standards (2010a) is the governing moral document for occupational therapists. As a practitioner, it is imperative that one is able to apply the ethical standards to all interventions and interactions with patients, including the incorporation of mobile technology and apps into therapy. Ethical considerations including effectiveness, evidence-based practice, and confidentiality are frequently difficult to assess with apps due to the lack of literature in this area.

As health care practitioners, occupational therapists and occupational therapy assistants have a duty to protect client's information (AOTA, 2010a). As technology becomes more integrated into health care, confidentiality becomes a larger concern. Pew Research Center (2015) reports that in 2012 more than half of app users had reported uninstalling or choosing not to install an app due to concerns about safety of their personal information. It is necessary to ensure that patient information is kept confidential and that apps being used in practices are meeting HIPPA guidelines. It is also necessary to protect the devices themselves. One of the large draws to apps and mHealth is the portability and size. These benefits can also make theft of the device higher than with standard computers.

Additionally, The Code of Ethics (2010a) states the need for evidence based practice to help others and to prevent harm. Unfortunately, literature on the use of apps in occupational

therapy is limited when compared to other healthcare fields. Most articles found during this literature review evaluated specific apps for use with specific populations and listed apps that are available and their applicability for specific populations or skill deficits. However, without evidence, these lists and suggestions may be difficult to generalize to each clinician's situation. Williamson, Casey, Robertson, & Buggey (2013) recommend that there are prerequisite skill requirements that must be taken into consideration when using apps in therapy. This suggests that a specific app or kind of app cannot be recommended as a blanket therapeutic intervention for clients with similar skill deficits. Additionally, Breland, Yeh, and Yu (2013) found that many apps are not currently following evidence-based knowledge and guidelines. Unfortunately, research to ensure effectiveness and compliance with evidence-based practice in apps is difficult because the market changes quickly (Baker, Gustafson, & Shah, 2014). More research is necessary to provide therapists with information about the conditions under which an app can be successful in therapy in order to provide the best practice for patients.

There is currently not enough third party research on apps to assist practitioners in deciding which apps are beneficial, which features are desirable, and for which clients. Without this type of information to guide clinical reasoning, therapists are left to trial and error implementation of apps based on anecdotal references of other practitioners or the short descriptions available in the app store. This can create additional cost and time demands for the practitioner and may translate to slower progress in skill development for clients. Waite (2012) found that therapists frequently feel overwhelmed when searching for apps and often spend up to one hour per day sifting through app markets. Having to maneuver app markets with limited guidance may be enough to keep many practitioners from trying to incorporate helpful apps into their practice.

The desire to continually improve the experience for others is inherent in occupational therapists and assistants, as is the desire to inquire. In her 2015 Eleanor Clarke Slagle Lecture, Cohen suggested that inquiry should be an instrumental activity of daily living and should be incorporated into everyday life and practice. The occupational therapy doctorate degree has been developed with this drive for inquiry in mind. The research and experiential learning aspects of the doctoral program work toward instilling in each graduate the need to question, explore, and continue to learn, grow, and improve as an individual and profession for ourselves and our patients.

In order to gain insight into the use and opinions of apps in occupational therapy, I have completed a doctoral capstone in this area including practicum in the areas of scholarly practice, clinical use of apps in therapy, and survey research. The purpose of this research was to gather information on occupational therapy practitioners' opinions and current app usage in therapeutic settings. Survey questions sought information regarding targeted populations and skill areas, barriers of use, recommended apps, feature preferences, and opinions to guide practitioners in their search for and implementation of apps in therapy. A list of currently recommended apps was compiled and analyzed to aid practitioners and app developers.

Methods

Practicum

In order to gain a more in depth understanding of the scholarly practice I have completed practicum including the creation and implementation of a journal club with occupational therapy doctoral students at the University of Toledo, statistical data analysis, inter-rater reliability, and mentorship for more junior occupational therapy doctoral students in the research process,

coordination of the Midwest Graduate Research Symposium, and preparation and presentation my scholarly research project to external audiences.

To gain insight into the clinical use of apps in therapy, I observed practitioners who used apps in practice, and assisted in bringing apps into an adult neuro inpatient facility focused on neuro-vision skills. The facility in which I conducted this practicum experience had previously purchased three large Slate 21 (HP) touch screen all–in-one computers mounted vertically to carts on wheels. The carts could be raised and lowered to allow for patients to engage in the touch-screen while standing or sitting. At this facility the time required for searching the app markets was a major barrier that was significantly delaying the facility's attempts. The touch screen computers had been available for months but sat unused. In my role as a capstone student, I performed the analysis of apps for clinical practice. The therapists and clinical supervisor were very willing to devote time for meetings with me throughout the semester. During these meetings, I verified their preferred features, goals, and population-specific needs and I reported my recommendations (see Appendix A for chart of apps considered). After training the OTs on the apps, and having the computers in each gym for approximately one month, I conducted an informal survey to assess OT opinions on the apps and the startup process.

Additionally, I explored the role of therapists in the app development process and investigated the life cycle of an app including basic coding and the development process from idea to market. Throughout this doctoral capstone I have participated in the development of apps in multiple ways. I have learned both Java Script and Object Oriented coding languages, which has been the most time and thought consuming way to be involved in app development. The option to learn coding online and from books and to take an idea from start to the app market independently may appeal to some therapists. However, there are other ways to be involved in

the process and have your thoughts guide development. Many developers, especially developers of apps aimed for educational or therapeutic use, want feedback from professionals using their apps. Frequently located in the setting option of an app, there is an email address to contact with feedback and for trouble shooting. Throughout this project I contacted many app developers. Occasionally it was to notify them of glitches or problems on different devices, or to make suggestions for changes to make an app more clinically applicable for the population. Other developers, like Binary Labs, Inc. reaches out to therapists for ideas and feedback to improve their apps and develop new apps for therapeutic use (F. Jensen, personal communication, February 14, 2015).

Lastly, this doctoral capstone included the design and implementation of original research which included authoring the survey, securing IRB approval, obtaining a sample, conducting statistical analysis on the results, and authoring and presenting the dissemination.

Research Study

Design

This study used a survey design. An internet-based questionnaire was utilized in order to increase ease of completion, cost effectiveness, and return. The survey included demographic questions and questions to address current use and opinions of apps in therapy.

Participants

A list of the email addresses of currently licensed occupational therapists and occupational therapy assistants in Ohio was obtained from the Ohio Occupational Therapy, Physical Therapy, and Athletic Trainers (OT/PT/AT) Board. The OT/PT/AT Board is responsible for regulation and licensure for these three professions in the state of Ohio (Occupational Therapy, Physical Therapy, Athletic Trainers Board, n.d.). Inclusion criteria

included self-reporting as an occupational therapist (OT) or occupational therapy assistant (OTA) in active practice and having an email address on file with OT/PT/AT. Exclusion criteria included other professions, students, and non-practicing occupational therapists and assistants.

Materials

An internet-based survey including twenty-one questions was created (See Appendix B for full survey screen shots). Questions included, demographic information, barriers for use, description of use, opinions, app preferences, search considerations, and preferred apps. Qualtrics (Qualtrics LLC, Provo, Utah), an internet-based platform for delivering questionnaires and collecting participant responses, was chosen based on 1) security features (questions and responses can be accessed only by secure login), 2) cost, and 3) technical support.

Procedure

Occupational therapists and assistants were emailed from the OT/PT/AT list obtained. The initial contact email explained the survey and provided a link. Submission of the survey was indicative of consent. A list of 5,349 occupational therapists and 4,137 occupational therapy assistants was obtained, totaling 9,486 occupational therapy practitioners. Of the list obtained, 68 OTs and 94 OTAs, totaling 162 individuals were excluded due to not having an email address on file through OT/PT/AT. Emails were sent to 9,324 individuals. Of the emails sent, 333 emails were returned undeliverable due to spam settings and inactive email accounts, and one individual indicated he/she were no longer in the occupational therapy field. Response rate was calculated out of remaining 8,990 surveys emailed.

Data Analysis

Demographic information was compiled using descriptive statistics. Results of the online survey were analyzed for patterns and trends using frequency data and Pearson's Chi-Square

analysis. The p value was decreased to p = .01 to adjust for multiplicity. Chronbach's α was used to assess the internal consistency of portions of the survey instrument.

Results

Of the 8,990 surveys emailed to valid email addresses 639 respondents opened the survey. Of those, thirteen respondents were removed due to failure to complete at least 50% of the survey. Of the remaining, five respondents were excluded due to reporting they had not been actively practicing with patients. Lastly, one respondent was removed due to failure to complete the survey in order, affecting the skip-logic and potentially taking the respondent down an incorrect line of questions that affected the amount of information received. A total of 620 respondents were included in analysis. Response rate was calculated to be 6.90%. Demographic information was compiled using frequency statistics in Table 1. Survey results concluded that 47.3% of occupational therapy practitioners reported using apps for therapeutic purposes (n= 293).

The survey was developed to include one instance of skip-logic. If a respondent answered that they did not use apps they were directed to a question asking why not. Of those who reported not using apps (n=327), reasons for lack of use were compiled using frequency statistics and are compiled in Table 2. Leading reasons for not use included *lack of access* (39.1%), *never thought about is* (33.3%) and the *inability to find good apps* (28.1%). If the respondent indicated any answer to this question they skipped the questions to describe their app use and went straight to the Likert scale opinion questions and completed the survey.

If a respondent answered that they did use apps for therapeutic practice, they skipped the question asking why not and went straight to the series of questions describing their use of apps. Of those who reported using apps (n=293), frequency statistics were compiled for these

questions describing their use including percent of population, what type of devise is used, recommend apps for clients, client and caregiver opinions, target skills, and support purposes. The yes/no questions describing use had moderate reliability, Chronbach's α = .692 with *I recommend apps for my clients/patients to use on their own devices* being less consistent (α = .791 if deleted). Data indicated that the majority of practitioners do not utilize apps for all of their clients (9.6% reported using apps with *76-100%* of case load) and instead utilize apps with *<10%* and *11-25%* of their caseload (35.8% and 23.2% respectively). Respondents predominately reported using apps on *tablet devices* (87.7%) as opposed to *smart phones* or *touch screen laptops* or desktop computers. Overall, the majority of therapists *recommend apps for their clients/patients to use on their own devices* (82.6%) and both *clients/patients* and *parents/caregivers like the use of apps in therapy* (95.6% and 88.4% respectively). Lastly, respondents indicated that the leading skill areas targeted were *fine motor skills* (83.6%) and *visual perception* (77.5%) while the leading support purpose reported was for *reinforcement* (75.1%) and *timers* (61.1%). This data is available in Table 3.

Practitioners' opinions of app use for therapeutic purposes were assessed using a five point Likert scale. Opinion subscale had high reliability, Chronbach's α = .861. Frequency data is available in Table 4. Data was then split by use of apps and frequency data was compiled to assess if there were differences in opinion based on app use. Table 5 reports the separate means and standard deviations for each of the four opinion questions based on whether or not the practitioner reported using apps in practice. Practitioners who reported using apps for therapeutic purposes reported higher opinions of apps than those who did not. Pearson's Chi-Squared analysis was completed to assess the distribution of opinions based on use of apps. There was a statistically significant association between app use and opinion of apps as *useful when*

integrated into therapy sessions (X^2 (4) = 218.626, p < .001), *increase engagement of patients/clients* (X^2 (4) = 263.356, p < .001), *save time and/or resources* (X^2 (4) = 111.147, p < .001), and can lead to improved outcomes in patients/clients (X^2 (4) = 171.490, p < .001) such that practitioners who report using apps have statistically significantly higher opinions of the benefits. Odds ratios were completed for each of the opinion questions to assess effect size. Respondents who reported using apps for therapeutic purposes were 21.522 times more likely to agree and strongly agree that *apps are very useful when integrated into therapy sessions*, 26.398 times more likely to agree and strongly agree that *apps increase engagement of patients/clients,* 5.995 times more likely to agree and strongly agree that *apps save time/and or resources,* and 13.619 times more likely to agree and strongly agree that *apps can lead to improved outcomes in patients/clients* than those who reported not using apps (95% confidence interval = 13.065-35.453, 16.060-43.389, 4.149-8.663, and 8.629-21.495 respectively). This data is presented in Table 6.

Practitioners were asked about their app preferences, search considerations and favorite apps. Data was compiled using frequency statistics and is available in Table 7, 8, and 9 respectively.

Pearson's Chi-Squared analysis was conducted to assess the distribution of app use by age (Table 10), primary population (Table 11), and setting (Table 12) to evaluate whether or not there was an association between each of these factors and app use. No significant association was found between app use and practitioner age (X^2 (4) = 9.020, p = 0.61). This indicates that practitioners of all ages are utilizing apps in practice. Results indicated that there was a significant association between app use and primary population (X^2 (2) = 190.909, p < .001) such that practitioners working with pediatric populations were 12.594 times more likely to use

apps than those working with adult or geriatric populations (95% confidence interval = 8.512-18.633). There was a significant association between app use and treatment setting (X^2 (8) = 176.345, $p < .001$) such that those working in school and outpatient settings use apps for therapeutic purposes statistically significantly more than would be expected while those who reported working in acute and skilled nursing facilities use apps statistically significantly less than would be expected.

Discussion

Results of this survey indicate that while not all therapists are integrating apps into therapeutic practice, many of them are (n= 293, 47.3%). Results also indicate that therapists are frequently using their clinical judgement in the application of apps in therapy indicated by the percentage of caseload, target skills, preferred features, and reasons for non-use. This supports previous articles suggesting that apps are similar to other therapeutic interventions and treatments, and should not be implemented with all patients (Harpold, 2015; Waite, 2012; Williamson, Casey, Robertson, & Buggey, 2013; Yamkovenko, n.d.). This client-centered thought process is imperative to maintaining implementation of apps for therapeutic purposes as a skilled therapy and to providing maximum benefit to each client.

Results of this survey also shed light onto the reasons practitioners are not employing apps in their practice. Many of the reasons indicated are ones that can be remedied. One of the leading reasons for not using apps was due to the inability to find appropriate apps (28.1%). These results support the interviews conducted by Waite (2012) indicating that searching for apps is frequently time consuming and difficult. There is significantly more literature and websites devoted to apps in pediatric therapies, and many more apps that have been deemed *therapeutic* are aimed toward handwriting and letter formation with juvenile animations. It can

be especially difficult to find appropriate apps for other populations. While many resources exist, including a list provided by practice area and target skill by AOTA (Yamkovenko, n.d.), many lists become quickly irrelevant due to the speed technology changes. When asked about considerations while searching for apps, only 35.5% responded that they utilize recommendations from AOTA while 65.3% indicated considering recommendations from peers.

Occupational therapy students can be a resource for therapists and facilities interested in apps. Until more research is available to aide practitioners in app decision making, searching the app market and internet will continue to require time that practitioners frequently do not have. Many fieldwork sites request or require a project for the Level II Fieldwork students. Students could use this opportunity to find apps that are appropriate to the specific client population of the facility.

In addition to finding apps for clinical use, there is a role for practitioners in the development of therapeutic apps. Occupational therapy practitioners have knowledge and creative ideas about what could benefit patients in their settings. In order to turn those ideas into clinically useful apps, practitioners must think about what role they are able and willing to take in app development. Therapists can play many roles in the development of apps for therapeutic purposes (Richmond & Janes, 2015, April). Some therapists have developed their own apps to meet the needs they see in their practice area. Others provide valuable feedback to app developers on the usefulness, improvements, and ideas for apps. Companies like Binary Labs, Inc. have recognized the need for clinical knowledge and insight that the developers lack and work to retrieve that information from occupational practitioners around the country (F. Jensen, personal communication, February 14, 2015). For many therapists learning code and having the time required to take on the development of an app is not feasible. However, many therapists

could have time to devote to a phone conversation about sketches, or an email to the developer about an improvement.

Another reason for non-use was the opinion that apps were not relevant or meaningful to the practitioners' population. Results of this survey support previous research suggesting that apps are more prevalent in pediatric and school based therapies (Pro, LeBlanc, Wasjutin & Williams, 2015). While it is necessary to continually assess meaning in the lives of clients, practitioners should use caution in over-generalizations. Between 1960, when the first commercial computer (the PDP-1, with only a keyboard and monitor) was introduced, and 2010 when the first iPad was introduced, technology has grown rapidly, becoming more integrated into business and leisure (Apple Inc., 2015; Polsson, 2015). Many of the adults and older adults that currently require occupational therapy services observed and even participated in the development of computers and technology since its infancy (Wadhwa, 2014). The adults and older adults currently in therapy were among the first to integrate computers into their jobs, bring computers home to their families, and to have learned how to text their children and grandchildren (L. Gladchild, personal communication, 2015). Pew Research Center (2014) reports that more seniors age 65+ own tablets and/or e-readers than cell phones (27% and 18% respectively). Some adults and older adults may be disinterested in tablets and apps. However, others may find meaning in integrating current technology into their everyday lives. This may include, for some, the ability to play an app with their grandchildren, the opportunity to complete their daily word search, or engage in a virtual board game with a distant friend from the confines of a hospital bed. If apps provide enhanced meaning for clients, they may be employed in occupations that target goal-related performance skills, for example range of motion of an

affected upper extremity after a stroke, visual scanning for a client with spatial neglect, or problem solving and attention for a client with a traumatic brain injury.

During implementation and via an informal survey, I worked to assess the use and opinions of the occupational therapists and patients about this new therapeutic activity in the clinic. Therapists commented that the game worked as a distraction from standing or the pain. A therapist reported that "patients don't think about fatigue and you get a better sense of how well they are doing. They are great". I also received feedback from the older adult patients that they enjoyed the games and challenges provided, including statements such as "this is why kids are always on their phones" and "not all therapy is this fun, I didn't even think about standing". Another therapists responded via the informal survey that "patients are excited to download the apps they used to continue using in their free time or with their families." The therapists discussed how older adults were able and interested to play the app in their rooms at night or with their grandchildren or family at home as a way to continue the therapy and engage with others. This is consistent with the results of the informal survey, in which occupational therapists reported that the majority of the patients reported enjoying the apps *most of the time* (66.67%), *50/50* (21.11%), and *always* (11.11%) with no one reporting *some of the time,* or *none of the time*.

When asked about preferred features of apps, 57.3% of respondents indicated they preferred apps that had multiple uses and 61.3% preferred activities that could be graded. Apps, similar to other therapeutic interventions, can frequently be graded and changed to meet different needs with adaptations. While the original focus was on apps for therapy geared toward visual deficits, at the end of the first month therapists reported using the apps to target deficits in *vision* (100%), *attention,* and *cognition* (77.78%). The vertical screen mount allowed therapists to

address *upper extremity endurance/strength* (77.78%) and *upper extremity range of motion* (66.67%), while the raising and lowering of carts allowed *standing balance/endurance* (77.78%), and *sitting balance/endurance* (34.44%) to be addressed as well. During this implementation of apps as a therapeutic occupation, we used patient education to emphasize the benefits and how each activity related to the specific goals for each patient. In these ways, we ensured that each patient had meaning and purpose associated with the apps.

Limitations

The results of this research study should be generalized with caution. This survey was sent out to all licensed occupational therapists and therapy assistants in the state of Ohio with valid e-mail addresses. The response rate was calculated to be 6.9%, a low response rate for survey research. However, due to the large population of 8,990 practitioners, 620 respondents were included in the analysis. While the response rate was low, the sample size was high.

Additionally, the respondent rate based on settings differs slightly from that provided by the AOTA report on national workforce trends (AOTA, 2010b). Respondent rates to this survey suggest that practitioners practicing in the areas of schools, skilled nursing facilities, and outpatient facilities were more likely to respond to the survey, while those practicing in hospital setting and early intervention were less likely to respond. Therefore, these results should be generalized to hospital settings and early intervention with caution. The low response rate and skewed practice areas could be due to a self-selection bias, limiting the ability to generalize to practitioners as a whole.

Lastly, many of the dependent variables were ordinal, which limited the type of statistical analyses that could be performed and in some cases limited the power of analysis.

Future Research

Future research should continue to assess the changing trends of app use in occupational therapy. A larger response rate from other parts of the country would be helpful to assess if there are geographic trends and to increase the ability to generalize results. Additional research is needed to address the needs of practitioners including guidelines for decision making, improvement and verification of available apps, and increased research on effectiveness to ensure evidence-based practice.

Summary/conclusions

The results of this study support other literature that indicates apps are being integrated into occupational therapy (Brown, 2010; Johnson, 2015; Olson, 2012; Pro, LeBlanc, Wasjutin & Williams, 2015; Waite, 2012; Williamson, Casey, Robertson & Buggey, 2013). Many practitioners across settings and populations are including apps into practice. These results also suggest that those who use apps for therapeutic purposes find them effective, engaging, and useful.

Currently practitioners are using the apps available to address primarily fine motor and visual perception skills. There is a role in app development for therapists who wish to broaden and improve the apps available. Occupational therapists and assistants have the patient knowledge and understanding of evidence-based guidelines to help improve the quality of apps available. Results of this survey indicate that therapists most frequently want apps that can be graded, have multiple uses, and have accurate feedback of performance.

Respondents also identified barriers to app use including lack of access at work, never thought about it, and difficulty finding good apps. More research is needed to address these barriers and make integration an option for those interested. Effectiveness and efficiency research is difficulty, but much needed to improve the evidence-based knowledge (Baker,

Gustafson & Shah, 2014). This could provide therapists support in requesting increased access at work and would also improve the knowledge of the potential uses for apps in practice. Research to guide searches and decision making would benefit the practitioner and decrease the time necessary.

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Table 1: Demographic Information

	n	%
I am an:		
- OT	412	66.5
- OTA	205	33.1
I have been practicing for:		
- <5 years	157	25.3
- 6-10 years	118	19.0
- 11-15 years	92	14.8
- >15 years	250	40.3
I am _ years old:		
- 20-29	101	16.3
- 30-39	176	28.4
- 40-49	164	26.5
- 50-59	125	20.2
- 60+	47	7.6
I am _:		
- Female	565	91.1
- Male	50	8.1
Current primary treatment population:		
- Pediatrics	251	40.5
- Adults	136	21.9
- Geriatrics	233	37.6
Current primary setting:		
- Early Intervention	8	1.3
- Schools	179	28.9
- Inpatient	33	5.3
- Outpatient	89	14.4
- Acute	40	6.5
- Skilled Nursing Facility	161	26.0
- Mental Health	12	1.9
- Home Health	56	9.0
- Other[a]	42	6.8
I use apps for therapeutic purposes:		
- Yes	293	47.3
- No	327	52.7

Note: n=620. Questions that total less than 620 indicate non-responses.

[a] Other responses include: Multiple locations/PRN (12), Private Peds Practice (2), Work and Industry/Industrial Rehab (3), Community (3), Occupational Health/Med (2), ICF/MR Residential Setting (2), Private clinic/practice (2), Autism Treatment Center, Research, Adult IID, NICU, Functional Capacity Testing in Factories, Rehab Center, Optometry, and Academic.

Table 2: Reasons for Not Using Apps (check all that apply) (n=327)

	n	%
I don't have access to the technology at work	128	39.1
I'm not confident with the technology	41	12.5
I get overwhelmed	16	4.9
I don't know how to find good apps	92	28.1
I think there are better uses of my limited therapy time	69	21.1
The cost	26	8.0
I've never thought about it	109	33.3
Other[a]	66	20.2

[a] Other responses include: beginning to implement (4), belief of lacking creativity, concerns for lack of hands on skill, social skills and mental health, lack of tech acceptance and support at facility (6), lack of time during both treatment and ability to research (9), not conducive for caseload (general = 4, hands = 2, Alzheimer/dementia = 2, patients lack cognition/education = 1, patients lack financial resources/ don't use tech = 1, early intervention = 3, geriatrics = 7, home health = 2, school = 1, vision = 1), not conducive for job requirements (general = 1, home modifications = 1, prn = 1), and not wanting to use own device in setting (1).

Table 3: Description of App Use (n=293)

	n	%
I use apps with __% of my caseload:		
- <10%	105	35.8
- 11-25%	68	23.2
- 26-50%	52	17.7
- 51-75%	40	13.7
- 76-100%	28	9.6
I use apps on ___ device: (check all that apply)		
- Tablet	257	87.7
- Smart Phone	84	28.7
- Touch Screen Laptop	14	4.8
- Touch Screen Desktop	16	5.5
I recommend apps for clients/patients to use on their own devices:		
- Yes	242	82.6
- No	51	17.4
My clients/patients like using apps in therapy:		
- Yes	280	95.6
- No	11	3.8
The parents/caregivers like the use of apps in therapy:		
- Yes	259	88.4
- No	19	6.5
I use apps to target the following skill areas: (check all that apply)		
- ADL	61	20.8
- Visual Perception	227	77.5
- Communication	117	39.9
- Organization	83	28.3
- Social Skills	59	20.1
- Typing	130	44.4
- Fine Motor Skills	245	83.6
- Other[a]	77	26.3
I use apps for the following support purposes: (check all that apply)		
- Reinforcement	220	75.1
- Timers	179	61.1
- Visual Schedule	115	39.2
- Assessment	59	20.1
- Collecting/Tracking Data	75	25.6

Other responses included: as a distraction to other tasks, academics/education (3), behavioral control, building self-esteem and confidence, cognition (5), compensation for memory and visual

deficits, directions, visual memory, patient education of injury/disability/treatment (4), exercises, feeding, focus, bilateral integration, attention (2), pre-writing/ handwriting/ formation (14), video modeling, memory (3), money management, literacy, problem solving (2), direction following, static standing balance and tolerance, self-regulation (4), relaxation/yoga (3), sensory (3), visual motor (6).

Table 4: Therapist Opinions of Apps for Therapy

On a scale of 1-5 how much do you agree with the following statements: Frequency Data

	1	2	3	4	5	Mean (SD)
I think apps are useful when integrated into therapy sessions	4	22	194	256	130	3.8 (.837)
I think apps increase engagement of my patients/clients	13	30	184	185	149	3.76 (.980)
I think apps save time and/or resources	14	52	239	179	73	3.44 (.921)
I think apps can lead to improved outcomes in patients/clients	6	19	179	244	117	3.79 (.844)

Note. Frequency that does not add up to 620 is indicative of non-response.

Table 5: Comparison of Opinion by App Use

On a scale of 1-5 how much do you agree with the following statements:

	I use apps for therapeutic purposes: YES	I use apps for therapeutic purposes: NO
I think apps are useful when integrated into therapy sessions	4.29 (.639)	3.36 (.744)
I think apps increase engagement of my patients/clients	4.40 (.711)	3.15 (.795)
I think apps save time and/or resources	3.76 (.970)	3.13 (.751)
I think apps can lead to improved outcomes in patients/clients	4.24 (.666)	3.37 (.775)

Note. Mean (SD)

Table 6: Distribution of Opinions by Use of Apps:

A. I think apps are very useful when integrated into therapy sessions

Use Apps		1	2	3	4	5	Total
Yes	n	0	4	17	159	109	289
	%[a]	0.0	0.7	2.8	26.2	18.0	47.7
	z	-1.4	-2.0*	-7.9*	3.3*	6.0*	
No	n	4	18	177	97	21	317
	%	0.7	3.0	29.2	16.0	3.5	52.3
	z	1.3	1.9	7.5*	-3.2*	-5.7*	

Note. X^2 (4) = 218.626, p < .001

B. I think apps increase engagement of my patients/clients

Use Apps		1	2	3	4	5	Total
Yes	n	1	4	18	111	139	273
	%[a]	0.2	0.7	3.2	19.8	24.8	48.7
	z	-2.1*	-2.8*	-7.6*	2.2*	7.8*	
No	n	12	26	166	74	10	288
	%	2.1	4.6	29.6	13.2	1.8	51.3
	z	2.1*	2.7*	7.4*	-2.2*	-7.6*	

Note. X^2 (4) = 263.356, p < .001

C. I think apps save time and/or resources

Use Apps		1	2	3	4	5	Total
Yes	n	6	23	62	119	62	272
	%[a]	1.1	4.1	11.1	21.4	11.1	48.8
	z	-0.3	-0.5	-5.5*	3.4*	4.4*	
No	n	8	29	177	60	11	285
	%	1.4	5.2	31.8	10.8	2.0	51.2
	z	0.3	0.5	4.9*	-3.3*	-4.3*	

Note. X^2 (4) = 111.147, p < .001

D. I think apps can lead to improved outcomes in patients/clients

Use Apps		1	2	3	4	5	Total
Yes	n	0	4	24	150	97	275
	%[a]	0.0	0.7	4.2	26.5	17.2	48.7
	z	-1.7	-1.7	-6.8*	2.9*	5.3*	
No	n	6	15	155	94	20	290
	%	1.1	2.7	17.4	16.6	3.5	51.3
	z	1.7	1.7	6.6*	-2.8*	-5.2*	

Note. X^2 (4) = 171.490, p < .001

Table 7: App Preferences

I like/prefer the following features in apps: (check all that apply)

	n	%
Accurate feedback of performance	346	55.8
Juvenile animations and colors	162	26.1
Mature visuals and feedback	239	38.5
Haptic/tactile feedback	127	20.5
Auditory directions	272	43.9
Visual directions	293	47.3
Game-like features	253	40.8
Patient profile	245	39.5
Activities can be graded	380	61.3
Multiple uses	355	57.3
Other	60	9.7

Other responses include: do not use apps (25), ability to change/customize (3), cause/effect, brief for warm up, cheap, easily integrated to non-screen, hand skills on controls, ability to adapt for visual deficits (2), interesting to clients (4), geared towards older adults, patient education (3), tracks or provides data on progress (2), therapist education, translation of languages, video modeling, visual schedule.

Table 8: Search Considerations

When looking for new apps I take the following into consideration: (check all that apply)

	n	%
Recommendations from AOTA	220	35.5
Recommendations from peers	405	65.3
Price	371	59.8
Operating system	249	40.2
Research articles	130	21.0
Search results	136	21.9
Description on the app marketplace	163	26.3
Reviews on the app marketplace	214	34.5
Reviews and descriptions from specific websites	95	15.3

Specific websites include: a4cwsn.com (2), OT Advance (5), bestappsforkids.com, iTaalk, otswithapps.com (5), mamaot.com, momswithapps.com, appshopper.com, smartappsforspecialneeds.com (2), pinterest, smartappsforkids.com (3), none.

Table 9: List of Apps by Frequency Noted

Letter School	69	Notability	3
Dexteria and Dexteria Jr.	48	Real bodywork	3
Bugs & Buttons series	17	Snap Type	3
Ready to Print	16	Tap the frog	3
Writing wizard	16	Timer Touch (and 2)	3
Lumosity	9	Word prediction	3
Injini	8	Word Search	3
Letter Reflex	8	Air Hockey	2
Dragon Dictate	7	Angry birds	2
HWT Handwriting Without Tears	7	Big Bang pictures	2
iWriteWords	7	Breathe2relax	2
Touch N Write and cursive	7	Bugs and numbers	2
Zones of Regulation	7	Chalkboard	2
Bugs & Bubbles	6	Cut the buttons	2
Doodle Buddy	6	Cut the Rope	2
Flow	6	Dyslexia Quest	2
Matrix Game 1, 2 and 3	6	Find It/Match It	2
Peekaboo Farm/Barn/Pets	6	Fluidity	2
Visual Timer	6	Help kids learn	2
Fit brains	5	Highlight	2
ProLoQuo2Go	5	highlights hidden pics	2
Toca Boca	5	I write my name	2
Visual Attention	5	ICD -9	2
Write my Name	5	Learn to write	2
Choice Works	4	Letter Quiz	2
CoWriter	4	LiftRight	2
HandDecide	4	Little writer	2
HWT Wet, dry, try	4	Memory	2
Start Dot	4	Model me kids	2
Time Timer	4	Monkey Preschool Lunchbox	2
ABC Tracer	3	monster hunt	2
Brain sync	3	Music Sparkle	2
Dexteria POV	3	My Name	2
Endless alphabet	3	Pinch Peeps	2
I write words	3	Puzzles	2
Imazing	3	Robot Lab	2
iOT	3	Rush Hour	2
jigsaw puzzle	3	Shape Builder	2
Kid Doodle	3	Sounding board	2
Metronome	3	StepbyStep	2
		Story creator	2

SuperStretch	2
Tx Tools	2
Typing web	2
vision tap	2
Visual tracking	2
Whimsy	2
White Board	2
A Monster at the End of this Book	1
A+Signature	1
ABC 123	1
ABC animal shape puzzle	1
Abc bubble pop	1
ABC lite	1
ABC maze	1
abc mouse	1
Abc touch	1
Abcya	1
ablipad	1
ADL	1
Alien buddies	1
All toca boca	1
Alphabet	1
Alphabet Race	1
Analogies	1
anatomy	1
animal puzzles	1
Animated puzzle	1
Any.Do	1
Appsgonefree	1
AppWriter US	1
Art of glow	1
ASD Tools	1
atlus	1
Autismate	1
baby elmo	1
Ballon popper	1
Balloonimals HD	1
Bejeweled Blitz	1
berg	1
Between the Lines	1
binaural beats	1
Bitsboard	1
Body Works	1
Bookshelf	1
Brain Age (NIntendo)	1
Brain baseline	1
brain school	1
brain trainer spot the difference	1
brighter bigger	1
Bubble popper	1
Bubble Typing	1
Bubble wrap free	1
bubble xplode	1
bubblepop	1
Bug Chase	1
build it up	1
Bus HD	1
Buttons and numbers	1
Cake doodle	1
camera	1
Captain lazy eye	1
cause and effect apps	1
Clicker Sentences	1
Color book	1
color id	1
color therapy	1
Cookbook Master	1
Cookie doodle	1
Cookie making	1
Core	1
Count battle	1
Countdown	1
Countdown timer	1
Cursive	1
Cursive Practice	1
cursive writing wizard	1
Data tracker pro	1
deslexic quest	1
Dexteria dots	1
Differences	1
Dino Maze	1
DME	1
Doodle Find	1
Dot to Dot	1
Draw Animals	1

Draw Race 2	1	Imimic	1
Dyslexia	1	Incredible Machines	1
Educreations	1	Just Dance	1
Egg and spoon	1	kandy fish	1
Eggroll puzzles	1	Keeble	1
Elevate	1	Keyboarding Without Tears	1
Emotions	1	Kid timer	1
Endless numbers	1	Kids slide puzzle	1
Evernote	1	Labyrinth 3D	1
Eye exerciser	1	labyrinth le	1
eye note	1	Lamp	1
feelings	1	Left or Right	1
field goal	1	lego jr	1
Find me	1	let's color	1
Find the Animals	1	Letter tracking	1
finger fun	1	letter writer	1
finger motion	1	Lickety Split	1
finger tied jr	1	Light box	1
Fireworks lite	1	Little bee sees	1
First Then schedule	1	logic games	1
First/Then	1	Look engineer	1
flow line	1	lunch bunch	1
Fruit ninja	1	mag lite	1
Games	1	Magic Piano	1
g-codes	1	magic puzzles	1
Ghost Type	1	magnetic letters	1
Ginger Keyboard	1	Mah jong	1
GloColoring	1	Mandala HD	1
glowrite	1	Map My Ride	1
go talk	1	Matching	1
go talk now	1	Me moves	1
Goniometer Records	1	medbridge	1
google	1	Memory block	1
Google Calendar	1	Memory find	1
Google docs	1	Memory matches	1
Guitar Hero	1	Metrotimer	1
heat pad	1	montessori matching board	1
Highlights countdown	1	Mr. Potato head	1
Hooked on phonics	1	Munch	1
Hoppy's vision trainer	1	my first preschool	1
how to	1	My First Tangrams	1
Ready to write	1	My mosaic	1
i-dress	1	My robot friend	1

Ned term and abrev	1
News-2-You	1
Nick Jr. Draw and Play	1
Noisy monster	1
Notes app	1
occ therapy	1
Ollies' Handwriting and Phonics	1
Omt	1
opposites	1
Optimism	1
origami	1
Out of Milk	1
Paint sparkle	1
Paper port notes	1
paper toss	1
Pariox	1
PEAK	1
pepi tree	1
pet doctor	1
Piano Keys	1
piano tiles	1
Pictello	1
pictoword	1
Picture Scheduler	1
Plants vs. Zombies	1
playground	1
Pocket pond	1
Potty time	1
Pre handwriting	1
promis	1
quick voice	1
RadSounds	1
Random	1
Read&Write for Google	1
Read2go	1
Real fireworks	1
rehab	1
rehab measures	1
ROM measure	1
S?sh	1
Saner bloser cursive	1
Saner bloser manscript	1
School of Perception	1
Scribblenauts	1
SD age calculator	1
search60	1
Sensory Room	1
sensory treat	1
Sensory/fireworks	1
Sesame Street's Breath Think Do	1
Shape Puzzle HD	1
shapes	1
sharing timer	1
Shelbys quest	1
Shoulder Decide	1
show me	1
sight book	1
Smule	1
Social adventures	1
social skill builder	1
Solitaire	1
Sorting	1
Sorting machine	1
Sound Effects	1
speak for yourself	1
special bites	1
Spot the Dot	1
Spotify	1
Stickman	1
stop- think- do	1
Story Starter	1
Stress baal	1
super mosaic	1
superkeys	1
Swirlicity	1
talk for me	1
Talking Ginger	1
talking larry	1
tanzen	1
Tap bugs	1
Tap n see	1
Tap to talk	1
Tap Typing	1
Teach me at various ages	1
Tempo	1

Therapy Boss	1	Vision training	1
Think it Through apps	1	Visual	1
Thomas and Friends	1	visual attention therAppy	1
Tic tac toe	1	Visual therapy suite	1
Timocco	1	Voice Dream	1
Tiny Hands Sorting	1	Voice Dream reader	1
tips	1	Voice Recorder	1
Toca Kitchen	1	wack a mole	1
Toca Monsters	1	Water	1
Toddler Food	1	Words for life	1
Touch and see	1	Write in sand	1
touch chat	1	Write Letters	1
Touch Switch	1	Write me	1
trigger point release	1	write start	1
Typing Club	1	Youtube	1
Typ-o	1	zaner-bloser	1
Unblock me	1	Zen View	1
Verbal me	1	Zones	1
Video scheduler	1		
Vision App Bundle	1		

Table 10: Distribution of App Use by Practitioner Age

Use Apps		20-29	30-39	40-49	50-59	60+	Total
Yes	n	39	90	76	68	17	290
	%[a]	6.4	14.7	12.4	11.1	2.8	47.3
	z	-1.3	0.7	-0.2	1.2	-1.1	
No	n	62	86	88	57	30	323
	%	10.1	14.0	14.4	9.3	4.9	52.7
	z	1.2	-0.7	0.2	-1.1	1.1	

[a] % indicates percent of total n = 613 indicating 7 non-response

Note. X^2 (4) = 9.020, p = 0.61

Table 11: Distribution of App Use by Primary Population

Use Apps		Pediatrics	Adults	Geriatrics	Total
Yes	n	202	43	48	293
	%[a]	32.6	6.9	7.7	47.3
	z	7.7*	-2.7*	-5.9*	
No	n	49	93	185	327
	%	7.9	15.0	29.8	52.7
	z	-7.2*	2.5*	5.6*	

[a] % indicates percent of total n = 620

Note. X^2 (2) = 190.909, $p < .001$

Table 12: Distribution of App Use by Setting

Use Apps		Early Intervention	Schools	Inpatient	Outpatient	Acute	Skilled Nursing Facility	Mental Health	Home Health	Other	Total
Yes	n	5	145	11	58	4	33	2	17	18	293
	%[a]	0.8	23.4	1.8	9.4	0.6	5.3	0.3	2.7	2.9	47.3
	z	0.6	6.6*	-1.2	2.5*	-3.4*	-4.9*	-1.5	-1.8	-0.4	
No	n	3	34	22	31	36	128	10	39	24	327
	%	0.5	5.5	3.5	5.0	5.8	20.6	1.6	6.3	3.9	52.7
	z	-0.6	-6.2*	1.1	-2.3*	3.2	4.7*	1.5	1.7	0.4	

[a] % indicates percent of total n = 620

Note. X^2 (8) = 176.345, $p < .001$

Appendix A

Visual Perception Apps Considered

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
[a]Marker Maze by Neural Play	Following & Tracking	Use your finger to guide the marker through the maze.	Free	Levels 1-6: Basic to very hard. Does not auto grade	Does not track time or number completed	None provided	Black background with neon colors	No	
[a]Find the Ball Delux by Natenai.com	Following & Tracking	Classic shell game: ball is placed under cup, cups move, ind. taps which cup with ball is under	Free	Auto increases in speed and number of movements	Reports rounds	Provided	design on background, but pretty clear	Yes	unable to locate android upgrade for no ads
Dexteria by Binary Labs	Tracking and fine motor	Pinch it- offers stationary and moving crabs to pinch; Tap in- improve fine motor deterity and coordination	$4.98	auto increases speed and number- red crabs multiply	Profiles/ Pinch it- tracks # completed and time; Tap it- # of taps, accuracy, and time	Provided	simple background	No	
Flow Free by Big Duck Games LLC	Tracking and Following	Connect same colored dots filling all the tiles only once	Free	Regular pack includes 150 puzzles- 30 puzzles for each level 5x5-9x9. Additional packs available for free and cost	Tracks number of moves to assess accuracy (10 moves to connect 6 sets)	Provided	simple background	Can remov e for $3.99	Flow Free Bridges offers more complexit y

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
Marble Sorter by Sorting Games	Following, speed	move the marbles to their matching color bar before they fall off the screen	Free	After 100 marbles of 2 colors sorted, moves to 4 colors, then 6	Tracks number of marbles sorted, have 3 errors allowed	Count at top of screen	strange background, poor graphics?	Bar along the botto m	
[ab]Matrix Game 1-3 by MyFirstApp Ltd	Form constancy	2 forms are combined and the person places it on the matrix where it belongs.	Lite-free	Each game 1-3 increases in complexity. Each has levels that have different difficulties.	no score report	wrong answers just bounce back	good clear graphics	No	2.49 each for full version. I'd recommen d #3 and 2
Guess the Shape Quiz by RedAppz	Form Constancy	guess the shape of shadowed pictures. Levels include animals, super heros, sports, cartoons, tech, simpsons, music instruments, a little bit of everything! (You have to know how to spell the items)	Free	Provides # of letters in word(s). 3 levels of hints- 1 tells you the answer, 1 gives all the letters mixed, 1 gives you 1 letter at a time up to 3 times.	none provided	Tells you if you are incorrect and referrences a hint.	slightly small graphics, but good basic colors	Yes	1.89 to remove ads + 100 hints

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
Memory Pattern by Absoon	Visual Sequential Memory	Mimic a pattern tapped out on a lock screen.	Free	Really nice. Starts very basic and then increases incrementally, adding half of new sequence at a time. Likely only the first few levels will be appropriate for patients. Gets very long and difficult	None provided	If you tap incorrectly the app throws a red X and replays the original sequence quickly. Repeating a level provides a slightly different pattern.	Fine graphics. There are audio tones associated with each tap also.	Yes	Unable to locate upgrade for no ads
Memory Trainer by Urbian	Visual memory	Tile Flip- tiles flip once to reveal pictures, then a second time to reveal the pictures have moved and one is different. Touch the different picture.		Automatic	Number of times animation was repeated is resented at end of session	Obvious right/wrong effects	Slightly small for screen size, but basic and clean	No	All activities are timed, so may not be great for pts required increased processing time.

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
	visual memory	Numbers- chunked numbers are provided then taken away, duplicate them in order							
	Attention, visual memory, working memory	Sequencer- repeat either the shape or color sequence provided. Need to pay attention because both shape and color are provided all the time.							
	Visual memory, working memory	GridGrind- You are provided a design to look for as an array of tiles are flipped in chunks. You have to remember all the places the design is located							
	Working memory	To-DoKu- provided a list of to do items, then asked about what was on the list							

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
	Attention, visual memory, working memory	N-Back- letters/grids are presented one at a time. If the visual you are seeing now is the same as the one 2 back, tap on it.							
Hidden Object- Journey into the Wilderness by Difference Games	Figure ground, form constancy	Basic iSpy game. Busy background with items to locate	Free, costs for additional levels	Can play with Normal: limited time and hints, Nice and Casual: no time limit and unlimited hints, or Challenge Mode: items are rotated, words are missing letters; Can find by picture, silhouette, or word. 9 items to find per level	Does not track time or number completed	None provided	Very busy background. Could be overwhelming	Yes	Will likely be too difficult, unable to make simpler. Froze my tablet 1x

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
Shape Match by Brian Cooley	Visual Memory	Memory game with large shapes with bold colors	Free	No gradation	Tracks number of turns	Running total at bottom		No	You have to tap for the next turn, however could be really beneficial for patients who need longer processing time
[a]Bugs and Buttons by Little Bid Studio LLC	Tracking	Bees-eye (tracking) launch the bee into the target	$2.99	target begins as stationary, then moves, then rocks are added as obstacles	Score provided at the end of each game	Good correct/incorrect feedback.	Good clear graphics. Audio sounds young.	No	Some really good gamesbut possibly too juvenile
	Sequencing	Patterns (sequencing)- complete the patterns out of buttons		Patterns and discrimination become more complex (shades of same color, details, etc)					
		Counting (JUVENILE)							

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
		Tic-Tac-Toe - Computer plays well							
	Tracking, visual motor	Catch 'em & Apple Pickin (tracking, visual motor) Catch the moving bugs, or stationary apples and put them in the container.		bugs increase in number and speed, different bugs to discriminate. Apple pickin adds bees as obstacles					
	Discrimination	Button Sorting & Factory Sorting (discrimination)- sort the buttons into the correct container		More buttons, more varieties					
	Tracking	Button Truck (tracking) tap the buttons as they fall off the truck		speed					
	Tracking	Bug Maze (tracking) take the bug through the maze with your finger		Length of maze increases, another bug makes you start over.					
	Tracking, sorting	Firefly Sky (tracking, sorting) put the correct color fire fly into the container		More bugs to discriminate					

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
	Fine motor coordination and speed	Bug Race (fine motor coordination and speed) alternate tapping the 2 buttons to make the ant go							
	Tracking	Find It (tracking) find the bug under the thimble		number of moves and speed of movement					
	Visual Memory	Matching (visual memory) memory game		number of cards					
	Sequencing	Letter Train (sequencing) fill in the missing letter in a sequence of 5		upper and lower case					
	Visual motor control, tracking	Butterfly Valley (visual motor control, tracking) tilt the screen to lead the butterfly through the gates.		number of gates and distance appart					
	Fine motor, sorting	Pinch and Grab (fine motor, sorting)		sort the bugs by pinching					
Find Differences by Pinecone Software	Figure ground	Find 5 differences in the 2 pictures side by side. There is a timer that counts down. Incorrect guesses decrease your time	Free	None	None	Green circles surround correct guesses, nothing for incorrect		No	Very Difficult

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
Hidden Object by Magma Mobile	Figure Ground	Find the hidden object in the scene as the timer counts down. 3 levels of difficulty. Hints available.	Free	3 levels of difficulty- amount of time, number of items placed on scene, number of items to locate	Tells you how long it took- player gets stars based on time	Provided at end of each game	images are just placed on top of a picture of a scene. Some images can be hidden by other images and not visible.	No	
Rolling Shapes by Vertex Games									Not what I thought it was going to be, not helpful and very difficult
rOtal by Binaura	Form Constancy	cubes are stacked together, you must locate the matching pairs by dragging the screen to rotate the view. You have a time limit to locate each piece (easy=15 seconds per pair)	Free	Easy, Medium, and Hard Levels	Reports amount of time	If the time runs out the game ends. If you guess incorrectly, the screen dims and freezes for a couple seconds	grey scale graphics	No	May be too difficult for patients with trouble in this area.

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
iOT Session by Dr. Frederick Covington	Visual discrim, pattern rec, spatial org, tracking, scanning	Offers games for visual tracking (tap the rain drops as they fall), scanning (find the object in an array), and spatial org (mimic the array). Also offers handwriting and fine motor activities	Free	Each game grades and tracks progress	Good information on time, completion, etc	Scores provided only with user profile, not immediately visible.	Poor graphics on android. May get better with future versions.	No	Poor quality on Android. Screen design not correct. Freezes when adding a user profile. Unable to obtain data without user profiles.
Tanagram HD by Pocket Storm	spatial relation, form constance	Create the design outlined using the blocks provided	Free	Many different levels, unable to grade within the app (can't provide hints or outlines)	None provided	Amount of time provided at top	Fine	Bar along the bottom	Unable to make simpler, will likely be too difficult

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
[a]Fruit Ninja by Halfbrick Studios	Tracking, visual motor	slice the fruit as it is thrown up on the screen. Classic mode- don't slice the bombs and don't let the fruit fall	Free	Different ways to play: Zen- slice as many fruit as you can within the time limit. No bombs, fruit can fall. Arcade- slice as many fruit as you can in time frame. Bombs are -10 points. Patterned fruit are bonuses.	score provided- number of fruit sliced	Number of fruit is always provided at end of game	Menus can be busy with characters talking, game is clear, but fast.	Yes	Unable to locate upgrade for no ads
ASAP Shapes by Fiero Interactive Ltd	Form Constancy	One shape is provided in the middle with an option to each side. The colors on the options are inverted from the middle. Person must tap which option matches middle							Too fast for patients- <10 seconds to chose
Simply Geometry by Simply LearningAide	Patterns, shape discriminatio n	complete the pattern	Free	Patterns and discrimination become more complex (hex/octogon)	none provided		simple background	No	Not good KOR accepts incorrect answers

Name/ Developer	Skill Area	Summary	Cost	Grading	Score Report	Feedback Provided	Visuals	In app ads	Notes
	Sorting, visual discrimination	Sort 2D/3D, number of corners/sides, etc			none provided			No	Not good KOR- no feedback on wrong answers
	Build Matrix- parts of a whole	Sort combined shapes into a matrix			none provided			No	Not good KOR- no feedback on wrong answers
Word Search by AppDrac	scanning, figure/ ground								Too hard, doesn't get simple enough

[a] Apps chosen for download

[b] Matrix Game 2 and 3 were utilized

Appendix B

Survey Questions

I am an:

- OT
- OTA

I have been practicing for:

- <5 years
- 5-10 years
- 11-15 years
- >15 years

I am ____ years old:

- 20-29
- 30-39
- 40-49
- 50-59
- ≥60

I am:

- Female
- Male

Current primary treatment population:

- Pediatrics
- Adults
- Geriatrics

Current primary setting:

- Early Intervention
- Schools
- Inpatient
- Outpatient
- Acute
- Skilled Nursing Facility
- Mental Health
- Other:

I use apps for therapeutic purposes:

- Yes
- No

Survey Completion

If not, why not (check all that apply)?

- ☐ I don't have access to the technology at work
- ☐ I'm not confident with the technology
- ☐ I get overwhelmed
- ☐ I don't know how to find good apps
- ☐ I think there are better uses of my limited therapy time
- ☐ The cost
- ☐ I've never thought about it
- ☐ Other:

Survey Completion

I use apps with _____% of my caseload:

- ○ <10%
- ○ 11-25%
- ○ 25-50%
- ○ 51-75%
- ○ 76-100%

With clients/patients I use apps on a _____ device (check all that apply):

- ☐ Tablet
- ☐ Smart Phone
- ☐ Touch Screen Laptop Computer
- ☐ Touch Screen Desktop Computer

I recommend apps for my clients/patients to use on their own devices:

- Yes
- No

My clients/patients like using apps in therapy:

- Yes
- No

The parents/caregivers of my clients/patients like the use of apps in therapy:

- Yes
- No

I use apps to target the following skill areas (check all that apply):

- ☐ ADL
- ☐ Visual perception
- ☐ Communication
- ☐ Organization
- ☐ Social skills
- ☐ Typing
- ☐ Fine motor skills
- ☐ Other:

I use apps for the following support purposes (check all that apply):

- ☐ Reinforcement
- ☐ Timers
- ☐ Visual schedules
- ☐ Assessment
- ☐ Collecting/tracking client/patient data

On a scale of 1-5 how much do you agree with the following statements:

	Not at all 1	2	No opinion 3	4	Very much 5
I think apps are very useful when integrated into therapy sessions.	○	○	○	○	○
I think apps increase engagement of my patients/clients.	○	○	○	○	○
I think apps save time and/or resources.	○	○	○	○	○
I think apps can lead to improved outcomes in patients/clients.	○	○	○	○	○

I like/prefer the following features in apps (check all that apply):

- ☐ Accurate feedback of performance (i.e. "good job" for accurate performance or "try again" when error occurs)
- ☐ Juvenile animations and colors (i.e. animals with faces and bright colors)
- ☐ Mature visuals and feedback (i.e. can be used with adults)
- ☐ Haptic/tactile feedback (i.e. vibrating when incorrect)
- ☐ Auditory directions
- ☐ Visual directions (i.e. instructions to read on screen)
- ☐ Game-like features
- ☐ Patient profile (i.e. can log in to specific to track progress of client/patient)
- ☐ Activities can be graded
- ☐ Multiple uses (i.e. targets academic skills and visual perception)
- ☐ Other:

When looking for new apps I take the following into consideration:

- ☐ Recommendations from AOTA
- ☐ Recommendations from peers
- ☐ Price
- ☐ Operating system (Apple, Android)
- ☐ Research articles
- ☐ Search results (i.e. Google, within market searches (iTunes, Google Play, Amazon))
- ☐ Description on the app marketplace
- ☐ Reviews on the app marketplace
- ☐ Reviews and description from specific website:

My favorite apps for therapy are:

	Name of app	Purpose
1		
2		
3		
4		
5		

Please feel free to share other comments about the use of apps in therapy: