

Occupational Therapists' Evaluation and Treatment of Everyday Technology with Adult Patients  
with Traumatic Brain Injury

May 2014

This research, submitted by Rebecca Covington and Gina Kim, has been approved and accepted  
in partial fulfillment of the requirements for the degree of  
Master of Science in Occupational Therapy from the University of Puget Sound.

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### **Abstract**

Everyday technology (ET), which includes devices such as smartphones and tablets, is dynamic, complex, and interactive and may be difficult for an adult with a traumatic brain injury (TBI) to use due to cognitive deficits, including executive dysfunction. Executive dysfunction leads to difficulty with higher level thinking, including planning, organizing, and problem solving, skills which are used in instrumental activities of daily living (IADL), work, leisure, and social participation. The purpose of this study was to examine how occupational therapists use ET in assessment and treatment of adults with TBI to regain or increase independence in IADL, work, leisure, and social participation. The researchers used a qualitative descriptive approach using semi-structured interviews with two occupational therapists who use ET with adults with TBI. Three themes emerged after reviewing the data: (1) Fit Between Person, Task, and ET, (2) Making it Work, and (3) Barriers to ET. Occupational therapists can use a holistic perspective and activity analysis in order to utilize ET as occupation-as-means or as occupation-as-ends to increase occupational performance for adults with TBI.

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There are 7 billion people in the world and 6.8 billion mobile-cellular subscriptions (International Telecommunication Union, 2013). We are living in an age where 91% of adults in the United States use mobile-cellular devices (Rainie, 2013), 56% of which are smartphones (Rogowsky, 2013). This dramatically increases to 80% for individuals between the ages of 18-34 years old (Rogowsky, 2013). Smartphones and other cellular telephones are only one type of device that is being used; others include tablets and computers. All of these devices are examples of everyday technology (ET). Currently in the U.S., the use of ET is becoming more common, especially for instrumental activities of daily living (IADL), leisure, work, and social participation (Cardell, Gneiting, & Christensen, 2012). Online bill paying, information gathering on the Internet, communication through email, participation through social media, and using electronic calendars are just some of the many ways ET has been assimilated into our lives. It is not uncommon to see five-year old children effectively navigating the functions on a smartphone, a tablet, or even the Internet, which shows the growing role ET will continue to have in our daily lives. Older individuals too are increasingly learning to use ET (U.S. Department of Commerce, 2009, 2010). Thus being independent in the use of ET is more important than ever before.

These ETs require executive function to operate. Executive function helps an individual independently engage in purposeful activities through a variety of cognitive processes including volition, planning, purposeful action, and self-awareness and self-monitoring (Toglia, Golisz, & Goverover, 2009). Individuals with traumatic brain injuries (TBI) often have difficulty with executive function, which consequently can inhibit the person's ability to use ET (Cardell et al.,

2012). As a result, individuals who were able to navigate the complex and expansive world of ET prior to injury may present with difficulties after their injury due to problems with executive function. For example, the once seemingly simple act of paying a bill online instead may be a confusing and frustrating task.

Occupational therapists are dedicated to providing patients the tools needed to fully participate in life activities. Since the early 1900s, occupational therapists have been closely linked with technology (Pedretti et al., 1992). Craft activities utilizing hand tools were used with individuals of varied diagnoses (Pedretti et al., 1992). Yet, occupational therapy has not kept up with changes in ET, as can be evidenced by the lack of assessment and intervention tools that incorporate new ET (Toglia et al., 2009). For example, occupational therapists use standardized assessments to try to pinpoint the type of cognitive impairment an individual has based on a specific set of guidelines (Toglia et al., 2009). However, these assessments do not incorporate the use of ET. As a result, they might not accurately predict the challenges the individual will face when using ET, which is dynamic and constantly evolving. Modifying current standardized assessments to address the use of it is challenging because assessments are static in nature (Toglia et al., 2009) and occupational therapists are bound to strict protocols when administering a standardized assessment in order to ensure reliability and validity of the test. Lacking information regarding the challenges a client might encounter when using ET may lead to ineffective treatment. Additionally, occupational therapy treatment tools that address executive function may not adequately prepare individuals with TBI for the specific skills needed to use ET. This limits the ability of occupational therapists to provide optimal evaluation and treatment for adults with TBI who want to use ET.

## **Background**

According to the U.S. Department of Commerce (2010), 81.4% of people in the U.S. live in a household with a computer, with the average increasing to 85.8% for individuals 18 to 45 years of age. These statistics reflect the integral role ET plays in our lives. ET can be used in a variety of ways, including communication, navigation, financial management, shopping, information gathering, and staying organized. These tasks most often fall into the areas of occupation of IADL, leisure, work, and social participation (American Occupational Therapy Association [AOTA], 2008). And these are the tasks that often prove very difficult for people after sustaining a TBI (Radomski, 2002).

**Traumatic brain injury.** A TBI is classified as insult to the brain caused by an external force after birth (Radomski, 2002). In the U.S., 1.7 million children and adults sustain a TBI each year (Centers for Disease Control and Prevention, 2006). TBI is most commonly caused by a fall (28%), motor vehicle crashes (20%), and assault (11%; Brain Injury Association of America, 2013). Young males are more likely to be involved in high risk activities that could result in severe trauma to the head, thus males between the age of zero to four and 15 to 19 are most at risk for a TBI (Brain Injury Association of America, 2013). TBI can vary in severity from mild to severe. It can result in an array of impairments in physical, behavioral, emotional, and cognitive functioning.

**Executive function.** One of the areas of cognition that is often affected is executive functioning (Brain Injury Association of America, 2013). The majority of individuals with TBI have a disruption to the pre-frontal cortex, which is linked to executive functions (McDonald, Flashman, & Saykin, 2002; Togliola et al., 2009). Lezak (1995, p. 650) divided executive functions into four components: volition, planning, purposeful action, and self-awareness and

self-monitoring. Executive functions allow an individual to independently engage in purposeful and goal-directed behavior through a wide range of performance skills (Toglia et al., 2009).

Studies have shown that intact executive functions are associated with vocational success and social autonomy (McDonald et al., 2002). Enhancing executive functions, using compensatory strategies, or modifying tasks to reduce executive function demands may allow individuals to participate more independently in IADL, work, leisure, and social situations.

The first component of executive function is motivation and volition to complete a goal-directed task (McDonald et al., 2002). Once the volition to initiate the task has been established, the next component of executive function is planning the process to complete the task. This includes the ability to organize steps, prepare for various setbacks, and acquire the needed materials and skills to carry out the task (McDonald et al., 2002). The ability to have foresight to look ahead and anticipate possible challenges is essential (McDonald et al., 2002). The third component of executive function is purposeful actions in which the individual takes the necessary steps to execute the task (McDonald et al., 2002). The person needs to be able to initiate the activity, switch steps, and with ease, stop the sequence (Toglia et al., 2009). This especially needs to be considered with novel tasks in which the individual has not developed habits, patterns of thinking, and behavior (McDonald et al., 2002). The fourth component of executive function requires the ability to self-regulate and self-monitor when the person has made a mistake. The individual needs to be able to recognize the mistake, adapt his or her thinking to fix the mistake, and have the motivation to correct the mistake (McDonald et al., 2002). In addition, it is important for the individual to be able to evaluate performance and regulate emotions (Toglia et al., 2009). An individual can have deficits in any or all of these four

components (volition, planning, purposeful action, and self-awareness and self-monitoring) of executive function.

For individuals with TBI, one of the most enduring and prominent problems is deficit in executive function (McDonald et al., 2002). Difficulties with executive function can significantly impair a person's ability to participate in IADL, leisure, work, and social participation. These activities are typically complex and dynamic, and as a result the activity demands require the use of executive functions, such as problem solving, organization, planning, etc. Overall, individuals with executive function deficits lack mental flexibility and the ability to respond adaptively (McDonald et al., 2002; Toglia et al., 2009). This can present a challenge in IADL, leisure, work, and social participation activities where the inability to adapt to the changing environment can hinder success. Not addressing these more complex activities does a disservice to individuals with executive dysfunction (Gutman, 2009), resulting in many individuals with TBI finding themselves at home, work, and in the community unable to carry out important activities in their lives.

**TBI and everyday technology.** TBI is one of the most frequent diagnoses occupational therapists treat due to the large number of adults who sustain a TBI. Extensive rehabilitation is required for such individuals (Gutman, 2009) to regain function in all areas of occupation. Due to the impairments in executive dysfunction, adults with a TBI tend to have more difficulties in novel and less structured tasks that require higher-level cognitive skills (Toglia et al., 2009). These can include planning, cognitive flexibility, organization, problem-solving, and self-regulation, which are frequently used to participate in IADL, work, leisure, and social activities (Toglia et al., 2009). Yet, occupational therapists tend to focus treatment on achievement of activities of daily living (ADL) for individuals with TBI and do not address IADL as often

(Gutman, 2009). Those who lack the skills needed for independence in IADL can have difficulties at home, work, and during social interactions (Gutman, 2009). Thus, helping adults with TBI gain independence in these areas should be a focus for occupational therapists.

Research that has considered the use of technology for this population has mainly focused on the use of specialized technologies that are not extensively used by the general public, which will be referred to as assistive technology (AT). AT is a type of compensatory tool and has been used with patients with TBI to complete IADL by helping to reduce memory problems (Lindén, Lexell, & Lund, 2011). ET, unlike AT, are items readily available and used by the general public and not specifically designed to be a specialized technology for individuals with disabilities. A few examples of ET are “washing machines, microwave ovens, remote controls, automated telephone services, computer, the Internet” (Lindén, Lexell, & Lund, 2010, p. 267), and smartphones such as the iPhone, Samsung Galaxy, or Droid. AT does not always require the same executive functions as those needed to use ET because they are designed to be a compensatory tool that is relatively simple and easy to use, in contrast to ET, which is to be complex and dynamic (Lund, Lövgren-Engström, & Lexell, 2012).

Several studies have considered AT with individuals who have a TBI. One study addressed the ability of 63 individuals with TBI to use a paging system to help carry out IADL (Wilson, Emslie, Quirk, Evans, & Watson, 2005). The results showed the paging system helped increase efficiency in the tasks (Wilson et al., 2005). However, the study used a specialized version of a pager created by the researchers, thus the pager was an AT rather than an ET. There have been fewer studies that have looked at the rehabilitation process in the use of ET that requires more executive functions.



Lund et al. (2012) investigated how individuals with an acquired brain injury responded to the difficulties they faced when using ET at home or in society. The researchers found that individuals with an acquired brain injury who had the ability to use a variety of response actions and transfer those strategies across various situations when using ET increased the likelihood of being successful using the ET (Lund et al., 2012). According to Lindén et al. (2011), individuals with TBI who have used their ET prior to their injury may relearn their familiar ET with minimal effort and within a short amount of time. Since TBI tends to affect a younger population (Brain Injury Association of America, 2013), they can benefit from intervention that includes previously used ET (Lindén et al., 2011).

**Accessing the Internet.** The Internet is complex and constantly evolving, which may make it difficult for individuals who have executive dysfunction to use, since dynamic environments are where challenges often arise (Toglia et al., 2009). For younger individuals, who constitute a high percentage of the TBI cases, ET, such as the Internet, tends to be more heavily utilized in many daily activities. According to the U.S. Department of Commerce (2010) 78.6% of adults aged 18 to 34 years old live in a household with access to the Internet. Having to deal with a multitude of stimuli and changing interactions on the Internet may pose difficulties for a person with executive dysfunction. Tsaousides, Matsuzawa, and Leibowitz (2011) found that 60% of individuals with a TBI used Facebook on a regular basis, but 40% did not, largely due to cognitive barriers, although half of those individuals reported an interest in learning to do so. If individuals find it difficult to navigate Facebook, they may also face challenges using the Internet for IADL, work, leisure, and social participation (Vaccaro, Hart, Whyte, & Buchhofer, 2007). Vaccaro et al. (2007) discovered common barriers for using the Internet for individuals with TBI were lack of access and knowledge, as well as poor anticipation of difficulties; yet,

these individuals expressed a strong interest in learning to use the Internet. A rehabilitation therapist helped one participant with fewer than 12 lifetime hours of Internet usage to learn how to use it, while all the other participants had a peer help them learn how to use the Internet (Vaccaro et al., 2007). The researchers concluded that individuals with TBI had a large interest in using and learning the Internet, thus supporting the need to develop interventions to improve Internet skills for this population (Vaccaro et. al., 2007). Because occupational therapists work with clients on social participation and other areas of occupation, they could fulfill the role of teaching or retraining these individuals with TBI to use the Internet, especially in IADL, work, leisure, and social participation activities that heavily require it.

**Current research and practice.** Hart, O'Neil-Pirozzi, and Morita (2003) surveyed 81 clinicians, including occupational therapists, and discovered more than two-thirds of the clinicians reported they were either not confident (26%) or only slightly confident (44%) when it came to their ability to teach clients with TBI how to use an ET. DeJoode, Van Boxtel, Verhey, and Van Heugten (2012) investigated using ET such as a personal computer, cell phone, or personal digital assistant (PDA) as a cognitive aid with people with TBI, as well as the efficiency and usability of the ET for this population. They found that a clinician's confidence on being able to assist patients with the ET had to do with their own experience level (DeJoode et al., 2012). DeJoode et al. (2012) discovered that all clinicians with ET experience wanted to use it more in rehabilitation treatment. Even most inexperienced clinicians were willing to use ET in future rehabilitation treatments if they had more training (DeJoode et al., 2012). Both of these studies showed that clinicians did not feel confident using ET with clients as a treatment tool. Knowledge and comfort regarding ET may be one deciding factor whether it is used in assessment and treatment.

Qualitative studies have shown the need to incorporate interventions that address relearning to use ET into occupational therapy practice because it not only benefits the client but also his or her significant other (Lindén et al., 2010; Lund, Lövgren-Engström, & Lexell, 2011). However, occupational therapy assessments have not kept up with the need to address the use of ET in activities especially as it relates to IADL, leisure, work, and social participation, as evidenced by the lack of standardized assessments that incorporate ET (Toglia et al., 2009). One example of this can be seen in the Kohlman Evaluation of Living Skills (KELS), an assessment used with a number of different patient populations, including those with TBI, to assess cognitive skills. It evaluates an individual's abilities to carry out basic living skills in the areas of self-care, safety, health, money management, transportation, telephone, work and leisure, but use of ET is not included in the assessment (Thomson, 1992). The KELS requires clients to use a telephone book, yet does not evaluate their ability to use the Internet to gather information (Thomson, 1992). The Executive Function Performance Test (EFPT; Baum, Morrison, Hahn, & Edwards, 2007) is another assessment tool that evaluates a client's cognitive function through five basic activities: simple cooking, telephone use, medication management, hand washing, and bill paying (Baum et al., 2007). The EFPT also does not incorporate ET; the telephone use task uses a telephone book rather than giving the option of using the Internet. In the bill paying task, the client uses a checkbook rather than giving the option to use an online bill paying method. Neither the KELS nor the EFPT incorporate ET into the assessment and thus lack the ability to accurately evaluate the deficits an individual with TBI experiences when using ET.

In addition, there is a lack of intervention tools that address the use of ET. One of the few interventions to incorporate "real life" application of ET is the University of Utah's Division of Occupational Therapy web site, which simulates online bill paying and online shopping (Cardell

et al., 2012). There is a need for more interventions that allow the client to directly use ET in order to increase independence in IADL, leisure, work, and social participation. Additionally, a limited amount of research on intervention tools using ET results in a lack of knowledge regarding what occupational therapists are doing in their evaluation and treatment sessions informally. Therefore, the purpose of this study was to examine the how occupational therapists use ET in assessment and treatment of adults with TBI to regain or increase independence in IADL, work, leisure, and social participation.

## **Method**

### **Research Design**

Qualitative methods can uncover and explore a phenomenon in which little information is known (Strauss & Corbin, 1990). Therefore, a qualitative research design was chosen for this study to explore the experiences of occupational therapists addressing the use of ET with clients with TBI. Since there had been limited previous research that has explored how occupational therapists address the use of ET with clients with TBI, a descriptive qualitative study approach was used (Sandelowski, 2000), which provided information about how occupational therapists were using ET for assessment and intervention with this population. The data were collected through interviews with occupational therapists who routinely evaluated and treated adults with TBI using ET to regain independence in IADL, leisure, work, and social participation.

Qualitative researchers, too, must consider the rigor of the data and the data collection process, as well as the potential for the researchers' bias during the interpretation of the data and the extraction of themes (Portney & Watkins, 2009). Informants may potentially answer questions based on what they deem as socially desirable, rather than the actual personal experience (Krefting, 1991). There are strategies that can be used to decrease the likelihood of

bias, thus increasing the trustworthiness of the findings. The trustworthiness of studies can be increased according to the four components of Guba's model: credibility, transferability, dependability, and confirmability (Guba, 1981). Credibility is the confidence in the truth of the researchers' analysis of the experience for the participant (Krefting, 1991). This can be achieved through open-ended and unbiased interview questions, triangulation of data methods and investigators, peer examination, and member checking (Krefting, 1991). Transferability is the ability to apply the findings to other settings or contexts (Krefting, 1991), which can be achieved through nominated sampling where professionals refer candidates who fit the inclusion criteria, and dense description of the informants and context. Dependability is the degree to which the study will be able to be replicated, within a similar context and with similar participants (Krefting, 1991). Dependability can be achieved through maintenance of a clear audit trail, triangulation of data methods and investigators, peer examination, and code-recode (Krefting, 1991). Confirmability refers to neutrality, which is freedom from researchers' bias in the procedures and results (Krefting, 1991). This can be achieved through triangulation of data methods and investigators, field notes, audio recordings, and audit trail (Krefting, 1991).

The researchers used a variety of methods in the study to increase trustworthiness. The methods employed included open-ended and unbiased interview questions, nominated sampling, member checking, code-recoding of the data, field notes, audio recordings, and a detailed audit trail.

### **Participants**

Researchers interviewed two occupational therapists in the United States who evaluate and treat adults with TBI and consider the use of ET in regaining or increasing independence in IADL, leisure, work, and social participation. The researchers selected two experienced

occupational therapists and attempted to capture themes regarding the participants' inclusion of the use of ET in the evaluation and treatment of adults with TBI. Due to limited time and resources for the researchers, two was the agreed upon number of participants to gather adequate overlapping themes. The inclusion criteria for the study were the following: (1) have a current state occupational therapy license, (2) currently employed full- or part-time with a minimum of one year of experience working with adults with TBI, (3) report that their evaluation and/or intervention routinely addresses clients' use of ET to complete IADL, leisure, work, and social participation and (4) willingness to participate in one 60 to 90 minute interview and one possible 30 to 45 minute follow-up interview via phone.

To recruit participants, researchers started by contacting occupational therapists nominated by faculty members of the University of Puget Sound Occupational Therapy Department. A snowballing and nominated sample technique was used to recruit participants, where participants enrolled in the study or other professionals refer other candidates who may fit the inclusion criteria. Also, contact was initiated with the head of rehabilitation at a number of facilities in the western U.S. that treated a large number of people with TBI. If the researchers were unable to contact potential occupational therapy participants through the head rehabilitation therapist, then, if the information was available, the researchers directly contacted occupational therapists at the facility. Once a potential participant was identified, she was contacted to screen for the inclusion criteria.

### **Instrument**

A limitation of using interviews to collect the data was that the researchers' bias could come across through the types of interview questions asked, interviewers' verbal and nonverbal communication, the participants chosen by the researchers, limited interviewing experience of

the researchers, or bias in interpreting the data. In the face-to-face interview, the participant may have given answers according to what she thought was a “good” response in the eyes of the interviewers. Also, the interviews posed a time constraint, as the initial interview lasted up to 60 minutes. This may not have allowed time to capture enough data, but a follow-up interview was allowed for further investigation.

A number of measures were taken to try to reduce the potential limitations of the interviews. The researchers conducted semi-structured interviews utilizing open-ended questions (see Appendix). The interview questions were agreed upon among the researchers and research advisor. Prior to the first interview, the researchers conducted a mock interview with an experienced faculty member. During the interviews, the researchers took field notes to include any additional observations to help identify themes. Field notes included observations regarding the participants’ facial expressions, gestures, and other nonverbal behaviors during the interview (Stein, Rice, & Cutler, 2013, p. 185). Field notes were examined for possible researcher bias to see if the participant’s nonverbal communication contradicted her verbal communication or revealed further information not otherwise given (Krefting, 1991).

### **Procedures**

Prior to the start of the study, an experienced qualitative researcher and occupational therapist reviewed the interview questions to ensure they had the breadth and depth to meet the purpose of the study. The study was submitted to the Institutional Review Board at University of Puget Sound. Once approved, the researchers actively recruited occupational therapists to participate in the study. Prior to the first interview, each researcher practiced mock interviews with faculty members, to allow practice, training, and the ability to receive feedback.

One participant interview took place in a meeting place that was quiet and free from distraction, mutually agreed upon by the participant and researchers. Due to a face-to-face interview not being feasible for the other interview, a telephone interview method was utilized. For the face-to-face interview, the consent form was emailed out to the participant to review two business-days in advance of the interview. A copy of the consent form was signed at the time of the first interview. For the telephone interview, a consent form was emailed to the participant for receipt one week prior to the scheduled telephone interview. The participant scanned the signed copy of the consent form to the researchers for receipt prior to the interview. Signed informed consent forms were kept in a locked file cabinet in Weyerhaeuser 107, the IRB room for the Department of Occupational Therapy at the University of Puget Sound.

The interviews were digitally audio taped. The initial interviews lasted 60 minutes and a follow-up interview was not deemed necessary. The interviewers left time at the end of the interview to allow the participant to ask any questions and to ask permission to contact her for further questions or member checking.

Each participant chose a pseudonym. The audio files did not contain real names of the participants, only pseudonyms were used, and did not contain the names of facilities. Confidentiality measures were also taken by housing the digital audio files on a password protected computer in a password protected folder. A transcriptionist transcribed the interviews verbatim. Once transcribed, the digital audio files were reviewed by the researchers in solitude to confirm accuracy of the transcribed data. After that review, audio files were deleted and the transcribed data were reviewed to ensure that identifying information was not included.



### **Data Analysis**

Following the interviews, the researchers used content analysis to analyze the data with the goal “to provide knowledge and understanding of the phenomenon under study” (Downe-Wamboldt, 1992, p. 314). Of the three types of content analysis, the researchers utilized a conventional approach (Hsieh & Shannon, 2005). Conventional analysis is a posteriori method that is “usually appropriate when existing theory or research literature on a phenomenon is limited” (Hsieh & Shannon, 2005, p. 1279). The researchers obtained direct information from the participants without imposing preconceived categories or theoretical perspectives (Hsieh & Shannon, 2005). The advantage of using this approach allowed the researchers to gain knowledge directly from the participants based on their unique perspectives and was grounded in the actual data (Hsieh & Shannon, 2005).

The data categories used in content analysis can represent either explicit communication (Hsieh & Shannon, 2005) from the interview transcriptions, or inferred communication (Hsieh & Shannon, 2005) from the field notes. This research method allowed the researchers to analyze the data “through the systematic classification process of coding and identifying themes or patterns” through subjective interpretation (Hsieh & Shannon, 2005, p. 1278). The data analysis began by reading all the data numerous times for full immersion to gain a sense of all the data (Tesch, 1990). The researchers read each word carefully to derive codes that captured key thoughts or concepts (Hsieh & Shannon, 2005). Then the researchers made notes about their first impressions, thoughts, and initial analysis. Through this initial coding, themes began to emerge (Hsieh & Shannon, 2005). The codes were then organized into categories based on the links and relationships between codes. Lastly, the categories were sorted into 10 to 15 clusters to develop

themes (Hsieh & Shannon, 2005). The coding scheme used during data analysis helped to increase the trustworthiness and validity of this study (Hsieh & Shannon, 2005).

### **Results**

Two female occupational therapists participated in the study to examine how they used ET in assessment and treatment with adults with TBI to regain or increase independence in IADL, leisure, work, and social participation. The first participant, Greta, was 47 years of age and had seven years of experience as a practicing occupational therapy clinician using ET with adults with TBI. Greta worked in the western U.S. in an academic setting and practiced in the outpatient student clinic associated with the occupational therapy program. The second participant, Lila, was 40 years of age and also had seven years of experience as a practicing occupational therapy clinician using ET with adults with TBI. Lila worked on a polytrauma team in the Pacific Northwest.

Through repeated examination of the data collected from interview transcripts and field notes the researchers agreed upon three main themes, with subthemes. The identified themes were the following: (1) Fit Between Person, Task, and ET, (2) Making it Work, and (3) Barriers to ET.

#### **Fit Between Person, Task, and ET**

**Evaluation.** Both therapists started to investigate the fit between the person, task, and ET during the evaluation. Lila and Greta both began by identifying clients' cognitive strengths and weaknesses through a top-down approach to evaluate occupational performance. Greta explained,

I tend to be someone who uses more occupational based assessments [such as the Executive Function Performance Test and Functional Simulated Technology Task] . . . . and do some standardized testing [such as the

Montreal Cognitive Assessment, Behavioural Assessment of the Dysexecutive Syndrome, and Test of Everyday Attention].

In addition, Greta used structured interview to learn about occupational performance.

Lila was able to use the results of neuropsychological testing that the majority of her clients received to begin to consider occupational performance through their strengths and weaknesses. She explained, “neuropsych testing is the best tool for figuring out people’s strengths and weaknesses.” Whether or not her client received neuropsychological testing, Lila used structured interview to gain a clearer picture of how the client was functioning. She explained, “I will use structured interview because that works pretty well learning about function.” As memory tended to be a prevalent cognitive deficit, in Lila’s interview she would ask about strategies her client was currently using for memory problems. Often ET would come up through this discussion, which allowed Lila to get a picture of how ET could possibly fit with her client. When Lila did not have access to neuropsychological testing, she used standardized tests that were often occupation based to learn about her client’s function. Regardless of how Greta and Lila first approached evaluating the fit between the person, task, and ET, they both considered occupational performance first when thinking about how ET would fit into their client’s lives.

**Readiness.** The participants discussed the three primary qualities their clients needed in preparation for using the ET, which were motivation, fine motor control/dexterity, and appropriate cognitive abilities. During the course of her interview, Lila mentioned on three separate occasions the importance of client motivation. Without motivation to go home to use the strategies taught by the therapist, the client will “never . . . become successful.” Lila also went on to mention that motivation “is the hugest thing” for the client as she frequently told her clients, “I can give you all the strategies, but I can’t light the fire under your butt.” When the client showed

the motivation to persist with lower technology options, such as sticky notes and a day planner, Lila progressed to the more challenging ET options, such as the iPod Touch, which was a more dynamic and interactive system compared to lower technology options. Because of the increased demands on the user, the iPod Touch often presented more challenges to using the technology, therefore a client's motivation was necessary to overcome barriers and successfully use the technology in daily life.

In addition to the client's motivation, both Greta and Lila mentioned the fine motor control/dexterity individuals needed in order to access the ET. Greta mentioned that when she first thought about using technology with a client she looked at "how they can access the technology--do they have the fine motor to do it?" This same thought was echoed by Lila, stating "I look at, obviously dexterity--that isn't typically a problem with our population, but it can be." These underlying fine motor skills were necessary components to effectively access the ET.

The other major factor in considering readiness related to a client's cognitive abilities. Lila expressed that individuals with mild TBI were more appropriate candidates for use of ET than individuals with moderate or severe TBI because there was a better fit between the client's abilities, occupational deficits, and the ET. Those with more severe TBI have more cognitive deficits, including executive dysfunction, that can be barriers to efficiently using the ET independently. Lila discussed the appropriate match of ET for individuals with mild TBI as compared higher level TBIs:

I think [ET] is a wonderful tool for people with brain injuries--lower level brain injuries . . . people with moderate brain injuries, you get a little more murky there. And I haven't done a lot of equipment issuance for that population.

Greta shared an example of a client with mild cognitive deficits. The client was in his late 30s and lived in a nursing home. He had no physical impairments and had memory deficits. As she stated,

He didn't have physical impairments; he just had cognitive impairments, and mostly memory problems. And it didn't seem to me like he should be living in a skilled nursing facility--that there was probably something that could be done about that.

She trained him to use an iPod Touch as a memory aid, which enabled him to move out of the skilled nursing facility into an apartment.

### **Making it Work**

**Work with what they have.** Both therapists first tried using the ET the individual currently had in order to decrease the cognitive load for the client of learning a new technology and keeping track of two different devices. As Greta stated, "my starting point would be what are they already using and what are already their habits of using that." This was also a goal for Lila, which she expressed as she discussed clients' smartphones, "my goal, if they can handle it, would be going towards something they already have--because one stop shopping--you want the convergence of all their apps. They have already got it." Lila also pushed for her clients to use their iPhone or smartphone, if they had one, as she went on to state,

I think that the best thing to use is what they already have. I find the veterans do the best -- the patients do the best when they use technology they are used to. So I think that is part of the reason we ask what phone they have because they are already using it, they are already familiar with it, and it is less novel.

**Training.** For individuals with a cognitive deficit, the training process was important to help them learn how to use ET. Lila understood the value of training from previous clients who were issued PDAs from the government,

...but they wouldn't train them. They would just say use this. And if I had a dollar for every veteran that told me they threw that thing against the wall

because they couldn't figure it out, I would be rich. They didn't do the training. So we learned, OK, that doesn't work. So we have to train people.

For Greta training was an essential part of her treatment, as she stated when talking about a particular client, "we ended up training him in how to use [the iPod touch] to remember things like taking his medications and doing simple errands and keeping track of things he did in the day." Greta went on to discuss the specific type of method she used to train her clients--errorless learning. She described errorless learning as,

...a technique that doesn't allow him to make trial and error kind of guesses about things, but . . . consistently teaching him the same way to go through the process. Because if memory was so poor, we just wanted to reinforce the right process instead of the wrong ones.

Greta and Lila primarily trained clients to use ET in different ways not previously used by the client. Greta gave an example of having,

One person who downloaded . . . a budget application--an app that they could keep track of their spending, and that was something they weren't doing prior to their brain injury, but it was something they started doing with their phone.

Although using ET could be a new, exciting experience for the client, Lila commented on the importance of training the client on the occupational performance he or she could gain,

And I think sometimes people get really caught up in getting a cool device and I think it is important as therapists--OTs especially--that it is very clear why they are getting the device, where functionally it is going to help them, and how to use it. Because we're doing them a disservice if we are just kind of, 'oh, here is a fun flashy device, you can listen to music on it' but not showing them how to manage their medication or appointments or medications and things like that.

In order to progress to higher technology, Lila began training with low technology options. This included sticky notes, a day planner, and a white board. She explained trying low technology options first can predict how the person would do with using ET,

I start to say, well, have you tried a white board? You know, if you had a white board up in your house. If people are using these visual cues and they

are still not working and they are really trying to use them, my brain goes towards technology because of the alarm reminder function. So that has been pivotal for a lot of people.

Another method Lila tried first was to issue a day planner, even if she initially thought ET would be appropriate. If the client was successful with using and bringing it back to treatment sessions, she would move on to ET because that indicated to her that they client had potential to use a compensatory device consistently.

Both therapists did not modify the ET for client use. Either the client could be trained to use the ET, or not. Through the evaluation process, the therapist assessed if the client had the necessary skills in order to be trained to use the ET. If the client did not possess the potential for these skills, a different compensatory method was used. When asked about modifications to ET, Lila stated, “It is either they get it or they don’t. I can’t think of any modifications I have done to get someone able to use it.” She also went on to explain, “We just train and then people show they are proficient [with the iPod touch], and then they get issued it.” For Greta, her approach was to address the underlying cognitive deficit of the individual in order to be able to eventually use the ET. She addressed the cognitive deficits of the client, rather than modifying the ET, as she explained, “I think the only way you can address [distractibility] is by addressing the deficit and trying to deal with their attention . . . [rather] than really trying to adapt the device or task.”

**ET’s use as a tool.** Lila and Greta mainly used ET as a compensatory tool to help increase independence with IADLs. Some of these IADLs included appointment management, child rearing, financial management, and health management. Greta discussed this when stating, “most often I would use technology is for memory as far as for an intervention tool or a compensatory strategy--most often it would be memory.” When Greta was asked to share specific examples of using ET with a client, she discussed mainly using the Smartphone to

augment clients' memory. Lila also used ET as a compensatory tool if her client was not successful at using appropriate lower technology compensatory strategies to increase independence. She explained that they try to use,

...organizational strategies but yet their intention or possibly their memory or concentration is still kind of undermining them--like I said, the alarm function starts to become like this is really going to work for them--then I start to consider [ET].

Lila also made a point of saying that although ET helped some of her clients, "you have got to be careful--you don't have too many alarms, because that makes people crazy." The alarms have to be "well strategized thought through alarms for things like appointments and medications."

Although Lila and Greta primarily used ET as a compensatory strategy, Greta also used ET as a treatment tool to work on problem solving and visual scanning. Greta provided an example of how she used ET as a tool, "I use technology . . . [to] . . . create a problem and have them get online and try to solve it as a process of working on their problem solving skills." Greta recognized there are many ways ET could be used as a treatment tool, indicating there were endless possibilities for ET when used as occupation-as-means.

### **Barriers to ET**

**Access.** One of the largest barriers to using ET for Lila's clients who were served by the Veteran's Administration (VA) was access to services due to decreased proximity. The area the VA serves was called the Veteran Integrated Service Network (VISN) and Lila's VISN consisted of Alaska, Washington, Oregon, Idaho, and part of Montana, which was the second largest in the nation. She went on to state,

So you can imagine it is really hard--now there are other smaller area VAs, but the full polytrauma team is only . . . [in this location]. They don't have cognitive rehab, and they don't have cognitive rehab OTs, for sure, in any of those [other] areas.



Clients with limited access to cognitive rehabilitation therapists created a barrier due to their inability to receive consistent treatment for “cognitive strategies.” Another barrier for Lila was limited access to the Internet due to her facility's policy of restricting veterans’ use of the Internet at the VA, which limited her ability to incorporate the Internet into treatment sessions.

Greta mentioned that access to monetary funds to pay for ET was the main barrier. When asked what the challenges were when working with adults with TBI to implement ET, she stated “probably the cost of it.” She goes on to state, “I guess you could come up with a great idea and you could think someone is a perfect candidate for a smartphone, but if they don’t have one, there is not much you can do about it.” Cost was also echoed by Lila who stated, “you want to be fiscally conservative with the VA as well.” Although the VA issued the iPod Touch to clients, for Lila, it was important to keep the cost in mind when issuing devices.

**Constantly changing.** Both Greta and Lila brought up the reality that technology is constantly changing. As Greta stated, “technology changes so quickly that it seems to me by the time you train someone to use something, it is outdated and you need the next version.” For Lila, she stated, “I learn from them [the clients], more than [them learning from] me,” when discussing the many different applications available on a smartphone. She introduced applications to her clients, but they showed her applications they found on their own as well. This was reflected in the following statement, “and I have so many patients, to be honest with you, who come in here and say, ‘Let me show you this app that I found. It is so cool.’”

### **Discussion**

The purpose of this study was to investigate how current practicing occupational therapists use ET in assessment and treatment of adults with TBI to regain or increase independence in IADL, leisure, work, and social participation. The demographics of the two

participants were similar: there was only a seven year age difference, both began incorporating ET into practice with adults with TBI seven years ago, both were white females, and each of them currently worked in an outpatient setting. Both participants echoed many of the same themes, however, each brought her own unique perspective.

Greta and Lila approached their clients with a holistic approach in which they looked at the person, task, and ET when deciding to implement ET. The first step Greta and Lila used when looking at the client as a whole was to take into account the fit between the person, task, and ET. Through this process, they considered the cognitive strengths and weaknesses of the client to decide if ET was the appropriate option. This is similar to results discovered by Lund et al. (2012), who found that individuals with an acquired brain injury who had the ability to use a variety of response actions and transfer those strategies across various situations when using ET had increased likelihood of being successful with the ET. By knowing the strengths of the client, the therapist can use a variety of the client's strengths to help him or her become successful in using ET, thus matching the fit of the person to the task and the ET.

In addition to addressing the client's cognitive abilities, the therapists' holistic approach also incorporated other client factors that would affect the use of ET. For example, the therapists took into account the fine motor control of their clients in order to access the ET devices. Motivation was another client factor assessed when considering ET, as it was a necessary preliminary component for using ET. As mentioned previously, Lila was not able to give a client the motivation required to use the ET. This falls directly in line with deficits in executive function (McDonald et al., 2002) in which motivation is the first out of four components (McDonald et al., 2002). As stated by Togliola et al. (2009), an individual with a TBI may often have difficulties in executive function. For Lila, if the client did not have the motivation, then the

client could be stagnant until the motivation was present and would be unable to move towards using ET to help regain or increase their independence. Without the client's desire to initiate the task, moving on to using ET becomes unattainable. The client having the preliminary skills needed to use ET could lead towards the successful path to regaining or increasing independence. Therefore, occupational therapists should also address the components of executive dysfunction, first focusing on the client's volition to initiate the task.

DeJoode et al. (2012) found that a barrier for clinicians being able to assist patients with ET was the clinicians' confidence level, which was related to their experience with the ET. One contributing factor to clinicians' decreased confidence level could be the constant changes that occur with ET. Many clinicians may not have the same confidence in using ET as Lila and Greta and may think they need to be experts with ET in order to address its use in treatment with clients. However, as Lila and Greta both discussed, utilizing ET in treatment simply requires activity analysis, which allows the clinician to analyze the demands of using ET and the desired occupation to determine the appropriate fit for the client. Through the skills of activity analysis, which occupational therapists already possess, addressing ET in treatment can be used despite the clinicians' unfamiliarity of it. By incorporating activity analysis, clinicians are able to break down the task of using ET into component parts, and thus be able to train their clients with TBI to use the ET.

### **Implications for Occupational Therapy**

This study's aim was to learn how occupational therapists use ET in assessment and treatment of adults with TBI to regain or increase independence in IADL, leisure, work, and social participation. As technology use continues to grow, there will be more opportunities and more demand to use ET to increase independence for adults with TBI. To encourage the use of

ET, occupational therapists must utilize a holistic perspective and activity analysis skills, both of which are already strengths for clinicians. As a result, occupational therapists are in a key position to help facilitate individuals with TBI to help regain or increase their participation in IADL, leisure, work, and social participation through the use of ET.

By taking a holistic approach in assessment and treatment, occupational therapists can consider the strengths and weaknesses of their clients, the task demands, and the characteristics of the ET when deciding to incorporate ET. They can also work to maximize the fit between the client's abilities and the demands of the ET, including when the mismatch is due to cognitive deficits. Cognitive rehabilitation is within the domain of occupational therapy and occupational therapists should embrace the role. Because of the holistic approach of occupational therapy, they are essential in helping adults with TBI regain or increase independence in occupational performance with the help of ET.

In addition, occupational therapists have the essential skills of activity analysis to effectively implement the use of ET with adults with TBI to increase independence and occupational performance. Occupational therapists can break down the task of using ET to evaluate the potential of a client with a TBI to successfully use ET. The therapist is then able to train the client to use ET by having the client complete the component parts of the task to increase success. Using activity analysis also enables the clinician to use ET either as occupation-as-means or as occupation-as-end. Occupational therapists can be confident in the skills they have and should not shy away from using ET in practice.

## **Limitations**

The small number of participants and time constraints were limitations of this study. Saturation of the data may not have been achieved through the two participants, and additional insights may have been gained with the inclusion of more participants from a variety of settings. Ideally, a more diverse demographic mixture of participants would have been included to increase the generalizability. In addition, Lila's access to neuropsychological testing results for many of her clients may not be representative of occupational therapists working with adults with TBI who do not have access to the same tests. Direct observations of occupational therapists implementing the use of ET with a client was not conducted, which would have given better triangulation of the data collected.

### **Future Research**

The integration of technology into everyday society will only continue to increase. Occupational therapists are in a position to help adults with TBI to incorporate ET in their daily lives to increase independence in areas of occupation. This includes the domain of leisure and social participation, especially when considering the increased trend of social networking. Greta and Lila both rarely addressed the use of ET for social participation and leisure, and did not discuss if they addressed ET in the context of work. Yet, Greta specifically indicated the use of ET for social networking was an area she believed occupational therapists should be involved because of the potential for adults with TBI to participate in social networking using ET. Further research should explore how occupational therapists can address social participation, leisure, and work activities with the use of ET for individuals with TBI.

Another area for further research could include an in-depth exploration of the types of assessments a variety of occupational therapists use to assess the potential benefit and usability of ET for a client. Due to one participant of this study having unique access to

neuropsychological testing, this may have skewed the results in terms of assessments used by occupational therapists. The study may have not obtained a wide breadth of knowledge regarding assessments occupational therapists use to evaluate the use of ET with a client to increase occupational performance. Therefore, further research needs to be completed to find out what exactly occupational therapists nationwide are doing to assess the appropriate fit between the person, task, and ET.

### **Conclusion**

As shown through this study, occupational therapists are in a position to increase independence and occupational performance with the use of ET for adults with TBI. Occupational therapists have a holistic perspective and the necessary activity analysis skills to address the use of ET with this population, either as occupation-as-means or occupation-as-end. This approach enables occupational therapists to remain client-centered in order to increase independence by establishing the appropriate fit between the client, the task, and the ET. Occupational therapists can utilize ET with adults with TBI to increase independence and occupational performance in IADL, but ET may also have potential to be used to address leisure, work, and social participation.

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## Appendix

## Interview Format

## PSEUDONYM:

## OPENING:

Hi, I'm (Rebecca/Gina) and we are so thankful you could spend some time to talk to us. I am the leader and will ask you the majority of the questions. (Rebecca/Gina) will be taking notes during the interview. Before we begin, can I have you pick a pseudonym to use during the interview, as well as in our research paper? We are going to use an application to record this interview and unfortunately it will beep approximately every 30 seconds so just disregard the noise. Also, due to the nature of this type of interview, I am going to do very little talking, as we want to hear your thoughts. Please feel free to ask for clarification if you are unsure about the question. Our study is looking at how occupational therapists use everyday technology, such as smartphones, the internet, and computers, with adults with a TBI. This could be either as an evaluation tool or in treatment, or both.

## I. Collect demographic information

1. Age
2. Sex
3. Race
4. Current/previous work settings
5. Number of years as practicing occupational therapist
6. Number of years of practice incorporating the use of everyday electronic technology with adult patients with traumatic brain injury
7. What is the typical diagnosis and age range of clients in which using ET is addressed?

## II. Grand tour question

- A. Tell me about typical evaluation and treatment session for adults with TBI.

## III. Follow-up questions:

1. Now, thinking about a typical components of an evaluation and treatment you mentioned, where does everyday electronic technology fit?
2. When using ET, where do you start and how do you progress?
3. Can you give me (a) specific example(s) (such as where did you start and/or modifications)?
4. What assessments and techniques/tools are you currently using?
5. What would your ideal tool(s) look like? What would it address?
6. What are the challenges you have working with this population?
7. What are the challenges people with TBI have?
8. How does the issue of using everyday electronic technology come up in treatment sessions?
9. What everyday electronic technology do you utilize most in your treatment sessions?

10. What is the demand from clients who want to work with using everyday electronic technology?
11. When using ET, tell me how you document, bill, and goal write?

IV. Summary:

- A. Do you have suggestions for therapists practicing with individuals with TBI to incorporate the use of everyday electronic technology in IADLs, leisure, work activities, and social participation?
- B. Are there any additional questions you may have, or any additional thoughts you would like us to know that may help us with our study?

Thank you for coming today and participating in our study. We will be in touch with you if we have any further question and a follow-up interview is necessary. Do you have any questions?