Using Errorless Learning and Individualized Task Analyses to Teach Adults with an Acquired Brain Injury (ABI) to Increase Communication with Family Through Technology

by

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Dedication

To my parents – Thank you for being so supportive during this placement experience, for always believing in me, and for being incredible role models.

To my girlfriend – Thank you for always sticking by my side and supporting me in all my endeavors.
Abstract

Increasing the quality of life for individuals with an acquired brain injury (ABI) is an essential step in rehabilitation post-injury. Communicating with family and friends after an ABI becomes an anticipated challenge which negatively affects quality of life. There is little research that investigates if social media technologies could effectively facilitate communication between families and increase quality of life in clients with an ABI. This thesis investigated whether there was an improvement of quality of life in individuals with ABI who learnt to send attachments through e-mail to their families. Three participants with a severe ABI between 40-60 years of age took part in this study. Each participant was taught how to send an e-mail with an attachment to their families through a task analysis paired with errorless learning (EL) procedures. Outcomes of each participant were evaluated by pretest and posttest measures, which included an adapted version of the Behaviour and Symptom Identification Scale (BASIS-32), as well as a Technology Proficiency Questionnaire assessment. Results from this study suggested that all participants who engaged in e-mail attachment communication with their families moderately increased their quality of life, and reduced the frequency and level of prompts needed to independently send an e-mail. For future research, a larger sample size with longer treatment duration and follow-up would be beneficial. Additionally, other forms of social media technology should be examined to assess their potential in rehabilitation for the ABI community.
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Chapter I: Introduction

Purpose of Study

Common in individuals with Acquired Brain Injuries (ABI) is a deficit in cognitive and executive functioning skills, which has been shown to affect socialization with others in social support roles and adds to feelings of frustration and failure in their daily lives (Ylvisaker, Jacobs, & Feeney, 2003). Communication with peers and other social supports (especially family) becomes an enduring challenge which affects their quality of life. Linden, Lexell, and Lund (2011) state that acquired brain injuries can contribute to difficulties such as skills of daily life (e.g. orientation to schedule), productive activities and leisure (e.g. cooking or cleaning), and increased isolation (e.g. difficulty communicating with others). These authors go on to say, that everyday technology (e.g. smartphones, tablets, and touch screen devices) is easily accessible and affordable for the general population. In addition, Linden et al say that there is great potential that this technology can be used to enhance cognitive and executive functioning skills, and the quality of life in those with ABI. The purpose of this study is to evaluate if communication between individuals with ABI and their families can be increased using Errorless Learning (EL) training procedures on how to use this portable technology. For this study and its participants, overall goals which all clients shared were to increase communication with their families. Consistent with ABI literature, collaborating with and making meaningful decisions with clients who have ABI provides options and a sense of control to their lives post-injury, as well as develops self-regulatory skills essential in rehabilitation (Feeney, 2010). As such, through collaborating with each client by offering different methods of communication with their family (e.g. choosing to use Facebook™ versus e-mail), a tailored approach to each client should best increase their quality of life.

Reason for Study

Everyday technologies (ET) are ubiquitous in society today (McNaughton & Light, 2013). These technologies are now more cost effective and accessible than ever, in comparison to alternative devices for augmentative communication (AAC). For example, typical forms of augmentative communication range from $3000-$4000, whereas the iPhone 7 costs $649. Additionally, many individuals with ABI strive to communicate with family; however, they may lack the skills and abilities post-injury. As such, the need of individuals with ABI to increase their quality of life is reliant on the goal of increasing levels of social communication with their families. While communicating with family through ET seems simple, it is not always such an easy task for these individuals. As McNaughton and Light (2013) state, the importance in utilizing technology is to focus on purposes of communication using technology, and to not lose sight of the main goal of utilizing this technology which is enhancing the quality of lives to those with ABI through increasing communication with social supports. As such, a logical way to increase quality of life could be by focusing on increasing communication to their families through using meaningful attachments (e.g. pictures of daily activities, routines) that are relevant and consistent with their goals.

Thesis Statement

Throughout this project, literature on current applications of technology to increase quality of life for those with ABI, and effective procedures in enhancing communication through errorless learning (EL) principles are synthesized. After careful consideration and analysis of relevant literature, a behavioural intervention is offered. The results of this method are inferred
and critically analyzed further for implication to this project’s central theme. That is, if individuals with ABI learn to send attachments through social media to their families, there is a greater chance that their quality of life and overall satisfaction will increase.
Chapter II: Literature Review

Prevalence and Impact

Traumatic brain injury (TBI) is one of the largest contributors to long-lasting disability (McLean, Jarus, Hubley, & Jongbloed., 2014). According to Braden et al. (2010), each year, roughly 1.4 million Americans acquire a TBI. As McLean et al. add, in a United States census statistic from 2005, there was around 3.17 million Americans estimated to be enduring the long-term effects of this disability (as cited in Aloshnja, Miller, Langlois, & Selassie, 2008). Data from the Brain Injury Association of Canada (BIAC) report that approximately 100,000 Canadians experience a brain injury annually (BIAC, 2002). This figure is likely to be even higher, now. A recent statistic from the same website has found that close to 160,000 brain injuries occur in Canada each year. This is evidence that (per information from the BIAC) there has been an approximately 63% annual increase of brain injury between 2002 to 2015. With continually rising rates of ABI, the prevalence of this issue in Canada is well established.

Long term effects of ABI include significant impairments for physical, cognitive, and behavioral domains, and these three domains place limits in areas of daily activities, work capabilities, education, quality of living, socialization, communication, and activities of leisure (McLean et al., 2014). Overall, the areas impacted effect an individual’s quality of life. An individual’s subjective quality of life (SQOL) involves aspects of cognitive and affect components, either positively (correlated with happiness) or negatively (correlated with isolation or sadness). McLean et al. (2014) state, that quality of life in those with ABI has vast variance depending on levels of involvement and engagement. Additionally, these authors found that a decrease in meaningful/leisure activities (such as reduced social engagement with others) in those with brain injuries directly caused lowered satisfaction and less meaningful endeavours. To add to this, with reductions in involvement in those with ABI, research has found that social isolation and low levels of social supports is common. It can be inferred that with increased isolation, significant reductions in access of social supports and communication with others likely occurs. Herein lies the risk that such deficits may act as a barrier to individuals with ABI in reaching their meaningful goals towards rehabilitation. As such, for those with ABI, it is vital that major goals in long-term recovery be consistent with re-integration to communities, active participation, and quality of life (McLean et al., 2014).

Communication Challenges

After a brain injury, long term speech communication challenges in individuals with ABI often persist in mild to profound amounts (Wallace & Bradshaw, 2011). The level of communicative skills in those with ABI is dependent on the severity of injury, and has an impact in their daily living. Per Tsaousides et al. (2011) psychosocial functioning in those with ABI suffers because of their injury. Individuals with brain injuries report they have fewer friends/supports, challenges in keeping contact with old and new friends, difficulties visiting and communicating with family, and maintaining participation in social events. Braden et al. (2010) found that 60 participants with ABI also had had major deficits in reported overall levels of productivity, fulfillment, and life satisfaction. Additionally, these authors go on to state that family and loved ones close to individuals with ABI displayed more communication challenges, and negative feelings such as embarrassment and agitation in response to their brain injury. Furthermore, it can be reasonably assumed that for individuals with ABI, communicating with
family can create a positive impact in quality of life. With the increasing prevalence of ABI, there is an increasing corresponding need for better communication skills with this population.

According to Diener and Seligman (as cited by McLean et al., 2014), participants in a study who communicated with available social supports had a significantly higher rating of happiness as opposed to participants who spent more time in solitude, without utilizing access of social supports. This is consistent with the findings reported by McLean et al. (2014) which demonstrated that quality of life and overall happiness was positively attributed to increased participation with others in their daily lives. Specifically, family members are the most direct, meaningful, and consistent supports that ABI patients have access to. Therefore, by accessing and utilizing social supports for communication, those with an ABI have the potential facilitate gains in quality of life. Based on the review of literature, it is imperative that these individuals possess the tools necessary to effectively communicate with their families, regardless of their disability and level of cognitive functioning, in order to facilitate a sense of belongingness and positive affect in their lives.

Quality of Life and Application

As previously indicated, the main goal of this study is to increase quality of life for individuals with ABI as facilitated by the use of consistent means communication with family. The importance of increasing quality of life in those with ABI is well documented. McLean et al. (2014) state that high levels social quality of life (SQOL) involved a high sense of community reintegration, perceived feelings of belongingness, access to meaningful relationships and supports, overall satisfaction with arranged living and capabilities, fulfilment, and motivation with everyday activities. In addition to accessibility, affordability, and benefits of improved SQOL, the use of everyday technology (ET) has the added benefit of increasing awareness and social acceptance in those with ABI. For example, ET facilitates a normalizing function for the ABI population, and reduces societal stigma regarding brain injury. As McNaughton and Light (2013) explain, a variety of apps for communicative support (such as Facebook™ and e-mail) are easily attainable in app stores across a multitude of mobile devices. Accessibility and use of such apps to facilitate communication not only creates public awareness of the unique needs of those with ABI, but additionally increases social acceptance. It is well known that traditional assistive technologies (AT) often are often highly associated with stigma, for being a noticeable identifier of disability. Kagohara et al. (2013) state, the use of ET has more value socially, as opposed to AT, as this type of technology is so common in society today (as cited in McNaughton & Light, 2013).

There are no studies that address use of everyday technology (ET) to increase quality of life in those with ABI. Rather, most studies to date have focused on the use of technology for augmentative and alternative communication (AAC) in a variety of clients with aphasia or severe memory disorders. Brownlee and Palovcak (2007) found that the use of AAC for those with amyotrophic lateral sclerosis (ALS) helped decrease levels of anxiety, agitation, and maintained social relationships effectively. The effectiveness of AAC use has been shown to increase communication with social supports (e.g. family and friends), active participation with family life, and help reintegrate individuals effectively into a community. Also, AAC has been shown to promote independence and a sense of accomplishment with daily tasks in the lives of those with ALS.
To contrast with AAC literature, the use of Assistive Technology for Cognition (ATC) is known to increase proficiency in communication in those with ABI seeking to keep consistent contact with their families (Braden et al., 2010). As these authors explain, the expanding innovations of everyday technology (ET) have contributed to great advances in communicative compensation for those with impairments of neurological capacities. Powell et al. (2015) explain that the use of ATC has clear benefits that complement and improve quality of life and daily activities in those with ABI. Along with functions such as memory aids, reminders as self-prompts, and portability, research shows there is vast potential for technological support over non-technological ones. The multitude of functions available for use on modern day mobile devices is unprecedented. From scheduling appointments, daily activities, and medication prompts, to increasing memory capabilities and recall abilities by taking photos or videos, ET has the potential to compensate and provide support to meaningful goals and daily tasks particular to each individual (Linden et al., 2011). Similar to research in the area of AAC technology, research on ET suggests these technologies have greatly enhanced levels of independence and quality of life in those with deficits of communication.

Social Networking Sites

With the access and availability of new and affordable apps, there is great potential in their use to facilitate increased communication with family. Social Networking Sites (SNS) today dominate the online communication culture. According to Tsaousides et al. (2011), out of 42 participants involved in a study with SNS use, 81% reported using e-mail and Facebook over all other applications. Facebook™ is viewed as the most popular SNS today, as Tsaousides et al. (2011) report that its network has close to 400 million active accounts to date, where half of this population amasses close to 500 billion minutes online each month. Facebook™ offers an effective interface which allows users to effectively maintain relationships with family and friends, send and receive messages, and share photos with others on this network. Previous studies have found that those with low levels of self-esteem and satisfaction in life can benefit from the use of Facebook™ (Tsaousides et al., 2011). Tsaousides et al. reported that in a cohort of participants with acquired brain injury (ABI), those who used online journaling through technology showed increases in social quality of life (SQOL), well being, and social satisfaction. The results suggested that since those with and ABI are more likely socially isolate and exhibit loneliness post-injury, the ability to have an outlet through an online forum of communication increased their quality of life. These findings support the promise that there is an interest in those with ABI learning to use ET to foster increased communication with their families.

Individualization of Goals

McNaughton & Light (2013) state that for both everyday technology (ET) and assistive technology (AT) alike to be effective, matching the features and use of technology is essential for the client so its use is individualized and based on the client’s meaningful goals. Client adoption of the technology is very important. In one study that taught a client to utilize AT for a job, Powell et al. (2015) explained the client’s success was largely based on the level of awareness and motivation to utilize the technology for functional use. In another study, 94% of participants with an ABI found AT to be easy to use and beneficial for their unique needs post injury (Muncert et al., 2011). Lund et al. (2011) suggest that the use of ET for compensatory functions can be a challenge if not adapted to client’s unique levels of cognitive function. According to research from Pramis (2013) between 80-90% of apps are no longer used by the
general public after one use based on overly complex interface and overall lack of meeting needs of targeted individuals (as cited in McNaughton & Light, 2013). Therefore, it is essential that the individualized goals of communication for individuals with ABI be supported by the features and apps provided by ET.

As selecting appropriate ET to fit the needs of the client is important, it is recommended that training be provided to teach and increase competent use of communication skills (McNaughton & Light, 2013). This is not only beneficial for functional use by clients, but the literature also supports training for staff and social supports of those with ABI. Wallace and Bradshaw (2011) state that training of communication technology should include immediate personal support workers, caregivers, and family. Ultimately, the involvement of a variety of social supports best ensures successful communication outcomes for those with ABI. For personal training, when asked if participants in a study would use Facebook™ if it was accessible, 70% of participants in one study said that they would if they had the opportunity, and 78% expressed training courses would be beneficial (Tsaousides et al., 2011). Therefore, based on the research, it is equally important to tailor training using ET based on the function intended for the individual, as it is to train them on compensatory strategies.

**Errorless Learning**

Errorless Learning (EL) is a widely-recommended strategy when teaching individuals with ABI acquisition of skills and increasing procedural memory capacity. EL includes procedures that aim to focus on successive approximations in a behavioral chain through using prompts and cueing, while reducing errors and random guesses during trials of learning (Cohen, Ylvisaker, Hamilton, Kemp, & Claiman, 2010). As Donaghey et al. (2010) state, EL has the advantage of increasing learning, while requiring little to no additional resources for implementation. Findings in literature supports that EL learning procedures for adults with brain injury are effective. In a study by Bourgeoise et al. (2007) EL techniques used increased performance on everyday tasks in 22 individuals with ABI (as cited in Cohen et al., 2010). Additionally, in a study by Linden et al. (2011) measuring acquisition of functions of mobile phones, eight of the ten participants (80%) mastered new skills when being taught through EL procedures, as opposed to a condition where EL was not offered. Therefore, based on the supporting literature on brain injury, the use of EL procedures is considered an effective approach to increase communication with family through Facebook or e-mail.

**Minimizing Errors in ABI**

The most significant advantage of EL is its reduction in errors. According to Bertens et al. (2013) a consistent finding in those with brain injury, is that when errors occur in learning, “if a stimulus is followed by a response, the subsequent pattern of neural activity will be more likely to be activated again in similar situations” (p.2, para.1). Simply put, when considering ABI in individuals, even if an incorrect response occurs it is more likely that the error will be remembered over the correct response. In a study comparing an EL condition to an error full learning condition, participants in the EL group were able to correctly identify more steps in a task analysis sequence than participants in the other condition (Donaghey et al., 2010). EL has the unique benefit of preventing incorrect patterns of neural activity by simply redirecting the individual and prompting action of only correct responses. By reducing incorrect patterns of learning, this creates an effective chain of behaviour which increases proficiency, without
evoking erroneous actions (Bertens et al., 2013). In a variety of neuroimaging studies, error full learning was shown to have significantly more demands on frontal/executive areas than EL procedures (Fish et al., 2015). Specifically, it was apparent that there was a correlation between increased identification and perseverance of errors in those who received error full treatment, as opposed to those who received EL.

**Errorless Learning Application**

For more evidence on this technique’s efficacy, in a review by Ehlhardt et al. (2008) it was discovered that out of 51 of the studies reviewed, 41 (80%) of them found that EL procedures produced more favorable outcomes than trial and error learning (as cited in Powell et al., 2015). Research done previously has shown that EL with the use of task analyses (list of steps often used in procedural acquisition of new skills) can effectively teach those with memory impairments how to use computer skills for useful function in daily life. In a study done by Jerome et al. (2007) participants successfully increased computer use through EL and task analyses. In a 13-step task analysis for computer use, all three participants had an average of 1-4 successful steps at baseline. This increased significantly depending on the client, but on average, clients were able to perform all 13 steps consecutively after intervention. In this study EL was successful in increasing procedural memory for computer use, and results indicated that twelve 40-minute training sessions created effective gains across all participants. Therefore, for the purposes of this present study, 30-60 minute EL sessions were considered to be effective in teaching ABI participants the skills necessary to communicate with family.

Keeping consistent with research just mentioned, task analyses also seem crucial in increasing procedural memory in those with ABI (Jerome et al., 2007). For this study, the use of task analyses can break down steps to send an attachment to a family member. Prior studies and research suggest that task analyses are more efficacious when used with an errorless procedure. The literature on this suggests that EL compliments task analyses interventions and strategies. For example, O’Reilly et al. (1990) found that with a group of ABI participants, individualized task analyses had more utility and favorable outcomes than ones with general instructions. These individualized task analyses with EL strategies as a framework for teaching skills had great results, noting increases in all participants for criterion levels. According to this study, skills learnt in task analyses were generalized in every participant. Additionally, maintenance of skills occurred at 100% proficiency at 1 month after the study. The significant implication to this study was that effective transfer and applications of skills in the task analyses were increased quickly by the minimization of errors (a crucial aspect of EL) and fading of prompts from those training participants.

Using fading of prompts when teaching skills with EL has been proven to be effective in literature. According to the results of study by Riley et al. (2004), tasks were remembered more often in the method of vanishing cues (MVC) group of participants than in the Errorless Learning Without Fading (ELWF) group. Around 4.5 out of 8 steps in a task analysis were remembered by the MVC group, whereas only 3.42 out of 8 were remembered in the ELWF group. Furthermore, there were no participants who showed an advantage with the ELWF approach, which suggests that fading of prompts is an effective and supported procedure in increasing procedural memory and skill acquisitions in those with brain injury. (Riley et al., 2004). This means that in addition to consistent minimization of errors, effective acquisition training for those with ABI must be simple, broken down into easy to understand steps, and have
gradual fading of prompts in order have maximum success. Therefore, when teaching those with an ABI to use technology with task analysis training and EL procedures, it is supported in the literature that a natural step in increasing and maintaining proficiency in this skill is to slowly fade prompts/cues and generalize skills.

**Summary of Research and Direction**

Technology is ubiquitous and accessible in society today. In a study by Tsaousides et al. (2011), in 128 participants with a brain injury, approximately 105 (82%) of them reported that they owned and used a device or computer in their day-to-day lives. The utility, normalization, and benefits that technology offers to those with ABI are endless. Using technology to increase communication in those with ABI has great potential. With AAC technologies being outdated and impractical, there is more of an acceptance and need for a transition to ET for rehabilitative purposes for those with memory impairments. By using EL procedures and tailored task analyses when teaching individuals with ABI how to increase communication with family using ET, it is suggested that quality of life in those with an ABI can be enhanced. Therefore, if individuals with ABI learn to send attachments through social media to their families, their quality of life and overall satisfaction should increase.
Chapter III: Method

Participants

Three participants with a severe acquired brain injury (ABI) between 40-60 years of age took part in this study. Inclusive criteria to take part in this study included having an established moderate to severe ABI, owning a mobile device (iPhone or iPad), and having a goal towards increasing communication with family using social media. Exclusive criteria included participants who have mild ABI, who do not own a mobile device, who are fluent enough in using technology to communicate with family, or who do not have goals directed at increasing communication with family as a meaningful activity.

Participant 1

Participant 1 is a male in his late fifties with a severe ABI. He was born in rural Ontario and has three brothers and one sister. His brain injury was sustained during a motor vehicle collision. As a result of this brain injury, he was hospitalized for 4 months post-injury, before transitioning to one of the residential units at Community Head Injury Resource Services (CHIRS). He has been diagnosed with a moderate memory impairment and mixed aphasia (difficulty in comprehension and expression of words). He can comprehend words better than he can express them. Due to his aphasia, he will use gestures (often write a message on his pant legs or in the air with his fingers) to communicate. He uses a wheelchair for mobility, but is also able to use a quad cane to walk short distances. Participant 1 communicates with his family members primarily through Facebook™. He is on medication to control seizures and prevent blood clots. His favourite activities include playing cards with others, and using his iPad for games and other apps.

Participant 2

Participant 2 is a male in his late fifties with a severe ABI. He is still in good phone contact with his mother and sister. He acquired a severe traumatic brain injury when he fell from a building while on vacation. He sustained a second brain injury shortly after his first injury. Having had two separate brain injuries, his balance, mobility, and cognitive capabilities were greatly affected. He primarily uses his wheelchair and only uses his walker when walking short distances under staff supervision. Due to the nature of his brain injury, he displays difficulties with short-term verbal and visual memory. He owns and uses an iPhone for planning a weekly schedule, and has good awareness of this deficit. He has shown impulsivity and difficulties in organizing himself when he becomes frustrated or nervous (most often when there is an unexpected change, or change in environment). He also has difficulties with attention and concentration, and requires frequent reminders of tasks and instructions. He is currently on anti-anxiety medications to relieve levels of anxiousness.

Participant 3

Participant 3 is a female in her late-forties with a moderate ABI. She has a brother who shares guardianship of her finances/property with her father. Her brain injury was sustained when she was hit by a car while crossing the street. Despite her brain injury, her memory is at an adequate level for recent events, though details become less clear as time passes. She owns and uses an Iphone as a scheduling and memory aid tool. She has
difficulties in initiating the completion of unfamiliar or less desirable tasks. It has been reported that she enjoys talking with her family over the phone, but often has difficulty maintaining or contributing to a conversation. She takes medications for a well-controlled seizure disorder.

**Selection Procedures**

Participants were selected based on their goals already in place. Each participant selected to take part in the study had an interest in learning to better communicate with family over social media. Participants were recruited through staff at CHIRS and a consent form was sent out to them and signed with their primary care worker. The consent form (found in appendix C) outlines a summary of the study, potential benefits to participant, benefits to research, potential disadvantages, precautions, and respect to privacy and confidentiality. This research project received ethical clearance from the Research Ethics Committee for Behavioral Psychology (SLC-REB; see appendix D) and at Community Head Injury Resource Services Canada’s (see appendix E). This project was developed under the supervision of Sarah Downing at CHIRS and Dr. Hal Cain.

**Design of Study**

A between participants A-B research design was used to track percentage of decreased prompts in clients attaching and sending files to family online. Additionally, the use of a pre-and post-test research design will be used to measure quality of life in using technology to communicate with family through social media. The application of errorless learning (EL) procedures in this study was twofold; 1) increase percentage of unprompted steps when using everyday technology (ET) for communication with family, and 2) to see if participants using social media to communicate with their families increased their reported levels of overall satisfaction and quality of life.

**Data Analysis**

Quantitative and qualitative data was collected on the three participants. Quantitative data on total number of prompted steps accomplished in trials was represented with a line graph as a percentage (e.g. 5/10 steps prompted = 50%) of prompts using the technology to send attachments. Additionally, the level of prompts (e.g. level 1 prompt = correct question/verbal nudge, level 2 prompt = verbal prompt or physical point, level 3 prompt = verbal direction and physical pointer, level 4 prompt = full support) used in each session was recorded on a datasheet (see appendix E). Quantitative data was collected from participants during four individual trials in each session, twice a week. Data for participants was visually analyzed using a standard pre-post design for changes in both the percentage and levels of prompts used during trials. During each training session, Trial 1 was recorded as a pre-score of the skill being taught, whereas trial 4 was be recorded as the post score.

Qualitative data was compiled and graphed as a bar chart from the participant’s pretest and posttest scores of the adapted version of the Behaviour and Symptom Identification Scale (BASIS-32). The adapted version of the BASIS-32 was modified to focus on questions about family closeness and communication for participants involved. Given that all participants have an ABI, a lengthy questionnaire would have also been difficult to effectively administer. For this reason, only the relation to self/others subscale was used for this study – which focuses on the
central theme of this study which is quality life as a factor influenced by family communication. A limitation to this measure is that with significantly less items, its validity suffers. However, due to its function and relevant subscale, it is effective as a measure because it tailors to the participant’s goals of increasing quality of life through the relation to self/others subscale. A Technology Proficiency Questionnaire (see appendix E) was also be used as resource for an intake and outtake measure. This questionnaire asks a few questions about participant’s familiarity with using technological devices and was created by the student researcher.

**Task Analyses**

Easy to understand and conceptualized steps to send an attachment to client’s family member. Number of steps will vary based on goal and mode of communication for each client. For example, more steps will be accrued for attaching file to Facebook, as opposed to attaching file to email. Number of possible unprompted steps the client achieved in task analyses was represented as an overall percentage.

**Errorless Learning**

Use of different level of prompts to promote learning and avoid acquisition of errors. Use of four levels of prompts (0 – spontaneous activity; 1 – correct question/verbal nudge; 2 – verbal prompt or physical point; 3 – verbal direction and physical pointer; 4 – full support which includes demonstration/explanation) to elicit learning and behavioral chains, while minimizing errors when learning a new skill or behaviour.

**Outcomes Variables**

*Proficiency in Sending an Attachment* = defined as number of prompts used when sending a file (text, picture, or video) on an Ipad or Iphone (Apple™ operating system specific device) to a family member by tapping the home button on the bottom of device, swiping right to unlock device, tapping on email app, selecting recipient of communication, attaching file, and sending selected file to recipient. Proficient use of sending an attachment is based on participant’s baseline level of 100% prompted for this skill. Success is determined by number of steps in task analysis that do not require prompting.

*Online Communication Skills* = defined as sending a photo attachment through email or Facebook, to another recipient (family member, or CHIRS email) at least once a week. Assessment of appropriate communication skills was based on standard conventional communication that is realistic (avoiding inadequate communication with family, but also avoiding too much communication with family which can be overbearing).

**Setting and Apparatus**

Setting took place in a recreational residential area at (CHIRS). Location included chairs, table, couch, and public washroom. Training of devices and errorless learning trials were conducted with clients individually twice a week, for five weeks. Standard protocol of EL principles was adapted from the Memory Link Program (Richards, Leach, & Proulx, 1990). Each session lasted thirty minutes to one hour in length. There was a total of 10 sessions total conducted during this study, at a time which suited participant’s daily activities.
Materials

Materials provided included client’s or CHIRS’s Apple™ product device (Ipad or Iphone), and a padded stylus for touch screen interface. Printed datasheets were used to record data trials of proficiency in sending an attachment to family.

Measures

• *Adapted Behaviour and Symptom Identification Scale* (BASIS-32; Eisen, 1995, see Appendix L)
  - Adapted 9-item index
  - Measures problems with areas of functioning in the specific domain of relation to self/others
  - Measured on a 5-point rating scale (0 meaning no difficulty; whereas, 4 means highest difficulty)

• *Technology Proficiency Questionnaire* (see Appendix O)
  - 3 item questionnaire
  - Focuses on participant’s level of usage and confidence in using technology
  - Conducted as an intake and outtake measure for study

Research Implementation Procedures

During the study, training for skill acquisition occurred twice a week, for 5 weeks, to teach skills of communicating with family through social media. Training and data recording was conducted by researcher Vincent Szenteczki.

Skill Acquisition

Errorless learning (EL) procedures were used in conjunction with individualized task analyses (broken down steps for a skill) for participants. Easy to understand and broken down instructions to send an attachment to client’s family member were prepared. The detailed steps can be found in the datasheets for each session (see appendix E). During each training session, there were 4 trials where each step for skill acquisition was outlined and recorded as the appropriate prompt. In trials 1-3, participants practiced sending an attachment to the student researcher through a CHIRS communication e-mail address. During the fourth and final trial, participants sent an attachment to a family member.

Prompts

Four levels of prompts (0 – no prompt; 1 – correct question/verbal nudge; 2 – verbal prompt or physical point; 3 – verbal direction and physical pointer; 4 – full support which includes demonstration/explanation) were used in skill acquisition training sessions. Level 4 prompts were used during the first session to introduce the skill. Subsequent sessions had 4 trials in each session. As the study progressed, the use of higher level prompts was gradually lessened and faded out. Prompts at Levels 1-3 were used for the first 6 sessions, and prompts at Level 1 and 2 were used in the last 6 sessions. Level of
prompts used in each session were indicated at each step, through a trial box in the datasheet provided.

**CHIRS Communication Group (Skills Reinforcement)**

As a considerable part of this study is increasing quality of life in those with acquired brain injuries (ABI) by using social media to communicate with family, a contingency plan for reinforcement was put in place. During training sessions, participants practiced sending attachments to a CHIRS e-mail address. As family members may not always be readily available to respond to messages from participants, reinforcement was given by creating this communication group (private email). When an attachment was received by the participant, the researcher responded to the participant with positive reinforcement and praise (e.g. “Good job, keep up the great work!”).
Chapter IV: Results

Quantitative Data

Number and Level of Prompts used

All participants began at a baseline of Level 4 prompting for the skill of sending an e-mail with an attachment to a family member. During the errorless learning (EL) intervention, data showed that all participants demonstrated a steadily decreasing trend in the number and level of prompts needed to perform the skill being taught. In addition to the reduction of prompts used in all participants during intervention, the level of prompts used across all participants decreased as well. For an example of the data sheet used and a classification on the level of prompts used during sessions, see appendix E. All participants started the first trial of the first session by being given all Level 4 prompts (full support/guidance) to properly demonstrate the skill required. All participants showed a steady increase to level 0 prompts (spontaneous response) for at least some of the trials during intervention.

Participant 1

On average, Participant 1 demonstrated proficiency in this skill with 38.5% prompting, when paired with an EL approach. By the end of this intervention, this participant demonstrated a prompt dependency of 16% (see Appendix F). Participant 1 relied most heavily on Level 1 (correct question/verbal nudge) and level 2 (physical point or verbal prompt) prompts during intervention (see appendix I).

Participant 2

On average, Participant 2 demonstrated proficiency in this skill with 33% prompting, when paired with an EL approach. By the end of this intervention, Participant 2 demonstrated a prompt dependency of 60.25% (see Appendix I). Participant 2 relied most heavily on level 1 and 2 prompts as well (see appendix J). Level 3 (physical point and verbal prompt) prompts were used more frequently in the beginning of the intervention for participant 2, however, they faded as they were replaced with lesser prompts. By the end of the intervention, Participant 2 required 26 prompts per session.

Participant 3

On average, Participant 3 demonstrated proficiency in this skill with 23.88% prompting, when paired with an EL approach. By the end of this intervention, this participant demonstrated 100% independence – she could independently perform the skill. Participant 3 relied most heavily on level 2 prompts during this intervention (see appendix K). However, it is important to note that this participant showed a steady and maintained increase in level 0 prompts. By the end of this intervention, participant 3 required 11 prompts per session.

Qualitative Data

Adapted BASIS-32

All participants completed an adapted version of the Behaviour and Symptom Identification Scale (BASIS-32) measure twice during the intervention. This 9-item
questionnaire measured quality of life under the specific domain of relations to self/other.

**Participant 1**

Based on the results of the pre-assessment (see appendix L), participant 1 noted quite a bit of difficulty in the areas of “goals or direction in life” and “recognizing and expressing emotions appropriately”. Based on the results of the post-assessment, the above areas of quality of life improved for participant 1, as he stated that after the intervention there was little difficulty in the areas of goals and direction and expression of emotion.

**Participant 2**

Based on the results of the pre-assessment, participant 2 noted quite a bit of difficulty in areas of “getting along with people outside of family”, “goals or direction in life”, and “lack of self-confidence” (see appendix N). Based on the results of the post-assessment, all the above areas in quality of life improved with participant 2 stating that he experienced a little difficulty in self-confidence and goals, and moderate difficulty in being realistic and getting along with people outside of the family. Additionally, it was noted that participant 2 felt no difficulty in relationships with family members after the intervention, as opposed to having some difficulty in the pre-assessment.

**Participant 3**

Based on the results of the pre-assessment, participant 3 noted quite a bit of difficulty in “recognizing and expressing emotions appropriately”, and moderate difficulty in “relationships with family members” and “getting along with people outside of the family” (see appendix N). Based on the results of the post-assessment, participant 3 increased in all areas of quality of life. The participant reported no difficulty in all the previous areas of relations with family, those outside of family, and expression of emotions.

**Technology Proficiency Questionnaire**

In addition to the use of the adapted BASIS-32 measure, a Technology Proficiency Questionnaire (TPQ) was created and used as a tool to gain information from the participants on the use and familiarity with devices that support social media. Like the BASIS-32 measure, each questionnaire was completed twice during the intervention.

**Participant 1**

Based on the intake results of the TPQ (see appendix O), participant 1 noted that this technology was used mostly to communicate with family, felt moderately comfortable using this technology, and would use this technology more with the help of others during training. Based on the outtake results, participant 1 noted that communication with family remained the main function. However, this participant noted increased confidence in using technology, and that he would use this technology more in the future if he was taught how to use it.
Participant 2

Based on the intake results of the TPQ (see appendix P), participant 2 noted that he mostly used this technology to schedule his daily activities, felt moderately confident in using this technology, and would use this technology more with the help of others. Based on the outtake results, participant 2 still used technology for the same function of planning schedules, felt moderately confident in using this technology, and would still use this technology with the help of others.

Participant 3

Based on the intake results from the TPQ (see appendix Q), participant 3 noted that she mostly used this technology to talk to family/friends, felt moderately confident in using this technology, and would use this technology more if she was taught how to use it. Based on the outtake results, participant 3 still agreed that she would still use this technology to communicate with family, mostly. However, she noted increased confidence in using this technology, and that she would use this technology more on her own; independently.
Chapter V: Discussion

Strengths and Limitations

Strengths to this study included the effectiveness of tailored task analyses with errorless learning (EL) procedures across all participants. Every participant involved in this study could successfully reduce not only the overall number of prompts required to perform the skill being taught, but every participant also reduced their level of prompt dependency. All participants showed a steady increase in the amount of unprompted (spontaneous response) steps in the task analysis of sending an e-mail with an attachment to a family member. By the end of this study, participants relied only on less assisted prompts of Level 1 (nod for clarification) and level 2 (physical point or verbal prompt). Thus, all participants seemed to improve their proficiency in sending attachments by the end of this intervention. By the end of this intervention, the participants could send an attachment to their family with minimal prompting.

All participant’s quality of life levels improved to some degree throughout this study, as reported on the BASIS-32. At baseline assessment of the adapted BASIS-32 measure, all participants expressed significant difficulties in relationships with family members, recognizing and expressing emotions appropriately, and with isolation or feelings of loneliness. At the post-assessment of this measure, all participants expressed increased quality of life in these areas. Because of their commitment to consistent communication with their families, these results suggest that participants felt more connected with their families and less alone due to the intervention procedures. Most significant in these results is that all participants felt more comfortable and confident in their recognition and expression of emotions, as reported in the results from the BASIS-32. Perhaps, due to this alternative form of communication (through sending an attachment by e-mail), participants felt more connected to their families, and thus could more easily identify and recognize how they were feeling. Most individuals with acquired brain injuries (ABI) have difficulties in communicating and expressing how they feel post-injury. This often results in a perceived loss of control and independence. Therefore, perhaps this small reintegration of successful communication with participant’s families contributed to an increased sense of control, mindfulness, and overall quality of life. This finding was consistent with the main goal of this study; that if individuals with ABI learn to send attachments through social media to their families, there is a greater chance that their quality of life and overall satisfaction should increase. Additionally, this study demonstrated a tailored approach for each participant involved.

Finally, all participants gained increased confidence in their use of technology with social media. Based on the pre-results from the Technology Proficiency Questionnaire, all participants noted that they would use this technology more if they were either taught how to use it or helped by others. Participant 1 reported that he would use technology more if taught how to use, participant two reported he would use technology with the help of others, and participant 3 reported that she would use this technology independently, at post-assessment. With regard to the use of this everyday technology, almost all participants agreed that this technology was used to help facilitate communication with family; excluding participant 2 who solely relied on this technology to plan his weekly schedules. While the main use of this technology may have differed, all participants had increased confidence in its usage. Therefore, it can be argued that due to this intervention, all participants had an increased sense of confidence and willingness to use this type of technology for meaningful ways in the future.
Limitations to this study included the number of sessions provided each week. While two sessions a week proved effective for most participants, perhaps more frequent sessions may have yielded increased proficiency in the use of this technology. It was found during the study that Participant 2 made significant gains when sessions were closer in proximity and less spaced out. Due to time constraints with this thesis project, as well as other activities participants were involved in daily, it is possible that having more frequent sessions may have generalized the skill more effectively. There was a clear decline of prompts used in participant’s data when sessions took place on consecutive days, and reversely, an increase in prompts used when skill had been not practiced for the rest of the week. Finally, there was a small sample size of participants that took part in this study. For future research, a larger sample size with longer treatment duration and follow-up would be beneficial.

In addition, each task analysis was tailored differently for each client. All participant’s devices were supported by a different operating system (e.g. Ios 5, 6, or 7). A potential limitation to this is that with each new version, the interface may be more complex and less simplistic than the version before. A great effort was put forth to ensure that each task analysis was customized to the individual’s unique skill levels, however, this could have yielded different results. For example, participant 2 received a new device (transitioning from Ios 4 to 7) just before the start of this study. While the newer models should be more simplistic and easier to integrate with, it could have been overwhelming for the participant to adapt with the updated technology.

Multilevel Challenges

Client Level

At the client level, motivation and adoption to a program can be difficult. To counter this, it was important to make a tailored and collaborative approach with the clients during the formulation of the treatment plan. To motivate clients to send meaningful photos, clients were encouraged before each session to take a picture of something that they are interested in or would like to share with their families. This way, as opposed to simply sending an attachment to practice the skill, this approach makes their skill both functional and meaningful in their everyday lives. Additionally, each task analysis was tailored to their skill level, and the operating system they were currently using on their devices.

Program Level

At the program level, teaching a new skill to someone with an acquired brain injury (ABI) can be difficult. When teaching a functional skill to those with an ABI, an effective practice often utilized is errorless learning. The principle behind errorless learning is that it sets up behavioral chains by using varying levels of prompts, while minimizing errors when learning a new skill or behavior. This is an important approach to follow, as with ABI and neurological deficits, often clients remember and encode an error more often than successes they make. Furthermore, when prompts used in errorless learning successfully create a behavioral chain for clients, the long-term goal is to gradually fade higher level of prompts and generalize the skill/behavior into their natural environment (everyday lives). To achieve this result, it was important to set up supports and plans for generalization at least 1 week before the end of the study. This way the process of generalizing was natural, and not rushed or difficult for clients to cope with.
**Organizational Level**

At the organizational level, communicating and collaborating effectively with an interdisciplinary team can be difficult. Utilizing a multi-disciplinary approach is required in this type of work environment. Communication was essential between all parties on the requirements of the treatment plan, and this included debriefing of current progress of program between the client, staff, supervisors, and other service care providers. A common difficulty is generalizing and maintaining these sessions after you leave the agency. Often, a client becomes dependent on these sessions and it is hard to fade out this type of intervention. It was important to teach other staff to continue utilizing this approach. This comes with its own difficulties, as staff member have a lot of work in their own schedule. It was important to set aside sufficient time to teach staff members the procedures, and work around these difficulties. Collaborating with the entire interdisciplinary team was essential. This included tailoring and changing the program to suit not only the client’s needs, but the staff’s as well.

**Societal Level**

At the societal level, a challenge to consider was if the individuals involved in the study felt an increased sense of quality of life, and reintegration into their communities. This program was tailored to increase quality of life in those with an ABI. This was done through teaching clients how to utilize technology (email) to send a meaningful attachment to their families. It was important to emphasize the importance of this treatment approach, and its applications in everyday life. In addition to increasing quality of life specific to the client, this approach also is proactive in reducing stigma for those with an ABI. The incorporation of modern technology into their lives has the added benefit of increasing awareness and social acceptance in those with ABI. Assistive technologies often are often highly associated with stigma; for being a noticeable identifier of disability. This approach, however, not only creates public awareness of the unique needs of those with ABI, but additionally increases social acceptance.

**Summary / Implications**

This thesis made contributions designed to enhancing quality of life in adults with acquired brain injuries (ABI). Three participants with an (ABI) between 40-60 years of age took part in this study. Overall, all participants involved increased their quality of life to some degree. It was demonstrated that through consistent e-mail communication paired with errorless learning (EL) procedures, participants felt more connected with their families. These findings are consistent with the hypothesis that if individuals with ABI learn to send attachments through social media to their families, there is a greater chance that their quality of life and overall satisfaction should increase.

Based on the literature examined, effective communication has always been a difficult compensation for those with ABI at post-injury. There is a vast field within psychology, and in other professions, that is searching for new and integrative methods to support alternative communication to those who have sustained brain injuries. Using everyday technology as a compensation tool for communication offers great utility and a sense of normality in the social reintegration of those with ABI. With technology now ubiquitous in society, it now has the capacity to increase satisfaction and self-worth, reduce stigma, and restore a sense of
belongingness. The results of this study support the potential for technology to be integrated in the lives of those with ABI in innovative and meaningful ways in the future.

**Recommendations for Future Research**

Encouraging participants to take a meaningful picture and continue communication with their families should take priority to generalize this skill. With increased independence and proficiency in communicating with family, all participants reported feeling greater quality of life. It is clear, that the function of sending meaningful pictures to their families had a large impact in reintegration, social validity, and increased quality of life during this study. This adapted form of e-mail communication was well received by participants. With this momentum in place, participants involved should continue to maintain this consistent communication with their family, but also learn how to take meaningful pictures on their everyday technology independently.

Modern technology is vast, rapidly evolving, and easily accessible. This makes it an appealing option for social reintegration with the acquired brain injury (ABI) population. While communication with family was at the forefront of this study, future research should focus on social communication with other communities available to those with an ABI. For example, approaches that might integrate and expose these individuals to dating, social media communities (such as Facebook, Twitter, Snapchat, etc.) and other outlets that may develop meaningful relationships with others through technology, could be worthwhile to examine. However, the focus in utilizing this technology should be on reintegration, and it should be kept that simple. Just as there are distinct benefits, there are also cautions in the use of this technology; making the leap in its integration to ABI communities difficult. It is important to keep communication and access to social supports the main priority. This approach has equal potential to successfully reintegrate, or successfully overwhelm this population. Future research needs to be patient, inviting of new technological approaches, and conscious of its adaptation towards this demographic.
References


Eisen SV: Assessment of subjective distress by patients’ self-reports versus structured interview. Psychol Rep 76:35–39, 1995


APPENDIX A

Consent to use Agency Name

St. Lawrence College
www.sl.on.ca

Date: Nov 16, 2014

Consent for Use of Agency Name

I, Dr. C. Brandsys, consent to the use of the name of Community Head Injury Resource Services (CHIRS) in Vincent Szenteczki’s applied thesis poster for the Honours Bachelor of Behavioral Psychology program at St. Lawrence College.

Dr. C. Brandsys
Agency Staff Signature

Vincent Szenteczki
Student Signature

Dr. Clare Brandsys
Printed Name

Vincent Szenteczki
Printed Name
APPENDIX B

Consent to use Agency Logo

St. Lawrence College
www.sl.on.ca

Date: Nov 16, 2016

Consent for Use of Agency Logo

I, [Name], consent to the use of the logo of Community Head Injury Resource Services (CHIRS) in [Name’s] applied thesis poster for the Honours Bachelor of Behavioral Psychology program at St. Lawrence College.

[Signature]
Agency Staff Signature

[Signature]
Student Signature

[Printed Name]
Printed Name

LOGO
Dear Research Participant,

I am a student in the Bachelor’s of Honors Degree in Behavioral Psychology program at St. Lawrence College. This four-year degree program is based on a behavioral framework; which has been demonstrated to be effective in developing positive skills with a wide range of individuals. Currently, I am completing an Applied Thesis that involves a project that I will summarize in a written report.

My project will be on the effects of quality of life in individuals with Acquired Brain Injury (ABI) who use technology to communicate with their family. To take part in this study you will need a technology device (iPhone or iPad) of your own which can send e-mails. There will be training sessions held at CHIRS twice a week and will last about 1 hour. Training sessions will involve how to use this technology. The session will be run by me and a supervisor from CHIRS. You will also need to send a message to your family member(s) at least once a week using your device. The sessions are expected to continue for a 5-week period. Data from these sessions will be recorded on a datasheet and through questionnaires. Questionnaires will be completed twice throughout the study and should take 20 minutes.

The potential benefits of taking part in this research study may include becoming better at using your device you own. Through participating in this study, you may learn to send an e-mail on your device. The hope is that through using technology to communicate with your family it will make you happy and fulfilled. The foreseeable risks of participating in this study are minimal. Some of the questionnaires or tasks may make you feel strong emotions. There are also risks that you should be aware of when using the internet. I will do my best to explain these risks to you in our training sessions so that you can avoid them and have an enjoyable time using the internet.

This project has been approved by CHIRS, Dr. Clare Brandys, Sarah Downing, and by the Research Ethic Board at St. Lawrence College. Thus, this project will be developed under the supervision of Dr. Hal Cain, my supervisor from St. Lawrence College and in collaboration with Dr. Clare Brandys, and Sarah Downing of CHIRS.

I would like your permission to implement the intervention/procedures described above. All information collected will be kept strictly confidential. You will be assigned a code number to enter on the questionnaires. The consent forms and completed questionnaires will be kept on a locked computer at CHIRS. The computer files will be kept in a password protected file on a secure, password protected computer. Participation in this project is voluntary and you may withdraw at anytime without incurring undue biases to current or future treatment.

If you agree to participate in this project, please complete the form at the bottom of this letter and return it to me as soon as possible. A copy of this signed document will be given to you for your own records. I sincerely appreciate your cooperation. If you would like to receive more information about the project or if you have additional questions or concerns, please contact my College supervisor, Dr. Hal Cain (HCain@sl.on.ca), Dr. Clare Brandys, and Sarah Downing.
I, _________________, understand and consent to the following.

**NOTE:** all information identifying you will be removed from any reports to protect confidentiality.

_____ I consent to participate in the project conducted by Vincent Szenteczki.

_____ I consent for the data collected as a part of this project to be put in a report.

_____ I consent for the data collected as part of this project to be presented at a conference.

Client/Guardian Signature: _________________ Date:______________

Printed Name: ______________________________

Witness Signature: _________________ Date:______________

Printed Name: ______________________________

SLC Student Signature: _________________ Date:______________

Printed Name: ______________________________
November 1, 2016

Student name: Vincent Szenteczki
Student address: VSzenteczki25@student.sl.on.ca; 41 Bridges Dr. Newcastle, ON, L1B 1M6

SLC REB Reference Number: 2016-REC-075V

Project Title: Using Errorless Learning and Individualized Task Analyses to Teach Adults with an Acquired Brain Injury (ABI) to Increase Communication with Family Through the use of Technology

Dear Vincent Szenteczki:

I am writing to advise you that the Research Ethics Committee – Psychology (REC-P), a subcommittee of the St. Lawrence College Research Ethics Board (SLC-REB), has granted Approval to the above-named research study. Your research may now begin.

You have one year to complete the project from the time of approval. Should you require more time to complete your project, you will be required to submit a SLC-REB Request for Renewal or Amendment Form to request an extension on your ethics approval for your project. This must be submitted prior to SLC-REB approval anniversary date.

Please review St. Lawrence College’s Policy on Research Integrity. You are obligated to keep your files up to date and inform the SLC-REB of any changes to your study. Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Both a SLC-REB Request for Renewal or Amendment Form and a revised application must be submitted to the Research Service Office for review by the SLC-REB.

Any adverse or unanticipated events during the course of your research must be reported to the SLC-REB as soon as you become aware of them. The SLC-REB reserves the right to review your file at any time to ensure that research is being conducted in accordance with all applicable SLC Policies and the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans (TCPS2, 2014).

Once your project is complete, you are required to complete a Project Termination form. This form must be submitted as a final report about your research to the SLC-REB.

Best wishes for the successful completion of your project.

Best Regards,

Jamie, Morris-Pocock
Chair, Research Ethics Board
## APPENDIX E

Level and Percentage of Prompts Datasheet

**“Sending an E-mail Attachment to Family” Datasheet**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Participant: 1</th>
<th>2</th>
<th>3</th>
<th>Date: __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn on Device</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Swipe to Unlock</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tap “E-mail” App</td>
<td></td>
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<tr>
<td>Tap Compose (small box)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tap “To” Line Field</td>
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<tr>
<td>Enter e-mail address</td>
<td></td>
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<tr>
<td>Tap Subject Line Field</td>
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<td></td>
</tr>
<tr>
<td>Type your Subject</td>
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</tr>
<tr>
<td>Tap the “Paperclip” Icon</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Attach Photo</td>
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<tr>
<td>Tap “Send” Button</td>
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<td></td>
</tr>
<tr>
<td>Tap “Home” Button</td>
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<table>
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<tr>
<th>Trial</th>
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<table>
<thead>
<tr>
<th>Unprompted Steps</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
## Level of Prompts

<table>
<thead>
<tr>
<th>Cuing Hierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 - Full support (demonstration/Explanation)</td>
</tr>
<tr>
<td>3 - Verbal direction and physical pointer</td>
</tr>
<tr>
<td>2 - Physical point OR Verbal Prompt</td>
</tr>
<tr>
<td>1 - Correct question / Verbal Nudge</td>
</tr>
<tr>
<td>0 - Spontaneous activity (no support)</td>
</tr>
</tbody>
</table>

## Notes

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Figure 1. Percentage of prompts used during errorless learning session with Participant 1. Participant was taught how to send an e-mail (with an attachment) to a family member through their Ipad device. Baseline indicates that Participant 1 required full prompting when practicing e-mail skill. Effects of errorless learning intervention shows a steadily decreasing trend; indicating that the overall use of prompts decreased and participant’s fluency of skill was well maintained with minimal prompting.
APPENDIX G

Percentage of Prompts During Errorless Learning Sessions: Participant 2

**Figure 2.** Percentage of prompts used during errorless learning session with Participant 2. Participant was taught how to send an e-mail (with an attachment) to a family member through their Iphone device. Baseline indicates that Participant 2 required full prompting when practicing e-mail skill. Effects of errorless learning intervention shows a steadily decreasing trend; indicating that the overall use of prompts decreased and participant’s fluency of skill was well maintained with minimal prompting.
APPENDIX H

Percentage of Prompts During Errorless Learning Sessions: Participant 3

Figure 3. Percentage of prompts used during errorless learning session with Participant 3. Participant was taught how to send an email (with an attachment) to a family member through their Ipad device. Baseline indicates that Participant 3 required full prompting when practicing email skill. Effects of errorless learning intervention shows a steadily decreasing trend; indicating that the overall use of prompts decreased and participant’s fluency of skill was well maintained. By the final session, Participant 3 successfully sent an email without being given any prompts.
Figure 4. Levels of prompts used during errorless learning sessions for Participant 1. The four levels of prompts used were as followed. A prompt level of 0 indicated spontaneous activity, a prompt level of 1 indicated correct question/verbal nudge; a prompt level of 2 – verbal prompt or physical point, a prompt level of 3 indicated a verbal direction and physical pointer from instructor, and a prompt level of 4 indicated full support which included a demonstration/explanation of what is required. Data indicates that overall frequency of level 0 prompts increased steadily during intervention, while level 2 prompts remained fairly stable.
Figure 5. Levels of prompts used during errorless learning sessions for Participant 2. The four levels of prompts used were as followed. A prompt level of 0 indicated spontaneous activity, a prompt level of 1 indicated correct question/verbal nudge; a prompt level of 2 – verbal prompt or physical point, a prompt level of 3 indicated a verbal direction and physical pointer from instructor, and a prompt level of 4 indicated full support which included a demonstration/explanation of what is required. Data indicates that overall frequency of level 0 and level 2 prompts increased steadily during intervention, while level 1 prompts remained stable.
Figure 6. Levels of prompts used during errorless learning sessions for Participant 3. The four levels of prompts used were as followed. A prompt level of 0 indicated spontaneous activity, a prompt level of 1 indicated correct question/verbal nudge; a prompt level of 2 – verbal prompt or physical point, a prompt level of 3 indicated a verbal direction and physical pointer from instructor, and a prompt level of 4 indicated full support which included a demonstration/explanation of what is required. Data indicates that overall frequency of level 0 prompts increased steadily during intervention, while level 1 and 3 prompts slightly decreased.
APPENDIX L
Adapted BASIS-32 Results: Participant 1

Pre Post

BASIS-32 ™ (Behaviour and Symptom Identification Scale) Adapted

**Instructions to Respondent:** Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty

1. Relationships with family members. _______________________________________________  
2. Getting along with people outside of the family. _____________________________________  
3. Isolation or feelings of loneliness. _________________________________________________  
4. Being able to feel close to others. ________________________________________________  
5. Being realistic about yourself or others. ____________________________________________  
6. Recognizing and expressing emotions appropriately. _______________________________  
7. Developing independence, autonomy. _____________________________________________  
8. Goals or direction in life. ________________________________________________________  
9. Lack of self-confidence, feeling bad about yourself. ________________________________  

0 = No difficulty / Not applicable  
1 = A little difficulty  
2 = Moderate difficulty  
3 = Quite a bit of difficulty  
4 = Extreme difficulty

IN THE PAST WEEK, how much difficulty have you been having in the area of:

1. Relationships with family members.  
2. Getting along with people outside of the family.  
3. Isolation or feelings of loneliness.  
4. Being able to feel close to others.  
5. Being realistic about yourself or others.  
6. Recognizing and expressing emotions appropriately.  
7. Developing independence, autonomy.  
8. Goals or direction in life.  
**BASIS-32™ (Behaviour and Symptom Identification Scale) Adapted**

**Instructions to Respondent:** Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty

<table>
<thead>
<tr>
<th>Difficulty Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No difficulty / Not applicable</td>
</tr>
<tr>
<td>1</td>
<td>A little difficulty</td>
</tr>
<tr>
<td>2</td>
<td>Moderate difficulty</td>
</tr>
<tr>
<td>3</td>
<td>Quite a bit of difficulty</td>
</tr>
<tr>
<td>4</td>
<td>Extreme difficulty</td>
</tr>
</tbody>
</table>

**IN THE PAST WEEK, how much difficulty have you been having in the area of:**

1. Relationships with family members. ________________________________ → 1
2. Getting along with people outside of the family. __________________________ → 2
3. Isolation or feelings of loneliness. ______________________________ → 1
4. Being able to feel close to others. ______________________________ → 2
5. Being realistic about yourself or others. ______________________________ → 2
6. Recognizing and expressing emotions appropriately. __________________________ → 2
7. Developing independence, autonomy. ______________________________ → 1
8. Goals or direction in life. ______________________________ → 1
9. Lack of self-confidence, feeling bad about yourself. __________________________ → 1
APPENDIX M

Adapted BASIS-32 Results: Participant 2

Pre Post

BASIS-32™ (Behaviour and Symptom Identification Scale) Adapted

Instructions to Respondent: Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty

0 = No difficulty / Not applicable
1 = A little difficulty
2 = Moderate difficulty
3 = Quite a bit of difficulty
4 = Extreme difficulty

IN THE PAST WEEK, how much difficulty have you been having in the area of:

10. Relationships with family members. _______________________________________________ → 1
11. Getting along with people outside of the family. _____________________________________ → 3
12. Isolation or feelings of loneliness. _______________________________________________ → 2
13. Being able to feel close to others. _______________________________________________ → 2
14. Being realistic about yourself or others. ____________________________________________ → 3
15. Recognizing and expressing emotions appropriately. _______________________________ → 2
16. Developing independence, autonomy. _____________________________________________ → 1
17. Goals or direction in life. ________________________________________________________ → 3
18. Lack of self-confidence, feeling bad about yourself. _________________________________ → 3
**BASIS-32™ (Behaviour and Symptom Identification Scale) Adapted**

**Instructions to Respondent:** Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty.

0 = No difficulty / Not applicable  
1 = A little difficulty  
2 = Moderate difficulty  
3 = Quite a bit of difficulty  
4 = Extreme difficulty

**In the past week, how much difficulty have you been having in the area of:**

10. Relationships with family members. ____________________________

11. Getting along with people outside of the family. ____________________________

12. Isolation or feelings of loneliness. ____________________________

13. Being able to feel close to others. ____________________________

14. Being realistic about yourself or others. ____________________________

15. Recognizing and expressing emotions appropriately. ____________________________

16. Developing independence, autonomy. ____________________________

17. Goals or direction in life. ____________________________

18. Lack of self-confidence, feeling bad about yourself. ____________________________

---
BASIS-32™ (Behaviour and Symptom Identification Scale) Adapted

**Instructions to Respondent:** Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty

0 = No difficulty / Not applicable
1 = A little difficulty
2 = Moderate difficulty
3 = Quite a bit of difficulty
4 = Extreme difficulty

IN THE PAST WEEK, how much difficulty have you been having in the area of:

19. Relationships with family members. ____________________________ → 2
20. Getting along with people outside of the family. ____________________________ → 2
21. Isolation or feelings of loneliness. ____________________________ → 1
22. Being able to feel close to others. ____________________________ → 0
23. Being realistic about yourself or others. ____________________________ → 0
24. Recognizing and expressing emotions appropriately. ____________________________ → 3
25. Developing independence, autonomy. ____________________________ → 0
26. Goals or direction in life. ____________________________ → 0
27. Lack of self-confidence, feeling bad about yourself. ____________________________ → 0
Pre Post

BASIS-32™ (Behaviour and Symptom Identification Scale) Adapted

**Instructions to Respondent:** Below is a list of problems and areas of life functioning in which some people experience difficulties. Using the scale below, fill in the box with the answer that best describes how much difficulty you have been having in each area DURING THE PAST WEEK.

**Note:** Please do not leave any questions blank. If any item does not apply to you, please select 0 = No Difficulty

<table>
<thead>
<tr>
<th>IN THE PAST WEEK, how much difficulty have you been having in the area of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Relationships with family members. ________________________________ → 0</td>
</tr>
<tr>
<td>20. Getting along with people outside of the family. ____________________ → 1</td>
</tr>
<tr>
<td>21. Isolation or feelings of loneliness. ________________________________ → 0</td>
</tr>
<tr>
<td>22. Being able to feel close to others. ________________________________ → 0</td>
</tr>
<tr>
<td>23. Being realistic about yourself or others. __________________________ → 0</td>
</tr>
<tr>
<td>24. Recognizing and expressing emotions appropriately. __________________→ 0</td>
</tr>
<tr>
<td>25. Developing independence, autonomy. ________________________________ → 1</td>
</tr>
<tr>
<td>26. Goals or direction in life. __________________________________________ → 0</td>
</tr>
<tr>
<td>27. Lack of self-confidence, feeling bad about yourself. __________________→ 0</td>
</tr>
</tbody>
</table>

0 = No difficulty / Not applicable
1 = A little difficulty
2 = Moderate difficulty
3 = Quite a bit of difficulty
4 = Extreme difficulty
Appendix O

Technology Proficiency Questionnaire Results: Participant 1

Intake Outtake

Instructions: The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. I use technology mostly to:
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. I feel confident using technology:
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. I would use technology more:
   a) On my own
   b) With the help of others
   c) If I was taught how to use it
Instructions: The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. I use technology mostly to:
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. I feel confident using technology:
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. I would use technology more:
   a) On my own
   b) With the help of others
   c) If I was taught how to use it
APPENDIX P
Technology Proficiency Questionnaire: Participant 2

Intake Outtake

**Instructions:** The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. **I use technology mostly to:**
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. **I feel confident using technology:**
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. **I would use technology more:**
   a) On my own
   b) With the help of others
   c) If I was taught how to use it
Instructions: The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. I use technology mostly to:
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. I feel confident using technology:
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. I would use technology more:
   a) On my own
   b) With the help of others
   c) If I was taught how to use it
APPENDIX Q

Technology Proficiency Questionnaire: Participant 3

Intake          Outtake

Instructions: The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. I use technology mostly to:
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. I feel confident using technology:
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. I would use technology more:
   a) On my own
   b) With the help of others
   c) If I was taught how to use it
Instructions: The Technological Proficiency Questionnaire asks a few questions about participants using technological devices and familiarity with using them. Please circle the most accurate answer to each question as it reflects to you.

1. I use technology mostly to:
   a) Plan my day (use a schedule)
   b) Play Games
   c) Talk to my family/friends

2. I feel confident using technology:
   a) Strongly Agree
   b) Agree
   c) Disagree
   d) Strongly Disagree

3. I would use technology more:
   a) On my own
   b) With the help of others
   c) If I was taught how to use it