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# Are all Instrumental Activities of Daily Living Equal? A Pilot Study on the Performances of Adults with Acquired Brain Injury

By

Crystal Lee, Samantha Schauer, Amy Tam, Yareli Vargas

A culminating thesis, submitted to the faculty of Dominican University of California in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

Dominican University of California

San Rafael, CA

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## Abstract

Aim: To determine if a relationship exists among performances of different instrumental activities of daily living (IADLs) in adults with acquired brain injury (ABI).

Methods: A two-group correlational design was used to examine the relationship among performances in cooking, medication management, and financial management in nine adults with ABI who returned to driving and nine adults with ABI who did not return to driving. The Executive Function Performance Test (EFPT) measured initiation, organization, sequencing, judgment and safety, and completion.

Results: No significant difference exists between adults with an ABI who returned to driving and adults with an ABI who did not return to driving in their performances in cooking, financial management, and medication management.

Discussion and Conclusion: The current study suggests that IADLs should be examined and evaluated independently in adults' natural environments in order to glean an understanding of their performances. The results suggest that IADLs are not equal.

*Keywords*: occupational therapy, cognitive impairment, rehabilitation, stroke, traumatic brain injury, automobile driving

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# Section I: Proposal

## Introduction

Acquired brain injury (ABI) is any insult to the brain acquired after birth and not due to a degenerative disorder ("Brain injury overview", 2018). Common examples of ABI include cerebrovascular accident (CVA), traumatic brain injuries (TBI), and infections to the brain such as encephalitis, and brain tumors (Entwistle & Newby, 2013). An ABI often alters brain function, which can alter a person's physical, cognitive, and psychosocial domains (Mahar & Fraser, 2011). Furthermore, these alterations may further impact a person's ability to engage in everyday activities.

The Occupational Therapy Practice Framework (OTPF) separates everyday activities into activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs are associated with bodily care and survival, such as bathing and feeding (American Occupational Therapy Association [AOTA], 2014). IADLs are activities that support independent living in the home and community, such as cooking and driving (AOTA, 2014). Evidence suggests that performances in IADLs requires more complex cognitive processes than performances in ADLs. Therefore, adults with ABI who experience cognitive impairments may encounter more challenges in performing IADLs (Akbari, Lyden, Kamali, & Fahimi, 2013; Koller et al., 2016; Olofsson, Nyman, & Larsson Lund, 2017; Perna, Loughan, & Talka, 2012; Tanguay, Davidson, Guerrero Nuñez, & Ferland, 2014). Although cognitive deficits can affect multiple IADLs in adults with ABI, there is insufficient and inconsistent research exploring the relationship across performances in different IADLs. Thus, it is necessary to gain insight into how performances among different IADLs relate to each other in adults with ABI. Inconsistencies among studies that examine performances across multiple IADLs leave opportunities for further research. This pilot study investigated if adults with ABI who return to

the IADL of driving will perform differently in other IADLs such as cooking, medication management, and financial management compared to adults with ABI who did not return to driving. Results from this study aimed to deepen our understanding of the impact brain injuries have on adults with ABI, as well as give practitioners insight into how performance in one IADL may predict the potential performance in another IADL. Additionally, results may be used to develop evidence-based interventions to assist adults with ABI return to IADL participation.

# Literature Review

This literature review discusses how an ABI affects an adult's cognition and impacts their performances in IADLs. The first section describes common examples of ABI. The second section examines common cognitive deficits experienced by adults with ABI. The third section explores the connection between cognition and performances in IADLs in adults with ABI, and the common IADLs that adults with ABI may struggle with.

## Acquired Brain Injury

ABI is any insult to the brain acquired after birth and not due to a degenerative disorder ("Brain injury overview", 2018). Common examples of ABI include CVA, TBI, and infections to the brain such as encephalitis, and brain tumors (Entwistle & Newby, 2013). Various types of meningitis such as bacterial meningitis, viral meningitis, fungal meningitis, and parasitic meningitis are also examples of acquired brain injuries (Centers for Disease Control and Prevention [CDC], 2017a).

Statistics on the total number of ABI occurring each year are difficult to compose due to ABI encompassing multiple diagnoses. However, the most frequent type of ABI are TBIs and CVAs. TBIs are described as any assault to the brain caused by an external force. Examples of a TBI include injury to the head from a motor vehicle accident, an assault, a violent act, a fall, or a sports accident (CDC, 2017b). TBIs can be fatal and are responsible for approximately 30% of injury-related deaths. In 2013, there were 2.8 million reported hospitalizations, injuries, and deaths from TBIs in the United States (Taylor, Bell, Breiding, & Xu, 2017). Over 70% of hospitalizations from TBIs were due to falls (50.4%) and motor vehicle accidents (21.5%) (Taylor et al., 2017). For those who survived the TBI, they may sustain varying severity levels of

injury to the brain: mild, moderate, and severe (Childers & Hux, 2016; Willmott, Ponsford, Hocking, & Schönberger, 2009).

CVAs occur when there is an interruption of blood supply to the tissues of the brain, resulting in damage or death of brain tissue in the location of the injury (CDC, 2018). CVAs consist of ischemic strokes, which occur from an occlusion of blood through an artery to the brain, and hemorrhagic strokes, which is when an artery ruptures and bleeds within the brain (CDC, 2018). Approximately 795,000 CVAs occur each year in the United States and CVAs are the leading cause of serious long-term disability (CDC, 2018). The American Heart Association (2016) estimates that 34 billion dollars are spent on health care services, medications, and missed days of work each year due to CVAs.

Regardless of how the injury occurs, injury to the brain may result in impairments in an adult's physical, cognitive, and psychosocial domains (Mahar & Fraser, 2011; Olofsson et al., 2017). The following literature review will focus on cognitive deficits experienced after ABI to establish the important role cognitive skills have on performances of various IADLs.

## Cognition

The Oxford dictionary (2018) defines cognition as the mental action or process of acquiring and understanding knowledge through thought, experience, and the five senses. Cognition encompasses different processes such as attention, memory, executive functioning, and metacognition (Arsic et al., 2015; Brown & Hux, 2017; Perna et al., 2012; Willmott et al., 2009).

Attention is the voluntary control to select and manipulate sensory information and store the incoming information for a brief or sustained period of time (Arsic et al., 2015). Attention serves as the basis for other cognitive processes, such as information processing speed and

memory (Chun & Turk-Browne, 2007; Dymowski, Owens, Ponsford, & Willmott, 2015). Information processing speed is the time it takes to process the information recently attended to, including understanding and interpreting the information (Brown and Hux, 2017; Dymowski et al., 2015). Memory is the encoding and storage of information after the sensory input from attention (Arsic et al., 2015). In other words, adults must pay attention to specific information in order to memorize it (Chun & Turk-Browne, 2007; Van Vleet, Chen, Vernon, Novakovic-Agopian, & D'Esposito, 2015). For example, when an adult is required to remember a phone number, it requires the adult to attend to the phone number, take time to process it and then commit it to memory.

Executive functions are a set of cognitive processes that are used to accomplish complex goal-based tasks and include initiation, organization, sequencing, and completion (Baum & Wolf, 2013; Perna et al., 2012; Tanguay et al., 2014). Studies demonstrate that performances in IADLs require a combination of executive functions in order to complete the activity (Akbari et al., 2013; Arsic et al., 2015; Olofsson et al., 2017; Perna et al., 2012). For example, planning the activity of grocery shopping involves initiating a grocery list, organizing grocery items by category, sequencing the order of retrieving groceries, and completing the grocery shopping trip once all of the items have been purchased. After an ABI, a variety of cognitive impairments can occur. Current literature suggests that attention, information processing speed, memory, and executive function work in conjunction with one another and are often impaired after sustaining an ABI (Brown & Hux, 2017; Couillet et al., 2010; Mahar & Fraser, 2011; Willmott et al., 2009).

**Attention deficits and decreased information processing speed after ABI.** Common deficits in attention after ABI may include difficulties with divided attention and sustained attention. Sustained attention is the ability to attend to important information related to a task

while disregarding irrelevant information. Divided attention is the ability to attend to multiple tasks and is most challenged when an adult must perform tasks that require attention to multiple stimuli, pressure to perform within a time limit, and monitoring own performance (Couillet et al., 2010). Adults who can effectively use divided and sustained attention, are better able to complete complex tasks (Couillet et al., 2010; Van Vleet et al., 2015).

Attention to information is needed in order for an adult to process incoming information and is often diminished in adults with ABI (Willmott et al., 2009). In a study comparing adults with TBI to adults without TBI, Willmott, Ponsford, Hocking, and Schönberger (2009) found that adults with TBI demonstrated slower information processing speed. The study involved 40 adults with moderate to severe TBIs. The researchers utilized the Symbol Digit Modalities Test (SDMT) to measure information processing speed (Willmott et al., 2009). The SDMT requires the adults to pay attention to a set of symbols, then look for a symbol and its corresponding number in a chart and report the corresponding number within 90 seconds (Smith, 1991). Willmott et al. (2009) found a significant difference between the number of correct responses reported between adults with TBI and adults without TBI. The adults with TBI completed significantly fewer number of items, indicating decreased information processing speed (Willmott et al., 2009). Thus, attention and information processing speed appear to work in tandem with one another to allow for engagement in activities.

**Memory deficits after ABI.** Impaired memory, specifically, working memory, prospective memory, and short-term memory, are common cognitive deficits seen in adults with ABI (Brown & Hux, 2017; Childers & Hux, 2016; Mahar & Fraser, 2011). Memory deficits may make engagement in complex activities difficult for adults with ABI due to their decreased capacity to process, organize, and remember intentional thoughts for future actions (Brown &

Hux, 2017). In a study by Brown and Hux (2017), the researchers observed memory deficits during a recall task in which adults with ABI had to correctly recall and execute specific tasks within a 10-day period. The researchers found that adults with ABI attempted and completed far less tasks than adults without ABI (Brown & Hux, 2017). These results may suggest that memory deficits impact an adult's ability to recall tasks and complete each component of a task at a later date.

Additionally, adults with ABI are likely to experience impairments with short term memory (Childers & Hux, 2016; Mahar & Fraser, 2011). In a qualitative study conducted by Childers and Hux (2016), five college students with self-reported experiences of mild traumatic brain injury (MTBI) were interviewed using a semi-structured interview. According to the study, all five college students with MTBI reported that memory deficits led to decreased engagement in their schooling. For example, deficits in short term memory may have contributed to difficulties with remembering to complete an assignment.

Long term memory may also become affected after an ABI. Researchers examined autobiographical memory, a component of long term memory, which refers to memories about themselves and their personal experiences in the past (Barry & Tomes, 2015). The experimental group consisting of 53 adults with MTBI were compared to a control group consisting of 60 adults without MTBI. All of the adults recalled the same number of memories from the last year, adolescence, and childhood periods. However, in the experimental group, adults with MTBI used fewer words to describe their memories in comparison to the control group. In addition, a significant difference was discovered between the two groups in the level of detail provided from their long term memories, with the control group using more pronouns, personal pronouns, cognitive processes, and perceptual processes. The results from Barry and Tome's (2015) study

suggest that sustaining MTBI may not directly impact the ability to retrieve autobiographical long term memories, but may impact the adult's ability to recall more detailed information from the autobiographical long term memory. These studies suggest that both short term and long term memories play a role in performance of various tasks.

**Executive functioning deficits after ABI.** Executive functions include planning, initiating, sequencing, and completion (Baum et al., 2008; Brown & Hux, 2016). Planning, the ability to form strategies and implement them to achieve goals, is impacted after sustaining an ABI due to decreased efficiency and increased time required to create a mental plan (Brown & Hux, 2016; Perna et al., 2012). Brown and Hux (2016) explored task planning and execution in adults using a two-phase study: phase one involved creating a plan to complete 12 tasks and phase two involved the execution of the tasks. The researchers found a correlational relationship in adults with ABI between their ability to plan using various strategies and correct execution of the tasks (Brown & Hux, 2016). The adults with ABI used fewer strategies during the planning period, which reflected a lower number of correct tasks completed compared to adults without ABI (Brown & Hux, 2016). Similarly, Perna, Loughan, and Talka (2012) found that adults with ABI required additional time to plan and organize to complete tasks. Hence, the results show the importance of planning for task completion.

Initiation is the cognitive process that comes before task performance (Baum et al., 2008). Lack of executive control may influence an adult's ability to initiate an IADL(Perna et al., 2012). Childers et al. (2016), also found that college students with MTBI self-reported an overall increase in difficulty with beginning tasks. In particular, one student stated that it felt like a mental obstacle to start an assignment (Childers & Hux, 2016). All five students in Childers et al's (2016) study altered their coursework in some manner to accommodate for the increased

time required to begin a task. For example, one student switched her major to a less rigorous course load, while another student decided to become a part-time student. Challenges with task initiation experienced among these students directly impacted their engagement in school occupations (Childers & Hux, 2016).

Sequencing is a cognitive process that involves mentally determining and organizing appropriate steps required to achieve goals (Tanguay et al., 2014; Zakzanis, Grimes, Uzzaman, & Schmuckler, 2016). For example, to cook scrambled eggs, an adult must create a plan and sequence of steps in his or her mind prior to executing the activity. Some of the steps may include turning on the stove, retrieving eggs from the refrigerator, and adding butter to the pan. These steps must be done in a specific sequence to achieve the end goal of cooking scrambled eggs. In a study by Zakzanis, Grimes, Uzzaman, & Schmuckler's (2016), 77 adults with MTBI completed the Tower of London (TOL) test that evaluates planning and sequencing. The study also utilized a self-report for adults to report their ability to engage in IADLs. The adults' self-reports were validated by an occupational therapist's (OT's) observations and assessments. After observing and assessing each participant, the OT interpreted the adults with MTBI as either impaired or disabled. In this study, adults with an ABI were considered impaired if they had a cognitive impairment present in formal testing but still engaged in IADLs. Adults with ABI were considered disabled in this study if they had a cognitive impairment present in formal testing and were unable to engage in IADLs (Zakzanis et al., 2016). The study found a difference between the impaired and disabled groups in the number of mistakes made on the TOL. The disabled group made more errors on the TOL than the impaired group. The increased number of errors in the disabled group indicated deficits in sequencing and planning. Furthermore, adults with MTBI who scored lower on the TOL also self-reported having more difficulties in completing IADLs.

The results of the study may infer that task planning and sequencing are correlated with participants' self-reported ability to complete IADLs (Zakzanis et al., 2016).

In summary, evidence suggests that cognitive deficits are common after an adult sustains an ABI. In particular, attention, information processing speed, memory, and executive function skills may be negatively impacted after injury to the brain (Brown & Hux, 2017; Couillet et al., 2010; Mahar & Fraser, 2011; Perna et al., 2012; Willmott et al., 2009). Cognitive deficits experienced after sustaining an ABI may lead to decreased engagement in cognitively demanding daily activities, therefore adults with ABI may report having more difficulties engaging in IADLs (Akbari et al., 2013; Childers & Hux., 2016; Olofsson et al., 2017).

**Cognitive Requirements in Daily Performance**

Multiple qualitative and quantitative studies on adults with ABI reveal how deficits in memory, attention, and executive functioning may affect performances in everyday activities, specifically in IADLs (Childers & Hux, 2016; Koller et al., 2016; Olofsson et al. 2017; Perna et al., 2012). In a correlation study by Akbari, Lyden, Kamali and Fahimi (2013), the researchers examined 27 adults with intense neurological impairments resulting from their CVA. The adults were independent in performing ADLs and IADLs prior to the CVA. The researchers measured and correlated levels of performances among ADLs, IADLs, cognitive processes, and the intensity of neurological impairments. Self-reported ADL and IADL performances were assessed by the Barthel Index and the Lawton IADL scale, respectively. In the study, Akbari et al. (2013) measured higher cognitive processes like categorization, sorting tasks, and reasoning with the Lowenstein Occupational Therapy Cognitive Assessment. Results showed that cognitive processes were statistically significant in correlation with IADL performance, but not statistically

significant in correlation with ADL performance. The results suggest that IADL performance may require higher cognitive processes in comparison to ADL performance (Akbari et al., 2013).

In a study done by Perna et al. (2012), the researchers determined a relationship between executive function scores using neuropsychological tests and reported levels of independence in IADLs using the Mayo Portland Adaptability Inventory 4. The researchers examined the ability to drive, work, manage finances and live independently in 65 adults with ABI. Results demonstrated that adults with ABI who performed higher on executive function measures were able to live more independently and have a higher level of independence with financial management. However, the results did not show significant differences among mean scores in the ability to drive, work, and executive function in adults with ABI. Therefore, Perna et al. (2012) concluded that higher scores in executive function may suggest more independence in financial management, but not other areas of IADLs. Hence, executive function skills may predict the ability for an adult to successfully complete certain IADLs but not all IADLs (Perna et al., 2012).

Eriksson, Tham, and Borg (2006) utilized a cross-sectional study design to explore the differences in performance of multiple IADLS in 187 adults with TBI and CVA before and after the injury. The researchers observed a statistically significant decrease in overall engagement in IADLs (Eriksson, Tham, & Borg, 2006). In another qualitative study by Olofsson et al. (2017), the researchers found that adults with ABI struggled with completing IADLs. Olofsson et al.'s (2017) study utilized semi-structured interviews to explore how eight adults with ABI engaged in activities outside of their home. The adults with ABI often struggled with higher cognitively demanding tasks, such as planning and preparing to execute a task. For example, one adult with ABI experienced cognitive fatigue due to deficits in planning a grocery shopping trip that

resulted in multiple unnecessary trips to the grocery store to purchase forgotten items. Similar to the findings in Eriksson et al.'s (2006) study, Olofsson et al.'s (2017) study determined that adults with ABI participated in fewer IADLs than before their injury occurred due to the higher level of mental energy devoted to each activity. Performance in IADLs that were once automatic, now require more planning, time and attention, which may cause cognitive fatigue (Olofsson et al., 2017; Sarre et al., 2014). Furthermore, Almborg, Ulander, Thulin, and Bergi (2010) conducted a cross-sectional study of 188 adults admitted to the CVA unit of a hospital. The researchers found that only 20% of these adults were able to perform leisure and interest activities as well as before the CVA. The lack of engagement in leisure and interest activities may have led to the lower score on the quality of life measure, which supports the idea that sustaining an ABI may limit performance in preferred activities (Almborg, Ulander, Thulin, & Berg, 2010). Together, studies conducted by Akbari et al. (2013), Eriksson et al. (2006), Olofsson et al. (2017), and Almborg et al. (2010) highlight the relationship between cognitive processes and completion of IADLs and the changes in IADL performance after an ABI.

Research also demonstrates that adults with ABI often experience deficits in cognitive processes that can affect their ability to complete IADLs independently (Akbari et al., 2013; Olofsson et al., 2017; Perna et al., 2012). The literature review will now further explore how adults' performance in the specific IADLs of cooking, medication management, driving, and financial management may be affected after sustaining an ABI.

**IADL performance after ABI.** ABI-related deficits in executive functioning may limit an adult's ability to follow through with the process of preparing, cooking, and cleaning up after a meal (Tanguay et al., 2014). Tanguay, Davidson, Guerrero Nuñez, and Ferland (2014) conducted a Virtual Breakfast Task (VBT) assessment on 22 adults with ABI. The VBT was

created to mimic executive function requirements during actual cooking in the kitchen and it examines planning, working memory, shifting attention between tasks, and metacognition (Tanguay et al., 2014). During the assessment, adults with ABI were asked to simultaneously cook five breakfast foods, complete cooking each item at the same time, and set a table. This study found that sequencing, reading instructions, managing transitions, and timing were areas of weakness among adults with ABI, which resulted in overcooked food items, forgetting to cook an item, or not setting the table up according to the instructions (Tanguay et al., 2014). However, a possible limitation of this study is that the VBT assessment does not allow participants to use strategies to compensate for impairments possibly similar to a cooking task at home, thus reflecting an inaccurate representation of how the adult with ABI cooks in their natural environment.

Medication management is another complex IADL that requires intact executive function for successful performance (Zartman, Hilsabeck, Guarnaccia, & Houtz, 2013). Researchers conducted a meta-analysis of three studies and found that among 581 adults, poor executive function is shown to be a barrier for maintaining a medication schedule (Stilley, Bender, Dunbar-Jacob, Sereika & Ryan, 2010). Particularly, decreased organization skills interfere with establishing a medication schedule and remembering to take medications appropriately (Stilley et al., 2010; Zartman et al., 2013). Impaired medication management may also suggest decreased safety for independent living (Zartman et al., 2013). Furthermore, Purdy (2007) examined 27 adults with CVA and discovered that the biggest barrier to independently managing medication is due to cognitive deficits. Research showed that a cognitive rehabilitation program, focusing on compensatory strategies, and restorative exercises to improve attention, memory, problem

solving, and reasoning, as part of an interdisciplinary self-medication program, were effective in increasing an adult's ability to self-manage a medication routine (Purdy, 2007).

Driving is a meaningful IADL that spans across adulthood and supports independence in daily life and continues to remain important to adults after an ABI. Driving facilitates adults' connection to people, resources, and activities within the community (Patomella, Johansson, & Tham, 2009). According to a systematic review of 24 articles, researchers found that adults with TBI demonstrated poorer performance when perceiving on-road hazards, processed information more slowly, and demonstrated slower reaction times while driving, when compared to adults without a TBI (Palubiski & Crizzle, 2016). Additionally, events of aggressive driving and motor vehicle accidents are significantly more common among adults with TBI, 12 months post-injury, compared to adults without a TBI (Palubiski & Crizzle, 2016). The inability to sustain attention, increased on-road mistakes, and lower self-efficacy are also challenges faced by adults who have experienced a TBI (Palubiski & Crizzle, 2016).

Financial management is the ability to count money, pay bills, make purchases, manage a checkbook, and demonstrate the use of financial reasoning (Koller et al., 2016). Independence in these tasks are compromised after an ABI (Koller et al., 2016). Deficits in cognition, specifically decision making, forming judgements, planning, and working memory, may be responsible for the decrease in independence in financial management (Koller et al., 2016). In a qualitative study of six adults with an average age of 45 who experienced a CVA or TBI, their independence in financial management was revoked by family members or caregivers due to events of spending their total income, getting into debt, having to borrow money, or family disapproval of spending patterns (Koller et al., 2016). Several adults with ABI in the study reported having no control over their own finances and were given an allowance each week by the individuals in charge of

their finances. Additionally, inability to resume working also affects income level and leads to reduced independence in financial management (Koller et al., 2016). The overall sentiment of adults with ABI who had limited financial control may include feeling forced to accept the reality of the situation, having an impaired ability to participate in work and leisure activities, and feeling unable to make their own decisions about how and when to spend money (Koller et al., 2016). Evidence suggests that adults with ABI experience difficulties with performance in different IADLs. However, there are a lack of studies examining performances across multiple IADLs.

## Conclusion

Current literature suggests that cognitive impairments secondary to ABI and performance in IADLs may be related (Akbari et al., 2013; Koller et al., 2016; Perna et al., 2012; Tanguay et al., 2014). Deficits in attention and information processing speed, memory, and executive function affect everyday activities after an adult sustains an ABI (Childers & Hux, 2016; Koller et al., 2016; Olofsson et al., 2017). Executive function is especially important after sustaining an ABI because it requires utilizing a combination of cognitive skills that include planning, initiating, and sequencing to successfully complete IADLs (Olofsson et al., 2017; Perna et al., 2012; Tanguay et al., 2014; Zakzanis et al., 2016). Eriksson et al. (2006) found an overall significant decrease in IADL performance after brain injury, and Perna et al. (2012) found a significant relationship between executive functioning skills and financial management, but not in other areas of IADLs such as employment and driving. Hence, the results from Perna et al.'s (2012) study are inconsistent with findings that deficits in planning, memory, and attention negatively impact multiple IADLs such as cooking, management of medications, ability to drive,

and management of finances (Koller et al., 2016; Palubiski & Crizzle, 2016; Stilley et. al., 2010; Tanguay et al., 2014).

Inconsistent results across studies and the lack of studies that examine performances across multiple IADLs warrants further research. A deeper understanding of how a brain injury affects performances across various IADLs is important for comprehending how adults with ABI are currently performing everyday activities. A thorough understanding of IADL performances among adults with ABI is imperative to provide evidence-based therapy to address difficulties performing IADLs. Therefore, it is necessary to gain insight into how performances among different IADLs relate to each other in adults with ABI.

## Statement of Purpose

Present literature indicates that cognition, in particular executive function, may become impaired after enduring an ABI, which may result in a decreased ability to perform various IADLs independently or successfully (Akbari et al., 2013; Brown and Hux, 2016; Eriksson et al., 2006, Tanguay et al., 2014). A gap in research exists regarding how performance in one IADL relates to performance in another IADL among adults with ABI. Although it is expected that performances across different IADLs will be impacted after ABI, our review of the literature suggests that adults with ABI commonly experience difficulties with cooking, medication management, driving, and financial management (Koller et al., 2016; Patomella et al., 2009; Olofsson et al., 2017; Stilley et. al., 2010; Tanguay et al., 2014). Therefore, this study aims to determine if a relationship exists among return to driving status after an ABI and performances in cooking, medication management, and financial management.

The research question for this study is "Do adults with ABI who returned to driving perform differently from adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management as measured by the Executive Function Performance Test (EFPT)?". The null hypothesis states that there will be no difference in performance between adults with ABI who returned to driving and adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management. The alternative hypothesis states that there will be a difference in performance between adults with ABI who returned to driving and adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management.

## Definitions and Variables

### Definitions

- Executive Functions Performance Test (EFPT): a standardized performance-based assessment of executive functioning (Baum & Wolf, 2013)
- Initiation: The beginning of a task by starting performance appropriately (Baum & Wolf, 2013)
- Execution: The completion of each step of a task (Baum & Wolf, 2013)
- Organization: Setting up of the environment to facilitate performance of a task (Baum & Wolf, 2013)
- Sequencing: The coordination and ordering of steps of a task, with each step requiring attention (Baum & Wolf, 2013)
- Judgment and Safety: The reasoning and decision-making required to avoid dangerous situations (Baum & Wolf, 2013)
- Completion: The knowledge of when a task is finished and stopping performance appropriately (Baum & Wolf, 2013)
- Driving experience: Driving experience is operationally defined as driving independently with or without an adaptive vehicle after ABI.
- Cooking: Operationally defined as the score of Simple Cooking task
- Medication management: Operationally defined as the score of the Medication Sorting task
- Financial management: Operationally defined as the score of the Paying Bill task.

## Variables

The independent variable in this study is adults with ABI who returned to driving or adults with ABI who did not return to driving. Scores in the Simple Cooking task, Medication Sorting task, and Paying Bills task of the EFPT assessment among adults with ABI serves as the dependent variable in this study.

## Theoretical Framework: Ecology of Human Performance

The Ecology of Human Performance (EHP) was developed by occupational therapists Winnie Dunn, Catana Brown, and Ann Mcguin to emphasize and incorporate environmental context into occupational therapy theory, practice, and research. The EHP focuses largely on the interrelationship between a person, context, tasks, and the person's performance range (Dunn, Brown, & McGuigan, 1994). The focus of the EHP is in line with the aims of this study, which is to understand if a person's performance in different tasks are related to each other when they utilize their unique skills and abilities in certain contexts. Therefore, the EHP serves as an appropriate theoretical framework for the study.

The major components of this framework include the person, task, context, and performance range (Dunn et al., 1994). In this framework, the person is described as a person with his or her own unique set of experiences, sensorimotor, cognitive, and psychosocial skills and abilities (Dunn et al., 1994; Dunn, McClain, Brown, & Youngstrom, 2003). Therefore, each person uses his or her experience, skills, and abilities to complete tasks in a unique manner.

Tasks are defined as an objective set of behaviors needed to complete a goal (Dunn et al., 1994). A boundless possibility of tasks exists around each person, and each task demands the person to use different behaviors and sets of cognitive skills to reach a goal (Dunn et al., 2003). For example, the goal of paying a bill includes different tasks such as determining the due dates for the bill, writing checks and balancing checkbooks. In comparison, the goal of driving to a grocery store may include individual tasks in determining the time of the day to drive, the route, and the operation of an automobile vehicle.

Context is the physical, social, and temporal conditions surrounding the person (Dunn et al., 1994). A person's temporal framework refers to the person's age and stage of life. The social

context is the presence, relationship and expectation of a person, group, or population. And the physical context is the geographic terrain and built surroundings such as buildings and furniture in which tasks can occur (AOTA, 2014). Contexts are constantly changing and depending on what is available in the context, which can either support or inhibit a person's performance in a task. When a person uses their skills and abilities to complete tasks in a context, this is the person's performance range (Dunn et al., 1994).

The performance range is dependent on the person and his or her context, and therefore the performance range changes when a person's set of skills and abilities change or when the surrounding context changes (Dunn et al., 1994). For example, when a person has a limited skill set and is placed in the same context as another person with a wider skill set, the person with the limited skill set will have a narrower performance range because they may not be able to successfully use the supports available in their surroundings to perform tasks (Dunn et al.,1994). Reductions in performance range are addressed by the framework's therapeutic intervention approaches.

The EHP views therapeutic intervention as a collaboration between a person, their support system, and the occupational therapist to determine how to meet performance needs and improve performance ranges (Dunn et al., 1994). This framework provides five options for therapeutic intervention which include establish or restore, alter, adapt, prevent, and create. Establish or restore is aimed at improving the person's skills and abilities, while alter refers to changing the actual context a person performs in. For example, a person can be placed in a different setting that more closely matches his or her skill set. Adapt is the modification of the contexts and/or the tasks to support the person's performance, such as adjusting the length of a recipe to match an adult with ABI's attention span. Prevent refers to the changing aspects of the

person, task, or context to avoid maladaptive performance and ensure functional performance, which includes using an external cueing system or alarm to remind an adult with ABI to take anti-seizure medication to prevent a seizure from occurring. Create is the therapeutic intervention that is the creation of tasks or contexts that are supportive of a performance. An example may include creating a driving route to the same grocery store every week to avoid getting lost (Dunn et al., 1994).

Adults with ABI may have deficits with their attention, memory, and executive function which ultimately impact their performance in IADLs (Akbari et al., 2013; Childers & Hux, 2016; Koller et al., 2016; Olofsson et al., 2017). Deficits in cognitive skills in adults with ABI decrease their performance range across different tasks that occur in various contexts. This study aimed to understand how these performance ranges relate to each other across different tasks and contexts in adults with ABI through the use of a performance-based assessment. When applying the EHP lens to the study, adults with ABI represented the "person". Each adult with ABI presented his or her unique strengths and weaknesses, and were asked to complete three "tasks" that are common IADLs such as cooking a bowl of oatmeal, paying bills using a checkbook, and sorting prescribed medications into a medication box. The adults with ABI completed the IADLs at one of the three research sites, which served as the "context". Although each site provided its own unique physical set of supports and barriers, the assessment was carried out in a controlled environment to maintain consistency. The researchers observed, quantified and analyzed the performance of the adults with ABI using a standardized performance-based assessment and assigned them a score which reflected their "performance range."

# Methodology

## Design

This study utilized a simple two-group exploratory correlational design to examine the degree of relationship among performances in cooking, medication management, and financial management in adults with ABI who returned to driving and adults with ABI who did not return to driving. The average scores of the two groups were analyzed with a paired t-test to determine if a significant difference in average performance scores existed between the two groups. Correlation coefficients were used to determine the strength of the relationship between the performances in IADLs in the two groups of adults with ABI. Consideration of extraneous variables such as age, gender, previous experience with cooking, financial management, and medication management prior to injury took place during the data analysis phase of the study.

## Participants

This study utilized convenience sampling to recruit English speaking adults, 18 years and older with a medical diagnosis of an ABI sustained at least 6 months prior. There was no gender, racial, or ethnic based enrollment restriction for this study and only adults who had experience in driving prior to the ABI were included in the study. Participants were excluded from the study if they had a bilateral upper extremity motor impairment that may have restricted their ability to perform the subtests of the EFPT independently. Participants were excluded if they did not pass a near vision screening test or if they had a severe cognitive impairment, as indicated by the Montreal Cognitive Assessment (MoCA © 8.1). Participants who had a diagnosis or co-diagnosis of a progressive neurodegenerative disorder were excluded from the study.

**Recruitment Process**

After receiving approval from the Institutional Review Board at Dominican University of California (DUC), recruitment of participants occurred in several manners. A letter was sent to the Schurig Center for Brain Injury Recovery (SCBIR) (Appendix A), and Pomeroy Recreation and Rehabilitation Center (PRRC) (Appendix B). Emails were also sent to occupational therapists working in the community to ask for permission to assist with recruitment (Appendix C). Flyers (Appendix D) were placed at SCBIR, PRRC, and on public posting boards in establishments, with permission, in Marin County, California.

Members at SCBIR, and PRRC were informed of the study through a brief 5-minute verbal presentation of the study in their respective program meeting. After the presentation, members of the SCBIR and PRRC had the opportunity to meet the student researchers to discuss their interest in partaking in the study and took a flyer with them. Participation was voluntary and interested participants contacted the student researchers by email or telephone message. Student researchers contacted the interested participants to conduct the telephone screening (Appendix E) to determine fulfillment of the inclusion criteria and confirm interest in the study.

All participants must have been able to understand and provide their own legal consent (Appendix F) or if not, legal consent from their conservator (Appendix G) was obtained prior to starting the assessments in the study. For participants who met the preliminary inclusion criteria, the consent process occurred in a face-to-face meeting; however, if the interested participant had a conservator, the conservator was contacted, and the consent form was sent to the conservator via email. Thus, face-to-face meeting with the participant was not arranged until a signed consent form was returned from the conservator. During the face-to-face meeting, the student researchers

explained the nature of the study and provided a participants' Bill of Rights (Appendix H) to each participant.

**Measures and Materials**

Student researchers conducted the demographic information questionnaire (Appendix I) to identify adults with an ABI who returned to driving or adults with an ABI who did not return to driving. Student researchers used the MoCA © 8.1 (Appendix J), with granted permission (Appendix K), as a screening tool to verify mild or moderate cognitive impairment, and the near vision reading test ensured that participants could read the instructions on the EFPT assessment. Student researchers were granted permission to use the EFPT in this study (Appendix L). The EFPT measured initiation, execution, organization, sequencing, judgment and safety, and completion in adults with ABI. The EFPT measured the adult with ABI's performances in a Simple Cooking task, Medication Sorting task, and Paying Bills task, which served as the dependent variables.

**Driving experience.** Driving experience was operationally defined as driving independently with or without an adaptive vehicle after an ABI. A demographic information questionnaire was utilized to determine whether an adult returned to driving after their ABI or whether an adult did not return to driving after their ABI. Participants answered the question "What is your experience with driving?". The options for this question were "current" or "in the past". A mark of "current" signified that the participant did return to driving after their ABI. A mark of "in the past" signified that the participant did not return to driving after their ABI. Participants self-reported their driving experience after their ABI, and current driving behavior such as average daily driving distance and driving during the day versus at night on the demographic information questionnaire. The information gathered from the demographic data

allowed the student researchers to describe the performance of driving after the ABI. This questionnaire was created uniquely for the study, and does not have established reliability or validity about driving performance.

**Cognitive Screening.** The MoCA © 8.1 is a 12-item, 30-point test, ten-minute tool that assesses the following cognitive abilities: orientation, short-term memory, executive function, language abilities, abstract reasoning, memory recall, attention, and short term memory (Nasreddine et al., 2012). The MoCA © 8.1 is valid and reliable in identifying cognitive impairment in ABI over other tools like the Mini-Mental State Examination (Chiti & Pantoni, 2014; Dong et al., 2010).

Normal cognition is defined as having a score of 26 points or higher on the MoCA © 8.1. Moderate cognitive impairment is defined as scoring between 10-17 points, while mild cognitive impairment is defined as scoring between 18- 25 points on the MoCA © 8.1. A score less than 10 on the MoCA © 8.1 indicates severe cognitive impairment (Nasreddine et al., 2005). Therefore, if a participant scored less than 10 on the MoCA © 8.1, indicating severe cognitive impairment, he or she was not included in the study.

**Near Vision Screening.** The near reading eye chart assessed the ability to read words 16 inches from the participant's face. The Department of Occupational Therapy at DUC purchased and owns the near vision eye chart. The near vision eye chart is a valid and reliable function-based vision test where the words gradually decrease in size from the top line to the bottom line of the chart (Stifter et al., 2004). This screening was important to make sure that reading instructions on the EFPT was not a confounding factor for participants when performing the EFPT subsets.

**Simple Cooking, Medication Sorting, and Paying Bills.** Performances in simple cooking, medication sorting, and paying bills were measured through the numerical scores on the EFPT. The EFPT is a performance-based assessment which measures cooking, telephone use, medication management, and financial management through a series of tasks: Simple Cooking task (preparing oatmeal), Phone Call task (using a telephone book to call a grocery store), Medication Sorting task (organizing a simulated pill box), and Paying Bills task (paying simulated bills). The Phone Call task requires experience using a phone book, which is an outdated method for finding a telephone number, and was not included in this study.

All EFPT subsets measure the following five executive function constructs: initiation, organization, sequencing, judgement and safety, and completion. The test results in three scores: the executive function (EF) construct score, the task score, and a total score. The EFPT manual offers a standardized scoring system in which the student researchers followed. The task score is calculated by summing the numbers recorded on each of the five EF constructs and each construct can range from a score of zero to five. In this study, the researchers assessed three of the four subsets. Therefore, each participant could earn an EF score between 0-15, with zero meaning the participant required no verbal and/or physical assistance and 15 meaning the participant required total verbal and/or physical assistance with executive function.

The EFPT is found to have high levels of interrater reliability, with a percentage agreement average of 88% when using the specific objective assessments and standardized set of instructions (Cederfeldt, Carlsson, Dahlin-Ivanoff, & Gosman-Hedstrom, 2015). The EFPT established construct validity by finding significant differences in the mean scores of EFPT total scores, task scores, and EF component scored among three experimental groups: adults without a cognitive impairment, adults with a mild stroke, and adults with moderate stroke. Adults without

cognitive impairment had the lowest and best scores, followed by the adults with mild stroke, and adults with moderate stroke had the highest and worst scores on the EFPT (Baum et al., 2008). Concurrent validity of the EFPT ($r$ =.61) in adults with mild stroke suggested that the EFPT is a suitable instrument to use when compared to the Assessment of Motor and Process Skills (AMPS). The non-parametric Spearman's rank correlation test between the EFPT and the AMPS resulted in significant correlations of $r$ =.54-.60. There was also a significant correlation between the AMPS and the total sum of all the EFPT tasks ($r$ =.61) (Cederfeldt, Widell, Andersson, Dahlin-Ivanoff & Gosman-Hedström, 2011).

**Data collection procedures**

Data were collected at SCBIR, PRRC, or DUC campus. Student researchers met with each participant to complete a demographic information questionnaire. The questionnaire yields information about participants' contact information, length of time since brain injury, type of brain injury, experience with driving, distance typically driven, experience with meal preparation, experience with medication management, and experience with bill management. Student researchers administered the MoCA © 8.1 and a near vision reading screen to determine participant eligibility for the study. The four student researchers were given either the role of assessor or observer: two served as assessors and two served as observers. The two assessors were assigned based on most consistent scoring of the EFPT tasks. The role of the observers was to ensure that the standardized protocol was followed by the assessors and to score the EFPT tasks simultaneously to validate the scores. Once participants met all of the inclusion criteria, one of the assessors administered the EFPT pre-test questions (Appendix M) and one of the EFPT subtests: the Medication Sorting task (Appendix N). Prior to starting the Medication Sorting task, participants were informed that the assessor would provide physical assistance if requested due

to barriers in the environment not meeting the participants physical abilities. The assessors provided verbal standardized instructions for the Medication Sorting task before the participant begins the assessment. Participants were provided with three prescription medication bottles with pretend pills and asked to sort the pills into a medication box according to instructions on the medication bottles. The medication box contains seven slots with two sections per day labeled 'AM' and 'PM'. One prescription bottle instructed the participant to take the pill twice per day, the second bottle detailed once per day with a meal, and the third detailed to take the pill once in the morning. A medication bottle with another person's name and a non-prescription bottle was used to distract from the correct prescription bottles.

Subtests two and three of the EFPT, the Paying Bills task (Appendix O) and the Simple Cooking task (Appendix P), were offered to be administered on a separate date to avoid issue with fatigue in a long assessment. The participants also had the opportunity to complete subtests two and three on the same day if desired. An assessor verbally explained the standardized directions of Paying Bills, which required participants to take materials out of a bag, find all bills, open all bills, pay the bills, and balance the account. Three other mail items were placed in the same bag to act as a distractor from the two bills. A calculator was available for use. If a participant reported that they have never used a checkbook before, the Paying Bills task was not completed. The Simple Cooking task required participants to make oatmeal using instructions on an old-fashioned oatmeal box and serve in a bowl. Participants were directed to repeat the steps back to the assessor to ensure an understanding of the process. Participants were asked to cook oatmeal using a pot on a stove top, thus requiring the use of supplies like a pot holder, measuring cups, stirring spoon, spatula, bowl and a timer.

Threats to internal and external validity were reduced by using a reliable performance-based measure, the EFPT, for assessing executive functioning in adults with ABI. Student researchers were trained to complete the EFPT to ensure inter-rater reliability and the use of observer in each assessment ensured accuracy in scores. When multiple assessment dates were requested, the assessment dates were scheduled within a two-week time frame in order to reduce threats caused by maturation.

**Data management and analysis procedures**

Demographic data and performance scores on the EFPT were entered into a secure, password protected Google Sheets file. Only the student researchers and faculty advisor had access to the Google Sheets. Raw data were entered into a secure, password protected excel file and transferred into SPSS software for analysis. Descriptive statistics allowed the student researchers to describe the two groups of participants such as the average age, length of time since injury and driving behaviors.

To answer the research question, the mean scores from each group of participants was calculated for each assessment task they completed. The difference between the mean scores of each task for each group was analyzed with a paired t-test tested at a 95% confidence level. The results of the paired t-test were used to determine acceptance or rejection of the null hypothesis. Pearson product moment correlation tests were utilized to determine if a relationship exists between driving status after an ABI and the average scores on each task of the EFPT.

**Ethical and Legal Considerations**

In order to ensure protection of all research participants involved in this study, an application was sent to Dominican University of California's Institutional Review Board for the

Protection of Human Subjects (IRBPHS). Approval from the University's IRBPHS, application #10741, ensured that each participant's rights and welfare were upheld (Appendix Q).

The AOTA Code of Ethics was upheld throughout the study. The AOTA Code of Ethics principles of beneficence, non-maleficence, and autonomy and confidentiality were used to ensure ethical protection of each participant. The principle of beneficence ensures that the research participants are removed from any condition that may cause harm and that the study only adds to their well-being (AOTA, 2015). Potential benefits included an opportunity to complete a performance-based assessment in which participants can add to their knowledge of their own abilities in IADLs. A Participant Summary Package, which included results of the EFPT assessment, and general tips and resources from "Occupational Therapy ToolKit" (Appendix R), were given directly to the participant at the end of the completion of the EFPT. Permission to use resources from the "Occupational Therapy ToolKit" was granted (Appendix S). Participants may have also benefited from knowing that they have contributed to the general knowledge of brain injury research and rehabilitation. If a participant was fatigued or frustrated during administration of the MoCA © 8.1, near vision screen, or EFPT, the participant was given the option to take a brief break or finish the assessment on another date within a two-week timeframe. Depending on the participant's preference, the three subtests of the EFPT were separated into two days, if fatigue was an issue. If necessary, the student researchers intervened in any subtest of the EFPT to prevent accidents leading to harm, such as burning oneself during the cooking assessment. If any event of inappropriate conduct occurred, the student researchers were prepared to report the incident to the IRBHS. The principle of nonmaleficence prevents researchers from taking any action that might inflict injury, harm, or wrongdoing onto a participant (AOTA, 2015). Participants were freely able to discontinue the study if they wished

and participants were allowed to continue testing at another time if they experienced physical or mental fatigue.

Autonomy and confidentiality is a principle that gives participants the right to self-determination (AOTA, 2015). All participants were provided with informed consent documents that describe the purpose of the study, the study procedure, possible risks and benefits, the participants' bills of rights, and their right to withdraw from the study at any time without concern for adverse consequences. Each participant was ensured confidentiality of their information as the student researchers kept all sources of communication, including verbal, non-verbal, written, and electronic correspondence confidential. Participants were each given a letter as a pseudonym during data collection so that all identifying information was protected. Participants' personal information and data were stored in a locked drawer at the DUC campus and on a password protected computer at DUC. After one year of study completion, all data will be destroyed. Finally, to prevent copyright infringement, permissions were gained from MoCA © 8.1 creators and EFPT creators and Occupational Therapy Toolbox author via emails.

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# Section II Manuscript

## Introduction/Background

Acquired brain injury (ABI) is any insult to the brain acquired after birth and not due to a degenerative condition ("Brain injury overview", 2018). Common examples of ABI include cerebrovascular accident (CVA), traumatic brain injuries (TBI), and infections to the brain such as encephalitis, and brain tumors (Entwistle & Newby, 2013). CVAs are the leading cause of serious long-term disability in the United States (U.S.), with approximately 795,000 CVAs occurring each year (Mozzafarian et al., 2016). Similarly, TBIs may have lifelong ramifications for an adult depending on injury severity. In 2013, there were 2.8 million reported hospitalizations, injuries, and deaths from TBIs in the U.S. (Taylor, Bell, Breiding, & Xu, 2017). Regardless of how the injury occurs, injury to the brain can result in both short-term and long-term physical, cognitive, and psychosocial impairments that may impact a person's ability to engage in everyday activities (Mahar & Fraser, 2011).

The American Occupational Therapy Association (AOTA) categorizes everyday activities into activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs are activities associated with caring for one's body, such as bathing and feeding, while IADLs are activities that support independent living in the home and community, such as cooking and driving (AOTA, 2014). Evidence suggests that performances in IADLs require more complex cognitive processes than performances in ADLs (Akbari, Lyden, Kamali, & Fahimi, 2013). In particular, IADLs require the use of executive function (EF), which is a broad term used to describe advanced cognitive processes that allow an adult to control their actions to complete goal-based tasks (Brown & Hux, 2017; Mahar & Fraser, 2011). A range of EF skills are described in literature: from planning, inhibition control, and problem solving to initiation, organization, sequencing, and completion (Baum & Wolf, 2013).

EF deficits are the most prevalent impairment after an adult sustains an ABI (Mahar & Fraser, 2011). EF deficits may present as difficulties with initiating actions, organizing thoughts, and carrying out a sequence of actions in IADLs (Brown & Hux, 2016; Perna, Loughan, & Talka, 2012; Zakzanis, Grimes, Uzzaman, & Schmuckler, 2016). Current literature suggests that a combination of EF skills are required to complete IADLs and when one EF skill is impacted by an ABI, overall IADL performance may decrease (Arsic et al., 2015; Brown & Hux, 2017; Tanguay, Davidson, Guerrero, Nunez, Ferland, 2014; Zartman, Hilsabeck, Guarnaccia, & Houtz, 2013). In particular, the IADLs of driving, cooking, financial management, and medication management often require a combination of EF skills and may be difficult to complete after an ABI (Koller et al., 2016; Palubiski & Crizzle, 2016; Tanguay et al., 2014; Zartman et al., 2013).

Driving is a meaningful IADL that spans across adulthood, and it supports independence in daily life, facilitates adults' connection to people, resources, and activities within the community (Patomella, Johansson, & Tham, 2009). However, after an ABI, an adult may need to cease driving due to an inability to meet the medical fitness to drive criteria or pressure from family to give up their privilege to drive (Dickerson, Reistetter, Schold Davis, & Monahan, 2011; Fleming, Liddle, Nalder, Weir, & Cornwell, 2014). According to a systematic review of 24 articles, researchers found that adults with TBI demonstrated poorer performance when perceiving on-road hazards, processed information more slowly, and demonstrated slower reaction times while driving, when compared to adults without TBI (Palubiski & Crizzle, 2016). Additionally, motor vehicle accidents were found to be significantly more common among adults with TBI, when examined 12 months post injury (Palubiski & Crizzle, 2016). Deficits in EF may contribute to post-injury driving accidents, a greater amount of penalties on driving offenses, as well as limited self-awareness into driving ability (McKerral, Moreno, Delhomme, & Gélinas,

2019). In addition to diminished driving performance, adults with ABI also demonstrate limited ability to cook. In a 2014 study, researchers used the Virtual Breakfast Task to compare performances in cooking between 22 adults with ABI and 22 adults without ABI. The study found that deficits in sequencing, reading instructions, managing transitions, and timing were areas of weakness among adults with ABI. Compared to uninjured adults, adults with ABI more frequently overcooked food items, forgot to cook an item, or did not set the table up according to the instructions (Tanguay et al., 2014). Hence, such deficits may have limited an adult with ABI's ability to prepare, cook, and clean up after a meal.

Similar to driving and cooking, adults with ABI often report difficulty with financial management. Koller et al. (2016) defines financial management as the ability to count money, pay bills, make purchases, and manage a checkbook. In a qualitative study by Koller et al. (2016), six adults with ABI reported that their independence in financial management was revoked by family members or caregivers due to events of overspending their total income, getting into debt, and having to borrow money. Deficits in decision making, forming judgements, and planning may be responsible for the decrease in independence in financial management (Koller et al., 2016). Hence, Koller et al.'s results suggest that EF skills are necessary for successful financial management.

Medication management is another complex IADL that requires intact EF for successful performance (Purdy, 2007; Zartman et al., 2013). Researchers conducted a meta-analysis of three studies and found that among 581 adults, poor EF is shown to be a barrier for maintaining a medication schedule (Stilley, Bender, Dunbar-Jacob, Sereika & Ryan, 2010). Particularly, decreased organization skills interfere with establishing a medication schedule and remembering to take medications appropriately (Stilley et al., 2010 ; Zartman et al., 2013). Impaired

medication management may also suggest decreased safety for independent living (Zartman et al., 2013). Purdy (2007) found similar results to Zartman et al. (2013), in which cognitive deficits were shown to act as the biggest barrier to independently managing medications among 27 adults with CVA. Research showed that a cognitive rehabilitation program, focusing on compensatory strategies, and restorative exercises to improve attention, memory, problem solving, and reasoning, as part of an interdisciplinary medication self-management program, were effective in increasing an adult's ability to self-manage a medication routine (Purdy, 2007).

Findings demonstrate that performances in IADLs require multiple EF skills (Akbari et al., 2013; Arsic et al., 2015; Olofsson, Nyman, & Larsson Lund, 2017; Perna et al., 2012). EF is especially important to examine after sustaining an ABI as it requires utilizing a combination of cognitive skills that include planning, initiating, organization, and sequencing (Olofsson et al., 2017; Perna et al., 2012; Stilley et al., 2010; Tanguay et al., 2014; Zakzanis et al., 2016). Although studies demonstrate that EF deficits can affect multiple IADLs in adults with ABI, there is insufficient and inconsistent research exploring the relationship among performances in different IADLs (Clark, Jak, & Twamley, 2019; Perna et al., 2012). For instance, Perna et al. (2012) found a significant relationship between EF and financial management among adults with ABI; however, Clark et al. (2019) found no significant relationship between EF and financial management among adults with ABI. The inconsistent findings warrant further research to gain insight into how performances among different IADLs relate to each other in adults with ABI.

In addition to the inconsistent findings of EF's relationship to different IADLs, there is a paucity of research investigating the relationship among performances in different IADLs in adults with ABI. Hence, the purpose of this pilot study was to investigate if adults with ABI who returned to driving performed differently in other IADL tasks, such as cooking, medication

management, and financial management when compared to adults with ABI who did not return to driving. The null hypothesis states that there was no significant difference in performance between adults with ABI who returned to driving and adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management as measured by the Executive Function Performance Test (EFPT). The alternate hypothesis states that there was a significant difference in performance between adults with ABI who returned to driving and adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management. Results from this study aimed to give practitioners insight into how performance in one IADL may be reflective of performance in another IADL.

# Methods

## Design

This study utilized a simple two-group exploratory correlational design to examine the degree of relationship among performances in cooking, medication management, and financial management in adults with ABI who returned to driving and adults with ABI who did not return to driving. The EFPT was utilized to measure initiation, execution, organization, sequencing, judgment and safety, and completion in performances in IADL among adults with ABI. Three out of the four EFPT subtasks were used to measure the adult with ABI's performances in a Simple Cooking task, a Medication Sorting task, and a Paying Bills task.

## Participants

After receiving approval from the Institutional Review Board at Dominican University of California (DUC), recruitment of participants occurred in several manners. Recruitment occurred in person, through short verbal presentations, at the Schurig Center for Brain Injury Recovery (SCBIR) in Larkspur, California (CA), and Pomeroy Recreation and Rehabilitation Center (PRRC) in San Francisco, CA. Flyers were placed at SCBIR, PRRC, and on public posting boards in public establishments, with permission, in Marin County, CA. Emails were also sent to occupational therapists working in the community to request assistance with recruitment.

Participation in the study was voluntary and interested adults with ABI reached out to the research team through emails or telephone calls. Interested participants completed a telephone screening to determine fulfillment of the inclusion criteria and confirm interest in the study. All participants needed to understand and provide their own legal consent or legal consent from their conservator was obtained prior to starting the screening assessments.

Convenience sampling was utilized to recruit English speaking adults, 18 years and older with a medical diagnosis of an ABI sustained at least 6 months prior to participating in the study. There was no gender, racial, or ethnic based enrollment restriction for this study, and only adults who had experience in driving prior to the ABI were included in the study. Participants were excluded from the study if they had a bilateral upper extremity motor impairment that may have restricted their ability to perform the subtasks of the EFPT independently. Participants were also excluded if they did not pass a reading test through a Near Vision Reading Card or if they had a severe cognitive impairment, as indicated by the Montreal Cognitive Assessment (MoCA © 8.1). Participants who had a diagnosis or co-diagnosis of a progressive neurodegenerative disorder were excluded from the study.

**Measures and Materials**

Demographic information was obtained through a questionnaire, designed by the research team, that yielded information on the participants such as time lapse since the brain injury, type of brain injury, current and prior experience with meal preparation, medication management, and bill management. Additional information gathered included return to driving status and driving behavior such as distance typically driven, use of freeway versus local driving only and any other self-limiting driving behavior such as day-time driving only. Driving status was operationally defined as driving an adapted or non-adapted automobile independently after an ABI. The MoCA © 8.1 was utilized as a screening tool, as it is a valid and sensitive tool to detect the level of cognitive impairment in adults with ABI (Nasreddine et al., 2005). Adults with ABI who scored less than ten out of 30 on the MoCA © 8.1, indicating a severe cognitive disability, were excluded from the study. A reading test was conducted using a Near Vision Reading Card obtained from a Vision Screening Test kit developed by the Wild Iris Optometrist Group, as part

of the screening process to ensure the participants' ability to read the instructions on the EFPT assessment. The Near Vision Reading Card contained two paragraphs with different sized fonts in which the participants were asked to read at arm's length. If a participant demonstrated difficulty in reading, with or without corrective lens, he/she was excluded from the study.

The main measurement utilized was the EFPT, a performance-based assessment that measured EF performance in IADLs and was created by Dr. Carolyn M. Baum and her team at Washington University School of Medicine in St. Louis (Baum et al., 2008). The assessment includes a standardized manual that describes the materials needed for the test, how to set up each subtask, and standardized instructions for the assessors. The EFPT measures five EF constructs used in cooking, telephone use, medication management, and financial management through a series of tasks: the Simple Cooking task (preparing oatmeal over the stove), the Phone Call task (using a telephone book to call a grocery store), the Medication Sorting task (organizing a simulated pill box using simulated prescribed medications), and the Paying Bills task (paying simulated bills and balancing a checkbook). The EFPT consists of an original and alternative version of each task (Baum & Wolf, 2013). The original versions of the Simple Cooking task and Bill Paying task were used in the study, while an alternative version of the Medication Sorting task was used as the original method required the participant to swallow sugar free candy as pseudo medication, which may have posed a choking hazard. Participants were exempt from the Paying Bills task if they had no experience writing a check or balancing a checkbook prior to this study. The Phone Call task was omitted because using a phone book to look up a phone number is an uncommon method.

The EFPT test yields three scores: the EF construct score, the task score, and a total score. Scores are determined by following a standardized scoring system described in the assessment

manual. Participants receive a score within each EF construct, and the score is based on the level of assistance they require with each EF construct to successfully complete the task. The EF construct score is calculated by summing the numbers recorded on each of the tasks for initiation, organization, sequencing, judgment and safety, and completion, which ranges from zero to five for each of the EF constructs. A score of zero indicates that the participant required no verbal and/or physical assistance and a score of five means the participant required total verbal and/or physical assistance with the specific executive function construct. Participants receive higher EFPT scores when they require a greater level of cueing to complete a task. The task score is the summation of each EF construct score ranging from zero to 25. Therefore, the total performance score of all three tasks can range from zero to 75 for each participant. Physical assistance due to a physical difficulty is not scored, such as opening a medication bottle for the participant, as it does not represent assistance needed for a cognitive impairment.

The EFPT has high levels of interrater reliability with intraclass correlation equal to .91 for the EFPT total score (Baum et al., 2008). A series of one-way ANOVA tests measuring significant differences among non-CVA, mild CVA, and severe CVA groups demonstrated construct validity for EFPT total sores, task scores, and EF construct scores (Baum et al., 2008).

**Data collection procedures**

Data were collected at three locations, the SCBIR, the PRRC, or the DUC campus. The EFPT test was administered to each participant by one assessor and one observer. To ensure accuracy in scoring, two assigned assessors and two assigned observers received norming training to administer and score the EFPT. The participants were given an option to complete the subtasks of the EFPT on the same day or on two separate days. When two assessment dates were

requested, the consecutive assessments were scheduled no more than two weeks apart to prevent effects of maturation.

**Data analysis procedures**

The results of the assessments were analyzed to explore whether a relationship existed among performances in cooking, medication management, and financial management, and if adults with ABI who returned to driving differed significantly in performances compared to adults with ABI who did not return to driving. Data obtained from demographic questionnaires and EFPT scores were transferred from an excel spreadsheet to Statistical Package for Social Science (SPSS version 22) for data analysis. Descriptive statistics were used to describe demographic and characteristics of the two groups of participants, those who returned to driving and those who did not. The differences between the mean scores of each task for each group, adults with ABI who returned to driving and those who did not return to driving, were analyzed using a paired t-test. Results of the paired t-tests determined acceptance or rejection of the null hypothesis. Pearson product moment correlation tests were used to determine if a relationship existed among return to driving status and performances in the Simple Cooking, Medication Sorting, and Paying Bills tasks.

# Results

## Demographics

A total of 21 participants were recruited but three did not meet inclusion criteria, resulting in 18 total participants who completed the entirety of the study. Participant demographics and the mean MoCA© 8.1 scores for each group are displayed in Table 1. Two-tailed paired samples t-tests determined there was no significant difference in average MoCA© 8.1 scores between the two groups ($t(16) = -2.02$, $p = .06$). Of the 11 participants who passed the Alternate Trail Making of the MoCA© 8.1, seven participants were in the return to driving group while four were in the did not return to driving group. Two-tailed paired samples t-tests determined there was no significant difference in passing the Alternating Trail Making portion of the MoCA © 8.1 between the two groups ($t(16) = -.970$, $p = .34$).

*Table 1 Participant Demographics*

| Group | Mean Age | Gender | Diagnosis | Mean time since injury | Mean MoCA© 8.1 score |
|---|---|---|---|---|---|
| Total (N = 18) | 60.34 years (*SD* = 9.40) | M = 10<br>F = 8 | CVA = 6<br>TBI = 11<br>BT = 1 | 9.9 years (*SD* = 10.60) | 23.11 (*SD* = 4.30) |
| Return to drive (n = 9) | 57.0 years (*SD* = 7.29) | M = 5<br>F = 4 | CVA = 1<br>TBI = 8<br>BT = 0 | 6.1 years (*SD* = 7.64) | 25 (*SD* = 3.39) |
| Did not return to drive (n = 9) | 63.9 years (*SD* = 10.38) | M = 5<br>F = 4 | CVA = 5<br>TBI = 3<br>BT = 1 | 13.7 years (*SD* = 12.15) | 21.22 (*SD* = 4.46) |

*Note.* BT= Brain Tumor

**EFPT Total and Task scores**

All participants completed the three EFPT tasks (Simple Cooking, Medication Sorting, Paying Bills), with the exception of one participant who had no experience with paying bills and therefore was not tested on the Paying Bills task. Refer to Table 2 for average scores on each task.

*Table 2 Participants' average EFPT Total and Task Scores*

| Group | EFPT Total Score | Cooking Task Score | Medication Sorting Task Score | Paying Bills Task Score |
|---|---|---|---|---|
| Total (N = 18) | 12.06 (SD = 7.54) | 2.83 (SD= 3.11) | 4.11 (SD = 3.23) | 5.35 (SD = 2.71) |
| Return to drive (N = 9) | 9.77 (SD = 7.36) | 1.88 (SD = 3.25 ) | 3.44 (SD = 2.60) | 4.33 (SD = 2.78) |
| Did not return to drive (N = 9) | 14.33 (SD = 7.41) | 3.77 (SD= 2.81) | 4.77 (SD = 3.80) | 6.50 (SD = 2.26) |

Two-tailed paired samples t-tests determined no significant difference in EFPT total scores and task scores between the two groups, adults who returned to driving versus adults who did not return to driving after the ABI. Refer to Table 3.

*Table 3 T-test between groups.*

| | **T-test (*t*)** | **P-value (*p*)** |
|---|---|---|
| EFPT total score | 1.308 | .21 |
| Medication sorting task score | .87 | .40 |
| Paying bills task score | 1.74 | .10 |
| Simple cooking task score | 1.32 | .21 |

A correlation was found between scores of Medication Sorting and Paying Bills task scores, as well as Medication Sorting and Simple Cooking task scores. There was a significant, positive correlation between the scores for Paying Bills and Medication Sorting ($r(16) = 0.62$, $p = .01$). Additionally, a significant, positive correlation was found between Paying Bills and Simple Cooking scores ($r(16) = 0.69$, $p = .00$). There was no significant correlation between Simple Cooking scores and Medication Sorting scores.

The EF constructs of initiation, organization, sequencing, judgment and safety, and completion within the tasks of Paying Bills and Simple Cooking, and Paying Bills and Medication Sorting were examined to determine if a significant relationship exists. Only one significant relationship was found. A significant, positive correlation was found between organization in Paying Bills task scores and Medication Sorting task scores ($r(16) = 0.835$, $p = .00$).

## Discussion

The purpose of the current study was to examine if a relationship exists between performance in one IADL and performance in another IADL in adults with ABI. Return to driving status was compared to EF performances in cooking, medication management, and financial management as measured by the EFPT. The results suggest acceptance of the null hypothesis: there was no significant difference in performance between adults with ABI who returned to driving and adults with ABI who did not return to driving in the areas of cooking, medication management, and financial management as measured by the EFPT. The study found no significant correlation between return to driving status and IADL performances. Therefore, performances in cooking, medication management, and financial management are not reflective of the driving status in adults after an ABI.

The lack of a relationship between return to driving and performances in the EFPT tasks of cooking, medication management, and financial management may be due to each IADL demanding a different set of cognitive skills, which supports the main conclusion of this study that IADLs are not equal. In particular, driving may demand EF and other cognitive skills that were not assessed by the EFPT in the tasks of Simple Cooking, Medication Sorting and Paying Bills. Assessments with good predictive ability to drive after a CVA assess multiple cognitive skills in addition to EF, such as visual perception, memory, divided and sustained attention, and knowledge of road laws (Dickerson et al., 2011; Unsworth et al., 2019). Strategies to make decisions on when and where to drive, flexibility to adapt to changing weather and road conditions, in combination with knowledge of road laws and quick motor responses are required for driving (Fleming et al., 2014). Each time an adult drives, there are a unique set of stimuli that an adult must attend to and process, possibly making the experience of driving less predictable

than cooking a familiar breakfast item or maintaining a medication sorting box. Driving utilizes a wide set of cognitive skills that the EFPT does not assess, which may explain why a relationship does not exist between driving and the performance in EFPT tasks. Although the results suggest that all IADLs are not equal, a relationship among different IADLs may exist if they demand a similar set of EF skills.

When the scores of each EFPT task were compared with one another, the Paying Bills task and Medication Sorting task scores were found to be significantly correlated. This finding suggests that performance in financial management may be related to performance in medication management. Upon further analysis, organization was the only significant EF construct found to correlate the performances of paying bills and medication sorting. Therefore, financial management and medication management may demand the use of similar organizational skills to successfully perform both tasks. The standardized way in which the two EFPT tasks are organized may also explain their significant relationship through organization. According to the standardized EFPT manual, both the Paying Bills and Medication Sorting tasks required all corresponding materials to be presented to the participants in their respective Ziploc bags. Additionally, both tasks were presented under similar contexts: both are completed on the table with materials easily accessible within the participant's visual field. Hence, the standardized instructions required each task to be presented in an inherently organized manner, which may explain why significance was found in the EF construct of organization. The current study supports McDougal, Han, Staggs, Johnson, and McDowd's (2019) findings that the organization of thoughts and materials may be responsible for the significant relationship between financial management and medication management. However, the current study is the first study, to the researchers' knowledge, to discover this result in a population of adults with ABI.

A significant positive correlation exists between the Paying Bills task and Simple Cooking task, however, no single EF construct measured by the EFPT was responsible for this finding. Therefore, cooking and financial management may be related by a combination of EF skills such as planning, inhibition, and decision making (Bottari, Gosselin, Guillemette, Lamoureux, & Ptito, 2011; Koller et al., 2016; Tanguay et al., 2014). A combination of EF skills may be utilized in both tasks due to the variable nature of performing financial management and cooking after an ABI. Data collected from the demographic questionnaire indicated variability in how participants completed cooking and financial management in their respective natural environments. Participants' self-reports of how they cooked in their natural environment after an ABI ranged from being dependent on a family member, or completing light meal preparation in a microwave, to independently completing full meal preparation on a stove top. Similarly, performance in financial management can vary significantly also, and demographic data indicated that participants reported managing their finances with varying levels of complexity. Some participants were dependent on family members or a conservator, while other participants used an automatic electronic system, wrote personal checks, or paid bills via a telephone. Reports from the participants are similar to current literature that highlights the variability of performing financial management after an adult experiences an ABI (Koller et al., 2016). The variability of a task may influence how an adult with ABI's EF skills are utilized to perform the task, thus explaining why no single EF construct was significantly correlated with performances in the Paying Bills and Simple Cooking tasks. The various methods used to complete an IADL further support the conclusion that all IADLs are not equal but may still be related if they demand a similar set of EF skills.

Similarly, participants in this study did not require equal assistance among the five EF constructs to perform each task due to the intricacies of the participants' ABI and variability of task performance. Every participant required some form of assistance in all EF constructs except completion. Participants required the most assistance in the area of sequencing, followed by safety and judgement, then organization, and finally, initiation of the EFPT tasks. The participants' ability to know when a task was completed may probably be explained by the method of performing the EFPT tasks in a controlled environment versus a natural environment. The study took place in a controlled environment which may not have elicited similar distractions and sequencing that could have occurred in an adult's natural environment. For example, in the EFPT, participants were presented with a copy of the directions to cook one bowl of oatmeal, which provided the participants with a clear end to the task. Conversely, in a natural environment, there may not be clear step-by-step instructions on how to perform a task and the environment may present more distractors that could hinder an adult with ABI's ability to end a task. Therefore, task performance in a natural environment may require the skill of completion more so than in a controlled environment.

Performance-based assessments, like the EFPT, allow researchers and clinicians to assess specific skills that contribute to successful task performance, but still may not be reflective of IADL performances in an adult's natural environment (Baum et al., 2008; Provencher et al., 2012; Tanguay et al., 2014). Additionally, the EFPT is limited in measuring only specific EF skills through the performance of IADLs. Therefore, to accurately assess IADL performance, each IADL should be examined independently and organically in an adult's natural environment.

An interesting secondary finding is the limited ability of the Alternating Trail Making Section of the MoCA© 8.1 to reflect driving among adults with ABI. The Trail Making Part B

screening test is a reliable pen and paper tool that is used to predict the risk of unsafe driving among adults with CVA (Choi, Lee, and Oh, 2016). However, Trail Making Part B test is not scored the same as the Alternating Trail Making section of the MoCA© 8.1 that was used in this study. Scoring of the Trail Making Part B is determined by how fast a participant is able to complete the assessment, whereas the Alternating Trail Making section of the MoCA© 8.1 is scored based on accuracy in alternating between consecutive numbers and letters and instead of alternating between 13 letters and 13 numbers, the Alternating Trail Making section in MoCA © 8.1. The difference in how each assessment is scored further supports that the Alternating Trail Making section of the MoCA© 8.1 cannot predict driving with the same level of accuracy that the Trail Making Part B can. In both of the return to driving and did not return to driving groups, three out of nine participants did not pass the Alternating Trail Making Section of the MoCA© 8.1. Therefore, the Alternating Trail Making Section of the MoCA© 8.1 does not seem to have a predictive ability of return to driving after an ABI.

## Limitations

Multiple limitations exist in this study. A small sample size reduces the statistical power of the results which may lead to a wider margin of error and lower confidence level. Convenience sampling of participants recruited from a similar geographical area limits generalizability to a larger population. This study's sample population represented a broad spectrum in severity of ABI, and the type of therapy each participant received after sustaining an ABI was not determined. Participants may or may not have received therapy, including various levels of cognitive and/or driving rehabilitation. For example, adults who had experience in driving rehabilitation may have stronger support systems and a higher opportunity to return to driving due to rehabilitation of skills required for driving. Moreover, utilization of a demographic survey may have been an inadequate form of determining IADL abilities. Additional demographic data on the amount and type of therapy received could have provided further insight into participants' performances on the EFPT tasks.

In terms of driving, driving status may not be reflective of driving performance. The study examined driving status after an ABI, not on-the-road driving skills. A participant may have returned to driving after an ABI; however, the quality of their on-the-road driving performances were not measured and remained unclear. Among the adults who returned to driving in this study, four out of nine reported varying self-imposed limitations to their driving behavior; participants often reported modifying the locations they drove to, the distance, and time of day driven. Some participants informally narrated how the self-limitations caused them to restrict engagement in leisure activities, such as taking road trips or golfing. However, the study did not formally examine a participant's reason for self-limiting driving behavior or ceasing to drive totally. Multiple reasons unrelated to their brain injury could have led to the

adult to not return to driving, such as finances and personal volition. Although driving status can provide some information on the participant's driving ability, driving status does not provide full details on performance in driving after their ABI. Thus, a limited understanding of the participants' performances in driving may have impacted the current study's ability to create a clearer distinction between the return to driving group or did not return to driving group after ABI, and therefore, could have created a threat to face validity in the study.

## Conclusion and Implications for OT practice

No significant relationship was found between driving status after an ABI and performances in the IADL tasks of Simple Cooking, Medication Sorting, and Paying Bills in the EFPT. Therefore, return to driving cannot infer performances in the three IADL tasks as assessed in the EFPT. Yet, a significant relationship may still exist among IADL performances if they demand the use of similar EF skills, which was discovered between financial management and cooking, and financial management and medication management. Yet, the results suggest that different combinations of EF skills are required to perform each IADL, hence IADLs are not equal from an executive function standpoint. Moreover, the results of the current study also support that in order to glean an understanding of an adult's performances in various IADLs, the IADLs should be examined independently in natural environments.

Implications for future practice are to encourage occupational therapists to use skilled task analysis to examine IADL performances independently from one another and in an adult with ABI's natural environment. Future research is needed to further examine how an adult with ABI's injury has impacted their performance in various IADLs in their natural environment. A thorough understanding of the cognitive components needed in IADL performances may help form interventions to remediate the abilities of adults with ABI to engage in meaningful occupations and promote health and wellbeing.

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## Appendix A: Letter of Permission to Agency Directors (Schurig Center for Brain Injury Recovery)

**Appendix A**

**Dominican University of California**
**Letter of Permission to Agency Directors**

November 8th, 2018

Schurig Center for Brain Injury Recovery
1132 Magnolia Avenue, Larkspur, CA 94939

Dear Reiko Kitamori and team,

This letter confirms that you have been provided with a brief description of our capstone project, which concerns factors related to performances in instrumental activities of daily living, such as cooking, medication management, and bill paying, and that you consent for us to visit your facility and recruit participants. This project is an important part of our graduate requirements for an Occupational Therapy degree and is being supervised by Dr. Kitsum Li, Professor of Occupational Therapy at Dominican University of California.

We will make every effort to ensure that our data collection minimally interferes with your regularly scheduled classes and workshops and that your clients are treated with the utmost discretion and sensitivity. If you have questions about the research, you may contact us at the phone number or email address below. If you have further concerns, you may contact our capstone advisor, Dr. Kitsum Li, at (415) 458-3753 or the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 257-0168.

If you agree with our request to visit your establishment, interview your clients, and to conduct assessments at your site, please sign and date this letter below. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,
Crystal Lee, Samantha Schauer, Amy Tam, Yareli Vargas

Phone: Dr. Kitsum Li (415) 458-3753
Email: IADLSStudy@gmail.com

**I agree with the above request,**

[redacted] [redacted] 11/09/18

Name Signature Date

## Appendix B: Letter of Permission to Agency Directors (Pomeroy Recreation and Rehabilitation Center)

**Dominican University of California**
**Letter of Permission to Agency Directors**

**Dominican University of California**
**Letter of Permission to Agency Directors**

November 20th, 2018

Pomeroy Recreation and Rehabilitation Center
207 Skyline Blvd, San Francisco, CA 94132

Dear David Dubinsky and team,

This letter confirms that you have been provided with a brief description of our capstone project, which concerns factors related to performances in instrumental activities of daily living, such as cooking, medication management, and bill paying, and that you consent for us to visit your facility and recruit participants. This project is an important part of our graduate requirements for an Occupational Therapy degree and is being supervised by Dr. Kitsum Li, Professor of Occupational Therapy at Dominican University of California.

We will make every effort to ensure that our data collection minimally interferes with your regularly scheduled classes and workshops and that your clients are treated with the utmost discretion and sensitivity. If you have questions about the research, you may contact us at the phone number or email address below. If you have further concerns, you may contact our capstone advisor, Dr. Kitsum Li, at (415) 458-3753 or the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 257-0168.

If you agree with our request to visit your establishment, interview your clients, and to conduct assessments at your site, please sign and date this letter below. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,
Crystal Lee, Samantha Schauer, Amy Tam, Yareli Vargas

Phone: Dr. Kitsum Li (415) 458-3753
Email: IADLSStudy@gmail.com

**I agree with the above request,**

[redacted] Name

[redacted] Signature

11/20/2018 Date

## Appendix C: Sample Email to Clinicians

**Sample Email to Clinicians**

Hi (name of clinician),

With support from our capstone advisor Dr. Kitsum Li, the graduate research team, Amy Tam, Yareli Vargas, Samantha Schauer, and I, Crystal Lee, are conducting assessments on instrumental activities of daily living in adults with an acquired brain injury (ABI). ABI is defined an injury to the brain after birth, and the most common being traumatic brain injury, stroke, brain tumors and brain infections, like meningitis, encephalitis. We are looking to recruit participants for two groups, adults with ABI who returned to driving and adults with ABI who did not return to driving but have previous driving experience prior to the brain injury. We are reaching out to you and your organization to request assistance with recruitment. We were wondering if you may have any possible participants that you could hand out our flyers to. Please note that participation in the study is voluntary

Our inclusion criteria are as follow:

- English speaking adults
- 18 years or older
- A medical diagnosis of an ABI at least 6 months prior to the study
- No more than moderate cognitive impairment. A score of 10 or higher in MoCA©8.1 will determine the eligibility for participation
- Being able to understand and read English writing in regular font size with or without corrective lens

Our exclusion criteria include:

- Having a bilateral upper extremity motor impairment
- A co-diagnosis of a progressive neurodegenerative disorder
- No driving experience before their ABI

Please feel free to reach us by email at IADLSStudy@gmail.com or phone at (415) 458- 3753 if you have further questions.

Sincerely,
Amy, Yareli, Samantha, and Crystal

## Appendix D: Flyer

**Flyer**

# Participants Needed for a Brain Injury Study!

Cooking

Bill Paying

Medication Management

## Research participants needed!

Occupational Therapy Students at Dominican University of California are conducting a study exploring performance in everyday activities among adults with an acquired brain injury

**In order to qualify for the study participants must be:**

- 18 years or older
- Able to read and follow instructions in English
- Have a diagnosed acquired brain injury at least 6 months ago (stroke, traumatic brain injury, concussion, meningitis, brain tumor, etc.)

**Participate in a study and:**

- ✓ Gain insight into your own abilities
- ✓ Contribute to health science
- ✓ Plus a chance to win a $25 gift card

**IADLSStudy@gmail.com**
**(415) 458-3753**

**This study will be conducted at Dominican University of California in San Rafael, CA**

Daily Activities Study IADLSStudy@gmail.com (415) 458-3753

# Appendix E: Telephone Screening

**Telephone Screening**

Full Name: _____
Address: _____
Phone Number:_____ Email Address: _____

Date of Birth (MM/DD/YYYY): _____ Gender: M / F
Able to give legal consent? Y / N
If unable to give legal consent, name & phone number/email of responsible party:
_____

Impairments: Upper body Y/N, If Y which side and describe _____

Which side is your dominant hand?_____

Speech Y/N, If Y, describe_____

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

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

Approximate date of acquired brain injury (MM/YYYY):_____

Do you have experience with driving?
□ Current □ In the past □ None

Are you comfortable reading and following instructions in English? Y/N

Can you arrive at _____ site once/twice (circle one) for the study? Y/N

Are you available to participate in a total of 2 hours of assessments between January 2019-May 2019? Y/N

## Appendix F: Participant Consent Form

**CONSENT TO BE A RESEARCH SUBJECT**
**DOMINICAN UNIVERSITY of CALIFORNIA**

Purpose and Background:

Ms. Crystal Lee, Ms. Samantha Schauer, Ms. Amy Tam, and Ms. Yareli Vargas, students in the Department of Occupational Therapy at Dominican University of California, are conducting a research study designed to look at performance in instrumental activities of daily living among adults with an acquired brain injury. The student researchers are interested in assessing performances in cooking, managing medications, and bill paying among adults with an acquired brain injury who are driving or not driving. I am being asked to participate because I am an individual with a brain injury greater than six months prior to the study's implementation.

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 one of these locations:
    - Dominican University of California campus, located at 50 Acacia Avenue in San Rafael, California
    - Schurig Center for Brain Injury Recovery, located at 1132 Magnolia Avenue in Larkspur, California
    - Pomeroy Recreation and Rehabilitation Center, located at 207 Skyline Blvd in San Francisco, California
2. I understand that after providing informed consent, I will complete a cognitive screening and a near vision screening to determine my eligibility to participate.
3. I understand that if I pass the eligibility screen, I will then complete a demographic information questionnaire, followed by the medication sorting task of the Executive Function Performance Test (EFPT) that same day.
4. I understand that I may continue on the same day or choose to meet on a separate date with the student researcher to complete the simple cooking task and the paying bill task of the EFPT to conclude the study.

**CONSENT TO BE A RESEARCH SUBJECT**
**DOMINICAN UNIVERSITY of CALIFORNIA (continued)**

Risks and/or Discomforts:

1. I understand that my participation may involve some mental or physical fatigue due to the time required to participate.
2. I understand there may be a risk of burns, although unlikely, due to the simple cooking task. This risk will be minimized by supervision from student researcher and she will intervene, if necessary, to minimize my risk of getting burnt.
3. I understand that I may elect to stop filling out the demographic questionnaire at any time and may refuse to participate before or after the study begins without any adverse effects.
4. I understand that I may take rest breaks at my own discretion to resolve any fatigue, mental or physical, that I may be experiencing and I will be allowed to return to complete the assessment on a different date under my own desire.

Benefits:

The anticipated benefits of this study include:

- I may learn more about my own abilities.
- I will have the opportunity to complete a performance-based assessment.
- I will contribute to the general knowledge of brain injury research and rehabilitation.
- My name will be entered into a pool for a chance to win one of the four $25 gift cards.
- I will receive a Participant Summary Package with results of my assessment and general tips and resources, after completing the assessment.

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 (IADLSStudy@gmail.com) or their faculty supervisor, Dr. Kitsum Li, OTR/L, Department of Occupational Therapy, Dominican University of California, (415) 458-3753.

If I have any questions or comments about participation in this study, I should talk first with the researchers and the research supervisor. If for some reason I do not wish to do this, I may contact the Dominican University of California Institutional Review Board for the Protection of Human Subjects (IRBPHS), which is concerned with the protection of volunteers in research projects. I may reach the IRBPHS Office by calling (415) 257-0168 and leaving a voicemail message, by Fax at (415) 257-0165 or by writing to the IRBPHS, Office of the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

**CONSENT TO BE A RESEARCH SUBJECT**
**DOMINICAN UNIVERSITY of CALIFORNIA (continued)**

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 decline to be in this study or withdraw my participation at any time without fear of adverse consequences.

My signature below indicates that I agree to participate in this study.

_____ _____

**PARTICIPANT'S NAME (PRINT)** **DATE**

_____ _____

**PARTICIPANT'S SIGNATURE** **DATE**

_____ _____

**RESEARCHER'S SIGNATURE** **DATE**

## Appendix G: Proxy Consent Form

**PROXY CONSENT FORM**
**DOMINICAN UNIVERSITY of CALIFORNIA**

Purpose and Background:
Ms. Crystal Lee, Ms. Samantha Schauer, Ms. Amy Tam, and Ms. Yareli Vargas, students in the Department of Occupational Therapy at Dominican University of California are conducting a research study designed to look at performance in instrumental activities of daily living among adults with an acquired brain injury. The student researchers are interested in assessing performance in cooking, managing medications, and bill paying between adults with an acquired brain injury who are drivers and non-drivers. The adult under my conservatorship is being asked to participate because s/he is an individual with a brain injury greater than six months prior to the study's implementation.

Procedures:
If I agree to allow the adult under my conservatorship to participate in this study, the following will happen:

1. I understand that all of the study's procedures will take place at one of these locations:
    a. Dominican University of California campus, located at 50 Acacia Avenue in San Rafael, California
    b. Schurig Center for Brain Injury Recovery, located at 1132 Magnolia Avenue in Larkspur, California
    c. Pomeroy Recreation and Rehabilitation Center, located at 207 Skyline Blvd in San Francisco, California
2. I understand that after providing informed consent, my conservatee will complete a cognitive screening and a near vision screening.
3. I understand that if my conservatee's cognitive and near vision screening results fit within the study's criteria, s/he will also complete a demographic information questionnaire, and the medication sorting task of the Executive Function Performance Test (EFPT) that same day.
4. I understand that my conservatee may continue on the same day or choose to meet on a separate date with the student researcher to complete the simple cooking task and bill paying task of the EFPT to conclude the study.

**PROXY CONSENT FORM**
**DOMINICAN UNIVERSITY of CALIFORNIA (continued)**

Risks and/or Discomforts:

1. I understand that my conservatee's participation may involve some mental or physical fatigue due to the time required to participate.
2. I understand there may be a risk of burns, although unlikely, to my conservatee due to the simple cooking task. This risk will be minimized by supervision from student researcher and she will intervene, if necessary, to minimize the risk of my conservatee getting burnt.
3. I understand that my conservatee may elect to stop filling out the demographic questionnaire at any time and may refuse to participate before or after the study begins without any adverse effects.
4. I understand that my conservatee may take rest breaks at his/her own discretion to resolve any fatigue, mental or physical, that s/he may be experiencing and s/he will be allowed to return to complete the assessment on or at a different date under his/her own desire.

The anticipated benefits of this study include:

- My conservatee may learn more about his/her own abilities.
- My conservatee will have the opportunity to complete a performance-based assessment.
- My conservatee will contribute to the general knowledge of brain injury research and rehabilitation.
- My conservatee's name will be entered into a pool for a chance to win one of the four $25 gift cards.
- My conservatee will receive a Participant Summary Package with results of my assessment and general tips and resources, after completing the assessment.

Questions:

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

If I have any questions or comments about participation in this study, I should talk first with the researcher and the research supervisor. If for some reason I do not wish to do this, I may contact the Dominican University of California Institutional Review Board for the Protection of Human Subjects (IRBPHS), which is concerned with the protection of volunteers in research projects. I may reach the IRBPHS Office by calling (415) 257-0168 and leaving a voicemail message, by Fax at (415) 257-0165 or by writing to the IRBPHS, Office of the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

**PROXY CONSENT FORM**
**DOMINICAN UNIVERSITY of CALIFORNIA (continued)**

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 decline to have my conservatee to be in this study or withdraw his/her participation at any time without fear of adverse consequences.

My signature below indicates that I give my consent for the adult under my conservatorship ("participant") to participate.

| | |
|---|---|
| **PARTICIPANT'S NAME (PRINT)** | **DATE** |
| **CONSERVATOR'S NAME (PRINT)** | **DATE** |
| **CONSERVATOR'S SIGNATURE** | **DATE** |
| **RESEARCHER'S SIGNATURE** | **DATE** |

## Appendix H: Participant Bill of Rights

**Participant Bill of Rights**
**RESEARCH PARTICIPANT'S BILL OF RIGHTS**
**DOMINICAN UNIVERSITY OF CALIFORNIA**

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

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

If you have other questions regarding the research study, you can contact the researchers at IADLSStudy@gmail.com or their advisor, Dr. Kitsum Li, at (415) 458-3753. You may also contact the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 257-0168 or by writing to the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Ave., San Rafael, CA 94901.

# Appendix I: Demographic Information Questionnaire

**Demographic Information 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): _____ Gender: M / F

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

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

Month/Year of acquired brain injury (or approximate) (MM/YYYY):_____

What is your experience with driving?

□ Current □ In the past

How do you commute from one place to another?

□ I currently drive solo □ I must drive with another person in the vehicle
□ Family/ Friend drives me □ Public transportation
□ Other:_____

If you do drive, on average approximately how far do you drive daily? _____ miles

Do you drive in the:

□ Daytime □ Nighttime □ Both

Do you drive on the:

□ Freeway □ Local Roads □ Both

How do you usually prepare a meal?

□ I make it using a stove □ I make it using a microwave □ Family/ Friend makes it for me □ I order pre-packaged food □ Other:_____

**Demographic Information Questionnaire (continued)**

Do you consider your meal prep to be:

□ Full meal prep (ex: chopping vegetables, cooking a protein, cooking rice, potatoes)

□ Light meal prep (ex: microwaving mac and cheese, heating up a can of soup, making instant noodles, making a salad or sandwich)

Do you have experience with medication management?

□ Current □ In the past □ None

How do you usually manage your medications:

□ I do it on my own using a medication management box □ I do it on my own without a medication management box □ Family/ Friend reminds me or sets out my medication for me

□ Other:_____

How do you remember to refill your medications:

□ I refill it myself when I notice I am running low

□ I handle it using an external reminder system (pharmacy calls, phone reminders, etc)

□ Someone reminds me/ refills them for me. (It's completely managed by someone else)

Do you have experience with paying bills?

□ Current □ In the past □ None

How do you usually manage your own bills:

□ I do it on my own □ Family/ Friend sets pays for me, including setting up my automatic bill pay □ Conservator □ Other:_____

How do you usually pay your bill?

□ Electronic (auto pay) □ Personal checks □ Online payment (not autopay)

□ Other: _____

Do you have experience writing personal checks? Y/N

Currently, who sets up your bill management?

□ I do □ A friend/ loved one □ Other: _____

THANK YOU FOR YOUR TIME!!!

## Appendix J: Resources

**Resources**

1. Montreal-Cognitive Assessment: mocatest.org
   The Montreal-Cognitive Assessment (MoCA) is a cognitive screening tool to detect cognitive decline.
2. OT Toolkit: ottoolkit.com
   The Occupational Therapy Toolkit is a collection fo 354 full-page illustrated patient handouts that are based on current research and best practice.

## Appendix K: Informed Use for Montreal Cognitive Assessment

**Informed Use for Montreal Cognitive Assessment**

From: MoCa <info@mocatest.org>
Date: Mon, Oct 29, 2018 at 7:02 AM
Subject: RE: MoCA© Permission Request

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
www.mocatest.org / www.alzheimer.TV

**Informed Use for Montreal Cognitive Assessment (continued)**

| | |
|---|---|
| Study Title* | Are all Instrumental Activities of Daily Living equal? A correlation study of performance of adults with acquired brain injury. |
| Study Objectives* | The purpose of this study is to examine the correlation among performances in different instrumental activities of daily living in adults with acquired brain injury. |
| Source of Funding* | None |
| Name of Principal Investigator* | Dr. Kitsum Li |
| Institution* | Dominican University of California |
| Country* | United States of America |
| Email* | [redacted]@gmail.com |

## Appendix L: Informed Use of Executive Function Performance Test

**Informed Use of Executive Function Performance Test (EFPT)**

Dr. Baum,

We, Crystal Lee, Samantha Schauer, Amy Tam, and Yareli Vargas, are writing this email to inform you that we have downloaded the EFPT training manual, labels and check template. We are a team of four occupational therapy graduate students at Dominican University of California conducting research under Dr. Kitsum Li, OTR/L. Thank you for providing the EFPT as a public domain instrument. If you have any questions or concerns, please do not hesitate to contact us.

Regards,
Crystal Lee

Crystal Lee
Occupational Therapy Student
Dominican University of California

## Appendix M: EFPT Pre-Test Questions

## EFPT Pre-Test Questions

*Pre-Test Questions (collated)*

**Do you cook?** 1= Yes 2= No
**Do you use the stove to cook meals?**
1= Yes 2= No
**Have you recently made oatmeal on the stove?**
1= Yes 2= No
**Will you be able to make oatmeal?**
0= by yourself
1= with verbal guidance
2= with physical assistance
3=I won't be able to do this task

**Do you pay your bills?** 1= Yes 2= No
**Does someone help you with your bills?** 1= Yes 2= No
**Have you ever used a checkbook?** 1=Yes 2=No
**Do you know how to use a checkbook?**
1= Yes
2= No
Note: If they have NEVER used a checkbook and they say they do not know how to use one, avoid the bill paying task (Form E) as you will be cueing because of lack of knowledge, not lack of processing.
**Will you be able to pay the bills?**
0= by yourself
1= with verbal guidance
2= with physical assistance
3=I won't be able to do this task

**Do you take medication?** 1= Yes 2= No
**When do you take your medicine?** _____
1=morning
2=afternoon
3=evening
4=before bed
5=more than once a day

**Will you be able to sort medication?**
0= by yourself.
1= with verbal guidance
2= with physical assistance
3=I won't be able to do this task

The tasks I am about to ask you to do may involve some movements that may be difficult for you. Please ask me for help if you need it.
Source: https://www.ot.wustl.edu/about/resources/executive-function-performance-test-efpt-308

## Appendix N: EFPT Medication Sorting Task

**EFPT Medication Sorting Task**

Items required for task:

- 3 Prescription Medication Bottles filled with beads for "pretend medication"
- Medication Labels- to write person's name on and tape to bottles
- One label directed to take twice a day
- One label directed to take once a day with a meal
- One label directed to take in morning
- Medication bottle labeled with another person's name and another non-prescription bottle both for use as a distracter
- Medication sorter- 7 day container with 2 slots for each day (AM & PM)

Commence Task:

***"I need you to pretend you have three prescriptions in the box. Find your prescriptions in the box, and sort them into the pill sorter for 7 days, according to the instructions on the medication. Everything you need is in the box."***

Source: https://www.ot.wustl.edu/about/resources/executive-function-performance-test-efpt-308

# Appendix O: EFPT Paying Bills Task

## EFPT Paying Bills Task

Note: If they have NEVER used a checkbook, ask them if they know how checkbooks are used. If they say they do not know how to use one, avoid this test as you will be cuing because of lack of knowledge, not lack of processing.

Note: This task will be skipped if they answered "no" to both questions of (1) ever using a checkbook and (2) if they know how to use a checkbook in the pre- test questions.

Items required for task:

- Two bills (one cable, one phone) mixed with 5 other pieces of mail (letter from credit card company, announcement of a sale, etc.) in a Ziploc bag
- Checks
- Balance sheet (i.e., account book) with a balance $5.00 less than the bills total
- Pen
- Calculator

Note: One of the bills is past due; the other is due upon receipt so they need to review both bills before they start to pay one. This may require cues.

Commence Task:

***"I want you to take what you need to pay the bills out of the bag, find all the bills, open all the bills, pay them, and balance the account. These are fake bills and this is not your account but I need you to pretend that these are your bills and your account as this is part of the assessment."***

If they do not have all the items they need first ask them if they need to get other materials, second- point to the box, third, give them a direct cue as to what to pick up, or assist them] If they have a motoric limitation they may ask you to get the items from the box for them (do not score a cue when they request).

Note: use of the calculator is not mandatory.

Be sure to know which bill is due immediately so that you cue them to pay the bill that is due immediately if they start paying the wrong bill.
Note: some have a strategy of paying part of each bill a
nd calling the company to tell them that this is their plan. This should not be counted wrong if they tell you what they are doing and why and don't exceed the balance.

Source: https://www.ot.wustl.edu/about/resources/executive-function-performance-test-efpt-308

## Appendix P: EFPT Simple Cooking Task

**EFPT Simple Cooking Task**

Items required for task:

- Pan (with handle that gets hot and requires a pot holder)
- Pot holder
- Measuring cup (glass) – 1 cup
- Dry measuring cups
- Spoon for stirring
- Rubber spatula
- Old- fashioned Oats
- Enlarged copy of the instructions for the stovetop version only
- Bowl
- Spoon for eating
- Salt shaker
- Timer – a timer with a dial rather than a digital recording

Commence Task:

***"I want you to make oatmeal. The instructions are on the oatmeal box. Here is an enlarged version of the instructions if you need them (hand to participant). Please read the directions to me so that I know that you understand what it is that you are to do. Follow these directions and when you are done, put the oatmeal in a bowl. The items you need are in the box."***

If they do not have all the items they need first ask them "do you need to get anything else?", second- point to the box, third, give them a direct cue as to what to pick up, or assist them] If they have a motoriclimitation they may ask you to get the items from the box for them (do not score a cue when they request physical help).

Note: The participant should not be penalized if he/she does not clean the bowl or pan.

Source: https://www.ot.wustl.edu/about/resources/executive-function-performance-test-efpt-308

## Appendix Q: IRBPHS Approval

# IRBPHS Approval

DOMINICAN UNIVERSITY of CALIFORNIA

November 30, 2018

Amy Tam
50 Acacia Avenue
San Rafael, CA 94901

Dear Amy,

On behalf of the Dominican University of California Institutional Review Board for the Protection of Human Participants, I am pleased to inform you that your proposal entitled *Are all instrumental activities of daily living equal? A correlational study on the performances of adults with acquired brain injury* (IRBPHP application #10741) has been approved.

In your final report or paper please indicate that your project was approved by the IRBPHP and indicate the identification number.

I wish you well in your very interesting research effort.

Sincerely,

Randall Hall, PhD
Chair, IRBPHP

## Appendix R: Participant Summary Package

**Participant Summary Package**

Name of participant:

| Task from EFPT | Score | Time |
|---|---|---|
| Cooking | | |
| Medication | | |
| Bill pay | | |

The student researchers are only responsible for conducting the Executive Function Performance Test (EFPT), please bring these results to your healthcare practitioner for interpretation.

General tips from "Occupational Therapy Toolkit" (referenced below) are attached to this package.

Included pages: (Reference Appendix J for more information on OT toolkit)
1. Tips to Conserve Energy with Meal and Home Tasks
2. Tips to Improve Attention
3. Tips to Improve Memory- External Memory Aids
4. Tips to Improve Memory- Internal Memory Aids
5. Tips to Improve Thinking Skills

Hall, C. A. (2018). *Occupational therapy toolkit: patient handouts and treatment guides (7ed.).* Timonium, MD: Hallen House Publishing.

# Appendix S: Informed Use of Occupational Therapy Toolkit

**Informed Use of Occupational Therapy Toolkit**

-------- Original Message --------
Subject: Permission to handout copy from OT toolkits
From: "Li, Kitsum"
Date: Wed, November 14, 2018 6:01 pm
To: Cheryl Hall OT

Cheryl,
My students are conducting a study on cognition with individuals with ABI. We would like to use several of your handouts in the OT toolkits as education material for our participants who completed the cognitive assessment with us. In particular:
Tips to Conserve Energy with Meal and Home Tasks (p.483)
Tips to Improve attention (p.485)
Tips to Improve Memory- External Memory Aids (p.491)
Tips to Improve Memory- Internal Memory Aids (p. 492)
Tips to Improve thinking Skills (p.496)

We anticipate to be distributing no more than 30 packets of the above handouts.
Will you grant us the permission?
Thank you

***Kitsum Li, OTD, OTR/L, CSRS***
*Associate Professor*
*Program Director*
*Department of Occupational Therapy*
*Dominican University of California*