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Functional Cognitive Activities for Adults with Traumatic Brain Injury: Pilot Case Studies

Ajay Pala
Dominican University of California

Karen Huang
Dominican University of California

Ashley Cook
Dominican University of California

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Functional Cognitive Activities for Adults with Traumatic Brain Injury: Pilot Case Studies

by

Karen Huang

Ashley Cook

Ajay Pala

A culminating capstone project submitted to the faculty of Dominican University of California in partial fulfillment of the requirements for the degree of Masters of Science in Occupational Therapy

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This capstone project paper, written under the direction of the candidates' capstone advisor and approved by the department chair, has been presented to and accepted by the Department of Occupational Therapy in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy. The content and research methodologies in this work represent the work of the candidate alone.

Karen Huang 12/1/17
Candidate

Ashley Cook 12/1/17
Candidate

Ajay Pala 12/1/17
Candidate

Dr. Julia Wilbarger, Ph.D., OTR/L 12/1/17
Department Chair

Dr. Kitsum Li, OTD, CSRS 12/1/17
Capstone Advisor

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Abstract

The purpose of these pilot case studies were to investigate the effectiveness of the Functional Cognitive Activities for Adults with Brain Injury: A Sequential Approach (FCA) in generalizing functional cognitive skills across meaningful occupations for adults with traumatic brain injury (TBI). This study was a pretest-posttest design consisted of two participants with TBI.

Both participants attended 14 out of the 16 intervention sessions, twice-a-week for eight-weeks. Pretest-posttest measurements, including the Canadian Occupational Performance Measure (COPM), Kohlman Evaluation of Living Skills, and Goal Attainment Scale (GAS), were used to measure changes in occupational performance. Additionally, a four-month follow-up phone interview using the COPM and GAS assessments explored the generalization of functional cognitive skills. Pretest-posttest results from the COPM demonstrated improvements, while the GAS results varied in occupational performance between participants. The four-month follow-up results demonstrated generalization in functional cognitive skills. The findings from this study provide preliminary evidence supporting the effectiveness of the FCA approach in improving functional cognitive skills and generalizability of skills to novel activities in individuals with TBI.

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We would like to thank all of the individuals contributing to the success of our capstone. Firstly, we would like to thank Dr. Kitsum Li for her constant feedback and guidance throughout our capstone experience. Dr. Kitsum Li's dedication to our study helped us produce a capstone project that we can truly be proud of. Secondly, we'd like to thank the creator of the FCA approach and second reader Rob Koch, OTR/L for his input and additional comments to keep us on track. We are eternally grateful for Rob Koch, OTR/L for training us on using such an innovative approach, for answering our endless emails and questions, and for developing such a groundbreaking and beneficial approach for adults who have experienced a TBI. Most importantly, we would like to thank our two participants who sacrificed their time to attend sessions at Dominican University for eight weeks. We are so grateful for the opportunity to work with these two participants to learn together, hear their feedback, and see them grow within this process. Finally, we would like to thank our friends and family for their understanding, love, and support during these past two years. We could not have done this without you.

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with these two participants to learn together, hear their feedback, and see them grow within this process. Finally, we would like to thank our friends and family for their understanding, love, and support during these past two years. We could not have done this without you.

Introduction

Traumatic brain injury (TBI) is among the most prevalent types of acquired brain injury (ABI) (Brands, Köhler, Stapert, Wade, & van Heugten, 2014). According to the Center for Disease Control and Prevention (2016), a TBI is a blow, bump, or jolt to the head that disrupts the typical function of the brain resulting in short-term or long-term changes affecting cognition, sensations, language, and emotion. These changes can permanently impact an adult's ability to perform daily occupations. Current cognitive rehabilitation programs include the use of remedial and compensatory interventions with the purpose of improving or accommodating for cognitive deficits (Dams-O'Connor & Gordan, 2010). Remedial interventions systematically utilize repetitive skill training exercises to promote the restoration of the brain's preinjury level of functioning. Although cognitive improvements are possible, remedial intervention have not shown to be effective in transferring skills learned to everyday occupations (Li, Robertson, Ramos, & Gella, 2013; Yip & Man, 2013; Christy, Huffine, Hannah, & de Leon, 2016).

Occupational therapists also utilize compensatory interventions involving adaptation and learning cognitive strategies embedded within occupation-based activities to address post-TBI deficits. These interventions can bridge the gap between performance in a therapy setting and performance in the context of the adult's natural environment in order to maximize independence (Dams-O'Connor & Gordan, 2010). Current research on compensatory interventions demonstrates that the therapeutic use of meaningful everyday occupations enhances performance and participation, which may result in improved generalization of cognitive skills across novel contexts (Dawson et al., 2009; Dawson, Binns, Hunt, Lemsky, & Polatajko, 2013; Spikman, Boelen, Lamberts, Brouwer, & Fasotti, 2010; Toglia, Johnston, Goverover, & Dain, 2010).

However, current research of compensatory interventions are limited. The Functional Cognitive Activities for Adults with Brain Injury: A Sequential Approach (FCA) was developed by Mr. Rob Koch, OTR/L to improve everyday occupational performance in adults with TBI through the utilization of a task-centered approach (Koch, 2014). The purpose of these pilot case studies is to provide preliminary evidence to determine the effectiveness of FCA for improving generalization in adults with TBI.

Literature Review

In developed countries, TBI is the leading cause of disability in young adults and affects more males than females (Langlois, Rutland-Brown, & Wald, 2006). Levine and Kumar (2013) found that over 5.3 million individuals in the United States are living with disabilities caused by, or related to, TBI. The leading causes of TBI are falls (35%), motor vehicle accidents (17%), blunt impacts (16%), and assaults (10%). Falls account for the majority of TBI for children under the age of 15 and adults over the age of 65, while motor vehicle accidents are the leading cause in teens and young adults (Levine & Kumar, 2013).

Physical damage to the brain and meninges while incurring a TBI, especially an injury that causes widespread damage to the brain tissue, can cause impairments in cognition (Brain Injury Association of America, 2015). A brain injury can affect both sides of the brain and result in impairments in functional cognition, causing confusion, fatigue, deficits in attention, and impaired performance in occupations. The term occupation is defined as an everyday activity that an adult does to occupy time and live a purposeful life (“Definition of Occupational Therapy” 2016). For example, an occupation can be as simple as eating breakfast to activities as complex as preparing a meal from start to finish (Brain Injury Association of America, 2015).

Due to the impacts of the impairments caused by damage to the brain, this literature review discusses the current research on cognitive rehabilitation for adults with TBI. First, the distinction between cognition and functional cognition is examined. Then functional cognition and the impact on occupation are discussed. Second, neuroplasticity relating to rehabilitation of ABI is explored. Third, remedial interventions, including computer-based training are investigated. Additionally, compensatory interventions and occupation-based training are reviewed. Lastly, generalizability using both remedial and compensatory interventions are examined.

Functional Cognition

Functional cognition requires the cohesive functioning of several components of cognition. Cognition refers to the accumulated skills that support or limit full participation in meaningful activities and is essential for effective performance across the broad range of occupations, including work, education, home management and leisure (American Occupational Therapy Association [AOTA], 2013; Cheney & Rivera-Finnen, 2016). Cognitive skills, may include processes such as self-awareness, working memory, and problem solving, which are required to accomplish everyday occupations (AOTA, 2013). Functional cognition is the application of cognitive skills to accomplish everyday occupations (Donovan et al., 2008). Occupations such as grooming, meal preparation, money management, and social participation, contribute to the adult's quality of life. For adults living with a brain injury, daily occupations, roles, and engagement in everyday life are often impacted by functional cognitive deficits. Successful utilization of functional cognition may allow an adult to independently formulate goals, execute plans, maintain a schedule, or participate in occupations at home or within the

community (Toglia et al., 2010). Challenges with functional cognition may result in an adult's inability to solve everyday problems within time constraints or organize multiple steps of an occupation (Kennedy et al., 2008). Functional cognition involves the utilization of complex cognitive skills such as self-awareness, working memory, and problem solving. These components influence an adult's ability to utilize function cognition during everyday occupations.

Self-awareness can impact the adult's ability to realize his or her own impairments. Biological psychologists define awareness as a perception and cognitive reaction to a condition or event (Toglia & Kirk, 2000). Lack of awareness impacts the ability to think, comprehend, and hold conversations (Long et al., 2014). One specific type of awareness is self-awareness. Self-awareness is the realization of one's own cognitive abilities and limitations (Doig, Kuipers, Prescott, Conwell, & Fleming, 2014; Holmqvist, Kamwendo, & Ivarsson, 2009). Evidence suggests that a lack of awareness is common in adults with cognitive deficits caused by damage to the prefrontal region of the brain (Boelen, Spikman, & Fasotti, 2011). Toglia et al. (2010) found that adults with TBI, who effectively displayed improved motivation to participate in rehabilitation, use compensatory techniques during intervention, and the ability to engage in the community can improve deficits in awareness. Therefore, to improve independent occupational performance by utilizing functional cognition, self-awareness must first be addressed (Fleming, Lucas, & Lightbody, 2006).

Working memory is a critical aspect of functional cognition because it allows an adult to access stored information to guide future decisions (Wilhelm, Hildebrandt, & Oberauer, 2013). Westerberg et al. (2007) defined working memory as the ability to manipulate information and respond appropriately after a short delay. Working memory allows adults to attend to and filter

out information that is necessary to perform occupations. Examples of working memory are grocery shopping using a mental checklist or mental organization of errands based on the bus schedule. The ability to remember and utilize compensatory memory strategies, such as developing a routine or following multi-step instructions, are critical factors for independence (Björkdahl, Åkerlund, Svensson, & Esbjörnsson, 2013).

Additionally, without the cognitive ability to problem solve, an adult may have difficulty identifying, prioritizing, and sequencing steps (Kennedy et al., 2008). Problem solving involves generating alternative solutions to everyday problems under a time constraint (Kennedy et al., 2008). For example, an adult must find alternative transportation to work if his or her car would not start. Therefore, effective problem solving requires an adult to perform a series of complex steps in an efficient manner (Kennedy & Coelho, 2005). Completing occupations can be difficult when the adult is unable to problem solve and utilize processing skills. In particular, if the brain injury occurs in regions responsible for functions such as self-awareness, then returning to a previous level of function can be challenging (Sohlberg, Todis, Pickas, Hung, & Lemoncello, 2005).

Cognitive skills, such as self-awareness, working memory, and problem solving, are utilized in various combinations to support effective functional cognition. If an adult experiences deficits with cognitive skills, the capability to employ functional cognition may be compromised. Impairments in cognition may be temporary or permanent, general or specific, and the severity of the impairments related to self-awareness, working memory, and problem solving can vary, pervading various facets of an adult's performance in occupations(AOTA, 2013).

Neuroplasticity

Research suggests that a human brain is plastic and possesses the ability to change neural

structure, connectivity ability, and function throughout the lifetime (Chen, Epstein, & Stern, 2010). Brain plasticity is the brain's ability to create, modify, and adapt connections in response to specific circumstances (DeFina et al., 2009). During a brain injury, physical impact often results in damaged brain matter which may cause an interruption in functional cognition and consequently, inhibits an adult's ability to participate in meaningful occupations. Chen, Epstein, and Stern (2010) discussed how the brain's neuroplastic abilities strengthen previously lost connections to reinforce pathways, weaken connections to unnecessary receiving locations, create new or alternate networks, and potentially link new networks to existing functional ones. Following brain injury, there is also evidence that unharmed neurons generate neuroblasts, a precursor to new neurons which can potentially restore function by establishing axonal branches and dendritic spines (Chen et al., 2010). Understanding the brain's capacities to restore function is significant when facilitating restorative learning strategies to regain lost or compromised function.

In an observational study, Kim et al. (2009) investigated the association between cognitive training, performance and attention. The study included 17 adults with moderate brain injury and 15 non-affected control subjects. Kim et al. (2009) concluded that after receiving computer-assisted cognitive training, the adults with TBI showed improved activity performance due to reactivation of the brain's attentional network. With the use of functional magnetic resonance imaging, Kim et al. also found that after receiving four weeks of attentional training focused on visual and auditory attention, vigilance, and divided attention, neuroplasticity promoted reconstruction in the attention and cognitive areas of the injured part of the brain (2009). Therefore, the results of the functional magnetic resonance imaging revealed the brain's ability to improve after trauma. The researchers also noted significant improvement with activity

performance in addition to the visible changes in the brain's neural network, including increased organization and reactivation of lost areas in the brain associated with attention (Kim et al., 2009). Overall, the study indicated that cognitive training promoted neuroplasticity in the brain after a TBI.

Smith et al. (2009) found that a combination of intensive practice, focus on perceptual speed and accuracy, adaptive strategies, and an emphasis on improving memory and attention skills for those who have experienced a TBI may help to address cognitive deficits. In a randomized control trial, 487 community-dwelling adults aged 65 and older, who had previously sustained a TBI, were randomly chosen to receive either a computerized cognitive training program or a novelty cognitive stimulation program. The computerized cognitive training program aimed to improve the function of the auditory system through intensive brain plasticity-based learning. This program consisted of six computerized exercises to improve speed and accuracy of auditory information processing. Half of the adults with TBI acted as a control group and received the novelty cognitive stimulation training program, which engaged learning processes but was not designed to improve cognitive function. The Repeatable Battery for the Assessment of Neuropsychological Status was used to assess for auditory attention and memory. The results showed that significant improvements in the computerized cognitive training group were apparent in the areas of memory and attention as compared to the control group. Thus, the cognitive training program, which focused on improving memory and attention, provided evidence to support restoration of lost cognitive functions as an important component in cognitive rehabilitation (Smith et al., 2009).

In summary, cognitive training focusing on performance and attention may lead to significant improvement with activity performance (Kim et al., 2009). Neural reorganization and

functional improvements occur with occupational practices and repetitive exposure to stimuli (Kimberley, Samargia, Moore, Shakya, & Lang, 2010). Additional support on cognitive training by Smith et al. (2009) supports the use of intensive practice to improve lost cognitive functions, memory and attention skills, for adults with TBI. In summary, current research on repetitive cognitive training has demonstrated that the brain is capable of neuroplasticity at the neural level (Kimberley et al., 2010). In conclusion, the brain's ability to improve cognitive functions following injury allows for the possibility of cognitive rehabilitation.

Cognitive Rehabilitation

Cognitive rehabilitation is a program that capitalizes on the brain's neuroplasticity to amend or compensate for the impacts of cognitive and behavioral complications following a brain injury and ultimately to improve daily function (Tsaousides & Gordon, 2009). Cognitive deficits vary depending on the severity and location of the brain injury. Therefore, cognitive rehabilitation aims to address an adult's specific cognitive impairments with the use of remedial and compensatory strategies. Through a systematic review, Cicerone, Levin, Malec, Stuss, and Whyte (2006) found that cognitive rehabilitation could potentially improve cognitive function, especially within the domain of attention, memory, and executive function.

The process of cognitive rehabilitation. Cognitive rehabilitation can utilize a remedial approach, a compensatory approach, or a combination of both. According to Holmqvist, Kamwendo, and Ivarsson (2009), a remedial approach focuses on restoring lost cognitive functions and a compensatory approach focuses on adapting parts of an activity to complete occupations. Interventions that implement a remedial approach aim to regain lost function while compensatory strategies may incorporate a change in the environment or use adaptive equipment to help an adult accomplish occupations as independently as possible. Cognitive rehabilitation

interventions may be facilitated by occupational therapists, to provide client-centered intervention to improve self-perceived and observed performance and satisfaction in occupations (Doig, Fleming, Cornwell, & Kuipers, 2009). The occupational therapists incorporates the adult's strengths and weaknesses to select the most appropriate approach to effectively address cognitive deficits and promote functional improvement.

Remedial interventions. The remedial approach utilizes neuroplasticity of the brain to improve cognitive functioning by grading activities in controlled therapeutic settings according to the adult's intellectual capabilities (Christy et al., 2016). Examples of this would be training adults with TBI to sequencing steps in dressing and scanning left to right during a reading activity. In a retrospective study, Christy et al. (2016) examined the medical records of adults with recent onset TBI received Cognitive Perceptual Motor Retraining (CPM). The CPM approach places emphasis on having the adults perform repetitions of basic foundational skills. Occupations were organized from simple to complex based on the cognitive demand placed on the adults. The effectiveness of CPM was determined by the differences between intake and discharge scores on tests of visual-spatial and tactile-kinesthetic perception, motor functions, and cognition. Forty of the 59 adults were discharged because they were able to resume previous occupations and seven adults were discharged because the therapist believed they had reached their maximum remediation potential. The study found that adults who were six months post-trauma improved more on the tests than those who had experienced trauma more than seven months prior to the intervention. Additionally, more than half of the adults demonstrated engagement in productive occupations including returning to work or school. However, as there was no control group in this study to determine the impact of neuroplasticity versus natural recovery, the intervention could not be determined as the sole factor leading to progress made by

the adults with a recent TBI (Christy et al., 2016). Although this study does not conclusively prove the effectiveness of a purely remedial approach, studies using computer-based training have contributed to the research supporting the efficacy of computer-based training.

Computer-based training. Computer-based training is a type of remedial intervention used to improve cognitive functioning by incorporating computer software with the purpose of systematically improving lost cognitive skills. A study conducted by Westerberg et al. (2017), utilizing a two-group pretest-posttest design, used a graded computerized software program called RoboMemo to examine its effectiveness in improving memory and attention in adults with TBI. The RoboMemo software required the adults with TBI to attend to multiple stimuli at once, then recall and sequence information after a short delay. After completing 40 minutes of training, five days a week for five weeks, the adults with TBI showed improvements in cognitive functioning, specifically in attention and working memory. Additionally, a self-assessment called the Cognitive Failure Questionnaire was given to the adults with TBI before and after the trial to measure perceived cognitive failure in everyday occupations. Despite the lack of a follow-up assessment, the results of the study indicated the potential effectiveness of RoboMemo in improving working memory and attention in both trained and untrained occupation-based activities when comparing the pretest and posttest scores on the Cognitive Failure Questionnaire (Westerberg et al., 2007).

Yip and Man (2013) also developed a computer-based training program to improve generalizability in planning and memory cognitive functions. Generalization refers to the ability to transfer skills learned in one setting to a different environment or situation (Toglia et al., 2010). Thirty-seven adults with ABI were included in a single-blinded, pretest-posttest randomized trial and trained to use a virtual reality program to bridge the gap between computer

simulations and real life. The adults were trained in event-based occupations such as shopping for groceries on sale, time-based occupations such as simple microwave meal preparation activities, and ongoing occupations such as shopping with a grocery list. After completing 30 to 45 minute sessions twice-a-week for six weeks, the intervention group demonstrated improvements in the everyday occupations (Yip & Man, 2013).

To investigate generalization of working memory and attention, Lindeløv et al. (2016) performed a randomized controlled trial with 39 adults with ABI and 39 healthy adults using remedial interventions. A continuous performance assessment called the N-back task was used, which required the adults to press a button when a specific visual or auditory item identically replicated an image or sound that they had seen previously. Several types of visual and auditory stimuli were randomly chosen for each of the 20 training sessions. The N-back task measured the generalization of skills by using several tests specific to different areas of cognition. Cognitive processing speed was determined by the Wechsler Adult Intelligence Scale, fourth edition. Processing Speed Index and working memory were measured using the Working Memory Index. Comparisons of pretest and posttest scores of these outcome measurements showed no selective effect of improvement on working memory or processing speed from the intervention in either groups. Although improvements on the N-back task were seen as the intervention progressed, improvements in processing and working memory did not translate to the contexts of the pretest and posttest examinations (Lindeløv et al., 2016). Lindeløv et al. (2016) concluded that the N-back task was too structured. Additionally, the study did not assess the effects of the N-back task with everyday occupations. Therefore, the N-back task did not allow for the adults with TBI to generalize the learned skills to everyday occupations .

Similarly, Li, Robertson, Ramos, & Gella (2013) used a one-group pretest-posttest design

to examine the effectiveness of a computer-based cognitive retraining (CBCR) program, called Parrot Software, in improving attention and memory. A convenience sample of adults with ABI participated in a two-month computer training program consisting of eight 60-minute sessions and were assessed before and after intervention using the Cognistat Assessment, which tests for language, spatial skills, memory, calculations, and reasoning. Significant improvements were found in both memory and attention (Li et al., 2013).

To follow-up and expand on the results by Li et al. (2013), a quasi-experimental study using a single group repeated measure design was used to determine if the improvements in memory and attention using the CBCR training were generalizable to novel occupations (Li et al., 2015). The study utilized a medication-box sorting activity, in which adults with ABI were instructed to organize the pseudo-medications into the appropriately labeled medication box. The medication-box sorting activity assessed the adult's ability to attend to specific instructions and recall information. The pretest and posttest scores indicated no significant changes in attention and memory from the medication-box sorting activity. However, global cognition scores improved after the CBCR intervention as measured by the Montreal Cognitive Assessment© (MoCA©). Therefore, the results of the study found that, although there was an improvement in global cognition, CBCR alone may not be able to improve generalization to novel occupations for adults with ABI (Li et al., 2015). Rigidity in training content and lack of modifiability when using a remedial approach, such as highly structured and repetitive memory activities, may hinder progress in the generalization of cognitive skills to novel occupations (Yip & Man, 2013). When the use of remedial interventions fail to allow transfer of functional cognition skills to everyday life occupations, compensatory interventions can be used to adapt interventions, contexts, or environments to help the adult independently perform occupations.

Compensatory interventions. Compensatory interventions are aimed to teach cognitive strategies to accommodate for the adult's cognitive deficits (Spikman et al., 2010). Compensatory interventions use a top-down approach that implements real-world situations to help adults adapt and apply strategies across daily occupations (Poulin, Korner-Bitensky, Bherer, Lussier, & Dawson, 2015; Spikman et al., 2010). A top-down approach may use internal and/or external strategies. External strategies are objects or cues in the environment that are used to help compensate for functional cognition deficits (Boelen et al., 2011). Examples of external strategies include the use of electronic devices as well as non-electronic devices, such as to-do lists and journals (Lannin et al., 2014; Lindqvist & Borell, 2010; Twamley et al., 2015). Internal strategies are the use of cognitive and self-regulatory strategies, which include self-talk, pacing, and mindfulness (Boelen et al., 2011; Twamley et al., 2015). Internal and external strategies can be used to compensate for cognitive deficits when performing occupations.

A randomized controlled trial conducted by Lannin et al. (2014) used an external strategy, assistive electronic devices, to assess the effectiveness in achieving memory-based goals. The study randomly assigned 42 adults with ABI to either the intervention group or the control group. The intervention group consisted of an eight-week training on the use of handheld electronic devices with an occupational therapist. The handheld electronic devices provided functions, such as a calendar, address book, camera and an alarm. The control group underwent eight weeks of OT with the use of non-electronic strategies, such as a paper diary, cue strategies and mnemonics. Both the intervention and control groups were encouraged to use the internal and external strategies outside of therapy. The study found that the adults with ABI using the handheld electronic devices demonstrated less memory failures than the control group as measured by the Goal Attainment Scale, which is used to assess the adult’s achievement of

goals. The study also showed that the intervention group relied more on their handheld electronic devices than internal memory strategies such as mnemonics. Therefore, the use of handheld electronic devices, which is an external compensatory device, can decrease memory failures for adults with ABI (Lannin et al., 2014).

Twamley et al. (2015) conducted a year-long randomized controlled trial exploring the effects of a 12-week Cognitive Symptom Management and Rehabilitation Therapy treatment (CogSMART) on postconcussive symptom management, prospective memory, attention, learning/memory and executive function. The study consisted of 50 Veterans with mild to moderate TBI and were receiving supported employment. The adults with TBI were randomly assigned to either the CogSMART intervention group or the control group who received additional supported employment sessions. The CogSMART interventions focused on psychoeducation and the use of internal and external compensatory strategies. Internal strategies included self-talk, self-monitoring, pacing, and mindfulness. External strategies included the use of journals, to-do lists, and calendars. The study measured changes in the four cognitive domains which includes prospective memory, attention, learning, memory and executive function using a battery of assessments. The assessments include the Wide Range Achievement Test-3rd Edition, Memory for Intentions Screening Test, Wechsler Adult Intelligence Scale-3rd Edition, California Verbal Learning Test-II, and Delis-Kaplan Executive Function System. Postconcussive symptoms such as anxiety, light and sound sensitivity, and decreased concentration were measured using a Neurobehavioral Symptom Inventory scale. Additionally, the adults' quality of life (QoL) were measured using the Quality of Life Interview- Brief Version scale. Measurements of each cognitive domain, postconcussive symptoms and QoL were administered at baseline, at three months after the 12-week intervention, at six months, and at 12 months. The

results of the study showed that the CogSMART intervention group demonstrated reduction of postconcussive symptoms, QoL, and improvement in prospective memory. Hence, CogSMART has the potential to provide adults with TBI with reminders such as to take medications or to pay bills, help manage postconcussive symptoms and increase QoL in adults with mild to moderate TBI (Twamley et al., 2015).

Lindqvist and Borell (2010) conducted an exploratory and descriptive design study to explore how assistive aids such as portable memory aids or personal digital assistants can support adults who have experienced a stroke, a type of brain injury, in daily occupations. The study collected data through the use of interviews. Twelve adults who had a stroke at least one year prior were recruited for the study and interviewed individually in their homes. The adults with brain injuries were asked to identify everyday occupations that were challenging for them at home. Some of the challenging occupations that were identified by the adults included occupations that the adults desired to do, such as going for a walk, or remembering household activities, such as reminders to turn off the stove. The study concluded from the interviews that assistive aids could be beneficial to help adults with cognitive impairments in the performance of daily occupations (Lindqvist & Borell, 2010).

To conclude, external and internal strategies may be used to compensate for functional cognitive deficits such as impairments in memory, and aid the adult an individual's performance in occupations. External strategies can be used in conjunction with internal strategies (Boelen et al., 2011). In combination, the utilization of both external and internal strategies may increase the likelihood for independence and enhance performance in occupations, in turn, increasing QoL (Boelen et al., 2011; Lannin et al., 2014; Lindqvist & Borell, 2010; Twamley et al., 2015).

Occupation-based training. Occupation-based training can combine both compensatory

and remedial interventions to engage adults in activity specific strategies to improve occupational performance (Dawson et al., 2013). While engaging in meaningful occupations, this type of training provides direct feedback based on the level of performance of the activity (Doig et al., 2014). Adults with TBI implement internal and activity specific strategies. For example, self-awareness, planning, and self-monitoring, as well as external strategies, such as written lists and alarms, are used in order to improve occupational performance. The Cognitive Orientation to Occupational Performance (CO-OP) approach, multicontext approach, and multifaceted strategy training are examples of occupation-based training that requires adults to actively engage in activity specific cognitive strategies to improve occupational performance (McEwen, Polatajko, Huijbregts, & Ryan, 2010; Spikman et al., 2010; Toglia et al., 2010).

CO-OP. Self-selected goals are implemented in intervention using the CO-OP approach. Self-selected goals can be highly variable and complex. Examples of self-selected goals may include reading, driving, gardening, participating in occupations with grandkids and repairing the house or any occupations that the adult considers important to himself or herself. The CO-OP approach incorporates the "guided discovery" concept in which the therapist guides the adult to discover strategies to achieve success in self-selected goals (McEwen et al., 2010; Poulin et al., 2015). Adults are taught to regulate their own behaviors using the global problem solving strategy, *Goal-Plan-Do-Check,* in both trained and untrained activities. Therefore, adults using CO-OP practice setting goals, making a plan, doing the planned action and checking their success once the goal is completed (Dawson et al., 2009; Dawson et al., 2013).

The effectiveness of the CO-OP approach on adults with TBI was examined among numerous studies. A randomized controlled pilot study was conducted to compare the effects of CO-OP to standard occupational therapy (OT) (Polatajko et al., 2012). Eight adults who were

six-months post-stroke were divided into either the CO-OP group or the standard OT group. Both groups chose their own goals but the standard OT intervention plans were therapist-driven, whereas the intervention plans for the CO-OP approach were driven by the adults with stroke while receiving guidance from the therapist. The study examined the difference in occupational performance between the two groups using the Performance Quality Rating Scale and the Canadian Occupational Performance Measure (COPM). The Performance Quality Rating Scale is a therapist-rated assessment designed to evaluate the performance of the adult on self-selected goals. The COPM is a standardized instrument used to elicit meaningful goals and assess the adult's perceived performance and satisfaction changes over time. The results of the study found that the CO-OP group had significantly greater improvements in occupational performance than the therapist-driven standard OT intervention group. Additionally, the CO-OP approach provided the adults with the autonomy to contribute ideas to their intervention sessions (Polatajko et al., 2012).

Similarly, Dawson et al. (2009) conducted a case series that supported the efficacy of the CO-OP approach and also further explored the generalizability of the CO-OP approach in untrained activities for adults with TBI. The case series examined three adults with TBI for one-hour sessions, twice-a-week for 10 weeks. Intervention sessions took place in various community locations including the adults' homes. The adults with TBI selected goals with the guidance from a therapist and were instructed to use the global problem solving strategy and verbal instructions to achieve their goals. The study assessed the adults with pretest and posttest intervention assessments and a three-month follow-up assessment using the COPM and the Dysexecutive questionnaire, which was used to measure daily life cognitive functions. Evidence for generalization was seen in the improvement of performance scores in the COPM and

Dysexecutive questionnaire for the untrained goals. The study found an improvement in occupational performance, through the use of global problem strategy training, and provided evidence for generalization at the three-month post-intervention follow-up (Dawson et al., 2009).

In addition, a partially randomized control trial evaluated the effectiveness of an adapted version of the CO-OP approach on real-world occupational goals, and to determine the effects of the CO-OP approach on participation in everyday life (Dawson et al., 2013). In the partially randomized control trial, six of the 13 adults were randomly assigned into either the intervention group or the control group. The seven other adults were divided into groups based on age, sex, education and severity of their TBI. Dawson et al. (2013) modified the CO-OP approach to increase the duration of the training and expanded on the guided discovery technique by having the adults develop sub-goals that would progress into achieving larger goals. The sub-goals required adults to identify and explain effective ways to execute their occupational goals and carry them out in relevant environments, such as their home and community settings. For example, if the goal of the adult was to plan healthy meals, a sub-goal may be to identify and create a list of healthy food options. The results of the study demonstrated that the experimental group showed greater improvement on occupational performance on untrained goals as compared to the control group (Dawson et al., 2013). The study also found an increase in the levels of participation as measured by the 8-item Mayo-Portland Adaptability Inventory-4 Participation Index, which was used to measure changes in participation in everyday occupations. Results of this study provided evidence on the use of the CO-OP approach to improve an adult's occupational performance (Dawson et al., 2013).

To conclude, the CO-OP approach may have been effective in improving occupational performance in daily occupations because the approach was conducted in the adult's natural

environment (Dawson et al., 2009; Dawson et al., 2013). With the CO-OP approach, the adults were able to self-select meaningful goals for their intervention plans which may have enhanced participation (Polatajko et al., 2012). After completing the interventions, the adults were able to provide examples of how to use the global problem solving strategy across trained and untrained occupations. Therefore, there is evidence to support the CO-OP approach in improving occupational performance and generalization of skills in daily occupations. However, some of the limitations from these studies demonstrated the need for additional research on the CO-OP approach. Limitations of the studies included the use of a small sample size and the lack of variation in complexity of self-selected goals between adults. All in all, these studies found that the CO-OP approach was effective in improving occupational performance among adults with TBI in both trained and untrained occupations (Dawson et al., 2009; Dawson et al., 2013; McEwen et al., 2010; Polatajko, McEwen, Ryan, & Baum, 2012).

Multicontext approach. In addition to the CO-OP approach, the multicontext approach is another type of occupation-based training. The multicontext approach suggests that in order for adults to generalize skills, daily occupations should be used to engage, motivate, and influence awareness of the adult (Toglia et al., 2010). The multicontext approach focuses on improving broad strategies that can likely be generalized across situations (Toglia et al., 2010; Toglia, Goverover, Johnston, & Dain, 2011). Strategies include the use of self-instructional strategies, verbal mediation, problem solving, and goal management training. The multicontext approach also includes gradually grading an activity. For example, during therapy, the number of steps use to complete an occupation are changed but the same rules still apply. A single-subject design study was conducted to explore the effectiveness of the multicontext approach and examine generalization of trained strategies in everyday situations (Toglia et al., 2010). The study also

examined the ability for adults with TBI to increase self-regulation, awareness, and occupational performance. Four adults with TBI participated in occupation-based activities such as making a fruit salad. Each occupation included 10 to 15 steps with instructions. The adults were taught to use strategies such as self-cues, visualization of end goal and underlining key points to effectively carry out the full list of steps, in order to complete the activity. The Self-Regulation Skills Interview is a semi-structured interview, which was used to assess the adult's awareness and use of strategies to complete occupations. The results of the interventions demonstrated an increase in awareness and the use of cognitive strategy as measured by pretest and posttest assessments using Self-Regulation Skills Interview (Toglia et al., 2010).

The study by Toglia et al. (2010) also incorporated generalization by having each adult practice strategies across occupations varying in complexity and context. For example, during the first session, the occupation-based activity took place in the kitchen and involved making a simple fruit salad. In the next session, the activity may increase in difficulty by adding more steps and ingredients, such as baking cookies from scratch instead of baking premade dough. The study examined generalization by including follow-up assessments four weeks post-intervention. The follow-up assessments included the Awareness Questionnaire and the Behavior Rating Inventory of Executive Functioning. The Awareness Questionnaire is a self-rated questionnaire that measures general self-awareness. The Behavior Rating Inventory of Executive Functioning is a standardized scale that assesses observations of functioning in everyday life. The results of the assessments demonstrated that three out of the four adults observed improvements in generalization of strategies (Toglia et al., 2010). The findings in the follow-up assessment appear to support generalization of trained strategies across contexts. Hence, the multicontext approach may be promising for improving occupational performance and the generalization of cognitive

strategies in adults with TBI (Toglia et al., 2010).

In addition, a single-subject case study examined the effects of the multicontext approach on an adult, five years post-TBI, across various occupations (Toglia et al., 2011). An adult with an ABI was recruited from a community day program. The study included nine 75-minute intervention sessions twice-a-week for five weeks. Each session consisted of multistep activities that required the use of cognitive techniques such as self-assessment and self-regulation. The Multiple Errands Test and the Executive Function Performance Test were used to measure the adult's changes in occupational performance. The study found that occupational performance improved after intervention but was not sustained at the four-week follow-up assessment. During the four-week follow-up assessment, the adult's performance in occupations digressed toward the adult's baseline results (Toglia et al., 2011). The findings may suggest that the use of multicontext approach should be reinforced after intervention through the use of follow-up, family support, and training in the adult's home to maintain the improvements gained from intervention (Toglia et al., 2011).

In conclusion, the multicontext approach is an occupation-based training that may be used to enhance occupational performance across contexts and promote generalization by training adults to utilize various cognitive strategies. After training, the adults were able to generate specific strategies across trained and untrained occupations requiring multiple steps. Hence, multicontext training has the potential to improve occupational performance among adults with TBI by using cognitive strategies in varying situations (Toglia et al., 2010; Toglia et al., 2011).

Multifaceted strategy training. A multifaceted strategy training approach is an occupation-based training which aims to target a wide range of cognitive deficits to improve

occupational performance and increase participation in daily life (Spikman, Boelen, Lamberts, Brouwer, & Fasotti, 2010). This approach relies heavily on goal management training and problem solving training to facilitate adult's improvement in occupational performance (Boelen et al., 2011). The multifaceted strategy training focuses on several aspect of cognitive functioning including self-awareness, goal-setting, planning, self-initiation, self-monitoring, self-inhibition, flexibility and strategic behavior when accomplishing daily goals.

Spikman et al. (2010) conducted a randomized control trial with 75 adults with ABI to examine the effects of the multifaceted strategy training and the ability to generalize cognitive strategies across occupations. All adults with ABI were recruited from outpatient clinics, and between the ages of 17 to 70. The study examined the experimental multifaceted strategy training group in comparison to a computerized cognitive functioning program, Cogpack. The experimental multifaceted strategy-training group applied strategy training in three stages. Additionally, generalization was emphasized throughout the study in the experimental group by encouraging the use of cognitive strategies, such as self-awareness, goal setting, planning, self-initiating, self-monitoring, self-inhibition, flexibility, and strategic behavior to help accomplish occupation-based activities.

In the first stage, the adults attended three to four sessions informing them about cognitive deficits and how cognitive deficits may impact their daily lives. Self-awareness was also addressed by asking the adults to predict their performance on in-home occupations. In stage two, the adults were trained in goal setting and planning in seven to nine sessions. By the end of stage two, the adults formulated goals based on daily occupations that they had difficulty with. For example, the adults may formulate a goal to create daily schedules of occupations that they needed to complete for the day. In stage three, the adults practiced initiating, executing, and

monitoring their goals. With initiation, the adults were taught to use external devices, such as a diary, alarm or phone, to help prompt their first step of goal execution. The adults practiced using problem solving skills to address problems that may occur during the execution of their goal, such as unexpected time changes in events. On the other hand, in the Cogpack control group, the adults engaged in repetitive cognitive computer exercises aimed to improve cognitive functioning such as memory, planning, and attention. After 10 sessions of Cogpack, the adults also formulated three goals that were meaningful to them (Spikman et al., 2010).

The study measured changes in executive functioning of participation using the Role Resumption List, where the therapist and the adult collaborate to rate the adult's participation on a five-point scale. The study demonstrated that the experimental multifaceted intervention group showed significant improvements in daily occupational performance as compared to the Cogpack control group (Spikman et al., 2010). The adults were also assessed at a six-month follow-up. At the follow-up, the adults were asked to indicate their level of goal attainment using the Treatment Goal Attainment five-point scale. Spikman et al. (2010) found that the experimental group showed greater improvement in daily life functioning over the six-month period compared to the control group. Throughout the study and the six-month follow-up, the experimental group showed an increase in participation in their life roles. The experimental group's areas of improvement included social relations, leisure occupations, and mobility. Additionally, the experimental group demonstrated the ability to accomplish goals and maintain the use of cognitive strategies such as setting, planning, organizing, monitoring and accomplishing goals. In contrast, the control group's activity level remained the same. Hence, the findings by Spikman et al. (2010) indicated that the multifaceted strategy training can be beneficial when used to improve participation and occupational performance in self-selected

goals.

Conclusively, learning generalization of skills may occur by gradually differentiating the environment and context (Toglia et al., 2010). Generalizations of skills are most automatic when occupations are similar to those of everyday life (Toglia et al., 2010). Occupation-based training, such as the CO-OP, multicontext approach, and multifaceted strategy training, used real world occupations in the intervention, which appear to be effective in generalization of skills across everyday situations (Dawson et al., 2009; Spikman et al., 2010; Toglia et al., 2010). Utilizing everyday occupations that are meaningful to the adult may potentially help him or her achieve generalization of cognitive skills, such as self-awareness, planning, and problem solving, across situations (Dawson et al., 2009; Spikman et al., 2010; Toglia et al., 2010).

Conclusion

A TBI can impact an adult's life in a variety of ways. Following a TBI, adults may experience cognitive deficits in some or all of the areas of functional cognition. These cognitive deficits may affect their participation in daily occupations. However, neuroplasticity is an important component of rehabilitation, utilizing the brain's ability to rewire and improve neural connections.

Neuroplasticity and functional cognitive improvements allow adults to participate in meaningful occupations. Cognitive rehabilitation is an intervention used with adult with TBI to remediate or compensate for the loss of cognitive skills following a brain injury ("The Society for Cognitive Rehabilitation," 2013). A challenge with cognitive rehabilitation is the ability of adults to generalize learned skills to novel situations in daily life (Li et al., 2015; Toglia et al., 2010). Although remedial interventions have shown to improve cognitive deficits, the gains in cognition are not generalizable to daily living activities. Similarly, Interventions using computer-

based intervention alone are not sufficient in improving occupational performance. Occupation-based training such as CO-OP, multicontext approach, and multifaceted strategy training, on the other hand, are promising effective interventions in cognitive rehabilitation for adults with TBI. However, there has been limited evidence to support generalizability of occupation-based intervention to occupational performance.

Statement of Purpose

Adults with TBI often struggle to perform daily activities due to deficits in functional cognition. Although current intervention strategies address components of cognitive deficits, the amount of supported research for the generalization of functional cognition skills toward everyday activities are limited. The FCA approach, as designed by Mr. Rob Koch, OTR/L, is to generalize learned skills in a therapy setting in order to engage in meaningful occupations across a variety of contexts (Koch, 2014). Therefore, the aim of this study was to provide preliminary evidence for the feasibility of the FCA approach to improve functional cognition when completing occupation-based activities.

The research questions for this study included:

1. Will the FCA approach facilitate generalization of functional cognition skills in daily occupations across contexts and environments for adults with TBI by assessing the extent to which the participants can meet their self-selected goals?
2. Will the FCA approach facilitate generalization of functional cognition skills for adults with TBI by measuring improvements in self-perception and ability to perform daily occupations across contexts and environments?

Definitions

- Cognition. Various processes of the brain which carry out essential information-processing functions (Diller & Weinberg, 1993).
- Cognitive Rehabilitation. An intervention used for adults with cognitive deficits in order to improve functional deficits by administering remedial and compensatory interventions ("The Society for Cognitive Rehabilitation," 2013).
- Compensatory Intervention. The compensatory intervention focuses on adapting the way activities are carried out to complete daily occupations (Holmqvist et al., 2009).
- Functional Cognition. The application of cognitive skills required to accomplish everyday activities (Donovan et al., 2008).
- Generalization. Refers to the ability to transfer skills learned in one setting to a different environment or situation (Toglia et al., 2010).
- Neuroplasticity. The brain's ability to rewire and improve neuroconnections. It is an important component of rehabilitation following a TBI (Dawson et al., 2009).
- Occupation. Everyday activities that an individual does to occupy time and live purposeful lives ("Definition of Occupational Therapy," 2016).
- Occupation-Based Training. Occupation-based training is used to guide individuals to use activity specific strategies to improve occupational performance (Dawson et al., 2013).
- Remedial Intervention. A remedial intervention focuses on restoring lost cognitive functions (Holmqvist et al., 2009).

Theoretical Framework

Toglia's Dynamic Interactional Model of Cognition approach (DIMC) aims to restore functional cognitive performance for adults with TBI (Toglia, 2011). DIMC emphasizes changes in performance through the dynamic interactions among the adult, the activity, and the environment. Optimal performance in occupation can be observed when a match between all three variables occur (Toglia, 2011).

The core aspects of the adult's cognition include self-awareness and processing strategies, which increase efficiency in occupational performance (Toglia, 2011). Self-awareness enables an adult to understand his or her cognitive limitations, strengths, and accurately estimate activity demands as well as anticipate problems. Adults with TBI often experience difficulty with completing activities that require awareness, working memory, and problem solving. Processing strategies are internal tools used to complete an activity with ease, such as attending to important stimuli or grouping relevant information. In addition to internal tools, performance in occupations can be supported by modifying the environment and the activity demands. Everyday occupations can be modified across contexts to increase the adult's occupational performance.

According to DIMC, learning and transferring information across activity boundaries are seen as essential components of functional cognition (Toglia, 2011). Similarly, the FCA approach addresses how the adult's personal perceptions influence functional cognition by incorporating the three-global elements, comprised of the time parameters, the environment, and the interpersonal relationships, to improve performance in occupations across contexts (Koch, 2014).

According to the FCA, improving awareness and management of the three-global

elements contributes to the adult's level of independence. Time parameters refer to the adult's ability to initiate activities and estimate the time needed to complete them, follow schedules, orient to the time of day, and manage multiple activities at once. Environment refers to the ability to visually scan, orient self to place, arrange workspaces appropriately in order to complete the activity, acknowledge safety hazards, safely navigate, and use a map and/or compensatory devices. Interpersonal relationships refer to the ability to initiate communication with others, utilize appropriate behavior in a group, understand activities and reading materials, follow commands, regulate emotions, correct errors, have insight of strengths and weaknesses (Koch, 2014).

The foundation of the FCA approach is based on the dynamic interaction between the adult, the activity and the environment. The three-global elements of FCA are used to identify problem areas, establish time management skills, and facilitate adjustments to occupations or the environment to facilitate generalization of cognitive skills applied to occupational performance. The components from DIMC influence FCA interventions by identifying and reinforcing effective problem-solving strategies, encouraging adults to modify the environment as necessary, and increasing awareness of functional cognitive deficits that impede performance in occupation. Analyzing the interplay among the adult, the activity, and the environment can guide modifications, thus enhancing performance.

Ethical and Legal Considerations

The Institutional Review Board for the Protection of Human Participants (IRBPHP) at Dominican University of California (DUC) have granted approval for the study after determining that the investigators would protect the rights, well-being, and safety of the participants through upholding the regulations established by the IRBPHP (#10527). The investigators obtained

consent from the Schurig Center for Brain Injury Recovery (SCBIR) to recruit participants affiliated with the organization for the study (Appendix A). Mr. Rob Koch, OTR/L, the author of the FCA approach, granted permission for the DUC Department of Occupational Therapy to use the cognitive rehabilitation approach (Appendix B). The MoCA Clinic & Institute granted permission to use the MoCA© for research purposes (Appendix C) to screen for levels of cognitive impairments. The permission to use the COPM, and the KELS assessments were not required as they were purchased by DUC and are accessible to students. The GAS is a part of the public domain and was used in this study to assess identify participants' goals and the extent to which the participant's goals were met (Appendix D). The investigators also upheld the American Occupational Therapy Association Code of Ethics principles of beneficence, nonmaleficence, autonomy, and social justice (American Occupational Therapy Association [AOTA], 2015).

The investigators adhered to the principle of beneficence by protecting and defending the well-being and safety of the participants (AOTA, 2015). The investigators took measures to assure the welfare of participants. Web-based training on the FCA approach was provided by Mr. Rob Koch to ensure competency in the implementation of the interventions. Dr. Kitsum Li, the faculty advisor, supervised the research study to ensure that the investigators followed ethical guidelines, and to protect the safety and well-being of the participants. The investigators used current evidence-based evaluations and interventions with the purpose of maximizing benefits for each client. The participants' progress in achieving goals were assessed and reevaluated after every session. Mr. Rob Koch and Dr. Kitsum Li oversaw the intervention sessions and had access to all intervention notes to provide guidance for the investigators as needed.

The principle of nonmaleficence states that the investigators should refrain from causing

any risk of harm to the participant (AOTA, 2015). The study was conducted in an ethical manner to protect participants from physical or psychological harm. During the study, the participants were provided with a safe environment at DUC. Participants were informed about the possibility of encountering situations that could have potentially caused physical or psychological discomfort. The investigators minimized the potential risk of physical or psychological discomfort by instructing proper techniques to complete activities and through diligent observation of participants during treatment session. Participants were informed and reminded to take breaks as needed. If participants experienced any discomfort or harm from the FCA approach, they would had the liberty to discontinue the treatment sessions and withdraw from the study at any time without any adverse consequences.

The principle of autonomy states that the investigators respected the participant's privacy, confidentiality, and consent (AOTA, 2015). The participants had the right to make their own decisions. The investigators provided the participants and guardians with informed consent forms (Appendix E) and proxy consent forms (Appendix F), respectively. The participants and guardians were given the Participant's Bill of Rights (Appendix G) addressing the purpose and procedure of the study, the risks and potential benefits, and informed on their right to withdraw at any time without adverse consequences. All paper forms and demographic data forms were secured with the use of assigned code names to respect the confidentiality of the participants. All written and electronic information of the participant were kept in a locked office of the faculty advisor, Dr. Kitsum Li, on either a password-protected computer or in a locked filing cabinet. Only the investigators, the faculty advisor, Dr. Kitsum Li, and the approach developer, Mr. Rob Koch, OTR/L had access to the information. All information that was collected throughout the study was destroyed one year after the completion of the study.

The researchers upheld the principle of social justice by providing services in a fair and reasonable manner (AOTA, 2015). Participation in the study was based solely on the inclusion and exclusion criteria. Potential participants who did not meet the inclusion and exclusion criteria were not accepted to participate in the study but were referred to the SCBIR as an alternative resource. In summary, social justice was upheld throughout the recruitment period for this study.

Methodology

Design

This research study utilized a case study pretest-posttest design. The purpose of the study was to examine the effects of the FCA approach, authored by Mr. Rob Koch, OTR/L, in facilitating generalization of functional cognition skills across novel activities in adults with traumatic brain injury. The FCA approach encourages the use of cognitive skills such as time-awareness, self-awareness, safety-awareness, planning, and problem solving while performing activities that require the utilization of the three-global elements. Pretest assessments were administered prior to the beginning of intervention sessions. Participants were expected to attend a total of 16 intervention sessions, twice-a-week for eight weeks, and each session took approximately 60-minutes. Following intervention sessions, posttest assessments were administered to compare pretest-posttest results to track changes in occupational performance. After four-months, a follow-up interview was administered over the phone to determine potential long-term effects of the FCA approach.

FCA approach. Mr. Rob Koch, OTR/L, the author of the FCA approach, provided two-hours of web-based training for the investigators on the proper administration of the FCA

approach. The intervention sessions within the FCA approach are based on eight levels of functional cognitive performance in the evaluation scale (Table 1) (Koch, 2014). Level eight is the highest cognitive functioning level and level one is the lowest cognitive functioning level. In level one, the adult is being directed step-by-step and is not aware of time, environment, or others. The goal for level one is for the participants to initiate the steps of the occupation, such as completing basic self-care activities. Level two focuses on the adult's ability to keep track of time throughout the intervention session. An adult in level three will focus on becoming more aware of time and the environment. The goal of level three is to navigate the environment while completing various occupations. In level four, the goal is to follow a schedule as well as begin and end occupations on time. The main focus of level five is for the adult to identify a navigation method that enables him or her to move through the environment independently. The goal of level six is for the adult to organize and complete a list of occupations using higher level functional cognition such as plan, estimate time, problem solve and execute his or her self-developed schedule. In level seven, the main focus is to demonstrate the ability to navigate a familiar and unfamiliar environmental safely. Lastly, the goal of level eight is to complete complex occupations that incorporate multitasking. It is projected at level eight, an adult has the potential to return to functional roles such as managing the home or, returning to work and school (Koch, 2014). The eight levels of functional cognitive performance are used to guide the intervention sessions. Regardless of which cognitive level an adult is at, each intervention session will use individualized schedules and goals, which are established by the pretest assessments results.

Subjects

The study utilized a convenience sample of English-speaking adults over the age of 18

who acquired a TBI at least six-months prior to the start of the study. The inclusion criteria for participation in the study consisted of adults who have functional vision, functional use of one-hand, mild to moderate cognitive impairment as determined by a MoCA© score between 10 and 26 points out of total of 30, independent in mobility with or without assistive devices, which includes the use of wheelchairs, walkers, or canes. Adults who had severe cognitive impairment as determined by MoCA© were excluded from the study.

The participants were recruited from the SCBIR in Larkspur, California. The SCBIR is a community-based, non-profit organization that provides a variety of classes, programs, and therapy, including yoga and movement groups, expressive art classes, therapeutic computer programs, speech therapy, and occupational therapy to adults with ABI (Schurig Center for Brain Injury Recover, 2016). With the assistance from the staff at the SCBIR, investigators recruited participants by posting recruitment flyers (Appendix H) and held a short in-person presentation at the center's support group. The recruitment period occurred between January and early March 2017.

Adults who were interested in participating in the study were contacted by the investigators for a 15-minute telephone screening to complete a Telephone Demographic Questionnaire (Appendix I). For those participants who fulfilled the initial screening criteria, they were invited to DUC to sign the legal consent or proxy consent form prior to completing the MoCA©. The MoCA© screening was used to further evaluate the participants' cognitive abilities to potentially partake in this study. Following the MoCA© screening, the participants were provided with the Participant's Bill of Rights to inform the participants' of their rights in this study. To follow, the participants' completed pretest assessments. The potential participants who did not meet the inclusion criteria for the study were referred back to the SCIBR for

community programs and resources.

Measures and Instruments

Multiple measures were used in this study. The MoCA© was used as the initial screening tool during the participant recruitment process to assess for cognitive impairment. Participants also completed pretest, posttest, and follow-up assessments, which included the COPM, GAS, and KELS assessments to detect changes in occupational performance immediately after intervention and after four months.

MoCA©. MoCA© is a single page, 30-point test to screen and evaluate cognition in adults with cognitive impairment (Wong et al., 2013). MoCA© assesses areas of cognition such as visuospatial skill, executive functions, orientation, verbal memory, learning, attention, and ability to recall information. The MoCA© can be used to categorize cognitive impairments into three cognitive levels. A MoCA© score between 18 and 26 indicates mild cognitive impairment (MCI). A score between 10 and 17 indicates moderate cognitive impairment, while a score less than 10 indicates severe cognitive impairment (MoCA Montreal-Cognitive Assessment, 2016). For this study, the MoCA© was used to screen for mild to moderate cognitive impairments in adults with TBI as one of the inclusion criteria.

A validation study conducted by Nasreddine et al. (2005) assessed 94 patients with MCI, 93 patients with mild Alzheimer's disease and 90 healthy older adults as the control group. The older adults were recruited from a community clinic and academic center. The study compared the MoCA© with the Mini-Mental State Examination (MMSE), which is a widely used cognitive screening for dementia. Both the MoCA© and the MMSE were administered to all older adults on the same day to compare the sensitivity of the two assessments for detecting MCI. The study found that the MoCA© demonstrated excellent sensitivity (90%) in detecting MCI. The MoCA©

also exhibited high test-retest reliability and good internal consistency in identifying MCI. Hence, the study demonstrated the ability of the MoCA© to quickly assess an adult for cognitive impairment when compared to the MMSE (Nasreddine et al., 2005).

COPM. The COPM is a practical, client-centered assessment that can effectively assess adults with neurological impairments to identify meaningful goals and changes in self-perception of occupational performance (Phipps & Richardson, 2007). Adults with neurological impairments are asked to rate performance and satisfaction in performing self-selected occupations on a scale of one to 10, one being low in importance and satisfaction, while 10 being high in importance and satisfaction. Areas of occupations may include activities of daily living (ADLs) such as eating, bathing, or dressing, and instrumental ADLs (IADLs) such as work, education, and leisure activities. For this study, the COPM was used during the initial evaluation, immediately following intervention, and at the four-month follow-up to track changes in self-perception on occupational performance.

The COPM was evaluated for test-retest reliability and discriminant validity in a study with adults' post-cerebrovascular accident (CVA) (Cup, Scholte op Reimer, Thijssen, & van Kuyk-Minis, 2003). All 26 adults who participated in the study were individually interviewed to determine their self-reported performance and importance of their chosen daily occupations. To ensure test-retest reliability, each participant was interviewed again eight days later by the same occupational therapist. The scores on performance and satisfaction in the chosen daily occupations, as assessed by the adults, were compared between the two interviews. The test-retest reliability score in satisfaction is .88, $p < 0.001$, and .89, $p < 0.001$, in performance (Cup et al., 2003). In order to test for discriminant validity, each adult's self-identified COPM items and performance scores were compared to a battery of standardized functional measures for adults

with CVA. Standardized functional measures include the Barthel Index, Frenchay Activities Index, Stroke Adapted Sickness Impact Profile-30, Euroqol 5D and the Rankin Scale. The study found that the standardized functional battery of measurements for adults with stroke were consistent with the self-perceived results using COPM (Cup et al., 2003), and thus confirming the discriminant validity of the COPM.

GAS. The GAS is used to measure achievement on the participants' self-selected goals (Turner-Stokes & Williams, 2010). The GAS consists of a symmetrical five-point scale ranging from -2 to +2. After the adult and the therapist determine potential goals for intervention, the five-point scale determines the level of accomplishment for each established goal. To determine the effectiveness of the intervention relating to the individualized goals, scores were determined as follows: achieved (0), overachieved (+1 or +2), or not achieved at all (-1 or -2), (Turner-Stokes & Williams, 2010). To ensure the participants' understanding of the criteria required to meet the goals, the investigators explained the criteria for meeting a -2,"a lot", or -1, "a little" less than expected. The participants and the investigators also discussed criteria for meeting +2, "a lot", and +1, "a little" more than expected. The GAS was conducted in this study during pretest and posttest measurements and was used to track changes in occupational performance. Additionally, the GAS was used during the four-month follow-up phone interview to assess for generalization of functional cognition.

KELS. The KELS is a standardized evaluation assessing the ability for an adult to live safely and independently in the areas of basic activities of daily living (BADLs) and IADLs (Thomson, 2016). The KELS assesses 13 living skills in five areas: (1) self care, (2) safety, (3) money management, (4) community mobility and telephone, and (5) employment and leisure participations. This 45-minute evaluation consists of participant interviews and performance of

various occupation-based activities. Each of the 13 living skills are scored individually. The KELS has two scoring categories, the adult may either receives “independent” or “needs assistance”. “Independent” refers to the adult ability to perform the BADLs or IADLs without direct assistance from other person. The evaluator may also take additional notes on the score form to help with interpretation of the results. The KELS was used in this study during pretest and posttest assessment to measure changes in occupational performance. Results from the KELS provided the investigators with an understanding of the participants’ strengths and areas that the participant may require assistance (Thomson, 2016).

The KELS, 4th edition (KELS-4) (2016), does not currently have sufficient updated research to verify the test’s validity and reliability. However, a number of studies have been done on the previous editions of KELS in establishing its reliability and validity. Ilika and Hoffman (1981) conducted two studies. One study explored the concurrent validity of the KELS, 3rd edition (KELS-3), while the other study examined the validity. The studies demonstrated acceptable to high interrater reliability (74% to 98%) and favorable validity (Thomson, 2016).

A more recent case control study examined the convergent validity between the KELS-3 and other cognitive measures to screen older adults’ ability to live safely and independently (Burnett, Dyer, & Naik, 2009). The study consisted of 200 community-dwelling older adults, 100 of whom were referred by the Adult Protective Services and the other half were referred from a community geriatrics clinic. The study measured the older adults ability to live safely and independently through a one-time home-based assessments on a battery of cognitive, affective, executive, and functional measures, which included valid and reliable instruments such as the the Executive Clock Drawing Test (CLOX) and the Executive Cognitive Test (EXIT25). The study found that the KELS-3 strongly correlated with the EXIT25 and CLOX assessments. Therefore,

the researchers suggested that the significant convergence between the KELS-3, EXIT25, and CLOX, indicates that KELS-3 may be a valid tool to measure an adult's ability to live safely and independently in the community (Burnett et al., 2009).

Procedures and Data Collection Methods

Adults that met the inclusion criteria in the telephone interview and the in-person MoCA© screening began pretest assessments for baseline measurement one week prior to the first intervention session. To measure for baseline, the participants completed the COPM, GAS, and KELS. The KELS was used to assess each participant's ability to complete daily occupations. The COPM was used to gain a better understanding of the participants' self-perception of their performance in daily occupations, while the GAS was used to formulate participants' self-selected goals.

The study consisted of 16 intervention sessions meeting twice-a-week for eight weeks. During each intervention session, participants were provided with a personalized schedule of occupation-based activities to complete, such as filing papers, putting away grocery items, and sorting medications. The participants' personalized intervention schedules were determined by the results from the pretest assessments following the FCA approach. Each session was conducted as a one-on-one intervention, beginning with a 10-minute discussion of the schedule for the session, objective of the day and review of strategies the participant could utilize. Completion of occupations was not the main focus of the intervention sessions. If participants were unable to complete the activity within the given time frame, they were instructed to move on to the next occupation listed on the schedule. Therefore, the main focus of the sessions was for the participants to stay on schedule and complete the schedule within a 30 to 40 minute time frame. Additionally, the investigator was present to observe the participant and provide cues as

necessary.

At the end of each intervention session, the participant and the investigator sat down for a debriefing. During the debriefing, the investigator and the participant discussed things that went well and things that could be improved upon for the following sessions. The investigator also provided feedback based on observations of the participant's performance during the intervention session.

After completion of the intervention sessions, the participants completed a battery of posttest assessments, including the KELS, COPM, and GAS, one-week after the final intervention session. The posttest measurements were used to measure changes in the participants' occupational performance and self-perception of his/her performance by comparing the pretest and posttest assessment results. Four months after the final intervention session, the participants were contacted for a 30-minute telephone follow-up assessment using the COPM and GAS to assess for generalization of functional cognition skills to everyday occupations.

FCA approach. Mr. Rob Koch, OTR/L, the author of the FCA approach, provided two-hours of web-based training for the investigators on the proper administration of the FCA approach. The intervention sessions within the FCA approach are based on eight levels of functional cognitive performance in the evaluation scale (Table 1) (Koch, 2014). Level eight is the highest cognitive functioning level and level one is the lowest cognitive functioning level. In level one, the adult is being directed step-by-step and is not aware of time, environment, or others. The goal for level one is for the participants to initiate the steps of the occupation, such as completing basic self-care activities. Level two focuses on the adult's ability to keep track of time throughout the intervention session. An adult in level three will focus on becoming more aware of time and the environment. The goal of level three is to navigate the environment while

completing various occupations. In level four, the goal is to follow a schedule as well as begin and end occupations on time. The main focus of level five is for the adult to identify a navigation method that enables him or her to move through the environment independently. The goal of level six is for the adult to organize and complete a list of occupations using higher level functional cognition such as plan, estimate time, problem solve and execute his or her self-developed schedule. In level seven, the main focus is to demonstrate the ability to navigate a familiar and unfamiliar environmental safely. Lastly, the goal of level eight is to complete complex occupations that incorporate multitasking. It is projected at level eight, an adult has the potential to return to functional roles such as managing the home or, returning to work and school (Koch, 2014). The eight levels of functional cognitive performance are used to guide the intervention sessions. Regardless of which cognitive level an adult is at, each intervention session will use individualized schedules and goals, which are established by the pretest assessments results.

Table 1 Functional Activities Evaluation Scale

Level	*Time Performance*	*Environmental Performance*	*Interpersonal Performance*
8	Creates time schedule for project	Navigates in unfamiliar community	Generates goals for self-improvement
8	Multi-tasks to maximize time	Plans entire outing before starting	Finds alternative solutions to problems
8	Uses daily/weekly planner effectively	Gathers all materials before starting	Uses compensation for deficits
8	Estimates time needed for project	Identifies shortcuts during outing	Modifies behavior to match situation
8	Completes project in time	Revises route if necessary	Spontaneously engages others
7	Schedules interleaving tasks	Navigates in familiar community	Enters appointments in planner
7	Prioritizes tasks by time	Uses map to find unfamiliar places	Includes key info when taking notes
7	Manages overlapping tasks	Aware of safety hazards on outing	Anticipates consequences of actions
7	Revises time schedule as needed	Plans most efficient route at start	Evaluates own behavior
7	Adjusts work speed to time limits	Uses landmarks to navigate	Accepts criticism of performance
6	Creates a time schedule for session	Navigates multi-level building	Finds appropriate people to ask
6	Estimates time needed for each task	Oriented using map	Spontaneously initiates taking notes
6	Aware of elapsed time during tasks	Keeps workspace organized	Highlights details of written instructions
6	Arranges tasks according to time limits	Avoids back tracking between places	Recognizes/corrects errors
6	Completes tasks at normal speed	Uses signs to navigate	Follows complex instructions
5	Arranges tasks according to number	Navigates on same floor of building	Initiates asking for help when needed
5	Attends to time while navigating	Keeps track of personal belongings	Takes notes when told
5	Writes schedule when dictated	Keeps task materials separated	Clarifies instructions before starting
5	Crosses off tasks when finished	Aware of safety during complex ADL	Denies or argues about performance
5	Completes *complex* multi-step tasks	Uses floor plan/map to navigate	Uses phone/computer to get info
4	Follows time schedule accurately	Navigates to rooms in same area	Solves simple word problems
4	Consistently checks clock	Recalls items in adjacent rooms	Communicates ideas clearly
4	Aware of being off schedule	Recognizes/states when lost	Aware of errors, but don't correct
4	Sets own alarm if needed	Returns to start from different room	States some deficit areas
4	Completes a series of *unrelated* tasks	Navigates by written/verbal directions	Initiates using phone to make call
3	Starts/stops tasks on time	Navigates to multiple places in room	Follows simple written directions
3	Identifies correct date on calendar	Carries checklist from task to task	Initiates communication
3	Understands printed time schedule	States current location when asked	Recalls names of *unfamiliar* persons
3	Uses alarm to switch tasks on time	Returns to start point in same room	Controls emotions
3	Completes series of *related* tasks	States next destination when asked	Appropriately addresses others
2	Initiates next task at correct time	Scans for items within room	Reads simple written phrases
2	Monitors clock during tasks	Returns to task if interrupted	Initiates greeting others
2	Stays on task until completed	Keeps checklist within reach	Recalls names of *familiar* persons
2	Checks time when alarm sounds	Scans area before starting out	Responds with appropriate emotion
2	Completes all *steps* in related *task*	Walks/propels safely	Looks at others when talking
1	Initiates next step on printed checklist	Scans for items within reach	Reads simple *typed* words or numbers
1	Uses message device for next step	Attends to task in distracting room	Follows one-step verbal instructions
1	States time when asked	Finds alarm and turns it off	Responds to name when called
1	Moves to next step when alarm sounds	Looks for checklist of tasks	Able to calm self after outburst
1	Counts exercises or task repetitions	Transfers safely	Answers question when asked

Setting and equipment. The intervention sessions were conducted in simulated environments at DUC. Publicly accessible campus facilities, including the library, dining hall, parking lot, walking paths, and bridges were used to simulate community environments. The occupational therapy lab room, which included a kitchen, bathroom, and bedroom, was used to simulate the home environment. Materials used in session included items that were relevant to

the participants' interests such as newspaper articles, grocery items, maps, computers, kitchen appliances, and basic clothing items.

Results

Ten interested adults with TBI expressed interest participating in this study and were contacted for a phone interview. However, only two participants fulfilled the inclusion criteria. Although 16 individual sessions were planned, both participants were only able to complete 14 sessions due to scheduling conflicts.

Participant One Case Study

Participant 1 (P1) is a 61-year-old Caucasian female who lives by herself in a single-story home. Prior to suffering a TBI in 2012, P1 worked full-time as a correctional officer and went to school to earn her Bachelor's degree in psychology. Currently, P1 enjoys attending church and weekly support group meetings. P1 self-identified cognitive impairments that made engaging in everyday occupations difficult as mental fatigue, inability to concentrate, problem solving, limited ability to sequence activities, and frustration with planning for the future. Additionally, P1 reported concerns with social isolation, inability to continue work as a corrections officer.

P1 scored a 23 out of 30 on the MoCA© indicating a mild cognitive impairment with deficits in attention, language, and short-term memory. During the pretest assessment, results of P1's KELS scores indicated that she needed assistance when using cash while making purchases and participating in leisure activities (Table 2). Additionally, after completing the COPM, P1 identified her top five areas of desired occupational improvement are as follows: (1) bill pay, (2) sequencing self-care activities, (3) functional mobility regarding balance, using divided attention while processing sensory input, and depth perception, (4) religious practices including

meditation and memorizing prayers, and (5) household management such as doing her laundry (Table 3). The GAS was used to determine participant's goals (Table 4). P1's first goal addressed community mobility. For optimal achievement of this goal, P1 would participate in activities in the community at least six-times per week, and nightly at least once per week, by the end of FCA intervention. P1's second goal included quiet recreation. For optimal achievement of this goal, P1 would engage in quiet prayer without distractions for 20-minutes daily by the end of FCA intervention sessions.

The investigators used the pretest assessments to determine the appropriate starting FCA level for intervention (Table 5). P1 exhibited insight into her cognitive deficits and was subsequently able to identify problem areas that impacted her occupational performance. Based on P1's self-reported mental fatigue, difficulty concentrating and problem solving, and challenge with planning ahead, P1 began intervention at FCA level five. At level five, P1 navigated beyond the immediate environment to perform tasks involving the three-global elements: (1) time awareness and management, (2) environmental awareness and management, and (3) interpersonal relationships and self-awareness. Within time awareness and management, P1 was able to attend to time while navigating and performing activities sequentially, such as completing activities on a schedule in the correct order. Within environmental awareness and management, P1 was able to use a map to navigate the environment outside of the lab room and maintain awareness of safety during complex activities. Within interpersonal relationships and self-awareness, P1 took notes of verbal instructions when prompted, used a phone/computer to gather information, asked for help when navigating in the community, and read directions in order to complete activities.

While on FCA level five, P1's sessions focused mainly on navigating beyond the lab

room at DUC, prioritizing, and problem solving. For example, during one of the sessions, P1 was given a schedule of items to complete in sequential order. The participant was instructed to navigate the environment around the lab room to find items in order to complete a coffee brewing activity, complete an IADL laundry activity involving organizing clothing items according to written instructions, and complete a sequencing activity with visual and auditory distractors. P1 demonstrated ability to problem solve, prioritize activities, and complete all activities on time but seemed to be distracted by auditory stimulation while completing sequencing activity. At the end of the session, P1 and the investigator discussed strategies to implement in future sessions and at home. Strategies included environmental adaptations and remembering to read instructions thoroughly to improve occupational performance.

After three weeks of intervention, P1 demonstrated progress in the use of cognitive skills including topographical awareness, problem solving, and attention. On week four, P1 progressed to FCA level six, shifting the FCA approach to focus on creating her own schedule from a list of activities with less structure from the investigator, navigating in unfamiliar environments outside of the building, and organizing the therapy schedule. Activities on the schedule included organizing and carrying out activities, such as making a bed, walking the dog, meditating, and checking the weather online, to simulate a typical daily schedule. P1 was able to spontaneously make appropriate environmental adaptations, such as dimming the lights before meditation practice, and prioritize activities to complete the self-created schedule on time. The client utilized strategies such as taking photos of the campus map to use as reference for navigating the campus and remembering to adapt her environment to improve activity performance. At the end of each session, P1 was debriefed on strategies used in previous sessions as well as recommended strategies to improve performance in the following session. Within time

awareness and management at this level, P1 was able to create a time schedule for sessions, estimate the amount of time needed for each activity and carry out her self-created schedule within specific time parameters. Within environmental awareness and management at this level, P1 was able to use signs, landmarks and campus maps to navigate at the outside environment as well as multi-level buildings. Within interpersonal relationships and self-awareness at this level, P1 was able to take notes spontaneously during the session, follow complex instructions, and find appropriate people to ask for directions when necessary to complete activities.

At the final session, P1 progressed to level seven after demonstrating consistent use of strategies and her ability to create and complete her own schedule, navigate to unfamiliar environments outside of the building as well as estimate time needed for each activity. At level seven, she was challenged to revise the schedule she created to accommodate for each activity. P1 was able to navigate to unfamiliar environments and evaluate her own performance throughout the session. Additionally, P1 demonstrated the use of coping skills including positive self-talk and incorporated pacing to decrease anxiety. Thus, P1's ability to recall strategies learned from previous sessions as well as her increased awareness of self, time, and environment indicated achievement of FCA level seven by the final intervention session.

At the four-month follow-up, P1 reported an increased participation in activities within the community and a decrease in frustration while navigating her environment. For example, P1 traveled to a new city for a weekend excursion and reported getting lost but was able to use strategies learned in session including identifying landmarks and using positive self-talk. These reports were also supported by the results on the four-month follow-up COPM and GAS assessments.

Outcome Measures

KELS. During the pretest assessment, P1 scored "independent" in all areas except for the "use of cash". At the posttest assessment, P1 scored "independent" in all areas. Pretest to posttest score comparisons demonstrates improvement in all areas of occupational performance.

Table 2 Participant 1 Pretest and Posttest Scores for Kohlman Evaluation of Living Skills Assessment

Occupations		Pretest			Posttest		
		Independent	Needs Assistance	N/A	Independent	Needs Assistance	N/A
Self Care	Frequency of self care activities	X			X		
	Appearance	X			X		
Safety & Health	Awareness of household safety hazards	X			X		
	Identify appropriate actions (sickness, accidents & emergencies)	X			X		
	Knowledge of medical and dental facilities	X			X		
Money Management	Use of cash		X		X		
	Payment of bills	X			X		
	Obtain and maintain source of income	X			X		
Community Mobility & Telephone	Mobility within community	X			X		

	Basic knowledge of transportation system	X			X		
	Use of telephone	X			X		
Employment & Leisure	Plans for future employment	X			X		
	Leisure activity involvement	X			X		

COPM. Overall P1's performance and satisfaction scores increased from pre to post-intervention. At the four-month follow-up assessment, P1's performance in quiet recreation, household management, and bill paying increased while her performance in personal hygiene remained the same. P1's satisfaction increased with the ability to complete quiet recreation while P1's satisfaction with household management and bill paying remained the same. However, P1 reported a decrease in satisfaction for personal hygiene activities and satisfaction in quiet recreation increased.

Table 3 Pretest, Posttest, and Four-month Follow-Up Scores of Canadian Occupational Performance Measure for Participant 1

OP Problems	Importance level scale 1-10	Pretest Performance T1	Posttest Performance T2	4 month Follow-Up Performance	Pretest Satisfaction T1	Posttest Satisfaction T2	4 month Follow-Up Satisfaction
1. Bill Paying	10	4	7	9	3	9	9
2. Personal Hygiene	9	6	8	8	5	8	7
3. Functional Mobility	8	5	9	9	5	9	9

4. Quiet Recreation	10	2	5	8	2	6	8
5.Household Management	7	3	7	9	3	9	9
		Total Performance T1	Total Satisfaction T2	Total Performance Follow-up	Total Satisfaction T1	Total Satisfaction T2	Total Satisfaction Follow-up
Total Scores		20	36	43	18	41	42
		Average Performance T1	Average Satisfaction T2	Average Performance Follow-up	Average Satisfaction T2	Average Satisfaction T2	Average Satisfaction Follow-up
Average Scores		4	7.2	8.6	3.6	8.2	8.4

GAS. Pretest to posttest scores for P1's goal of quiet recreation increased to +1 at the posttest assessment and increased further, to +2, at the four-month follow-up. P1's scores for the goal in the category of quiet recreation increased to +2 at the posttest assessment and remained at +2 at the four-month follow-up.

Table 4 Participant 1 Pretest, Posttest, and Four-month Follow-Up Scores for Goal Attainment Scale

Participant Goals	GAS Pretest	GAS Posttest 1 (≤ 1 week follow-up)	GAS 4-month follow-up
Goal 1: Community mobility	0	+1	+2
Goal 2: Quiet Recreation	0	+2	+2

Table 5 Functional Cognitive Activities Evaluation Scale for Participant 1

FCA Level	Time Performance	Environmental Performance	Interpersonal Performance
5	• Arranges activities according to number • Attends to time while navigating	• Uses floor plan/map to navigate • Aware of safety during complex ADL	• Takes notes when told • Initiates asking for help when needed • Uses phone/computer to get information
6	• Creates a time schedule • Aware of elapsed time during tasks	• Oriented using maps • Uses signs to navigate	• Asks for directions • Identifies details of written instructions • Follows complex instructions
7	• Schedules interleaving activities • manages overlapping activities • adjusts work speed to time limits	• Uses maps to find unfamiliar places • Plans most efficient route at start • Uses landmarks to navigate	• Includes key information when taking notes • spontaneously initiates taking notes • accepts criticism of performance

Participant Two Case Study

Participant two (P2) is a 77-year-old Caucasian male who lives with his wife, his primary caregiver, and the family dog in a single-story apartment. Prior to sustaining a TBI in 2014, P2 worked as an attorney and was the sole financial provider for his family. Post-TBI, P2 reported spending a majority of the day watching television at home, relying on assistance from his wife to perform most ADLs and IADLs. P2 ambulates around the apartment and the community with a front-wheel walker. P2's wife reported having concerns with her husband's safety awareness while ambulating and completing ADLs. During pretest assessments, P2 expressed a desire to return to work and to become more independent in self-care activities.

P2 scored a 20/30 on the MoCA© which suggested a mild cognitive impairment in the

areas of visuospatial awareness, executive functioning, attention, language, and abstract thinking. During pretest assessments, results from the participant's KELS score indicated that he required assistance with awareness of safety hazards within the household, use of cash in purchasing items, and gathering payment for bills (Table 6). Additionally, the COPM results identified that his top five areas of desired occupational improvement are as follows: (1) dressing, (2) personal care such as showering, (3) functional mobility using a front wheeled walker, (4) returning to life roles such as work, and (5) leisure activity such as reading a book (Table 7). P2's goals were identified using the GAS (Table 8). P2's first goal included self-care. For optimal achievement of this goal, at the four-month follow-up, P2 would verbally recall daily self-care activities in chronological order, with 100% accuracy. P2's second goal addressed leisure activities. For optimal achievement of this goal, at the four month follow-up, P2 would attend to morning newspaper reading routine without verbal prompts to stay on activities, for 25-minutes a day.

During the pretest assessment session, P2 was unable to identify specific cognitive deficits that impacted his performance, which indicated a lack of insight. However, the investigators were initially unaware of P2's degree of insight, based on his screening and pretest assessments alone. Although, P2's caregiver reported P2's inability to ambulate safely with a walker during ADLs, P2's pretest assessment results and the FCA scale suggested to the researchers that FCA level four was the appropriate starting point (Table 9).

At FCA level four the focus was to follow a timed schedule through the performance of the same three-global elements in FCA. Within time awareness and management, the investigators identified that P2 was able to complete a series of unrelated activities. Within environmental awareness and management, P2 was able to navigate around his immediate environment within one room using written and verbal directions. Within interpersonal

relationship and self-awareness, P2 was able to solve simple word problems, clearly communicate ideas verbally, and was aware of personal errors but failed to self-correct mistakes.

While at FCA level four, P2's sessions focused on beginning and ending activities on time within the immediate environment and adjacent rooms. For example, during one of the sessions P2 was given a schedule which provided simple instructions on how to complete each individualized activity. The schedule involved P2 organizing bills chronologically by due date, memorizing and producing a given drink order using materials located within the room, and answering questions from information found in a given newspaper. However, in spite of the instruction, P2 focused heavily on completing activities rather than following the time schedule. P2's inability to follow time schedule demonstrated concern for response inhibition, attentional control, and self-awareness of deficits. At the end of the session, the participant was provided strategies to incorporate for future sessions to stay on schedule, which included using a wrist watch, checking the clock, and rereading the schedule.

After four sessions, the investigators decided that P2 was having difficulty with activities at FCA level four and therefore, was moved to FCA level three. FCA level three focused on scanning the immediate environment and ceasing activity at the designated time, which was more fitting for P2. In FCA level three, he was able to identify correct dates on a calendar, understand a printed time schedule, and complete a series of related activities. In regards to environmental awareness and management, P2 was able to state his current location when asked, return to the start point within the room, and identify the next destination when asked. Lastly, in regards to interpersonal relationship and self-awareness, P2 demonstrated the ability to follow simple written directions, initiate communication, self-regulate emotions, and appropriately address others.

At FCA level three, his sessions focused on orienting himself to a single environment and demonstrating safety awareness. P2 was asked to recall the time management strategies discussed in previous sessions, such as asking clarifying questions, rereading written instructions provided on each activity of the schedule, and taking notes. P2 was reminded to use the strategies to complete the schedule within a given time frame. Before a schedule was provided, each activity was explained in detail. The schedule focused on lower body dressing, washing the dishes, and folding laundry. By the final session, P2 was able to complete lower body dressing independently with use of long-handled shoe horn and was able to recall one out of three strategies by writing down notes.

At the four-month follow-up, P2 reported occasionally putting on and taking off his shoes independently but the majority of the time his caregiver assisted him in ADLs and IADLs. He also reported an increased utilization of memory strategies with his caregiver. Additionally, P2's COPM scores, at the four-month follow-up, showed sustained performance and satisfaction, while GAS scores varied.

Outcome Measures

KELS. At pretest, P2 scored "needs assistance" in areas of "awareness of household safety hazards" and "use of cash". By posttest, P2 scored "independent" in all areas except "awareness of household safety hazards" category within the safety and health and "leisure activity involvement" category within employment and leisure. The pretest-posttest results demonstrate improvement in the use of cash when purchasing items but declined in leisure involvement.

Table 6 Participant 2 Pretest and Posttest Scores for Kohlman Evaluation of Living Skills Assessment

Occupations		Pretest			Posttest		
		Independent	Needs Assistance	N/A	Independent	Needs Assistance	N/A
Self Care	Frequency of self care activities	X			X		
	Appearance	X			X		
Safety & Health	Awareness of household safety hazards		X			X	
	Identify appropriate actions (sickness, accidents & emergencies)	X			X		
	Knowledge of medical and dental facilities	X			X		
Money Management	Use of cash		X		X		
	Payment of bills			X			X
	Obtain and maintain source of income	X			X		
Community Mobility & Telephone	Mobility within community	X			X		
	Basic knowledge of transportation system	X			X		
	Use of telephone	X			X		
Employment & Leisure	Plans for future employment	X			X		
	Leisure activity involvement	X				X	

COPM. Performance and satisfaction scores indicated a slight increase from pre to post-intervention. During the four-month follow-up, P2's performance scores in dressing, showering, functional mobility, and leisure activities remained the same while performance in law practice score decreased. P2's satisfaction scores in areas of showering and law practice increased while dressing and leisure activities remained the same. However, the satisfaction score in functional mobility decreased.

Table 7 Participant 2 Pretest, Posttest, and Four-month Follow-Up Scores for Canadian Occupational Performance Measure

OP Problems	Importance level scale 1-10	Pretest Performance T1	Posttest Performance T2	4-month Follow-Up Performance	Pretest Satisfaction T1	Posttest Satisfaction T2	4-month Follow-Up Satisfaction
1. Dressing	10	1	7	7	2	7	7
2. Shower	10	3	5	5	2	5	6
3. Walking with walker	10	5	9	9	4	9	7
4. Law Practice	9	1	5	1	0	7	4
5. Leisure Activity	4	3	4	4	1	4	4
		Total Performance T1	Total Performance T2	Total Performance 4-month Follow-Up	Total Satisfaction T1	Total Satisfaction T2	Total Satisfaction 4-month Follow-Up
Total Scores		13	30	26	9	32	28
		Average Performance T1	Average Satisfaction T2	Average Performance Follow-up	Average Satisfaction T2	Average Satisfaction T2	Average Satisfaction Follow-up
Average Scores		2.6	5	5.2	1.8	6.4	5.6

GAS. Pretest to posttest assessment for P2's goal of self-care activities was a -0.5 and leisure activity remained at 0. At the four-month follow-up, P2's achievement of self-care goal decreased further, to baseline, with a score of -1. In contrast, his leisure score increased to +1, indicating goal achievement.

Table 8 Participant 2 Pretest, Posttest, and Four-month Follow-Up Scores for Goal Attainment Scale

Participant Goals	GAS Pretest	GAS Posttest 1 (≤ 1 week follow-up)	GAS 4-month follow-up
Goal 1: Self-care	0	-0.5	-1
Goal 2: Leisure	0	0	+1

Table 9 Functional Activities Evaluation Scale for Participant 2

FCA Level	Time Performance	Environmental Performance	Interpersonal Performance
4	• Able to complete a series of unrelated activities	• Able to navigate to rooms in his immediate environment • Navigates by written/ verbal directions	• Solves simple word problems • Communicates ideas clearly • Aware of errors • Fails to self-correct mistakes
3	• Able to identify correct dates on a calendar • Understands a printed time schedule • Completes series of related activities	• States current location when asked • Able to return to start point in the same room • Able to state next destination when asked	• Demonstrates ability to follow simple written directions • Initiates communication • Able to use self-regulation Appropriately addresses others

Discussion

This pilot study examined two research questions involving the FCA approach with adults with TBI. The first research question aimed to investigate if the FCA approach would

facilitate generalization of learned functional cognitive skills across various contexts and environments by assessing the extent to which the participants can meet their self-selected goals. The second research question aimed to explore the ability for the FCA approach facilitate generalization of functional cognition skills by measuring improvements in self-perception and ability to perform daily occupations across context and environments. Comparison of pretest and posttest assessments measured changes in occupational performance. Improvement in self-selected goals from the GAS, demonstrated varying results between participants. Clinical significance from the COPM scores was suggested when participants' scores improve or decline by two or more points (COPM, 2017*)*. Results of the COPM demonstrated clinically significant improvements in self-perception and ability in occupational performance for both participants. Additionally, the participants' posttest and sustained scores at the four-month follow-up revealed that generalization of learned skills had occurred. Based on the findings on self-selected goals, the ability for the FCA approach to facilitate the generalization of functional cognitive skills on self-selected goals are inconclusive. However, the FCA approach may be effective to facilitate the generalization of functional cognitive skills in daily occupations across contexts and environments for adults with TBI.

The FCA scale and the three-global elements are important components of the FCA approach to effectively address functional cognitive deficits. The FCA scale serves as a systematic guide for clinicians to determine the participants' FCA level for adults in various stages of recovery after TBI. The three-global elements, consisting of time parameters, environment and interpersonal relationships, are manipulated and used within each intervention session to create the most appropriate challenge corresponding to the participant's FCA level. The FCA levels, in conjunction with the three-global elements, are used to provide a more

thorough understanding of the participant's level of independence and can be used as a guide to simplify or increase the difficulty of activities. If the challenges were too great during intervention sessions, specific components of the three-global elements were adjusted using remedial or compensatory strategies. If the participants had persistent difficulties performing at selected FCA level, the participant would be placed to a lower FCA level. However, if the participants demonstrated consistent ability to successfully perform at the selected FCA level, the participant would advance to a higher level and the three-global elements would be adapted to provide a higher level of challenge.

Investigators selected FCA levels based on the pretest assessments. Within each FCA level, functional cognitive strategies were suggested based on specific challenges relating to the three-global elements. P1 began intervention at FCA level five and ended at FCA level seven. P1's progression through FCA levels was demonstrated through consistent use of strategies and the ability to be self-reflective about which strategies were most effective for her. Additionally, active collaboration between the investigators and the participant during debriefing appeared to be effective for optimal progression in performance for P1. Once P1 demonstrated the ability to consistently problem solve and appropriately apply functional cognitive strategies, P1 advanced to a higher FCA level.

On the other hand, P2 began intervention at FCA level four but was later moved to FCA level three. During intervention sessions at FCA level four, P2 demonstrated inconsistent use of compensatory and remedial strategies to address his cognitive deficits while completing activities. Investigators speculated that P2's short term memory impacted his ability to recall and implement strategies during performance in occupations. In order for P2 to complete the activities within a schedule, the investigators provided verbal and gestural cues to address P2's

difficulty remembering previously discussed cognitive strategies. Inconsistent use of strategies, reliance on cues, and stagnation over several sessions at FCA level four, resulted in P2's lowering to FCA level three. In order to better support P2's independence in occupations and the generalization of functional cognitive skills, P2 was placed in the FCA level three. Within FCA level three, P2 demonstrated slight increase of the use of strategies and was able to perform the self-care task of lower-body dressing with supervision.

Improvements in scores on the COPM from pretest to posttest indicate clinically significant results with both participants. The results demonstrate sustained use of strategies learned in the FCA intervention sessions to improve performance and satisfaction in self-selected occupations. The self-selected occupations were meaningful to the participant and were incorporated within interventions. Results suggest that occupation-based interventions may be effective to improve functional cognition. Additionally, these findings support current research for the use of occupation-based activities. Polatajko et al. (2012) suggested that the use of meaningful activities may influence motivation for participation in intervention sessions. This claim was supported by our study when comparing the pretest to posttest results of the COPM.

The improvements demonstrated on the GAS varied between participants. The investigators questioned whether self-selected goals were realistic due to the discrepancies between the GAS results at posttest and four-month follow-up. P1's findings from the GAS demonstrated improvement in self-selected goals, while P2 did not. P1's improvement in self-selected goals may have been due to realistic goal setting and her awareness of the impact of her cognitive deficits. However, the goals established by P2 may have not been realistically attainable within the timeframe of the study. Additionally, at four-month follow-up phone interview, P2 provided information which contradicted his caregiver's reports pertaining to his

level of independence in occupational performance. Furthermore, the ability to select realistic goals could be influenced by the participants' level of insight. P1 exhibited insight into her cognitive deficits and was subsequently able to identify problem areas that impacted her occupational performance most, resulting in her willingness to adopt strategies to compensate for functional cognition deficits. On the other hand, P2 demonstrated a lack of insight into the severity of his TBI and his level of independence with occupations. This lack of insight may have impacted his willingness to adopt strategies to compensate for deficits in functional cognition. The persistence of the previously mentioned deficits may impact his performance in everyday occupations. Hence, if intervention potentially began at a lower level for P2 to focus on developing awareness of the severity of his cognitive deficits, an increase in occupational involvement and independence at follow-up may have been more likely. Furthermore, this raises the question of whether or not the FCA approach has the ability to address and provide insight for adults with TBI if participants who lack insight began intervention at an appropriate level.

Additionally, willingness to adopt cognitive strategies and opportunities to practice learned strategies could impact potential gains in occupational performance. In P2's situation, a caregiver barrier may have existed. P2's wife, his primary caregiver, may have limited opportunities for P2 to implement strategies outside of session, thus impacting potential improvement in occupational performance. In contrast, this potential barrier did not exist for P1 due to her higher level of independence and lack of caregiver. Self-reliance and the motivation to increase independence may have also contributed to P1's willingness to adopt new strategies and participate in meaningful activities. P2's wife reported assisting P2 with ADLs and IADLs outside of treatment sessions due to her fear of him falling and sustaining further injury. As a result, his opportunities to implement learned strategies at home were limited. Once the caregiver

barrier was discovered, the investigators educated P2's wife on potential caregiver burnout and the benefits of practicing the cognitive strategies learned in P2's home environment to increase his independence. The identified barrier raises the question of whether direct involvement of the caregiver in the intervention sessions would aid in the improvement of P2's occupational performance. Despite differences observed in participant performance, findings demonstrated sustained improvements in several areas, according to assessment scores.

Sustained results from posttest to the four-month follow-up seen in both participants in several categories on the COPM indicated that generalization of functional cognitive strategies using the FCA approach had occurred outside of the intervention setting. Participants were provided functional cognitive strategies in relation to their deficit area within the three-global elements. These strategies could be used to address everyday occupations and applied across various contexts and environments to improve performance in meaningful occupations. At the four-month follow-up, P1's self-reported improvement in her ability to navigate in a new environment and to utilize the skills learned in session as well as P2's self-reported improvement in his ability to put on and take off his shoes at home provides evidence on the generalization of functional cognitive skills using the FCA approach. Current research by Toglia et al. (2010) supports the findings of this study in the use of occupation-based interventions in various contexts to generalize cognitive strategies. Furthermore, occupations used in intervention sessions that mimic everyday life has been suggested to aid in generalization of functional cognitive skills (Toglia et al., 2010). However, these case studies demonstrated that the willingness to adopt new strategies and having the opportunities to apply those strategies outside of the clinical environment may potentially impact the degree to which the strategies were practiced and maintained. Additionally, the extent of insight on one's deficits may influence the

understanding of how to appropriately apply learned strategies in everyday situations across contexts and environment. The ability for adults with TBI to generalize functional cognitive skills may be influenced by factors such as level of insight, number of opportunities, and the willingness to apply strategies, on one's ability to generalize functional cognitive skills across contexts and environments.

These pilot case studies indicate that the use of the FCA scale and the three-global elements can help improve functional cognitive skills in adults with TBI. The results support the potential of the FCA approach in facilitating generalization of learned functional cognitive skills across contexts and environments. However, for successful intervention, a clear understanding of how the FCA scale can be optimally utilized, and how the three-global elements function within the scale are both important to determine the most appropriate level of challenge for the adult with TBI. Additionally, the ability to adapt and modify occupations using the three-global elements is necessary to successfully implement the FCA approach.

Implications for Occupational Therapy

The FCA approach contributes to current evidence supporting the use of meaningful occupations as an effective means to address cognitive deficits caused by TBI. This client-centered occupation-based approach is an alternative approach to enhance engagement in occupations, to improve functional cognition, and generalize skills outside of the clinical setting. The FCA scale offers a multi-tiered approach for clinicians to determine the most appropriate challenge for an adult with functional cognition deficits. Furthermore, occupational therapists would benefit from utilizing the FCA approach to incorporate meaningful, occupation-based intervention to facilitate successful occupation engagement.

Limitations and Recommendations

Several limitations existed within this study. First of all, the sensitivity of the MoCA© screen to detect deficits associated with MCI has recently been revised. Current research suggests a revised cut-off score of 23 to indicate MCI due to the increased rate of false positives (Carson et al., 2017). Secondly, the investigators took turns conducting and facilitating the one-on-one intervention sessions for each participant. This may have impacted the consistency of the intervention implementation. However, to address inconsistencies in implementation, the investigators documented detailed notes, sought guidance from the faculty advisor, Dr. Kitsum Li, and FCA author, Mr. Rob Koch, OTR/L, and discussed participant progress with face-to-face meetings. Additionally, the investigators may lack fully developed clinical reasoning which may have impacted the ability to address lack of insight early on in the study and the misplacement of P2 being placed in a higher level than appropriate when beginning FCA intervention. Furthermore, caregiver barriers may have limited P2's potential performance and satisfaction scores. Following the completion of intervention sessions, caregiver training was given through brief education on the importance of occupational engagement and follow-through of strategy use outside of the sessions. Lastly, additional limitations of the study included limited resources and access to locations in the community, which decreased opportunities for practice of cognitive skills in naturalistic environment.

From the results of this study, recommendations for future studies include use of more sensitive tools to measure functional cognitive impairments, such as performance-based testing to detect for mild cognitive impairment. Secondly, an initial screening for self-awareness pertaining to functional impacts of cognitive impairments could be more effective when selecting the appropriate FCA level for the participant. Additionally, future studies should consider

including caregiver involvement within the intervention sessions to increase opportunities for the application of strategies outside of session, increase opportunities for practice, and education to prevent caregiver burnout. Furthermore, receiving formal training on the FCA approach is suggested for clinicians who would like to have better understanding of the approach before implementation. Finally, further research should include a larger sample size and implement the FCA approach across various therapy settings to validate the current findings from this pilot study.

Conclusion

An adult with TBI may experience cognitive deficits in areas impacting functional cognition necessary to accomplish everyday occupations. Occupational therapists are trained to administer cognitive rehabilitation to help adults with TBI remediate or compensate for the loss of cognitive skills. The FCA approach uses both remedial and compensatory interventions to improve occupational performance. The eight levels of functional cognition in the FCA approach emphasize awareness and management of the three-global elements, which consist of time parameters, environment, and interpersonal relationships. The use of the FCA scale may be an effective way in guiding clinicians, such as occupational therapists, in pairing and selecting suitable occupation-based interventions to address functional cognition. Additionally, the three-global elements can be modified and adapted with the use of internal and external strategies to provide the adults with TBI the appropriate support in occupational performance. The preliminary findings of these case studies contribute to the current research pertaining to cognitive rehabilitation and the feasibility for the FCA approach to facilitate generalization of functional cognitive skills across contexts and environments. Future studies on the FCA approach would be beneficial to investigate the effects of caregiver involvement and the use of

the FCA approach to provide insight for adults with TBI as well as to validate the findings in this case study.

Occupational therapists administer cognitive rehabilitation for adults with TBI by utilizing compensatory and remedial approaches to address limitations after brain injury. Adults with TBI may experience functional cognitive deficits years after their injury. Occupation-based cognitive rehabilitation, such as the FCA approach, may be suitably utilized within an outpatient or community-based setting to address functional cognitive deficits. The use of cognitive rehabilitation within these settings address cognitive deficits which may not be initially addressed immediately after experiencing a TBI. Additionally, the field of OT emphasizes the use of meaningful occupations to increase motivation and improve QoL.

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Appendix A: Schurig Center For Brain Injury Agreement Letter

October 20, 2016
Director of Programs, Schurig Center
1132 Magnolia Avenue
Larkspur, CA 94939

Dear Director of Programs,

This letter confirms that you have been provided with a detailed description of the graduate research project, which concerns the effectiveness of the Functional Cognition Activities for Adults with Brain Injury in facilitating generalization of functional cognition in individuals with Traumatic brain injury. This project is part of the occupational therapy master's capstone project requirement of Ashley Cook, Karen Huang and Ajay Pala at Dominican University of California.

The implementation of the Functional Cognitive Activities for Adults With Brain Injury will be guided by Dr. Kitsum Li, OTD, and Mr. Rob Koch, OTR/L. The three student researchers, the faculty advisor, Dr. Kitsum Li, and Mr. Rob Koch, OTR/L will have access to the demographic forms and raw data, including the master sheet with the participants' code numbers.

We will make every effort to co-operate with your organization to ensure that our study 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 us (TBICasptone1617@gmail.com) or our faculty advisor, Dr. 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 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,
Ashley Cook, Karen Huang, Ajay Pala
Dominican University of California
Occupational Therapy Students

X [redacted]
Director of Program

12/6/16
Date

Appendix B: Permission For The Use Of "Functional Cognitive Activities"

From: "Rob Koch" <web207@gmail.com>
Date: Oct 21, 2016 7:44 AM
Subject: Re: Official approval
To: "Kitsum Li" <kitsum.li@dominican.edu>
Cc:

Hello Kitsum,
Enjoyed talking with and your students.

I am the author of "Functional Cognitive Activities for Adults with Brain Injury: A Sequential Approach".
I grant permission for Kitsum Li and her students at Dominican University of California to use this approach for their study.
Rob Koch OTR/L

Appendix C: Permission To Use Montreal Cognitive Assessment©

De : MoCa Test [mailto:info@mocatest.org]
Envoyé : 20 octobre 2016 19:15
À : info@mocatest.org
Objet : MoCA© Permission Request

Study Title*	Functional Cognition Activities for Adults with Brain Injury or Stroke: A Sequential Approach
Study Objectives*	The primary purpose of this study is to investigate generalizations in individuals with TBI from intervention using the Functional Cognition Activities for Adults with Brain Injury or Stroke: A Sequential Approach to perform occupational performance.
Source of Funding*	Dominican University of California
Name of Principal Investigator*	Ashley Cook
Institution*	Dominican University Of California
Country*	United States
Email*	ashley.cook@students.dominican.edu

From: **MoCa** <info@mocatest.org>
Date: Monday, October 24, 2016
Subject: MoCA© Permission Request
To: ashley.cook@students.dominican.edu
Cc: Ziad Nasreddine <ziad.nasreddine@mocaclinic.ca>
Hello,
Thank you for your interest in the MoCA©.
You are welcome to use the MoCA© Test as you described below with no further permission requirements.
No changes or adaptations to the MoCA© Test and instructions are permitted.
All the best,

Kathleen Gallant, MSOT
Occupational Therapist/ Psychometrician
On behalf of Dr Ziad Nasreddine, Neurologist, MoCA© Copyright Owner
MoCA Clinic & Institute
4896 Taschereau Blvd, suite 230
Greenfield Park, Quebec, Canada, J4V 2J2
Tel : (450) 672-7766 #222 Fax : (450) 672-3899
kathleen.gallant@mocaclinic.ca
www.mocatest.org / www.alzheimer.TV

Appendix D: Goal Attainment Scale

Goal Attainment Scale

Participant: _____
Goal:
_____
_____

Rating		Measurable Criteria
Exceed Goal	**+2**	
Met Goal	**+1**	
Baseline (no change)	**0**	
Less Than Baseline	**-1**	
Much Less Than Baseline	**-2**	

Timeline	Rate yourself using the rating described above
Pre-test Assessment	
Post-test Assessment	

6 Month Follow-up	

Appendix E: Consent Form To Be A Research Participant

Purpose and Background:

Ms. Ashley Cook, Ms. Karen Huang, and Mr. Ajay Pala, students from the Department of Occupational Therapy at Dominican University of California are conducting a research study designed to investigate the effectiveness of practicing cognitive skills such as awareness, memory and attention (also known as functional cognition) required to accomplish everyday tasks. In addition, the study will explore an individual's capability to transfer skills learned in one setting to a different environment or situation. This research is a capstone research project for Ms. Ashley Cook, Ms. Karen Huang, and Mr. Ajay Pala, and it is being supervised by Dr. Kitsum Li, Assistant Professor, Occupational Therapy Department, Dominican University of California.

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 Dominican University of California, located at 50 Acacia Avenue, San Rafael, California.
2. I understand that I am required to have my own means of transportation to Dominican University of California.
3. I understand that my participation in this research study will be in addition to my regular program at the Schurig Center (e.g. day or computer or counseling program).
4. Before beginning my first intervention session, I will complete all pretest assessments.
5. I will attend 16 individual Functional Cognitive Activities sessions, twice-a-week for eight weeks, as scheduled. Each session will take approximately one hour to complete.
6. After completing my final intervention session, I will complete all post-test assessments.

7. I understand that four months after completing the Functional Cognitive Activities sessions, I will receive a telephone call to complete follow-up assessments.
8. I agree to not begin any new intervention program during my participation in this research study.

Risks and/or Discomforts:

1. I understand that the student researchers will do their best to address psychological discomfort by acknowledging my concern/discomforts. However, if I feel it is necessary, I may request a break from any demographic questionnaire or session. I will be allowed to return to session when I am ready. Should I experience any adverse psychological harm, I will be referred to the Schurig center staff to address my concerns. I also understand that I have the right to refuse to participate and withdraw from the study at any time before, during, or after the study begins without any adverse consequences.
2. I understand that my participation may involve some minor physical risks and/or fatigue due to the various occupation-based tasks that I will be completing. I understand that the student researchers will do their best to prevent physical injuries and/or quickly assist with physical barriers within reason by educating me on activity precautions. The student researchers will be ready to assist with any unsafe actions. However, if I feel it is necessary, I may request a break from sessions and I will be allowed to return to session when I am ready. Should I experience any adverse physical discomfort, the faculty advisor, Dr. Kitsum Li, will be contacted immediately in person or by phone.
3. 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 improvements in cognition skills such as awareness, memory and ability to problem solve when completing a task.
- I may see an increased independence in my daily occupations.
- I may see a decrease in frustrations when completing daily tasks.

Questions:

I have talked to the student researchers about this study and have had my questions answered. If I have further questions about the study, I may contact the student researchers at TBICapstone1617@gmail.com or their faculty advisor, Dr. Kitsum Li, 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 student researchers and the faculty research advisor. 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 IRBPHP, Office of the Associate Vice President of 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 and understand all of the above information regarding this study, and I voluntarily give my consent to participant.

_____

PARTICIPANT'S NAME (PRINTED) DATE

_____

PARTICIPANT'S SIGNATURE DATE

_____

STUDENT RESEARCHER'S SIGNATURE DATE

Appendix F: Proxy Consent For Research Participation

DOMINICAN UNIVERSITY OF CALIFORNIA
PROXY CONSENT FOR RESEARCH PARTICIPATION

Purpose and Background:

Ms. Ashley Cook, Ms. Karen Huang, and Mr. Ajay Pala, students from the Department of Occupational Therapy at Dominican University of California are conducting a research study designed to investigate the effectiveness of practicing cognitive skills such as awareness, memory and attention (also known as functional cognition) required to accomplish everyday tasks. In addition, the study will explore an individual's capability to transfer skills learned in one setting to a different environment or situation of functional skills in adults with traumatic brain injury. This research is part of a capstone research project at Dominican University of California, California. This research project is being supervised by Dr. Kitsum Li, Assistant Professor, Occupational Therapy Department, Dominican University of California.

The adult under my guardianship is being asked to participate because s/he is an individual who sustained a traumatic brain injury at least 6 months prior to the study's implementation, and s/he has difficulty with functional cognition 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 Dominican University of California, located at 50 Acacia Avenue, San Rafael, California.
2. I understand that the participant is required to have his/her own means of transportation to Dominican University of California.
3. I understand that the participant's participation in this research study will be in addition to his/her regular program at the Schurig Center if applicable (e.g. day or computer or counseling program).
4. I understand that the adult under my guardianship will be contacted by the student researchers for a telephone screening to complete a telephone demographic questionnaire. If the adult under my guardianship results fulfill the inclusion criteria, I will be included in the study.
5. Before beginning the first intervention session, the adult under my guardianship will complete all pretest assessments.

6. I understand that the adult under my guardianship will attend 16 individual Functional Cognitive Activities sessions as scheduled. Each session will take approximately one hour to complete.
7. After the final intervention session, the adult under my guardianship will complete all post-test assessments.
8. I understand that four months after completing the Functional Cognitive Activities sessions, the adult under my guardianship will receive a telephone call to complete all follow-up assessments.
9. I understand that the adult under my guardianship cannot begin any new intervention program during his/her participation in this research study.

Risks and/or Discomforts:

1. I understand that there may be some psychological discomfort for the adult under my guardianship, given the nature of the topics addressed in the demographic questionnaire. I will be discussing topics of a personal nature, and the adult under my guardianship may refuse to answer any questions that cause his/her distress or seems to be an invasion of my privacy. Should the adult under my guardianship experience adverse psychological harm, s/he will be referred to the Shurig Center staff to address his/her concerns.
2. I understand that the participation of the adult under my guardianship may experience some minor physical risks and or physical fatigue due to the various occupation-based tasks that I will be completing. I understand that the student researchers will do their best to prevent physical injuries and/or quickly assist with physical barriers within reason by educating the adult under my guardianship on activity precautions, and be positioned and ready to assist with any unsafe actions. However, if the adult under my guardianship feel it is necessary, s/he may request a break from sessions and s/he will be allowed to return to session when s/he is ready. Should the adult under my guardianship experience any adverse physical injuries, the research staff and I will be contacted immediately.
3. If the adult under my guardianship feel it is necessary, s/he may request a break from sessions and s/he will be allowed to return to session when s/he is ready or 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:

- S/he may see improvements in cognition skills such as awareness, memory and ability to problem solve when completing a task.
- S/he may see an increased independence in my daily tasks.
- S/he may see a decrease in frustrations when completing daily tasks.

Questions:

I have talked to the student researchers about this study and have had my questions answered. If I have further questions about the study, I may contact them at TBICapstone1617@gmail.com or their faculty advisor, Dr. Kitsum Li, 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 student researchers and the faculty research advisor. 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 IRBPHP, Office of the Associate Vice President of 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. The adult under my guardianship is free to withdraw my participation at any time without fear of adverse consequences.

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

_____

PARTICIPANT'S NAME (PRINTED) DATE

_____

GUARDIAN'S NAME (PRINTED) DATE

_____

GUARDIAN'S SIGNATURE DATE

_____

STUDENT RESEARCHER'S SIGNATURE DATE

Appendix G: Research Participants Bill Of Rights

DOMINICAN UNIVERSITY of CALIFORNIA RESEARCH PARTICIPANT'S BILL OF RIGHTS

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

1. To be told what the study is testing

2. To be told what will happen in the study and whether any of the procedures or alternate intervention will 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 alternative intervention are available 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 informed of alternative intervention should any complications from the study arise

8. To refuse to participate before or after the study is stated 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 of pressure when considering whether s/he wishes to agree to

participate in the study

11. To receive equal but individualized quality of care as the other participants

If you have other questions regarding the research study, you can contact the primary researcher Dr. Kitsum Li, at (415) 458-3753 or email Kitsum.li@dominican.edu . You may also contact the Institutional Review Board for the Protection of Human Subjects (IRBPHS). The Dominican University of California IRBHS can be reached by telephoning the Office of Academic Affairs at (415) 257-0168 or by writing to the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA. 94901.

Appendix H: Recruitment Flyer

TRAUMATIC BRAIN INJURY?

Graduate student research study

Do you have trouble staying on schedule, completing a task, or remembering where you left your keys? We can help by using simulated environments to complete tasks and staying on schedule. A 10-week study two times a week for 60 minute sessions. Resources and strategies will be provided. Minor compensation will be provided for eligible participants. Participants must have transportation to and from Dominican University (50 Acacia Ave, San Rafael, CA 94901).

DOMINICAN UNIVERSITY of CALIFORNIA 1890

IMPROVE ELEMENTS OF COGNITIVE DEFICITS

_____

AWARENESS

_____

MEMORY

_____

TIME MANAGEMENT

_____

REDUCE FRUSTRATION WHEN COMPLETING ACTIVITIES

CONTACT US

TBICapstone1617@gmail.com

415-458-3753

Dr. Kitsum Li, OTR/L, CSRS

Appendix I: Telephone Demographic Questionnaire

PHONE 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 brain injury (*check all that apply*):

[ ] Neurodegenerative condition (exclusion) [ ] Infection

[ ] Traumatic Brain Injury (TBI) [ ] Brain Tumor

[ ] Cerebrovascular Accident (CVA) [ ] Encephalopathy

[ ] Hypoxia/ Anoxia [ ] Other:_____

[ ] Meningitis

Date of traumatic brain injury (or approximate) (*dd/mm/yyyy*)
Experience with Occupational Therapy? Y/ N If yes, please list:
_____

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

Can arrive at Dominican University of CA 1-hour, 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. 2017- May 2017? Y/ N