5-2016

Effectiveness of the Bridge/Adapt Program on Functional Skill Generalization After Acquired Brain Injury

Janice S. Li
Dominican University of California

Diana Lopez
Dominican University of California

Eugene Cheung
Dominican University of California

Angela Talamantez
Dominican University of California

https://doi.org/10.33015/dominican.edu/2016.OT.08

Effectiveness of the Bridge/Adapt Program on Functional Skill Generalization After Acquired Brain Injury

Janice S. Li

Diana Lopez

Eugene Cheung

Angela Talamantez

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science Occupational Therapy

School of Health and Natural Sciences

Dominican University of California

San Rafael, California

December 2015

This thesis, written under the direction of Kitsum Li, OTD, OTR/L and approved by the Chair of the Master's program, Ruth Ramsey, EdD, OTR/L, has been presented to and accepted by the Faculty of the Department of Occupational Therapy in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy. The content, project, and research methodologies presented in this work represent the work of the candidates alone.

Janice S. Li, Candidate	12/9/2015
Diana Lopez, Candidate	12/9/2015
Eugene Cheung, Candidate	12/9/2015
Angela Talamantez, Candidate	12/9/2015
Ruth Ramsey, EdD, OTR/L, Chair	12/9/2015
Kitsum Li, OTD, OTR/L, Thesis Advisor	12/9/2015

Acknowledgements

From our team:

We would like to wholeheartedly thank our advisor, Dr. Kitsum Li, OTR/L, for her unwavering guidance and support. Dr. Kitsum Li believed in our ability as a team and encouraged us to reach our highest level of success throughout the capstone process. We would also like to thank Jane Dressler, JD, OTR/L, for being a fresh set of eyes as our second reader and providing us with her experience and valuable feedback. We owe our gratitude to Maggie Pesta, OTR/L, the occupational therapist at the Brain Injury Network of the Bay Area (BINBA), for partnering with our team and generously sharing her time and knowledge. We would also like to thank the extended staff at the BINBA that kindly welcomed us into their facility and were available to help us at any time. Without the gracious donations of Dr. Frederick Weiner at Parrot Software and Gina Musser and the Cognistat team, we would not have had the tools to complete this study. We would like to warmly thank the participants and their families for agreeing to be in our study; it was a privilege and inspiration to work with each one of you. Lastly, we would like to thank our family and friends for their invaluable guidance, love, and support.

Personal Acknowledgements:

I, Eugene, would like to thank my parents for their continued support throughout my education. Without them, I would not have the opportunity or the motivation to persevere through this arduous process and arrive to where I am today.

I, Janice, would like to thank my family and friends who offered continuing love and encouragement throughout my graduate education. I owe my deepest gratitude to Robert for his remarkable patience and constant support throughout this journey. Finally, I would like to thank Lori Ann for believing in me from the start and encouraging me to reach higher.

I, Diana, would like to thank my family and friends for their unconditional love and support. I could not have completed this program without them. Thank you for always encouraging me to pursue my dreams and standing behind me as I fulfill them.

I, Angela, would like to thank my children, Samuel and Maggie, because my love for you both has made me determined, fierce and courageous. And to my own mother, without your support I could have never managed the demands of being a mother and a graduate student.

Table of Contents

List of Tables

Abstract

This study explored the effectiveness of the Bridge/Adapt program for generalizing increased cognition to functional skills. Three participants, identified as having significant cognitive impairments as measured by the Cognistat assessment, participated in the Bridge/Adapt program, an eight-week program that includes both remedial and compensatory components. The remedial component used was a computer-based cognitive rehabilitation program called Parrot Software. Past studies have proven computer-based cognitive rehabilitation to be effective in increasing overall cognition. The Bridge/Adapt module is the compensatory component that utilized a variety of strategies and everyday tasks to facilitate the generalization of improved cognition to functional performance. A homework component was also implemented for participants to incorporate the strategies learned in the Bridge/Adapt program to their own meaningful occupations. This study utilized a pretest posttest design using the medication box assessment to measure functional performance. Results of the medication box assessment indicated that one of the three participants demonstrated generalization of skills from improved cognition to functional performance. Future research should include re-evaluating the Bridge/Adapt modules and the medication box assessment. Recommendations to improve future implementation are provided to increase likelihood of generalization.

Introduction

Acquired brain injury (ABI) is any injury to the brain caused after birth – the two most common forms being cerebrovascular accidents (CVA) and traumatic brain injuries (TBI) (Brands, Köhler, Stapert, Wade, & van Heugten, 2014). Individuals with ABI often experience cognitive deficits that impair their ability to perform daily activities and negatively affect their quality of life (Cicerone et al., 2011). Participation in daily activities is influenced by client factors such as cognition, and cognitive deficits may hinder or impair participation (American Occupational Therapy Association [AOTA], 2014). Many cognitive rehabilitation interventions have proven effective in addressing these cognitive deficits including remedial approaches such as computer-based cognitive rehabilitation (CBCR) programs and compensatory approaches like problem-solving strategies (Dams-O'Connor & Gordan, 2010; Li, Alonso, Chadha, & Pulido, 2015; Li, Robertson, Ramos, & Gella, 2013).

Despite acquiring or improving cognitive skills through CBCR, current evidence shows that what is learned is not generalized outside of intervention (Li et al., 2015). Gains made through CBCR are not translating into functional performance in real-world situations. It is imperative that effective interventions target skill transfer as occupational therapy is dedicated to improving individual functioning so that the highest quality of life can be attained. The Bridge/Adapt program was developed by Bergen, Repin, Bennet, and LaFrenz (2015) to be used alongside a CBCR program, combining compensatory and remedial approaches to promote generalization of learning. There is currently no research to support the effectiveness of the Bridge/Adapt program in bridging the gap between intervention and functional performance. The purpose of this study is to determine the effectiveness of the Bridge/Adapt program in facilitating generalization of improved cognitive skills to functional performance in

individuals with ABI. The results may contribute to evidence-based practice so that cognitive rehabilitation with individuals with ABI can be conducted in the most effective possible manner.

Literature Review

This literature review discusses cognitive rehabilitation for individuals with ABI. First, ABI and its impact on cognition and functional performance are addressed. Second, cognitive rehabilitation is examined through remedial and compensatory approaches. Included in the discussion of cognitive rehabilitation is the use of remedial CBCR and two frameworks that guide compensatory approaches. Third, skill transfer and generalization of learning to other situations and environments is discussed. Lastly, various cognitive and performance-based assessments to measure cognition are described.

Acquired Brain Injury

ABI refers to any non-progressive injury to the brain following birth. The two most common forms of ABI are CVA and TBI (Brands et al., 2014). CVA is currently the fourth leading cause of death in the United States. To date, more than 800,000 new CVA cases are reported every year (Centers for Disease Control and Prevention, 2014a). The two most common forms of CVA, ischemic and hemorrhagic, can lead to various physical and cognitive deficits (Kearney, 2014).

In 2010, 2.5 million incidences of TBI were reported (Centers for Disease Control and Prevention, 2014b). TBI is categorized as either primary or secondary brain injuries. Primary brain injury is the immediate physical damage sustained at the time of the injury to the brain. Secondary brain injury refers to a cascade of subsequent cellular and molecular processes triggered by the initial mechanical damage to the cerebral tissues associated with the primary insult (Tran, 2014). TBI may result in long-term cognitive, emotional, and physical impairments

that negatively affect performance of activities of daily living (ADL) and instrumental activities of daily living (IADL) (AOTA, 2014; Truelle et al., 2010).

Cognitive and performance deficits. Individuals with ABI may experience cognitive deficits. These deficits can include: memory impairment, attention deficit, executive dysfunction, impaired awareness (decreased awareness of one's own strengths and weaknesses regarding cognitive abilities), and impaired behavioral and interpersonal skills (Bartfai, Markovic, Landahl, & Schult, 2014; Smeets et al., 2014). When working with individuals with ABI, a clear understanding of the relationship between cognitive deficits and functional performance is necessary for successful implementation of interventions (Bertisch et al., 2013). Using remedial and compensatory interventions to address the cognitive deficits of individuals with ABI may yield to improvements in functional performance of ADL and IADL.

Neuroplasticity

Neuroplasticity refers to the brain's ability to reorganize neural pathways throughout the lifespan by changing neural structure, function, and connections between neurons as a result of learning and cognitive, behavioral, and sensory experiences (Chen, Epstein, & Stern, 2010; Duffau, 2006). To restore function after injury, neuroplasticity may involve strengthening synaptic connections to reinforce neural pathways, weakening synaptic connections to cull unnecessary synapses, creating new synaptic connections, creating new or alternate neural networks, or linking new neural networks to existing ones (Berlucchi, 2011; Chen et al., 2010). Brain injury stimulates generation and migration of neuroblasts, precursors to neurons. Neurons that survive the brain injury can re-establish some function through the generation of new synapses between neurons by developing axonal branches and dendritic spines (Berlucchi, 2011; Chen et al., 2010). Neuroplasticity is the process by which the central nervous

system restores function, and, thus, it has important implications for cognitive rehabilitation (Berlucchi, 2011).

Cognitive Rehabilitation

Cognitive rehabilitation is a set of interventions designed to maximize functional performance of individuals with ABI (Dams-O'Connor & Gordon, 2010). The goal of cognitive rehabilitation is to optimize cognitive functioning and improve quality of life for individuals with ABI by remediating or compensating for cognitive deficits (Cicerone et al., 2000; Tsaousides & Gordon, 2009). Cognitive rehabilitation targets deficits in a number of cognitive domains including attention, memory, learning, executive function, and visual perception. It also addresses the psychosocial aspects of ABI such as training in emotional regulation and social skills (Dams-O'Connor & Gordon, 2010).

Cognitive rehabilitation uses targeted, purposeful activities with the goal of facilitating neuroplasticity to regain functional performance (Duffau, 2006). The parameters of cognitive rehabilitation, such as number of repetitions and intensity, influence neuroplasticity and functional outcomes of intervention (Kleim & Jones, 2008). A study by Kim et al. (2009), using an observational study design, provided evidence in support of cognitive rehabilitation inducing neuroplasticity by using functional magnetic resonance imaging (fMRI) to compare images of participants' brains before and after intervention. Seventeen participants with chronic TBI, averaging 16 months post-injury, were compared with 15 control subjects. For the intervention, the participants participated in a CBCR program focused on visual and auditory attention over four weeks with three sessions per week. Participants underwent fMRI as they engaged in a visuospatial attention task. The researchers noted significant improvement in performance on the task after the CBCR, and changes in the brain's neural network, neuroplasticity, detected by

fMRI corresponded with increased organization and activation of areas within the brain associated with attention, and indicated neuroplasticity had occurred (Kim et al., 2009).

The effectiveness of cognitive rehabilitation on improving cognitive skills, such as memory retrieval and attention, for individuals with ABI is supported by robust evidence (Cicerone et al., 2000; Cicerone et al., 2005; Cicerone et al., 2011; Rohling, Faust, Beverly, & Demarkis, 2009). Cicerone et al. (2000, 2005, 2011) published three seminal literature reviews in the field spanning 20 years, from 1988 through 2008, and generated several practice standards based on the best available evidence. In the most current review, Cicerone et al. (2011) concluded that cognitive rehabilitation interventions are effective in addressing deficits in attention, memory, and executive function. In order to promote generalization of cognitive skills to functional performance in individuals with deficits in executive function, Cicerone et al. (2011) recommended that cognitive rehabilitation incorporate metacognition training. Metacognition training facilitates self-awareness, self-monitoring, and self-regulation (Cicerone et al., 2011).

Cognitive rehabilitation consists of two approaches: remediation and compensation. The goal of cognitive remediation is to restore function that was lost or impaired post-injury, whereas the goal of compensation approach is to support performance by utilizing the individual's intact cognitive abilities to work around his or her impaired abilities (Dams-O'Connor & Gordon, 2010).

Remedial approach. Cognitive remediation involves a structured, graded application of repetitive training with the goal of improving cognitive skills necessary for optimal functional performance (Elgamal, McKinnon, Ramakrishnan, Joffe, & Macqueen, 2007). It is an effective

treatment for cognitive deficits of individuals with dementia, schizophrenia, other types of brain injury, and the elderly (Lynch, 2002; McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007).

Using a two-group pretest-posttest design, Westerberg et al. (2009) demonstrated the effectiveness of cognitive rehabilitation in facilitating generalization of working memory and attention. Eighteen participants, one to three years post-CVA, were randomly assigned to either an intervention or control group. The intervention consisted of a CBCR program with various working memory training tasks. For example, in one of the tasks, participants reproduced a sequence of lights lit in various locations on a grid. The intervention consisted of 90 daily trials of the working memory training task, five days a week for five weeks. The study found that the intervention improved cognitive functioning, especially in working memory and attention (Westerberg et al., 2009).

Technological advances have provided new and varied CBCR interventions. One type of computer-based treatment involves virtual reality training. Yip & Man (2013) conducted a study using a 12-session virtual reality (VR) computer-based remediation with individuals with ABI. A total of 37 participants were included in the single-blind, pretest-posttest randomized trial. Participants were randomly assigned to either a treatment group or a control group. The VR program was given twice a week for 30-45 minutes per session. The Cambridge Prospective Test and a behavioral checklist developed to evaluate cognitive response in a shopping scenario were used as posttest data. Improvements in both VR-based tasks and real-life tasks were demonstrated. Results demonstrated that the VR computer-based remediation can be generalized into improved functional performance (Yip & Man, 2013).

For individuals following a CVA, the remediation approach is effective in improving cognitive function (Cha & Kim, 2013). Cha and Kim (2013) conducted a systematic review and

meta-analysis of twelve studies published between 1988 and 2011, which involved a total of 461 individuals that had a CVA. Literature was retrieved from multiple computerized medical and science databases. The inclusion criterion for adult participants was having been diagnosed with a CVA. The intervention criterion was use of a computer-based cognitive remediation program. Treatment schedules varied in session time and duration of weeks among studies. Cognitive outcome was assessed by standardized evaluation tools, including the Mini-Mental State Examination, the Wechsler Adult Intelligence Scale, the Test Ride for Investing, the Rivermead Behavioural Memory Test, and the Testing Battery for Attention Performance. The results showed a medium effect with the intervention group, specifically in verbal learning and memory measures (Cha & Kim, 2013). Thus, the results illustrated that remediation can be effective in rehabilitation with individuals who have had a CVA.

Computer-based cognitive rehabilitation. According to the United States Census Bureau (2014), 74.8% of homes had computers with Internet access in 2012. Using CBCR programs as an intervention is advantageous given the high-accessibility and the general population's knowledge of computer systems. Within the last decade, numerous software programs have been developed that claim to improve areas of cognition such as memory, attention, and problem-solving skills for people with and without TBI (Riker, Stires, & Ramsey, 2012). Examples of CBCR programs used in rehabilitation settings or at home include Captain's Log, CogMed, Happy Neurons, Luminosity, Parrot Software and POSIT Science (Riker, Stires, & Ramsey, 2012).

Research conducted by Johansson and Tornmalm (2012) examined whether individuals with moderate-to-severe cognitive deficits after brain injury could benefit from CBCR memory training. Specifically, the study looked at the benefits CBCR training could provide in

performance of daily life activities. The computerized training software CogMed was used with 18 participants, aged 17-64, in an outpatient center for individuals with ABI. Criteria for participant selection were individuals with ABI that required substantial support to manage daily life, inability to work, and memory difficulties. The intervention included support and education in using the CogMed program. Data collected before, during, after training and at a six-month follow up indicated that participants had a significant improvement in trained working memory tasks (Johanson & Tornmalm, 2012). While they found that cognitive functioning increased, this did not generalize into functional performance.

Another similar research study by occupational therapy graduate students at Dominican University of California focused on the effectiveness of increasing cognitive skills by using a CBCR intervention program with individuals with ABI in a community setting (Li et al., 2013). The Parrot Software was used as the intervention with twelve individuals with chronic ABI. The study focused on the Parrot Software training for improving memory and attention deficits. Participants completed eight weeks of computer sessions lasting 60 minutes each. Pretest and posttest data were collected using the Cognistat assessment. Results found improvement in both memory and attention (Li et al., 2013).

Further research conducted by graduate students at Dominican University of California focused on determining if cognitive improvements gained from CBCR training would transfer to functional performance (Li et al., 2015). Transfer of cognitive improvement to functional performance is a vital component of rehabilitation. The acquired cognitive skills gained with CBCR training are most effective when they are transferred into the daily context of life. Li et al. (2015) used a quasi-experimental single group repeated measure design. Twelve individuals with chronic ABI, with the mean age of 61 years and 83% male, participated. Pretest and posttest

cognition measurements were obtained by using The Montreal Cognitive Assessment. Participants completed eight one-hour sessions of the Parrot Software program modules for memory and attention. Results confirmed the prior research that CBCR does increase overall cognitive skills. This study then took the research process one step further by assessing functional performance improvement. A medication box assessment developed by the researchers was used to evaluate the transfer of cognitive skills to a functional task, thereby indicating skill generalization. Data confirmed that skill generalization did not occur and there remains a need to address this gap between increase in cognitive skills and lack of transfer to functional performance (Li et al., 2015).

Compensatory approach. Compensatory approach employs the use of assistive devices and compensatory strategies to manage functional performance despite cognitive deficits. The goal of this approach is not to remediate skills but to maintain and optimize function (Pryor, 2013). In addition to assistive devices and compensatory strategies, interventions under this approach include environmental modifications (e.g. minimizing distractions) and adaptive procedures (e.g. task simplification) to facilitate successful task completion. Examples of assistive devices are lists, calendars, beepers, and mobile phone applications, while compensatory strategies may include cognitive strategies such as verbal self-instruction and the use of acronyms for memory recall (Allott, Francey, & Velligan, 2013; Twamley, Jak, Delis, Bondi, & Lohr, 2014).

Studies show that compensatory rehabilitation can be effective in enabling individuals to work around their cognitive deficits. Furthermore, these studies demonstrate that compensatory strategies are effective in allowing individuals to better perform daily activities, hence improving life satisfaction (Huckans et al., 2010; Lannin et al., 2014). Huckans et al. (2010) investigated

the effectiveness of a compensatory approach called Cognitive Strategy Training in combat veterans with history of TBI. Over the course of six to eight weeks, 16 participants attended the group-based intervention that provided training on using compensatory cognitive strategies. Some of the strategies used included visual imagery for memory recall, problem-solving techniques, and assistive devices. The group incorporated a variety of teaching techniques such as didactic presentations, in-class discussion, and activity-based exercises that introduced different cognitive strategies. The study found that the intervention was effective in increasing the participants' life satisfaction and decreased severity of psychiatric symptoms (Huckans et al., 2010).

In a study by Lannin et al. (2014), 184 individuals with ABI used handheld computers to compensate for memory deficits. In this randomized controlled trial, participants were randomly assigned to the intervention group where they received handheld computers or the control group where they received non-electronic memory aids. The intervention group constituted an eight-week product support and training facilitated by an occupational therapist. The control group was given non-electronic memory aids including a paper diary, cueing techniques, and mnemonics for memory recall. The control group also received an eight-week training provided by an occupational therapist on use of the non-electronic memory aids. Performance improvements were found in both groups on Memory Compensation Questionnaire (MCQ). Results showed an effect size of 12.5 (p =.021) with a confidence interval of 95% on MCQ's frequency of forgetting subtest (Lannin et al., 2014). The results indicated that compensatory aids and strategies may be effective tools for cognitive rehabilitation in individuals with ABI. There is evidence to support the use of compensatory approach in occupational therapy treatments for individuals with ABI. However, the research is still limited (Huckans et al., 2010; Lannin et al., 2014). Few studies

have investigated how interventions that use compensatory approach may facilitate skill transfer and generalization.

In attempt to address skill transfer and generalization, Bergen et al. (2015) developed a systematic retraining curriculum to be used alongside the Parrot Software CBCR program, as part of a master's capstone project. The Bridge/Adapt program includes group sessions to be done concurrent with weekly CBCR sessions of the Parrot Software over a period of eight weeks. The group sessions use a compensatory approach that aims to bridge the gap between the remedial CBCR program and generalization to functional performance.

Skill Transfer and Generalization

Transferring and generalizing gains in functional skills from one context to another is a challenge in rehabilitation for individuals with ABI (Toglia et al., 2010). *Generalization* is a term that refers to the application of a learned skill to novel situations and contexts, while transfer of skill means the ability to use specific skills to related tasks (Toglia, 1991). Studies have found that individuals with ABI can transfer skills more easily than generalize (Dawson et al., 2009; Rodger & Brandenburg, 2009; Toglia et. al, 2010). In addition, gains in cognitive skills do not appear to generalize to improved functional performance (Li et al., 2015).

A study by the Department of Veterans Affairs addressed the question of generalization by implementing Goal Management Training (GMT), a metacognitive intervention, to increase functional skills in veterans with TBI (Waid-Ebbs et al., 2014). GMT offers an executive function rehabilitation approach that draws upon theories concerning goal processing and sustained attention. A total of four men and two women, aged 25 to 40 years old, with an average post injury time of 2.8 years, met the inclusion criteria for decline in executive functioning. After attending 10 biweekly sessions that incorporated guided presentation of

information, group interaction, and practice of complex tasks, it was found that changes to everyday activities were not observed. Only minimal changes were found from baseline to post-intervention results. Therefore, generalization did not occur (Waid-Ebbs et al., 2014).

A pilot study by Ehlhardt, Sohlberg, Glang, and Albin (2005) was conducted to evaluate an instructional package applied to a multi-step e-mail task for individuals with severe impairments in memory and executive functions due to TBI. The four participants, two males and two females, were taught a seven-step e-mail task using the TEACH-M program, which aimed to facilitate learning in individuals with ABI. In addition to the TEACH-M instructional package, generalization probes were implemented into the program, where an altered interface and a computer game were introduced. Following the generalization probes, the participants were able to demonstrate the ability to generalize the skills learned from the previous interface to the slightly altered e-mail interface. Furthermore, all four participants replicated and maintained the effects of the training 30 days after treatment. However, none of the participants showed significant improvement on the computer memory game (Ehlhardt et al., 2005). This suggested that only transfer of skill occurred, not generalization. The participants were unable to generalize skills to the computer game as it was a completely different context.

Conversely, there have been studies that showed generalization of skills. Using a multiple single case design with repeated measures, McGraw-Hunter, Faw, and Davis (2006) conducted a study showing the efficacy of self-modeling and feedback in teaching a life skill within the natural environment in facilitating generalization. In this study, four individuals with TBI watched a video of themselves correctly cooking rice in their homes and then proceeded to perform the cooking task in their kitchen after viewing the video (McGraw-Hunter et al., 2006). Feedback and prompts from the researcher were provided only if the participant stopped

responding or made an error. The researcher then gave specific verbal praise when the participant performed a step correctly. Training ceased once the participants were able to complete all the steps in the task for three consecutive sessions. To test if the participants could generalize the learned skill, participants were asked to cook a different dish. Data were collected at five different points: baseline, twice within two days following completion of the program, two and four weeks thereafter. Generalization occurred in three of the four participants. The participants were able to independently complete 92-100% of the steps on the generalization test and 92-96% of the steps two weeks later (McGraw-Hunter et al., 2006). The study demonstrated that therapy delivered in the natural environment helped facilitate generalization.

In conclusion, while cognitive rehabilitation interventions have proven effective in facilitating improvement in cognitive skills for individuals with ABI, there is limited evidence of those learned skills transferring and generalizing outside of treatment. Furthermore, the gains made in cognitive rehabilitation in a controlled context have limited functional application in the real world. However, evidence showed that generalization can be achieved when the skill is practiced in a real world situation (McGraw-Hunter, Faw, & Davis, 2006). As such, cognitive rehabilitation should promote generalization by practicing learned skills in the natural environment to bridge the gap between treatment and functional independence. Two occupational therapy frameworks that aim to facilitate generalization are Cognitive Orientation to daily Occupational Performance and multicontext approach.

Cognitive Orientation to daily Occupational Performance

Cognitive Orientation to daily Occupational Performance (CO-OP) is a framework that uses compensatory strategies for improving functional skills in individuals with a variety of different conditions. Developed by Polatajko and Mandich in the early 1990’s for children with

Developmental Coordination Disorder, this framework utilizes the Goal-Plan-Do-Check approach to improve performance of tasks (Dawson et al., 2009; Rodger & Brandenburg, 2009). It focuses on using verbal self-instruction to regulate behavior (Dawson et al., 2009). In CO-OP, the individual, in collaboration with the therapist, chooses meaningful goals to address in treatment. In each treatment session, the therapist guides the individual to discover and plan strategies to meet these goals. In each subsequent session, the individual checks if the plan was effective in achieving the goals, and if not, the individual is guided to change the plan of action. Using the Goal-Plan-Do-Check approach, the therapist engages the individual in a “guided discovery” that uses global and task-specific strategies to problem-solve the execution of a task (Dawson et al., 2009; McEwen, Polatajko, Huijbregts, & Ryan, 2010).

Studies have found that the CO-OP approach may be effective in facilitating improvement and inter-task transfer of functional skills in individuals with ABI (McEwen et al., 2010; Rodger & Brandenburg, 2009). In a study by McEwan et al. (2010), the effectiveness of the CO-OP approach was evaluated in individuals with chronic CVA. The study was a multiple single case experimental design that involved three participants with chronic CVA. The participants chose four functional goals, three of which were trained using CO-OP and one was not. After a 10-session intervention using CO-OP’s Goal-Plan-Do-Check strategy, performance of both trained and untrained tasks showed improvement, indicating inter-task transfer of skills (McEwan et al., 2010).

In a similar study by Rodger & Brandenburg (2009), a multiple single case experiment explored the effectiveness of CO-OP in promoting generalization of functional skills in individuals with moderate-to-severe TBI. Three participants self-selected three functional goals that were trained using CO-OP and one to three goals that were not addressed in the

intervention. Both the participants and their significant others rated the performance of the selected goals. After a 20-session intervention, participants and their significant others noticed improvement in performance in the majority of these goals. The study found improved ratings of both trained and untrained goals after intervention (Rodger & Brandenburg, 2009).

The CO-OP approach is a promising occupational therapy intervention for individuals with ABI. This intervention has been shown to facilitate inter-task transfer of skills (Dawson et al., 2009; Rodger & Brandenburg, 2009). However, further research with a larger sample is warranted as there are currently only a few studies, all of which are case studies that have investigated this approach in individuals with ABI.

Multicontext approach

The multicontext approach facilitates generalization of cognitive strategies to increase functional independence in individuals with ABI. This treatment approach was developed by Joan Toglia and is based on cognitive psychology research in learning (Toglia, 1991). Generalization is the ability to transfer skills and strategies learned in one context, such as within treatment sessions, to various novel situations and environments (Toglia, 1991). The multicontext approach supports generalization by incorporating opportunities to practice transferring learned skills throughout the intervention process (Toglia, 1991; Toglia, Johnston, Goverover, & Dain, 2010).

The multicontext approach includes many components such as gradually grading activities, improving the individual's metacognitive skills, and developing the individual's ability to generate cognitive strategies (Toglia et al., 2010). In the multicontext approach, individuals practice a cognitive strategy through a directed activity. The therapist facilitates generalization by systematically and gradually modifying the parameters of subsequent activities, providing

opportunities for individuals to practice transferring the strategy to increasingly different activities and situations (Toglia, 1991). However, in order for individuals to accurately determine if a particular cognitive strategy is appropriate or not, they must have awareness of their cognitive abilities and be able to monitor their performance on the activity. The therapist facilitates improving these metacognitive skills – self-awareness and self-monitoring – through a series of questions. For instance, to calibrate their self-awareness skills, the therapist will ask individuals to predict their performance before an activity then compare it to actual performance afterward (Toglia, 1991). Lastly, the therapist encourages individuals to generate strategies by cueing them to similarities between new and old situations (Toglia et al., 2010).

The multicontext approach has been used in conjunction with other approaches or frames of reference (Zgaljardic, Yancy, Levinson, Morales, & Masel, 2011; Zlotnik, Sachs, Rosenblum, Shpasser, & Josman, 2009). However, only two studies have implemented all components of the multicontext approach, while a third paper was a case study of a participant from one of the aforementioned studies (Landa-Gonzalez, 2001; Toglia et al., 2010; Toglia, Rodger, & Polatajko, 2012). Using a single-subject design with repeated measures, Toglia et al. (2010) demonstrated the effectiveness of the multicontext approach in facilitating transfer of a cognitive strategy. Four participants, ranging from three to five years post-TBI, received two 75-minute treatment sessions per week for six weeks. With each treatment session, participants engaged in progressively graded activities building upon the cognitive strategy of creating or following a list or plan. The study found that all participants improved in self-awareness, strategy generation, and accuracy in predicting performance. All but one participant continued to use the cognitive strategy four weeks later. The study also found that cueing participants to make connections

between old and new situations was required to increase generalization, or strategy use across situations (Toglia et al., 2010).

In the second study, a single case study by Landa-Gonzalez (2001), the researcher investigated the effectiveness of the multicontext approach in conjunction with an awareness training model that used strategies of repetition, feedback, self-rating, and prediction. The participant received one hour of occupational therapy and eight hours of life skills practice per week for six months. During sessions, the participant worked on strategies such as error detection to self-monitor, rating self to predict performance, and use lists to plan or organize. Progression of activities followed Toglia's (1991) systematic method of grading and included activities such as self-care, meal preparation, and community mobility. Over the course of the study, the participant demonstrated skill generalization and increased his independence in self-care, home management, and leisure (Landa-Gonzalez, 2001). As this case study demonstrates, transfer and generalization of learned skills plays a crucial role in increasing the independence and functional outcome for individuals with ABI.

Assessment

Assessments are vital in occupational therapy practice as they give occupational therapists a means of measuring the efficacy of an intervention. This is accomplished by providing occupational therapists with a baseline and outcome measures. There are a variety of assessments available to occupational therapists. When working with individuals with ABI, it is crucial to test cognition. Cognitive assessments typically measure the type and severity of cognitive deficits an individual is experiencing. In addition, cognitive assessments give occupational therapists an idea of how safely an individual can resume important life roles

following an ABI (Sansonetti & Hoffmann, 2013). For the purpose of the Bridge/Adapt program, it is necessary to measure any changes in cognition before and after the intervention.

Cognitive assessment. The Montreal Cognitive Assessment (MoCA) was originally developed as a screening tool for evaluating various aspects of cognition in individuals with mild cognitive impairments and was later applied for cognitive impairments following CVA (Wong et al., 2013). The MoCA has been proven effective in detecting cognitive impairments in individuals with CVA (Horstmann, Rizos, Rauch, Arden, & Veltkamp, 2014). The MoCA is a 30-item screen that covers various areas of cognition including memory, visuospatial abilities, language, executive function, attention, concentration, and orientation. The scores range from zero to 30 with a cut-off score of less than 26 indicating cognitive impairment (Horstmann et al., 2014). In another study, the validity of the MoCA was tested against the Mini-Mental State Exam (MMSE) in a two-session study involving 60 participants who were three months post-CVA. Two researchers visited each participant in their place of residence twice, one week apart, and administered the MoCA and MMSE. The results of the study indicated that the MoCA may be a more sensitive tool and suggested a greater predictive sensitivity for cognitive impairments than the MMSE for individuals with ABI (Cumming, Churilov, Linden, & Bernhardt, 2013). While effective, the MoCA is only a screen tool to indicate impairment, but it lacks the ability to measure severity of impairment.

In addition to the MoCA, the Neurobehavioral Cognitive Status Examination (Cognistat) is a cognitive assessment that can be used to assess cognition in individuals with ABI. Cognistat assesses five major cognitive areas: language, spatial skills, memory, calculations, and reasoning. Language contains four subsections: spontaneous speech, comprehension, repetition, and naming. Reasoning has two subsections: similarities and judgement (Mueller & Dollaghan,

2013). Unlike the MoCA, Cognistat does not assess areas of executive functioning. Cognistat is comprised of both screen and metric items. Failure on the screen does not imply abnormality. However, if the individual passes the screen, no further testing with the corresponding metric items is performed in that section as the ability involved is assumed normal. The metric is a series of test items that further build upon the areas of cognition previously tested by screen items (Mueller & Dollaghan, 2013). Cognistat is an assessment that may be used to measure changes in cognition, allowing for the quantification of the effectiveness of an intervention.

In a study by Drane et al. (2003) the effectiveness of the MMSE was compared to Cognistat. The participants, 180 healthy older adults between the ages of 60 and 96 years, participated in a comprehensive neuropsychological normative project. Participants were excluded for any existing physical or neurological conditions. Cognistat and the MMSE were individually administered in a counterbalanced sequence as part of a battery of neuropsychological measures comprising the study. Results indicated that Cognistat may be sensitive to normal aging and promises greater sensitivity to the impact of age than the commonly employed MMSE. This study noted that Cognistat includes a lengthier period of delay and presentation of more distractor items, which likely makes it more sensitive than the MMSE to detect memory dysfunction (Drane et al., 2003). Inclusion screening for the Bridge/Adapt program was based on memory and attention subtest scores of Cognistat, making it an effective tool to use for screening in the current study on the Bridge/Adapt program.

Furthermore, a study done by Nøkleby et al. (2008) assessed the validity of three screening tests for cognitive impairments after stroke. Nøkleby et al. (2008) concluded that Cognistat had the highest level of sensitivity in detecting deficits in any domain. Forty-nine stroke patients, aged 25 to 91 years old, were included from two stroke rehabilitation units in

Norway. Cognistat, the Screening Instrument for Neuropsychological Impairment in Stroke (SINS), and the Clock Drawing Test were administered by physicians, psychology students or psychologists in randomized order. For each participant, the same tester administered all three tests in one session. The results showed that the composite scores of Cognistat, when compared to the other two tests, indicated far greater sensitivity at a 95% confidence interval. Cognistat can be used for the detection of focal cognitive deficits after a stroke. Lastly, the researchers concluded that Cognistat was an effective screening tool with stroke patients, but it should be followed up with a full neuropsychological assessment (Nøkleby et al., 2008). The conclusions of the study confirm the validity of Cognistat as a screening tool for use in this current study.

Ecologically-valid assessment. A primary objective of occupational therapy is to enable individuals to function in daily life as independently as possible. Ecologically-valid assessments can measure the effectiveness of an intervention in respect to functional performance. The Multiple Errands Test and the Neuropsychological Assessment Battery are examples of ecologically-valid assessments utilized to predict an individual's performance in real-life community-based situations.

In a study done by Sansonetti and Hoffmann (2013), 209 Australian occupational therapists reported that occupational performance-based assessments were ranked as the most important assessment method, with 69% of the therapist using these assessments for more than 75% of their clients with cognitive impairments. Challenges identified with using cognitive screens and batteries included linking assessment results to occupational performance and difficulties using results to generate intervention strategies (Sansonetti & Hoffmann, 2013). This study concluded that a combined assessment approach, which includes a performance-based

assessment, allows the occupational therapist to develop the most effective intervention possible on an individual basis.

Potvin, Rouleau, Charbonneau, and Giguere (2011) evaluated the validity of an ecologically-based test with individuals that had sustained a moderate to severe TBI. The test targeted prospective memory impairments, which are crucial for daily function and are often observed following a TBI. Potvin et al. (2011) developed an ecologically-based test because few sensitive, validated tests are available. A group of 30 participants (12 females and 18 males) was selected among patients who were treated for moderate-to-severe TBI at a hospital in Montreal in the last 10 years (Potvin et al, 2011). A comparison group of 15 healthy adults, matching in age, sex and education were recruited within the community. The *Test ecologique de memoire prospective* (TEMP) is a 20-minute movie in which prospective memory is tested when participants drive around a virtual city and perform ten event-based tasks and five time-based tasks. When the movie was over, a questionnaire with forced-choice and multiple choice answers was given to the participants to recall the tasks. The control group outperformed the participants with TBI in all tasks and when results were compared to additional neurological tests that were given, the test outcomes were found to be highly correlated (Potvin et al. 2011). The performance on the TEMP also strongly paralleled the level of performance in daily life, illustrating that a designed ecologically-based test can be a valid measure of functional performance.

An area of cognition that is necessary for functional performance is the ability to read and apply written information. One ecologically-valid assessment that can measure this area of cognition is the medication box assessment. The medication box assessment was designed to assess an individual's ability to attend, recall, and apply written information to perform the task

of medication management (Li et al., 2015). In the medication box assessment, the participant is given five prescription medication bottles with beads of various colors that correlate to simulated medications. The participant is also given two medication boxes, one labeled “morning” and the other labeled “evening.” The participant is then given verbal instructions to read the written instructions and sort the medication accordingly. Additionally, the medication box assessment incorporated random distractors to provide additional challenges. Upon completion of the task, the number of correct compartments of the medication boxes is then recorded and an overall score is derived (Li et al., 2015). The medication box assessment has not been validated with any population, but it has been administered in a previous study with individuals with ABI (Li et al., 2015).

Outcome measure. The Goal Attainment Scaling (GAS) is a valuable tool for evaluating outcomes, as it allows occupational therapists to quantify and measure changes towards an individual’s personal goals (Krasny-Pacini, Hiebel, Pauly, Godon, & Chevignard, 2013). The original method consisted of a 5-point scale, where zero is the expected level of achievement. Scores of +1 and +2 respectively indicate “a little” or “a lot” better than expected. Likewise, score of -1 and -2 respectively indicate “a little” and “a lot” less than expected (Turner-Stokes & Williams, 2010).

In a study of 243 patients with ABI (82%), spinal cord injuries (9%), and other neurological conditions (9%), two additional 6-point scales for the GAS were compared against the original 5-point scale (Turner-Stokes & Williams, 2010). The purpose of this study was to assess if adding additional points to the scale can improve the sensitivity of the GAS. Baseline for version one of the 6-point scale was set at -2, with partially achieved goals being allocated to -1, and goals that worsened being allocated -3. Baseline for version two of the 6-point scale was

set at -1, with -2 indicating “worse” than expected, and 0, +1, and +2 indicating as “expected”, “a little more”, and “a lot more”, respectively. Version two also introduces a -0.5, indicating “partially achieved”. The results indicated that both versions produced systematic bias in different directions, with version two overestimating the goal attainment, and version one underestimating the goal (Turner-Stokes & Williams, 2010). The addition of -0.5 scoring in version two allowed teams to record partial achievement while maintaining the -2 to +2 scaling of the original scale, which is advantageous for clinical use. However, for scientific use, the standard 5-point GAS is still more sensitive (Turner-Stokes & Williams, 2010).

There is an ever-growing need for occupational therapists to be able to measure cognitive changes between before and after intervention. Assessments enable occupational therapists to reliably evaluate the effectiveness of a particular intervention on an individual (Alotaibi, Reed, & Nadar, 2009). Ultimately, assessments determine whether an individual is able to resume premorbid activities or assume new roles and responsibilities, leading to improved quality of life (Mueller & Dollaghan, 2013).

Conclusion

Individuals with ABI often experience cognitive deficits that reduce their functional independence. To address these cognitive deficits, therapists utilize a variety of cognitive rehabilitation interventions. Many of these remedial and compensatory interventions have clinical evidence of effectiveness in improving either cognitive or functional skills.

Remedial interventions, such as CBCR, are based on neuroplasticity. They have been proven to improve cognitive skills but have yet to support the generalization of those skills into functional performance. Compensatory interventions, such as planners and group-based interventions, work around cognitive deficits to manage and re-enable functional

performance. The Bridge/Adapt program, a group-based curriculum combining remedial CBCR and compensatory approaches, aims to facilitate generalization of cognitive gains by incorporating the CO-OP and multicontext approach. However, the effectiveness of the program has yet to be proven.

The Bridge/Adapt Program

The Bridge/Adapt program is an eight-week program consisting of three main components: Bridge/Adapt modules, Parrot Software lessons, and homework. The Bridge/Adapt modules are weekly instructor-led group sessions in which participants learn and apply a new adaptive strategy while completing worksheets simulating IADL. Later in the week, during the Parrot Software lessons, participants complete a specific memory and attention lessons within the Parrot Software, an online CBCR program, which corresponds to that week's Bridge/Adapt module (Parrot Software, 2013). In the final component, homework, participants practice the adaptive strategies in their natural environment, at home, or in the community by applying the adaptive strategies to an activity that is selected at the beginning of the program.

Statement of Purpose

Individuals with ABI often experience deficits which impede their ability to perform daily activities and negatively affect their quality of life. Many cognitive interventions have proven effective in improving cognitive skills and strategies, but current evidence shows that what is learned is not generalized outside of the intervention. In other words, gains made through cognitive rehabilitation are not translating into functional independence in real world situations.

In a project by occupational therapy students at Dominican University of California, the Bridge/Adapt program was developed to be used alongside the Parrot Software, which combines compensatory and remedial approaches as a tool to promote generalization of learning (Bergen et

al. 2015). There is currently no research to support the effectiveness of the Bridge/Adapt program.

The purpose of this study was to determine the effectiveness of the Bridge/Adapt program in facilitating generalization of improved cognitive skills as measured by functional performance in individuals with ABI. The research question and hypotheses for this study were:

1. Will the Bridge/Adapt program facilitate generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance?
2. Null hypothesis: The Bridge/Adapt program will have no positive effect on generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance.
3. Alternative hypothesis: The Bridge/Adapt program will have a positive effect on generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance.

Definitions and Variables

Definitions

- Activities of daily living. Self-care tasks required for daily living, such as dressing, grooming, and hygiene; abbreviated as ADL (AOTA, 2014).
- Cognitive rehabilitation. Remediation or compensation of cognitive symptoms (Helmick, 2010).
- Computer-Based Cognitive Rehabilitation. Using a computer as an intervention tool for cognitive remediation; abbreviated as CBCR (Cha & Kim, 2013).
- Generalization. The transfer of a learned skill from one context to another context or novel situation (Toglia, 1991).

- Instrumental activities of daily living. Tasks required for daily living, such as financial management, home maintenance, and parenting; abbreviated as IADL (AOTA, 2014).
- Remedial approach. Approaches that use methods to train, practice, and stimulate one's impaired cognitive functions into recovery (Cha & Kim, 2013).

Variables

The independent variable of this study was the Bridge/Adapt program. The dependent variables were the participants' performance on the 2013 Cognistat Paper, the medication box assessment, and the goal attainment scaling.

Theoretical Framework

Developed by Winnie Dunn, Catana Brown, and Ann McGuigan in 1994, Ecology of Human Performance (EHP) explores the dynamic relationship among the three constructs of person, task, and context and how this interrelationship impacts human performance. The EHP model outlines guidelines and interventions intended to address variables in these three constructs to affect a change in performance. The five intervention alternatives proposed under this model include establish/restore, adapt/modify, alter, prevent, and create (Dunn, Brown, & McGuigan, 1994). The principles of the EHP model guided this research study. Using the model's intervention approaches to address variables in the person, task, and context, this study investigated the effectiveness of the Bridge/Adapt program in increasing performance range in individuals with ABI.

The EHP model consists of four constructs: person, context, task, and performance. According to the model, the interrelationship among person, task, and context helps understand or predict the fourth construct of performance. Person variables are features related to the individual and include the following: personal interests, experiences, sensorimotor, cognitive,

and psychosocial skills (Dunn, 2007). Task, meanwhile, is defined as an "objective set of behaviors" that an individual performs in order to accomplish goals (Dunn, 2007, p. 129). Examples of tasks include doing laundry, studying, cooking, driving, and managing medication. Unlike other models used in occupational therapy, the authors decided to use the word "task" instead of "occupation" to make the terminology universal and easily understood by other disciplines (Dunn, 2007). The third construct, which is the context or environment, includes physical, temporal, social, and cultural features. Examples of context are the individual's age, social groups, physical environment, and cultural influences. The model proposes that the interaction between person and context helps determine performance range or "the number and types of tasks available to the person" (Dunn, 2007, p. 128-129). For example, if the person variable such as cognitive skill is impaired, the individual's performance range decreases, limiting the number and variety of tasks that can be performed successfully. Similarly, performance range is reduced when the context poses barriers to engagement in participation.

The EHP model outlines five therapeutic interventions to guide occupational therapy practice: *establish/restore, adapt/modify, alter, prevent,* and *create*. The intervention of *establish/restore* focuses on teaching or improving the individual's skills and abilities. If the individual has not learned the skill, the therapist helps "establish" or teach it. On the other hand, if the individual has lost the skill or is having difficulty with a previously established skill, the therapist can help "restore" it in the individual (Dunn, 2007). The second intervention of *alter* focuses on the context. In this intervention, the right context is chosen for the individual. Features of the context are not modified to suit the individual; rather, the individual is placed in an already existing context that best matches the client's skills and abilities. This intervention changes neither the constructs of person nor task (Dunn et al., 1994). Unlike *alter*, in the third

intervention of *adapt/modify,* features related to the context or the task are changed. Components of the task or the environment are modified or adapted to support client participation within the context. In the fourth intervention of *prevent*, the goal is to change the outcome or course of events before the individual experiences the problem or difficulty (Dunn, 2007). The fifth intervention alternative of *create* provides an intervention that is applied in a larger context with the purpose of enhancing performance by facilitating enriching experiences (Dunn, Gilbert, & Parker, 1996). All five of these interventions address the complex relationship among person, context, and task to maximize performance range.

Two of the most common cognitive deficits associated with ABI are impaired attention and memory (Bartfai et al., 2014). As such, individuals with ABI often experience difficulty performing daily activities that require the use of these two cognitive domains (Twamley et al., 2014). As cognitive deficits impair performance of tasks, the individual's performance range decreases. According to EHP, decreased performance range limits the number of tasks that an individual can successfully perform (Dunn, 2007). Using this model's therapeutic intervention as guidance, this study utilized the establish/restore approach to address deficits in person variables of cognitive skills. The goal of the Parrot Software lessons was to restore or improve cognitive skills of attention and memory. The Bridge/Adapt modules, meanwhile, aimed to establish problem-solving skills that would facilitate generalization of the improved cognitive skills to functional performance. Using EHP's adapt/modify approach, the Bridge/Adapt modules taught adaptive strategies for planning the execution of a task within a given context. This may have included adapting or modifying properties of the environment and the task to achieve successful performance. The homework component of the program used both the adapt/modify and alter interventions. It encouraged the use of adaptive strategies to modify the

environment or task to optimize performance. The context in which the performance was completed was altered to be more realistic and therefore most suitable for successful performance. The homework provided the individual with the opportunity to practice the strategies in a naturalistic context, therefore increasing the likelihood of generalization. Employing the prevent intervention, the program utilized the goal-oriented attentional regulation approach. This approach aimed to improve client factors of attention and self-regulation skills to increase mindfulness and prevent distractions while performing a task. In addition, this study aimed to teach adaptive strategies to help participants re-engage in occupations and prevent cognitive decline.

The goal of the Bridge/Adapt program was to expand the individual's performance range by addressing variables related to the person, task, and context. While the Parrot Software lessons aimed to improve the client factors of cognitive skills, the Bridge/Adapt modules and homework intended to facilitate generalization of these skills to different functional tasks and contexts. Using EHP's intervention approaches, the Bridge/Adapt program aimed to optimize performance range, thus increasing the number of tasks that can be performed successfully in various contexts.

Ethical and Legal Considerations

Research approval was obtained prior to the beginning of the study by the Institutional Review Board for the Protection of Human Participants (IRBPHP) at Dominican University of California. Approval was given to conduct the study after it was determined that the researchers would protect the rights and well-being of all participants through upholding the regulations set forth by the IRBPHP (#10306). Consent was given by the Brain Injury Network of the Bay Area (BINBA) to use their facility for the study (Appendix A). Donation of the 2013 Cognistat

booklets and assessment forms to the occupational therapy department of Dominican University of California allowed for use of the assessment for this study (Appendix B). Consent was obtained from Parrot Software and a free six-month subscription was given for this study (Appendix C). Information regarding the medication box assessment used by the prior Dominican University of California research group was obtained. The medication box assessment was developed in a prior study in the Department of Occupational Therapy, Dominican University of California, to assess the generalization of skill with a real life functional performance. The researchers abided by the American Occupational Therapy Association Code of Ethics by upholding the principles of beneficence, nonmaleficence, social justice, autonomy, and confidentiality.

The principle of beneficence states that the researchers will protect the welfare and safety of all participants to ensure the participants' well-being (American Occupational Therapy Association [AOTA], 2015). The researchers attempted to maximize the potential benefits of the study, while minimizing any possible harm. Participants were informed and reminded that if they encountered any physical or psychological discomfort, they could take any needed breaks at any time or completely withdraw from the study. Participants were able to discontinue sessions if they felt any discomfort or harm from both the Bridge/Adapt modules and/or the Parrot Software lessons. Participants were given the option to make up Parrot Software lessons at another time and were allowed to take any breaks during sessions as needed. Research was conducted in an ethical manner in order to protect the safety of all participants. If any inappropriate conduct occurred, the researchers handled the situation immediately and reported the incident to the BINBA staff, the faculty advisor, and the IRBPHP.

Phone call reminders and printed schedules were provided to participants in order to alleviate possible anxiety due to a change in normal scheduling. Printed schedules with dates and times of all sessions were provided before the study began in order to allow participants to make necessary travel arrangements ahead of time. Researchers worked with the staff at BINBA in addressing any difficulties with transportation or scheduling to decrease attrition rates and increase participants' motivation to be involved in the study.

The principle of nonmaleficence prohibits researchers from allowing any harm, injury or wrongdoing to be inflicted on participants (AOTA, 2015). The participants were not forced to continue with the study if they felt harmed or if they felt uncomfortable. The participants were provided a safe environment at the BINBA during the study.

The principle of autonomy and confidentiality required the researchers to respect the rights of the participants' to assert their own free will and self-determination (AOTA, 2015). The researchers provided the participants and guardians with informed consent forms (Appendix D) and proxy consent forms (Appendix E), respectively, to verify that they were aware of the purpose and procedure of the study, the risks and benefits, and their right to withdraw at any time. To maintain confidentiality, the researchers respected the participants by keeping all verbal, nonverbal, written and electronic information confidential. After initial information was obtained, researchers used an identifying letter instead of the participant's names in all documentation for the duration of the study. Original identifying paperwork was kept in a locked drawer at the BINBA. Only the researchers, the faculty advisor, and one designated BINBA employee had access to the information. Any further data was kept in the locked drawer or on password-protected computer files of the researchers and the faculty advisor's computer. All data collected will be destroyed one year after the completion of the study.

The principle of social justice requires the researchers to provide services in a fair and reasonable manner (AOTA, 2015). Participation was not denied to any participants that qualified for the study. For those individuals that did not qualify for the study, information was provided on how to utilize the Parrot Software for a free trial period. Referral to the BINBA coordinator of programs or to the facility director of resources was given if individuals needed further direction.

Methodology

Design

This study used a quasi-experimental single group pretest-posttest design. The purpose of the study was to determine the effectiveness of the Bridge/Adapt program in facilitating generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance. The Bridge/Adapt program was an eight-week program consisting of three main components. Each week, participants practiced a new cognitive strategy by participating in a Bridge/Adapt module, an instructor-led group curriculum; completing a Parrot Software lesson on memory or attention; and completing homework. The first two components of the Bridge/Adapt program, the Bridge/Adapt modules, and Parrot Software lessons took place at the BINBA in a designated room and the facility's computer laboratory, respectively. The two components took approximately 75 minutes each per week, 60 minutes for the activity and 15 minutes for discussion afterward, and were scheduled on separate days. The participants participated in the Bridge/Adapt module prior to completing the corresponding Parrot Software lesson. Participants were instructed to complete their homework, practicing the weekly strategies at their place of residence and natural environment.

Before beginning the program, baseline measurements were taken. Participants were given a pretest assessing their memory, attention, and orientation using the 2013 Cognistat Paper assessment (Cognistat) and also a pretest of their functional performance using a performance-based medication box assessment (Appendix F). To control for bias, each researcher was trained in administering the Cognistat assessment and medication box assessment. In addition, during the first group session, participants set one personal goal each and, in collaboration with the researcher, self-rated his or her progress toward the goal on a 5-point scale following the goal attainment scale (GAS) (Appendix G). The effectiveness of the Bridge/Adapt program in facilitating generalization of improved cognitive skills was measured by the differences between pretest and posttest results. Upon the day of completion of the Bridge/Adapt program, researchers re-assessed the participants using the Cognistat, the medication box assessment posttest (Appendix H), and the GAS. Lastly, to assess if the treatment effects were maintained and generalized to their natural environment and context, the researchers re-assessed the participants using the GAS four months after completion of the Bridge/Adapt program by contacting participants via telephone.

Subjects

The study utilized a convenience sample of English-speaking adults over 18 years old with chronic ABI from the BINBA in Larkspur, California. The BINBA is a community-based, non-profit organization that provides a variety of classes, programs, and services to individuals with ABI and their families or caregivers. Programs and services offered by the organization include a day program, art therapy, individual therapeutic computer program (ITCP), counseling, support groups, and resource referral services (Brain Injury Network of the Bay Area [BINBA], 2013).

To qualify for the study, the participant must have had sustained a brain injury at least one year prior to the start of the study. The ABI could be caused by any of the following: TBI, CVA, infection, meningitis, hypoxia, anoxia, encephalopathy, or brain tumor. The participant must have had presented with mild to moderate cognitive deficits, as indicated by scores of 9 or lower in memory or 5 or lower in attention, and a score of 10 or higher in orientation on the 2013 Cognistat assessment. In addition, the individual must have scored less than 14 on the medication box assessment. Participants were required to either be able to legally give consent or consent was obtained from the participant's legal guardian or conservator prior to the beginning of the study. Exclusion criteria for participation included diagnosis of a neurodegenerative condition. Participants with impairments in visual and/or motor skills that prevented use of a computer and participants with speech impairments which prevented participation in group discussions during Bridge/Adapt modules and Parrot Software lessons were excluded.

The recruitment period was from January 2015 to March 2015. Due to the nature of the Bridge/Adapt program, participants followed a specific weekly sequence and order of sessions. Once the study began and the Bridge/Adapt program started, no further participants were recruited. Therefore, recruitment targeted an array of individuals from the BINBA and utilized various methods to maximize the number of potential participants. With assistance from staff at the BINBA, researchers recruited participants by posting recruitment flyers (Appendix I) at the BINBA facility and sent the flyer through the BINBA email list. Researchers held information meetings at the BINBA explaining the study and qualifications to participate. The BINBA staff facilitated recruitment by informing individuals with ABI during the BINBA intake process and informing individuals on the BINBA waitlist. Furthermore, the BINBA staff offered

participation in the study as an alternative to the ITCP. The offer was extended to individuals who were interested in, were on the waitlist for, were between sessions of, or had completed the ITCP.

Data Collection Procedures

Individuals interested in participating in the study underwent a telephone screening (Appendix J). If individuals met inclusion criteria based on the screening, they were provided with a copy of the Research Participant's Bill of Rights (Appendix K), an informed consent form or proxy consent form if they had a legal guardian or conservator. The individuals met with one or two researchers to complete a demographic questionnaire (Appendix L). Next, the individuals completed the Cognistat. Participants whose performance on the assessment indicated mild to moderate impairments in memory (a score of 9 or lower) or attention (a score of 5 of lower) and average orientation (a score of 10 or higher) were given the medication box assessment. Participants who demonstrated deficits in functional performance on the medication box assessment (a score of 13 or lower) were included in the study.

2013 Cognistat Paper assessment. Cognistat is a standardized assessment that assesses cognitive functioning in the levels of consciousness, orientation, and attention, as well as abilities in language, spatial skills, memory, calculations, and reasoning. The assessment was used to assess the degree of impairment in memory and attention in this study's participants. The researchers used the 2013 paper format of the Cognistat assessment, which Cognistat donated to the Department of Occupational Therapy at Dominican University of California.

Medication box assessment. The medication box assessment is a performance-based assessment designed to simulate medication self-management as a measure of attention and memory. During the assessment, participants were given verbal instructions to sort simulated

pills (differently-colored beads) from five target medication bottles into a medication organizer based on instructions on the medication bottle labels. The medication dosage instructions on the labels varied based on time of day (i.e. to take in the morning or evening), frequency per day, and frequency per week. In addition, over-the-counter medication bottles filled with simulated pills served as distractors during the assessment and were mixed amongst the aforementioned five target medication bottles. The number of distractors in each assessment, between zero to five, was determined at random by rolling a six-sided die before the medication box assessment began. For this study, the medication box assessment was administered twice: as a pretest upon recruitment and as a posttest upon completion of the Bridge/Adapt program. Former students from the Department of Occupational Therapy at Dominican University of California (Li et al., 2015) developed the medication box assessment, and the assessment is a property of the Department of Occupational Therapy at the university.

Goal attainment scaling. The GAS is a highly individualized tool for assessing an individual's outcomes. The goals for the GAS are set by the individual according to his or her priorities. The scoring for this measure is based on a symmetrical 5-point scale, ranging from -2 through +2 (Turner-Stokes & Williams, 2010). For this study, the participants each created a goal and both the participants and the caregivers rated on the 5-point scale prior to beginning the program. The participants and caregivers rated again within a week following the completion of the program and in a four-month follow-up.

Bridge/Adapt modules. The Bridge/Adapt modules are a systematic adaptive skills training curriculum designed to facilitate generalization of functional skills in individuals with ABI. It was developed by occupational therapy students Bergen et al. (2015) at Dominican University of California as part of a master's capstone project. The Bridge/Adapt modules are

designed to be used alongside the Parrot Software lessons. In the current study, for eight weeks, participants attended weekly instructor-led group sessions focused on learning and applying a new adaptive strategy (e.g. visual scanning) while completing one of the three simulated IADL – bill paying, shopping, or scheduling appointments. Afterward, participants completed the corresponding Parrot Software lesson and practiced the new adaptive strategy at home by completing their homework.

Parrot Software lessons. Parrot Software is a commercially-available, Internet-based, interactive CBCR program with lessons to address deficits in attention, memory, speech, cognition, and language (Parrot Software, 2013). A free six-month subscription to use Parrot Software was granted by Dr. Fredrick Weiner, the developer of the software. The selection and sequence of lessons used within this study followed the Bridge/Adapt program curriculum. Participants accessed the program from the computer laboratory at the BINBA, and researchers kept a log to track participants' progress on the lessons (Appendix M). Participants completed eight memory and attention lessons: *Attention Perception and Discrimination, Auditory and Visual Instructions, Concentration, Remembering Visual Patterns, Remembering Written Directions, Remembering Written Letters, Remembering Written Numbers, and Visual Attention Training*. Each lesson had sub-lessons with varying levels of difficulty. Participants used the assigned lesson for 60 minutes each week. Participants who completed the lesson before 60 minutes reviewed their progress with the researchers, and they were encouraged to re-attempt lower scoring sub-lessons to improve their score or time.

Results

A total of 13 individuals were screened for inclusion in the study and five met inclusion criteria. Two participants dropped out before the intervention began – one due to

communication difficulties and the other due to a schedule conflict. The final sample (*N* = 3) was included in the data analysis (Table 1). The majority of participants were male (67%) with an average age of 71 years (*SD* = 4.04) and average years post-ABI of 8 (*SD* = 7.09).

Table 1. *Participant Demographics*

Participant	Age	Gender	Education level	ABI Type	Years post-ABI	CBCR experience
A	67	M	College	Hypoxia	7 years	Luminosity, Neuropsych Online
B	70	F	College	TBI	16 years	Luminosity
C	75	M	Doctorate	TBI	2 years	None

Table 2. *Pretest and Posttest Scores for Overall Cognistat, Attention, and Memory*

	Overall Cognistat Score			Attention			Memory		
Participant	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff.
A	54	62	+8	8	8	0	4	6	+2
B	58	65	+7	6	8	+2	4	7	+3
C	72	79	+7	8	7	-1	7	11	+4

Note: Pre=Pretest; Post=Posttest; Diff=Difference between pretest and posttest

Table 3. *Pretest and Posttest Scores for Medication Box Assessment*

Participant	Med Box Pretest	Med Box Posttest (≤ 1 week follow-up)
A	0	0
B	0	14
C	0	0

Note: Med Box = Medication Box Assessment

Table 4. *Pretest and Posttest Scores for Goal Attainment Scale*

Participant	GAS Pretest	GAS Posttest 1 (≤ 1 week follow-up)	GAS Posttest 2 (4-month follow-up)
A	0	+2	+2
B	0	0	+2
C	0	+2	+2

Table 5. *Client Factors*

Participant	Attention to Task	Active Participation Level	Application of Cognitive Strategies	Social Support
A	Minimum	Moderate	No	Paid caregiver present at all sessions; caregiver provided minimal assistance
B	Maximum	High	Yes	No additional support at sessions
C	Maximum	High	Yes	Non-paid caregiver present at all sessions; caregiver provided moderate assistance

Data Analysis

Two sets of pretest and posttest data were collected for each participant during the course of this study: memory and attention scores from Cognistat, scores of performance on the medication box assessment, and scores from the GAS. Another GAS posttest was collected in a four-month follow-up in September 2015.

All participants improved their memory score from the Cognistat assessment from pretest to posttest (Table 2). Change in performance on attention in the Cognistat assessment varied. One participant improved, one had no change, and another slightly declined in performance

(Table 2). Overall performance on the Cognistat assessment improved from a pretest mean of 61.33 to a posttest mean of 68.67 (Table 2). In the posttest assessment, within one week post-intervention, one out of three participants improved on the medication box assessment (Table 3). Within 1 week after intervention concluded, two out of three participants self-rated as having exceeded their goal on the GAS (Table 4). In the follow-up four months after completion of the program, all participants self-rated as having exceeded their goal on the GAS (Table 4).

Discussion, Limitations, and Recommendations

Discussion

Our study sought to answer the research question: Will the Bridge/Adapt program facilitate generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance? The null hypothesis was: The Bridge/Adapt program will have no positive effect on generalization of improved cognitive skills in memory and attention in individuals with ABI by measuring functional performance. Three participants were included in the final data analysis of the study. Each participant completed eight 75-minute Bridge/Adapt modules and eight Parrot Software lessons that specifically addressed attention and memory. The researchers utilized the Cognistat assessment to measure overall cognition, specifically the attention and memory subtests. In addition, the researchers used a performance-based medication box assessment to measure the participants' ability to generalize gained cognitive skills. A functional goal was set at start of the study and self-evaluation using GAS was administered to analyze the effects of the intervention on goal attainment. Participants attended all sessions and completed all work assigned during Bridge/Adapt modules and Parrot Software lessons. Due to small sample size, inferential statistics could not be applied. Therefore,

no definitive conclusions can be inferred from the data. As such, the null hypothesis can neither be accepted nor rejected.

However, results revealed that there was an increase in overall cognition and memory in all three of the participants. Scores on attention varied with only one participant showing improvement in this skill. Results from this study corroborate previous findings that CBCR, such as the Parrot Software, may be effective in improving memory and overall cognition in individuals with ABI (Li et al., 2013; Li et al., 2015). Only one out of three participants improved performance on the medication box assessment, but, as the sample size was small, no definitive conclusion can be drawn about whether the Bridge/Adapt program was successful in facilitating generalization of improved cognitive skills to functional performance.

Performance of each participant during the study varied (Table 5). Participant A, a 67-year-old man seven years post-ABI, required maximum prompting to stay on task and apply the strategies. He received minimum support from a paid caregiver. Participant B, a 70-year-old woman 16 years post-TBI, independently applied strategies and maintained attention to task. She did not have any additional support. Participant C, a 75-year-old man two years post-TBI, also independently applied the strategies and maintained attention to task. Unlike Participant B, however, he had a non-paid caregiver who provided him with moderate support. The effect on participants' performance due to variations in external support must be considered. The level of assistance provided by caregivers may have impacted the participants' performance during the program.

There were several challenges that we encountered in implementing the program. First, it was difficult to establish a meaningful goal for each participant within the time constraints of the first session of the Bridge/Adapt module. In a group-based setting, there was not enough time in

one 75-minute session for researchers to meet at length with each participant to discuss and decide upon a meaningful goal. Being under pressure to generate a goal within the time allotted, the participants may not have had sufficient time to thoroughly think about a meaningful goal. In addition, our information about the participants was limited as it was the first session, so determining an appropriate goal for them was an issue. Second, homework completion was inconsistent. Although homework was assigned each week, participants often forgot to complete the assignment. It became apparent that caregivers needed to take a more active role in the process to remind and assist the participants to complete their homework and providing the "just-right challenge" by grading and fading support.

Two of three participants reported exceeding their goals on the GAS posttest within one week post-intervention. One of the participants reported remaining at baseline (a score of zero); however, this participant-rated score did not match the objective data observed by the researchers. Per the participant's GAS, having "exceeded goal" (a score of +2) was defined as being able to reply to an email via her handheld device, and baseline was defined as being able to operate her handheld device but not able to use the email application to send or reply to emails. Despite the participant's self-rated baseline score, the participant was able to reply to two emails the researchers sent to her prior to the first posttest assessment, with the email signature confirming the handheld device was used to compose the email replies. At the four-month follow-up, all participants reported exceeding their goals. However, these results cannot be definitively attributed to the Bridge/Adapt program as all three participants were non-compliant in attempting the majority of homework assignments, in which participants were supposed to practice applying the learned adaptive strategies to their personal goals.

Limitations

Limitations existed within all phases of the study that impacted ability to generalize the study's results to broader populations, as well as reduced the inferences that could be drawn. Due to the small sample size, the study had no statistical power. Consequently, the results of the study may not reflect the true effects of the intervention, the Bridge/Adapt program. The study used a single-group design, and, without a control group, the researchers were unable to determine if the results directly resulted from the intervention, short-term maturation effects such as mood or fatigue, or other extraneous variables.

In the recruitment phase of the study, the study was vulnerable to selection bias or sampling error due to convenience sampling, and the results may not have been representative of the broader population. Researchers used a convenience sample, recruiting through a brain injury support organization local to the university, due to limited resources and time frame available to the researchers. Participants were recruited from a county with a higher than state average number of residents aged 65 years or older (United States Census Bureau, 2015). Inclusion criteria were mild to moderate cognitive impairment and chronic ABI as defined by at least one year post-injury. Due to the aforementioned recruitment factors, the participants recruited fell within an older age range, between 65-75 years old, and the majority were many years post-injury. All these factors may have introduced significant extraneous factors of age-related life roles and established routines. Therefore, the combination of sampling method, location, and inclusion criteria may have resulted in a sample that was not well-matched to the design of the Bridge/Adapt curriculum.

Older adults often experience changing life roles and a natural reduction in daily responsibilities, especially IADLs, during that life stage. For instance, parenting demands have

decreased as the children have grown into independent adults. Role reversal may now exist, with the adult children aiding their aging parents with home management and maintenance activities. Also, individuals with chronic ABI are more likely to have established support systems, catalyzed by their initial injury, such as paid caregivers or non-paid caregivers such as family and relatives. Therefore, older adults may have less of a need to independently complete IADLs, and the participants may have had less intrinsic motivation and engagement with the simulated IADLs within the Bridge/Adapt modules.

In the implementation phase of the study, the external support that the two caregivers provided to participants A and C were extraneous variables. The caregivers did not receive sufficient training on the process of scaffolding -- facilitating learning by grading and fading of external support to provide the "just-right challenge". As a result, one of the caregivers may have over-helped during multiple simulated IADLs in the Bridge/Adapt modules and the Parrot Software lessons, preventing Participant C from making mistakes and decreased opportunities for learning. The other caregiver had little interaction with Participant A during the program at the BINBA and provided intermittent and minimal support with verbal cues to stay on task. The impact of the external support the caregiver provided Participant A is undetermined due to its sporadic and varied nature.

The group nature of the Bridge/Adapt module and the Parrot Software lessons decreased the ability of the researchers to provide the individualized attention and scaffolding necessary to address the unique needs and deficits of each participant. Due to time constraints each Bridge/Adapt module, the adaptive strategy was introduced with a description and demonstration before giving participants the opportunity to practice applying the strategy with the simulated IADL. After discussion, participants were assigned homework to apply the strategy in their

natural setting. However, not enough time was allotted within the curriculum to more thoroughly instruct or guide the participants in how to apply the adaptive strategy to their personal goals.

The analog style of the simulated IADLs within the Bridge/Adapt module was not aligned with some participants' lifestyles due to current technological advances, which may have decreased the effectiveness of the intervention. An example of a simulated IADL within the Bridge/Adapt module included referencing a paper bus schedule to determine the correct route and time to board the bus in order to arrive at an appointment at a designated time. However, technology such as on-demand transportation services via widely available smartphone applications and alternative modes of transportation like local door-to-door paratransit which can be scheduled with a telephone call have greatly simplified and increased the convenience and speed of accomplishing the same IADLs. As a result, the participants may have found the simulated IADLs cumbersome and not meaningful or necessary. Therefore, with decreased intrinsic motivation and engagement from the participants, the effectiveness of the intervention may have been reduced.

The Parrot Software lessons were not graded sufficiently to provide the "just-right challenge" for many of the participants. In particular, almost all the participants stated it was too easy in one of the lessons, and they found it difficult to maintain the motivation necessary to persist with a task they had already mastered. During implementation of the study, two of the Parrot Software lessons were switched in sequence. The implementation error resulted in two Parrot Software lessons not corresponding to the adaptive strategies learned earlier in the week, resulting in a threat to the internal validity of the study that may have affected the participants' outcomes.

Several limitations within the environment were present during the implementation of the study. The BINBA as a testing and intervention site was not ideal. Despite researchers' best efforts to minimize distractions, the environment at the BINBA was at times visually and auditorily distracting with other programming in adjacent rooms or meetings running concurrently. In addition, one participant's final Parrot Software lesson and post-intervention assessments were performed at her place of residence, rather than at the BINBA, due to the participant's inability to travel to the study site. As the implementation and posttest assessment locations were not consistent across all participants and all sessions, the internal validity of the study was weakened due to the location threat.

In designing the study, the researchers wanted to utilize a novel, ecologically-valid, and performance-based assessment to measure generalization of increased cognitive skills, so the researchers used the medication box assessment that was developed by the prior research team at Dominican University of California. The results from the assessment, a potential score ranging from zero to 14 representing the correct number of medication times accurately filled, does not account for the wide spectrum of functional deficits that individuals with ABI may demonstrate. The medication box assessment had not been validated or undergone reliability testing with the ABI population prior to data collection. Therefore, the assessment lacked content validity and external validity. Whether the medication box assessment is an accurate measure of improved cognitive skill generalization remains to be seen.

Recommendations

Based on the results from this study, the Bridge/Adapt program may be more effective as an individualized intervention, rather than a group-based intervention, as each participant requires a different level of assistance. With a wide range of symptoms presentation, individuals

with ABI require individualized instruction tailored to address their cognitive deficits. In a one-to-one session, the therapist may be able to better grade the activity to match the participant's skills and focus on facilitating acquisition of the adaptive strategies. On the contrary, in a group setting, it is challenging to address the progressive needs of each participant. As participants were inconsistent with completing homework, strategies were not always practiced in the natural environment. In addition, we suggest that the family or caregivers should also be trained to be more involved in helping with homework completion. The participant and his or her family or caregivers should be educated on the importance of completing homework to facilitate skill generalization. A structured schedule to be given to the family may minimize the lack of homework completion and the gap in application of strategies between sessions. Similarly, during the initial meeting, it is likewise crucial to provide education to family and caregivers about the importance of providing the "just right challenge" and avoid "over-helping". Family and caregivers need to understand that giving the just right amount of external support would facilitate guided discovery learning.

To help in determining meaningful personal goals for participants, an additional assessment such as Canadian Occupational Performance Measure (COPM) could be administered during one-to-one session before the start of the program. Involvement of the family or caregivers is recommended in determining personal goals to encourage their active participation in the process. From the results of COPM, a list of the participants' meaningful and important occupations could be generated. We recommend to use these client-centered occupations, instead of predetermined, simulated activities, when practicing the strategies introduced in the Bridge/Adapt module. Generalization is more likely to occur with task-specific training (McEwan et al., 2010).

Moreover, the program may be more effective in a subacute setting with younger participants. Younger participants are more likely to be more receptive to learning new strategies and motivated to return to previous life roles and occupations. At this subacute recovery phase, individuals with ABI are re-establishing habits and routines, making it an ideal time to integrate new strategies.

Finally, we recommend furnishing participants with a handout describing each module's adaptive strategy and a written step-by-step instruction for the activity. Participants expressed that the strategies and module activities were at times difficult to understand. Having a handout for reference would make it easier for participants to follow along.

Conclusion

Generalization of cognitive skill to functional skill is essential for improving the quality of life for individuals with ABI. Deficits in cognitive skills, such as attention and memory, impact the ability of individuals with ABI to perform IADLs. While previous studies have found that CBCR is effective in improving cognitive skills, there is no evidence that this generalizes into functional performance in individuals with ABI. The Bridge/Adapt program was developed to bridge the gap between improvement in cognitive skills and functional performance by combining CBCR with compensatory interventions. This pilot study investigated the effectiveness of the Bridge/Adapt program in facilitating generalization of improved cognitive skills as measured by functional performance in individuals with ABI. The results of the pilot study corroborated findings from previous studies: CBCR programs, such as the Parrot Software, may improve memory and may be an effective form of cognitive remediation. Due to the small sample size, the study did not yield conclusive results regarding Bridge/Adapt's effectiveness in facilitating generalization of improved cognitive skills. In addition, future researchers should

consider the influence of participants' performance patterns and external support on cognitive skill generalization. To increase likelihood of generalization, future researchers should also consider implementing our recommendations to modify the Bridge/Adapt program.

References

Allott, K. A., Francey, S. M., & Velligan, D. I. (2013). Improving functional outcome using compensatory strategies in comorbid intellectual disability and psychosis: A case study. *American Journal of Psychiatric Rehabilitation, 16*(1), 50-65. doi:10.1080/15487768.2013.762306

Alotaibi, N. M., Reed, K., & Nadar, M. S. (2009). Assessments used in occupational therapy practice: An exploratory study. *Occupational Therapy in Health Care, 23*(4), 302-318. doi:10.3109/07380570903222583

American Occupational Therapy Association. (2015). Occupational therapy code of ethics (2015). *American Journal of Occupational Therapy*, *69*(Suppl. 3), 6913410030. doi:10.5014/ajot.2015.696S03

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy, 68*(Suppl. 1), S1-S48. doi:10.5014/ajot.2014.682006

Bartfai, A., Markovic, G., Landahl, K. S., & Schult, M. (2014). The protocol and design of a randomised controlled study on training of attention within the first year after acquired brain injury. *BMC Neurology, 14*(1), 1-19. doi:10.1186/1471-2377-14-102

Bergen, J.S, Repin, N., Bennet, A., & Lafrenz, A. (2015). *Bridge/Adapt: A systematic cognitive rehabilitation curriculum.* (Master's thesis). Retrieved from http://scholar.dominican.edu/masters-theses/141/

Berlucchi, G. (2011). Brain plasticity and cognitive neurorehabilitation. *Neuropsychological Rehabilitation, 21*(5), 560-578. doi:10.1080/09602011.2011.573255

Bertisch, H. C., Long, C., Langenbahn, D. M., Rath, J. F., Diller, L., & Ashman, T. (2013). Anxiety as a primary predictor of functional impairment after acquired brain injury: A brief report. *Rehabilitation Psychology, 58*(4), 429-435. doi:10.1037/a0034554

Brands, I. H., Köhler, S., Stapert, S. Z., Wade, D. T., & van Heugten, C. M. (2014). Psychometric properties of the coping inventory for stressful situations (CISS) in patients with acquired brain injury. *Psychological Assessment, 26*(3), 848-856. doi:10.1037/a0036275

Brain Injury Network of the Bay Area. (2013, September 11) Current Services. Retrieved from http://www.www.binba.org/current-services

Centers for Disease Control and Prevention. (2014a) Stroke. Retrieved from http://www.cdc.gov/stroke

Centers for Disease Control and Prevention. (2014b) Rates of TBI-related Hospitalizations by Age Group – United States 2001-2010. Retrieved from http://www.cdc.gov/traumaticbraininjury/data/rates_hosp_byage.html

Cha, Y., & Kim, H. (2013). Effect of computer-based cognitive rehabilitation (CBCR) for people with stroke: A systematic review and meta-analysis. *Neurorehabilitation, 32*(2), 359-368. doi:10.3233/NRE-130856

Chen, H., Epstein, J., & Stern, E. (2010). Neural plasticity after acquired brain injury: Evidence from functional neuroimaging. *PM & R: Journal of Injury, Function & Rehabilitation, 2*(12), S306-12.

Cicerone, K. D., Dahlberg, C., Kalmar, K., Langenbahn, D. M., Malec, J. F., Bergquist, T. F., . . . Morse, P. A. (2000). Evidence-based cognitive rehabilitation: Recommendations for clinical practice. *Archives of Physical Medicine & Rehabilitation, 81*(12), 1596-1615.

Cicerone, K. D., Dahlberg, C., Malec, J. F., Langenbahn, D. M., Felicetti, T., Kneipp, S., . . . Catanese, J. (2005). Review article: Evidence-based cognitive rehabilitation: Updated review of the literature from 1998 through 2002. *Archives of Physical Medicine and Rehabilitation, 86*, 1681-1692. doi:10.1016/j.apmr.2005.03.024

Cicerone, K. D., Langenbahn, D. M., Braden, C., Malec, J. F., Kalmar, K., Fraas, M., . . . Ashman, T. (2011). Review article (meta-analysis): Evidence-based cognitive rehabilitation: Updated review of the literature from 2003 through 2008. *Archives of Physical Medicine and Rehabilitation, 92*, 519-530. doi:10.1016/j.apmr.2010.11.015

Cumming, T. B., Churilov, L., Linden, T., & Bernhardt, J. (2013). Montreal Cognitive Assessment and Mini-Mental State Examination are both valid cognitive tools in stroke. *Acta Neurologica Scandinavica, 128*(2), 122-129. doi:10.1111/ane.12084

Dams-O'Connor, K., & Gordon, W. A. (2010). Role and impact of cognitive rehabilitation. *Psychiatric Clinics of North America, 33*, 893-904. doi:10.1016/j.psc.2010.08.002

Dawson, D. R., Gaya, A., Hunt, A., Levine, B., Lemsky, C., & Polatajko, H. J. (2009). Using the cognitive orientation to occupational performance (CO-OP) with adults with executive dysfunction following traumatic brain injury. *Canadian Journal of Occupational Therapy / Revue Canadienne D'Ergothérapie, 76*(2), 115-127. doi:10.1177/000841740907600209

Drane, D. L., Yuspeh, R. L., Huthwaite, J. S., Klinger, L. K., Foster, L. M., Mrazik, M., & Axelrod, B. N. (2003). Healthy Older Adult Performance on A Modified Version of the Cognistat (NCSE): Demographic Issues and Preliminary Normative Data. *Journal Of Clinical & Experimental Neuropsychology*, *25*(1), 133.

Duffau, H. (2006). Review: Brain plasticity: From pathophysiological mechanisms to therapeutic applications. *Journal of Clinical Neuroscience, 13*, 885-897. doi:10.1016/j.jocn.2005.11.045

Dunn, W. (2007). Ecology of Human Performance Model. In S. B. Dunbar (Ed.), *Occupational Therapy Models for Intervention with Children and Families* (pp. 127-155). Thorofare, NJ: SLACK Incorporated.

Dunn, W., Brown, C., & McGuigan, A. (1994). The ecology of human performance: A framework for considering the effect of context. *American Journal of Occupational Therapy, 48*(7), 595-607.

Dunn, W., Gilbert, M. P., & Parker, K. (1996, September). *The Ecology of Human Performance Framework: A model for identifying and designing appropriate accomodations for adult learners.* Paper presented at the National Association for Adults with Special Needs*,* New Orleans, LA. Retrieved from http://files.eric.ed.gov/fulltext/ED461192.pdf

Ehlhardt, L. A., Sohlberg, M. M., Glang, A., & Albin, R. (2005). TEACH-M: A pilot study evaluating an instructional sequence for persons with impaired memory and executive functions. *Brain Injury, 19*(8), 569-583. doi:10.1080/02699050400013550

Elgamal, S., McKinnon, M. C., Ramakrishnan, K., Joffe, R. T., & Macqueen, G. (2007). Successful computer-assisted cognitive remediation therapy in patients with unipolar depression: A proof of principle study. *Psychological Medicine, 37*(9), 1229-1238.

Helmick, K. (2010). Cognitive rehabilitation for military personnel with mild traumatic brain injury and chronic post-concussional disorder: results of April 2009 consensus conference. *Neurorehabilitation*, *26*(3), 239-255. doi:10.3233/NRE-2010-0560

Horstmann, S., Rizos, T., Rauch, G., Arden, C., & Veltkamp, R. (2014). Feasibility of the Montreal Cognitive Assessment in acute stroke patients. *European Journal of Neurology, 21*(11), 1387-1393. doi:10.1111/ene.12505

Huckans, M., Pavawalla, S., Demadura, T., Kolessar, M., Seelye, A., Roost, N., . . . Storzbach, D. (2010). A pilot study examining effects of group-based cognitive strategy training treatment on self-reported cognitive problems, psychiatric symptoms, functioning, and compensatory strategy use in OIF/OEF combat veterans with persistent mild cognitive disorder and history of traumatic brain injury. *Journal of Rehabilitation Research & Development, 47*(1), 43-60. doi:10.1682/JRRD.2009.02.0019

Johansson, B., & Tornmalm, M. (2012). Working memory training for patients with acquired brain injury: Effects in daily life. *Scandinavian Journal of Occupational Therapy, 19*(2), 176-183. doi:10.3109/11038128.2011.603352

Kearney, P.M. (2014). Stroke: Frameworks for understanding. part 1. *Journal of the Australasian Rehabilitation Nurses' Association (JARNA), 17*(1), 8-13.

Kim, Y., Yoo, W., Ko, M., Park, C., Kim, S. T., & Na, D. L. (2009). Plasticity of the attentional network after brain injury and cognitive rehabilitation. *Neurorehabilitation & Neural Repair, 23*(5), 468-477. doi:10.1177/1545968308328728

Kleim, J. A., & Jones, T. A. (2008). Principles of experience-dependent neural plasticity: Implications for rehabilitation after brain damage. *Journal of Speech, Language & Hearing Research, 51*(1), S225-S239.

Krasny-Pacini, A., Hiebel, J., Pauly, F., Godon, S., & Chevignard, M. (2013). Goal attainment scaling in rehabilitation: A literature-based update. *Annals of Physical & Rehabilitation Medicine, 56*(3), 212-230. doi:10.1016/j.rehab.2013.02.002

Landa-Gonzalez, B. (2001). Multicontextual occupational therapy intervention: A case study of traumatic brain injury. *Occupational Therapy International, 8*(1), 49-62.

Lannin, N., Carr, B., Allaous, J., Mackenzie, B., Falcon, A., & Tate, R. (2014). A randomized controlled trial of the effectiveness of handheld computers for improving everyday memory functioning in patients with memory impairments after acquired brain injury. *Clinical Rehabilitation, 28*(5), 470-481. doi:10.1177/0269215513512216

Li, K., Alonso, J., Chadha, N., & Pulido, J. (2015). Does generalization occur following computer-based cognitive training? -- An exploratory study. *Occupational Therapy in Health Care, 29*(3), 283-296. doi: 10.3109/07380577.2015.1010246

Li, K., Robertson, J., Ramos, J., & Gella, S. (2013). Computer-based cognitive retraining for adults with chronic acquired brain injury: A pilot study. *Occupational Therapy in Health Care, 27*(4), 333-344. doi:10.3109/07380577.2013.844877

Lynch, B. (2002). Historical review of computer-assisted cognitive retraining. *Journal of Head Trauma Rehabilitation, 17*(5), 446-457.

McEwen, S. E., Polatajko, H. J., Huijbregts, M. P. J., & Ryan, J. D. (2010). Inter-task transfer of meaningful, functional skills following a cognitive-based treatment: Results of three multiple baseline design experiments in adults with chronic stroke. *Neuropsychological Rehabilitation, 20*(4), 541-561. doi:10.1080/09602011003638194

McGraw-Hunter, M., Faw, G. D., & Davis, P. K. (2006). The use of video self-modelling and feedback to teach cooking skills to individuals with traumatic brain injury: A pilot study. *Brain Injury, 20*(10), 1061-1068. doi:10.1080/02699050600912163

McGurk, S. R., Twamley, E. W., Sitzer, D. I., McHugo, G. J., & Mueser, K. T. (2007). A meta-analysis of cognitive remediation in schizophrenia. *Ajp, 164*(12), 1791-1802. doi:10.1176/appi.ajp.2007.07060906

Mueller, J., A., & Dollaghan, C. (2013). A systematic review of assessments for identifying executive function impairment in adults with acquired brain injury. *Journal of Speech, Language & Hearing Research, 56*(3), 1051-1063. doi:10.1044/1092-4388(2012/12-0147)

Nøkleby, K., Boland, E., Bergersen, H., Schanke, A., Farner, L., Wagle, J., & Wyller, T. B. (2008). Screening for cognitive deficits after stroke: a comparison of three screening tools. *Clinical Rehabilitation*, *22*(12), 1095-1104.

Parrot Software [Computer software]. (2013). West Bloomfield, MI. Retrieved November 9, 2014, from http://www.parrotsoftware.com

Potvin, M., Rouleau, I., Audy, J., Charbonneau, S., & Giguere, J. (2011). Ecological prospective memory assessment in patients with traumatic brain injury. *Brain Injury*, *25*(2), 192-205. doi:10.3109/02699052.2010.541896

Pryor, J. (2013). Compensatory care: The elephant in the inpatient rehabilitation room. *International Journal of Therapy & Rehabilitation, 20*(4), 178-179.

Riker, M., Stires, G., & Ramsey, R. (2012). Computer-assisted cognitive remediation: Treatment goes hi-tech. *Advance Healthcare Network, 28*(3), 26. Retrieved from http://occupational-therapy.advanceweb.com/Archives/Article-Archives/Computer-Assisted-Cognitive-Remediation.aspx

Rodger, S., & Brandenburg, J. (2009). Cognitive orientation to (daily) occupational performance (CO-OP) with children with asperger's syndrome who have motor-based occupational performance goals. *Australian Occupational Therapy Journal, 56*(1), 41-50. doi:10.1111/j.1440-1630.2008.00739.x

Rohling, M. L., Faust, M. E., Beverly, B., & Demakis, G. (2009). Effectiveness of cognitive rehabilitation following acquired brain injury: A meta-analytic re-examination of Cicerone

et al.'s (2000, 2005) systematic reviews. *Neuropsychology, 23*(1), 20-39. doi:10.1037/a0013659; 10.1037/a0013659.supp (Supplemental)

Sansonetti, D., & Hoffmann, T. (2013). Cognitive assessment across the continuum of care: The importance of occupational performance-based assessment for individuals post-stroke and traumatic brain injury. *Australian Occupational Therapy Journal, 60*(5), 334-342. doi:10.1111/1440-1630.12069 **this was already ref in one sentence in another section.

Smeets, S. M. J., Ponds, R. W. H. M., Wolters Gregório, G., Pouwels, C. G. J. G., Visscher, A. J., Winkens, I., & van Heugten, C. M. (2014). Impaired awareness of deficits in individuals with neuropsychiatric symptoms after acquired brain injury: Associations with treatment motivation and depressive symptoms. *Neuropsychology, 28*(5), 717-725. doi:10.1037/neu0000068

Toglia, J., Johnston, M. V., Goverover, Y., & Dain, B. (2010). A multicontext approach to promoting transfer of strategy use and self regulation after brain injury: An exploratory study. *Brain Injury, 24*(4), 664-677. doi:10.3109/02699051003610474

Toglia, J. P. (1991). Generalization of treatment: A multicontext approach to cognitive perceptual impairment in adults with brain injury. *American Journal of Occupational Therapy, 45*(6), 505-516.

Tran, L. V. (2014). Understanding the pathophysiology of traumatic brain injury and the mechanisms of action of neuroprotective interventions. *Journal of Trauma Nursing, 21*(1), 30-35. doi:10.1097/JTN.0000000000000026

Truelle, J., Koskinen, S., Hawthorne, G., Sarajuuri, J., Formisano, R., Von Wild, K., . . . Von Steinbuechel, N. (2010). Quality of life after traumatic brain injury: The clinical use of the

QOLIBRI, a novel disease-specific instrument. *Brain Injury, 24*(11), 1272-1291. doi:10.3109/02699052.2010.506865

Tsaousides, T., & Gordon, W. A. (2009). Cognitive rehabilitation following traumatic brain injury: Assessment to treatment. *Mount Sinai Journal of Medicine, 76*(2), 173-181. doi:10.1002/msj.20099

Turner-Stokes, L., & Williams, H. (2010). Goal attainment scaling: A direct comparison of alternative rating methods. *Clinical Rehabilitation, 24*(1), 66-73.

Twamley, E. W., Jak, A. J., Delis, D. C., Bondi, M. W., & Lohr, J. B. (2014). Cognitive symptom management and rehabilitation therapy (CogSMART) for veterans with traumatic brain injury: Pilot randomized controlled trial. *Journal of Rehabilitation Research & Development, 51*(1), 59-69. doi:10.1682/JRRD.2013.01.0020

United States Census Bureau (2014, February 3). Measuring America: Computer and Internet trends in America. Retrieved from http://www.census.gov/library/infographics/computer_2014.html

United States Census Bureau. (2015, October 14). Marin County QuickFacts from the US Census Bureau. Retrieved November 20, 2015, from http://quickfacts.census.gov/qfd/states/06/06041.html

Waid-Ebbs, J. K., Daly, J., Wu, S. S., Berg, W. K., Bauer, R. M., Perlstein, W. M., & Crosson, B. (2014). Response to Goal Management Training in Veterans with blast-related mild traumatic brain injury. *Journal Of Rehabilitation Research & Development*, *51*(10), 1555-1566 12p. doi:10.1682/JRRD.2013.12.0266

Westerberg, H., Jacobaeus, H., Hirvikoski, T., Clevberger, P., Östensson, M. -., Bartfai, A., & Klingberg, T. (2007). Computerized working memory training after stroke–A pilot study. *Brain Injury, 21*(1), 21-29. doi:10.1080/02699050601148726

Wong, G. K. C., Ngai, K., Lam, S. W., Wong, A., Mok, V., & Poon, W. S. (2013). Validity of the Montreal Cognitive Assessment for traumatic brain injury patients with intracranial haemorrhage. *Brain Injury, 27*(4), 394-398. doi:10.3109/02699052.2012.750746

Yip, B. C. B., & Man, D. W. K. (2013). Virtual reality-based prospective memory training program for people with acquired brain injury. *Neurorehabilitation, 32*(1), 103-115. doi:10.3233/NRE-130827

Zgaljardic, D. J., Yancy, S., Levinson, J., Morales, G., & Masel, B. E. (2011). Balint's syndrome and post-acute brain injury rehabilitation: A case report. *Brain Injury, 25*(9), 909-917. doi:10.3109/02699052.2011.585506

Zlotnik, S., Sachs, D., Rosenblum, S., Shpasser, R., & Josman, N. (2009). Use of the dynamic interactional model in self-care and motor intervention after traumatic brain injury: Explanatory case studies. *American Journal of Occupational Therapy, 63*(5), 549-558.

Appendix A

BINBA Agency Agreement Letter

BRAIN INJURY NETWORK OF THE BAY AREA
AGREEMENT LETTER

October 27, 2014

Maggie Pesta, OTR/L
Director of Programs, Brain Injury Network of the Bay Area,
1132 Magnolia Avenue
Larkspur, CA 94939

Dear Mrs. Pesta,

This letter confirms that you have been provided with a detailed description of the graduate research project, which concerns the effectiveness of the Bridge-Adapt program in facilitating generalization of functional skills in individuals with acquired brain injury. This project is part of the master's capstone project requirement in occupational therapy at Dominican University of California.

The four student researchers and the faculty advisor, Kitsum Li, will have access to the raw data, including the master sheet with participants' code numbers. All four students have completed a course in Ethics in Healthcare and have been trained on maintaining participants' privacy throughout the course of the research.

We will make every effort to co-operate with your organization to ensure that our data collection will minimally interfere with your regular outpatient therapy schedules, and that your clients are treated with the utmost discretion and sensitivity. If you have any questions about the research you may contact the faculty advisor, Kitsum Li, at (415) 458-3753 or kitsum.li@dominican.edu, or the Institutional Review Board for the Protection of Human Subjects at Dominican University of California by calling (415) 257-0168.

If our request to conduct our capstone research study at your facility meets with your approval, please sign and date this letter below and return it to us in the enclosed self-addressed, stamped envelope. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,

Appendix A

BINBA Agency Agreement Letter (continued)

Angela Talamantez, Diana Lopez, Eugene Cheung, and Janice Li
[redacted]

I agree with the above request.

[redacted]

Signature **Date** 10/29/14

Appendix B

Cognistat Donation Acceptance Letter

DOMINICAN
UNIVERSITY
of CALIFORNIA
1890

October 22, 2014

Gina Musser
Cognistat
P.O. Box 460
Fairfax, CA 94978

Dear Gina,

On behalf of Dominican University of California, I am pleased to acknowledge receipt of forty (40) 2013 Cognistat assessment forms, manuals, and booklets. This generous donation was accepted for the University's Department of Occupational Therapy on October 21, 2014.

By contributing to the university, Cognistat recognizes and rewards Dominican's tradition of excellence. Gifts from alumni, parents, and friends of the university provide vital support for academic programs and student scholarships, as well as campus ministry and athletic programs. Your support makes it possible for Dominican to retain its unique character as a small community, while at the same time expanding the curriculum and providing the resources that attract exceptional faculty, coaches, and students.

Thank you for your organization's continued support of Dominican University of California.

Sincerely,

[redacted]

Ellen Donovan
Director of Annual Giving

Dominican University of California is a 501(c)(3) charitable organization, tax ID# 94-1156525. In accordance with IRS regulations, Dominican University of California does not assign a Fair Market Value to items donated.

Gina, thank you for your support

50 Acacia Avenue, San Rafael, California 94901-2298 • p. 415-257-1396 • f. 415-257-0162
www.dominican.edu

Appendix C

Parrot Software Letter of Permission

LETTER REQUESTING PERMISSION TO USE A COGNITIVE INTERVENTION

October 17, 2014

Parrot Software
P.O. Box 250755
West Bloomfield, MI 48322

RE: Permission to use Parrot Software

Dear Dr. Frederick F. Weiner,

We are writing to request **written permission** to use the online Parrot Software (Weiner, 2009) attention and memory modules in our capstone research study. The purpose of this study is to examine the effect of a new intervention curriculum designed to supplement Parrot Software for the improvement of skill generalization in individuals with acquired brain injury. The study will be implemented at a non-profit brain injury organization in Larkspur, CA. This project is part of the master's capstone research requirement in occupational therapy at Dominican University of California.

We will appreciate if you would grant us free access to the Parrot Software from January 2015 through June 2015 and any instructional material related to administering the intervention.

Our research is being supervised by Kitsum Li, OTD, OTR/L, Assistant Professor of Occupational Therapy, Dominican University of California, San Rafael, CA 94901, (415) 458-3753.

If this request meets with your approval, please sign, date, and return an electronic signed copy to Diana.Lopez@students.dominican.edu

If you have any questions, please do not hesitate to contact us at (650) 452-4658, or if you prefer, Dr. Li (kitsum.li@dominican.edu). Thank you for your generous support to our research study.

Sincerely,

Angela Talamantez, Diana Lopez, Eugene Cheung, and Janice Li

[redacted]

I agree to the above request.

[redacted]

(Addressee's Signature) 10/28/14
Date

Appendix D

Consent to be a Research Participant

CONSENT FORM TO BE A RESEARCH PARTICIPANT
DOMINICAN UNIVERSITY OF CALIFORNIA

Purpose and Background:

Mr. Eugene Cheung, Ms. Janice Li, Ms. Diana Lopez, and Ms. Angela Talamantez, students from the Department of Occupational Therapy at Dominican University of California are conducting a research study designed to investigate the effectiveness of a systematic adaptive skill training program (Bridge-Adapt) in facilitating generalization of functional skills in individuals with acquired brain injury.

Procedures:

If I agree to be a participant in this study, the following will happen:

1. I understand that all of the study's procedures will take place at the Brain Injury Network of the Bay Area (BINBA), located at 1132 Magnolia Avenue in Larkspur, California.
2. I understand that my participation in this research study will be in addition to my regular programming at BINBA (e.g. day or computer or counseling programs).
3. After completing my consent to participate, I will complete a demographic questionnaire, complete the 2013 Cognistat Paper assessment, and a medication box task. If my results fulfill the inclusion criteria, I will be included in the study.
4. I will attend eight Bridge-Adapt group sessions as scheduled. Each group session will take approximately one hour to complete.
5. I will complete eight modules in the Parrot Software intervention that are designed to improve attention and memory. I will complete the modules according to the sequence and schedule as outlined in the Bridge-Adapt program. I will complete the Parrot module after each corresponding weekly Bridge-Adapt group session. Each module will take approximately one hour to complete.
6. I will identify a personal goal during the first Bridge-Adapt group session. Then, I will collaborate with the researchers to develop a measureable goal and the corresponding goal attainment scale.
7. After completing all eight Bridge-Adapt group sessions and eight Parrot Software modules, I will return to BINBA as within two weeks to complete a second 2013 Cognistat Paper assessment, medication box task, and the goal attainment scale.
8. Four months after completing the Bridge-Adapt program, I will either receive a telephone call from the researchers or return to BINBA to complete the goal attainment scale for a final time.

Risks and/or Discomforts:

1. I understand that my participation involves no physical risk, but may involve some mental or physical fatigue due to the time required to participate.
2. I understand that there may be some psychological discomfort, given the nature of the topics addressed in the demographic questionnaire. I will be discussing topics of a personal nature, and I may refuse to answer any questions that cause me distress or seems to be an invasion of my privacy. Should I experience adverse psychological harm, I will be referred BINBA staff to address my concerns.
3. I understand that there may be some psychological discomfort during interactions with other group members during group sessions (e.g. peer pressure). I understand the researchers will do their best to prevent and/or quickly diffuse such situations by setting rules and limits and using other redirections. However, if I feel it is necessary, I may request a rest break from the group session, and I will be allowed to return to the group session when I am ready. Should I

Appendix D

Consent to be a Research Participant (continued)

experience adverse psychological harm, I will be referred to BINBA staff to address my concerns.

4. I understand that if I feel it is necessary, I may request a rest break from the Parrot Software module session, and I will be allowed to return to the session when I am ready.
5. I understand that I may refuse to participate and withdraw from the study at any time before, during, or after the study begins without any adverse consequences.

Benefits:
The anticipated benefits of this study include:

- I may see improvement in my memory and attention skills, or other cognitive skills.
- I will have the opportunity to develop cognitive strategies during group sessions, which I may implement in my daily life.
- There may be improvement in my ability to use a computer-based cognitive software, and I may continue to use similar software programs in the future.
- I will contribute to the general knowledge of brain injury research and cognitive rehabilitation.

Questions:
I have talked to the researchers about this study and have had my questions answered. If I have further questions about the study, I may contact them at (teambridgeadapt@gmail.com) or their research supervisor, Dr. Kitsum Li, OTR/L, Department of Occupational Therapy, Dominican University of California, at (415) 458-3753.

If I have further questions or comments about participation in this study, I should first talk with the researcher and the research supervisor. If for some reason I do not wish to do this, I may contact the Institutional Review Board for the Protection of Human Participants (IRBPHP) at Dominican University of California, which is concerned with the protection of volunteers in research projects. I may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, by FAX at (415) 257-0165 or by writing to the IRBPHP, Office of the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

Consent:
I have been given a copy of this consent form, signed and dated, to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. I am free to withdraw my participation at any time without fear of adverse consequences.

My signature below indicates that I have read understand all of the above information regarding this study, and I voluntarily give my consent to participate.

____
PARTICIPANT'S NAME (PRINTED) DATE

____
PARTICIPANT'S SIGNATURE DATE

____
RESEARCHER'S SIGNATURE DATE

Appendix E

Proxy Consent to be a Research Participant

PROXY CONSENT FOR RESEARCH PARTICIPATION
DOMINICAN UNIVERSITY OF CALIFORNIA

Purpose and Background:

Mr. Eugene Cheung, Ms. Janice Li, Ms. Diana Lopez, and Ms. Angela Talamantez, students from the Department of Occupational Therapy at Dominican University of California are conducting a research study designed to investigate the effectiveness of a systematic adaptive skill training program (Bridge-Adapt) in facilitating generalization of functional skills in individuals with acquired brain injury.

The adult under my guardianship is being asked to participate because s/he is an individual who sustained a brain injury at least one-year prior to the study's implementation, and s/he has difficulties with attention and memory skills.

Procedures:

If I agree to allow the adult under my guardianship be a participant in this study, the following will happen:

1. I understand that all of the study's procedures will take place at the Brain Injury Network of the Bay Area (BINBA), located at 1132 Magnolia Avenue in Larkspur, California.
2. I understand that participation in this research study will be in addition to the regular programming at BINBA (e.g. day or computer or counseling programs) the adult under my guardianship attends.
3. After completing the consent for my ward to participate, s/he will complete a demographic questionnaire, complete the 2013 Cognistat Paper assessment, and a medication box task. If her/his results fulfill the inclusion criteria, s/he will be included in the study.
4. I understand that my ward will attend eight Bridge-Adapt group sessions as scheduled. Each group session will take approximately one hour to complete.
5. I understand that my ward will complete eight modules in the Parrot Software intervention that are designed to improve attention and memory. S/he will complete the modules according to the sequence and schedule as outlined in the Bridge-Adapt program. S/he will complete the Parrot module after each corresponding weekly Bridge-Adapt group session. Each module will take approximately one hour to complete.
6. I understand that my ward will identify a personal goal during the first Bridge-Adapt group session. S/he will collaborate with the researchers to develop a measurable goal and the corresponding goal attainment scale.
7. After completing all eight Parrot Software modules and eight Bridge-Adapt group sessions, my ward will return to BINBA as scheduled to complete a second 2013 Cognistat Paper assessment, medication box task, and the goal attainment scale.
8. I understand that four months after completing the Bridge-Adapt program my ward will either receive a telephone call from the researchers or return to BINBA to complete the goal attainment scale for a final time.

Appendix E

Proxy Consent to be a Research Participant (continued)

Risks and/or Discomforts:

1. I understand that my ward's participation involves no physical risk, but may involve some mental or physical fatigue due to the time required to participate.
2. I understand that s/he may experience some psychological discomfort, given the nature of the topics addressed in the demographic questionnaire. S/he will be discussing topics of a personal nature, and s/he may refuse to answer any questions that cause her/him distress or seems to be an invasion of her/his privacy. Should s/he experience adverse psychological harm, s/he will be referred to BINBA staff to address her/his concerns.
3. I understand that my ward may experience some psychological discomfort during interactions with other group members during group sessions (e.g. peer pressure). I understand the researchers will do their best to prevent and/or quickly diffuse such situations by setting rules and limits and using other redirections. However, if my ward feels it is necessary, s/he may request a rest break from the group, and s/he will be allowed to return to the group session when s/he is ready. Should s/he experience adverse psychological harm, s/he will be referred BINBA staff to address her/his concerns.
4. I that understand that my ward may refuse to participate and withdraw from the study at any time before, during, or after the study begins without any adverse consequences.

Benefits:

By participating in this study, the adult under my guardianship can anticipate the following benefits:

- S/he may see improvement in her/his memory and attention skills, or other cognitive skills.
- S/he will have the opportunity to develop cognitive strategies during group sessions which he/she may implement in her/his daily life.
- There may be improvement in her/his ability to use a computer-based cognitive software, and s/he may continue to use similar software programs in the future.
- S/he will contribute to the general knowledge of brain injury research and cognitive rehabilitation.

Questions:

I have talked to the researchers about this study and have had my questions answered. If I have further questions about the study, I may contact them at (teambridgeadapt@gmail.com) or their research supervisor, Dr. Kitsum Li, OTR/L, Department of Occupational Therapy, Dominican University of California, at (415) 458-3753.

If I have further questions or comments about participation in this study, I should first talk with the researcher and the research supervisor. If for some reason I do not wish to do this, I may contact the Institutional Review Board for the Protection of Human Participants (IRBPHP) at Dominican University of California, which is concerned with the protection of volunteers in research projects. I may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, by FAX at (415) 257-0165 or by writing to the IRBPHP, Office of the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

Appendix E

Proxy Consent to be a Research Participant (continued)

Consent:
I have been given a copy of this consent form, signed and dated, to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. The adult under my guardianship is free to withdraw her/his participation at any time without fear of adverse consequences.

My signature below indicates that I have read understand all of the above information regarding this study, and I voluntarily give my consent for the adult under my guardianship ("participant") to participate.

____
PARTICIPANT'S NAME (PRINTED) DATE

____
GUARDIAN'S NAME (PRINTED) DATE

____
GUARDIAN'S SIGNATURE DATE

____
RESEARCHER'S SIGNATURE DATE

Appendix F

Medication Box Assessment Pretest

PRE-TEST MEDICATION-BOX ASSESSMENT

Verbal Directions:

This activity is asking you to put the correct medication in the medication organizer. On the table, you will find a medication organizer, with one row designated as “AM” for the morning and one row designated as “PM” for the evening. Please follow the directions so that you can set up the medications for one week. Please read the directions on the medication labels carefully.

Bottle #1: (30 White)	**Profnix** 1 pill at bedtime
Bottle #2: (30 White)	**Zorbidal** 2 tablets each morning
Bottle #3: (30 White)	**Sanitol** 2 tablets every other morning
Bottle #4: (30 Red)	**Diprozine** Take as needed for pain
Bottle #5: (30 Blue)	**Nexotram** 2 pills each day, 1 morning and 1 evening

Appendix G

Goal Attainment Scaling

Participant Code: __________

GOAL:
____

Rating	Measureable Criteria
+2 Exceeded Goal	
+1 Met Goal	
0 Baseline (no change)	
-1 Less than baseline	
-2 Much less than baseline	

Timeline	Rate yourself using the ratings described above
Beginning of Bridge-Adapt program	
Within 1 week after Bridge-Adapt program	
4 months after Bridge-Adapt program	

Appendix H

Medication Box Assessment Posttest

POST-TEST MEDICATION-BOX ASSESSMENT

Verbal Directions:

This activity is asking you to put the correct medication in the medication organizer. On the table, you will find a medication organizer, with one row designated as “AM” for the morning and one row designated as “PM” for the evening. Please follow the directions so that you can set up the medications for one week. Please read the directions on the medication labels carefully.

Bottle #1: (30 White)	**Profnix** 1 pill at bedtime
Bottle #2: (30 White)	**Zorbidal** 2 tablets each morning
Bottle #3: (30 White)	**Sanitol** Take as needed for pain.
Bottle #4: (30 Red)	**Diprozine** 2 pills each day, 1 morning and 1 evening
Bottle #5: (30 Blue)	**Nexotram** 2 tablets every other morning

Appendix I

Recruitment Flyer

WOULD YOU LIKE TO...

- Improve your memory and attention?
- Receive weekly support for improving life skills?
- Contribute to general knowledge about brain injury research and rehabilitation?

Students at Dominican University of California are recruiting for a study to investigate the effectiveness of a new program to improve memory and attention and help you apply those skills to everyday life.

TO PARTICIPATE IN THE STUDY, YOU NEED TO…

- Have a diagnosed acquired brain injury caused by any of the following:
  - traumatic brain injury
  - stroke
  - hypoxia or anoxia
  - infection
  - meningitis
  - encephalopathy
- Be at least 18 years old
- Be able to speak, write, and read instructions in English
- Be able to use a computer
- Be able to participate twice weekly, in the morning, for a total of 2 hours per week

The study will be conducted at the Brain Injury Network of the Bay Area in Larkspur, CA.

If you are interested or have any questions, please contact: teambridgeadapt@gmail.com or call (415) 458-3753.

Appendix J

Telephone Screening Questions

TELEPHONE SCREENING QUESTIONS
DOMINICAN UNIVERSITY OF CALIFORNIA

1. Are you 18 years old or older? Y / N
2. Are you able to give legal consent to participate in a research study? Y / N
   a. If no, who will be able to give legal consent for you to participate?

   ____

3. Have you had your injury or condition for more than one year? Y / N
4. Are you available to participate in an eight-week study (2 hours/week) between February – May 2015? Y / N
5. Are you able to arrive at BINBA in the morning twice a week for the study? Y / N
6. What type of brain injury do you have?

- ☐ Neurodegenerative condition (exclusion)
- ☐ Traumatic Brain Injury (TBI)
- ☐ Cerebrovascular Accident (CVA)
- ☐ Hypoxia / Anoxia
- ☐ Meningitis
- ☐ Infection
- ☐ Brain Tumor
- ☐ Encephalopathy
- ☐ Other: __________________

7. Do you have any vision problems / eye conditions? Y / N

   If yes, please explain. ____

   If yes, how does it interfere with your ability to read or use a computer?

   ____

   (If applicable) Do you wear corrective lens (e.g. glasses or contact lens)? Y / N

8. Do you have any motor impairments, especially in your upper body? Y / N

   If yes, please explain. ____

   If yes, how does it interfere with your ability to use a computer or open bottles?

   ____

9. Potential participant's English proficiency as determined via conversation during telephone screen: ☐ Limited ☐ Fluent

Appendix K

Research Participant's Bill of Rights

RESEARCH PARTICIPANT'S BILL OF RIGHTS
DOMINICAN UNIVERSITY OF CALIFORNIA

Every person who is asked to be in a research study has the following rights:

1. To be told what the study is trying to find out;
2. To be told what will happen in the study and whether any of the procedures or devices are different from what would be used in standard practice;
3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;
4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;
5. To be told what other choices s/he has and how they may be better or worse than being in the study;
6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;
7. To be told what sort of medical treatment is available if any complications arise;
8. To refuse to participate at all before or after the study is started without any adverse effects. If such a decision is made, it will not affect her/his rights to receive the care or privileges expected if s/he were not in the study;
9. To receive a copy of the signed and dated consent form;
10. To be free from pressure when considering whether s/he wishes to agree to participate in the study.

If you have other questions regarding the research study, you can contact the researchers at teambridgeadapt@gmail.com or their advisor, Kitsum Li, at (415) 458-3753. You may also contact the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 482-3547 or by writing to the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Ave., San Rafael, CA 94901.

Appendix L

Demographic Questionnaire

DEMOGRAPHIC QUESTIONNAIRE
(To be completed with researcher)

Full Name: ________________________________

Address: ____

Phone Number: ______________Email Address: _____________________________________

Preferred Method of Contact: ☐ Phone ☐ Email ☐ In-Person

Emergency Contact Information (*name and phone*): ___________________________________

Date of birth (*MM/DD/YYYY*): ________________ Over 18? Y / N Gender: M / F

Able to give legal consent? Y / N.

If no, name & phone of responsible party _____________________________________

English Proficiency*:* ☐ Limited ☐ Fluent

Impairments: ☐ visual skills ☐ motor skills ☐ speech ☐ none

Type of Acquired Brain Injury *(check all that apply):*

☐ Neurodegenerative condition (exclusion)
☐ Traumatic Brain Injury (TBI)
☐ Cerebrovascular Accident (CVA)
☐ Hypoxia / Anoxia
☐ Meningitis
☐ Infection
☐ Brain Tumor
☐ Encephalopathy
☐ Other: ____________________

Date of acquired brain injury (or approximate) *(dd/mm/yyyy):* _____________________

Experience with Parrot? Y / N

Experience with other CBCRs? List names and approx. date: ________________________

____

Other information (e.g. co-treatments, ABI support services):

____

____

Experience with medication self-management? ☐ current ☐ in the past ☐ none

Experience using a medication organizer? ☐ current ☐ in the past ☐ none

Can arrive at BINBA twice a week in the morning for the study? Y / N

Can participate in an 8-week study for a total of 2 hours per week between Feb. 2015 - May 2015? Y / N

Appendix M

Parrot Software Tracking Log

PARROT SOFTWARE TRACKING LOG

Instructions:
Researcher will log Parrot Software module completion corresponding to schedule set by the Bridge-Adapt manual by signing his/her initials in the corresponding boxes below.

Participant	Week								Notes
	1	2	3	4	5	6	7	8	
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									
N									