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Fall Risk Evaluation Tool for Acquired Brain Injury: A Validation of a Multifactorial Assessment: A Pilot Study

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Fall Risk Evaluation Tool for Acquired Brain Injury: A Validation of a Multifactorial Assessment

A Pilot Study

A Master Thesis Project

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Abstract

Objective: The purpose of this study examined the reliability and validity of FRET to predict falls in community-dwelling individuals with acquired brain injuries (ABI).

Method: The target population was English speaking, community-dwelling individuals 18 years or older who have sustained an ABI. Individuals were excluded if they had neurodegenerative diseases, used a wheelchair for more than 25% of the day, or were classified as globally confused. Global confusion was assessed using the first three-questions on the Saint Louis University Mental Examination (SLUMS). A total of 12 participants were recruited for the study, two were excluded and there was one attrition. After the Fall Risk Evaluation Tool (FRET) was administered, participants were instructed to record whenever they had a fall in the following three months in the provided fall journal. Researchers made telephone calls every two weeks to remind the participants to record falls. At the end of the three months, each participant returned the fall journal by mail in a self-addressed envelope.

Results: A Spearman's Rank correlation was used to analyze the data to detect any correlation between the risk rank as determined by FRET and the fall rank determined by the number of times a participant fell. There was a positive relationship between the risk rank and the fall rank.

Conclusion: There is a lack of valid and reliable multifactorial assessments to assess fall risk in individuals with ABI. FRET was developed to assess fall risk in individuals with ABI. Although we had a small sample size, our pilot study returned significant data that FRET may be a valid and reliable multifactorial tool for assessing individuals with ABI who are at risk for falling.

Introduction

Each year 1.7 million Americans sustain a traumatic brain injury (TBI) and approximately 800,000 sustain an acquired brain injury (ABI) from causes that are not traumatic (Center for Disease Control and Prevention, 2013, 2013). Individuals who have moderate or severe brain injuries often have deficits with cognition, proprioception, balance, and bilateral symmetry, which can lead to a greater risk of falling (Japp, 2005). If individuals with ABI fall, they may sustain additional injuries that can limit their mobility, further impeding their functional independence (Medley, Thompson, & French, 2006). Fall risk assessments can identify individuals who are at a greater risk for falling. Ivziku, Matarese, and Pedrone (2011) reported that fall risk reduction programs that include fall risk assessments could decrease the risk of falling in individuals with brain injuries.

Reed et al., (2010) suggested that well-being and safety of all clients should be the primary concern of all occupational therapists (OTs). OTs routinely work with individuals who are at risk of falling. OTs use a fall risk assessment to identify individuals who would benefit from a fall risk reduction education program. Once therapists identify fall risks, they can then educate individuals and caregivers about how to complete activities safely (Lampiasi & Jacobs, 2010).

Currently, multifactorial fall risk assessments have been widely studied in the geriatric population. A search of the literature has revealed a lack of multifactorial assessments that target the ABI population (Medley et al., 2006). Many of the fall risk assessments that are available to assess individuals with ABI have not been tested for reliability or validity (Mertle, Richter, & Scirica, 2012). In 2011, occupational therapy

students at Dominican University of California sought to remedy the lack of valid and reliable assessment for individuals with ABI and developed a multifactorial Fall Risk Evaluation Tool for TBI (FRETT). The purpose of this study is to examine the reliability and validity of FRET and its ability to predict falls in community-dwelling individuals with ABI.

Literature Review

ABIs are the most common cause of disability and death in the adult population (Oregon Health & Science University, 2013). ABI is a term that describes a vast array of injuries that occur to the brain after birth such as cerebral vascular accidents, TBI, tumors, hypoxia, concussions, and encephalopathy. Individuals with ABI may experience deficits in cognitive function, visual function, and balance. These deficits may increase the risk of falls. While most fall risk assessments in the literature are geared for the community-dwelling elderly population, fall risks found in the community-dwelling elderly population are believed to be similar to that of the ABI population. Interventions for fall risk populations should focus on identified risk factors for falls (Scott, Votova, Scanlan, & Close, 2007). Due to a lack of valid and reliable multifactorial assessments for fall risk in the ABI population, students at Dominican University of California created a fall risk assessment tool named, Fall Risk Evaluation Tool for TBI (FRETT).

Reliability and validity are key aspects to any assessment. When an assessment is reliable, the measurement will remain constant every time the assessment is given. Validity insures that the assessment is testing what it says it tests (Joppe, 2002, as cited in Golafshani, 2003). Specificity and sensitivity are also important concepts for any

assessment. Specificity rules out true negatives. Sensitivity is the ability of an assessment to correctly identify individuals with given conditions. Sensitivity of an assessment is the ability to rule out individuals who do not have the condition (NCSSM, 1999).

Acquired Brain Injuries

Acquired brain injury is the term used to classify injuries to the head that happen after birth. An ABI is non-degenerative and non-congenital. They can be traumatic or non-traumatic. These injuries include, but are not limited to cerebral vascular accident or stroke, near-drowning, brain tumors, infectious diseases such as encephalopathy, and TBI (Ciuffreda & Kapoor, 2012). Deficits in proprioception, balance, cognition, and bilateral symmetry are commonly seen in all types of ABI and the elderly. These deficits can cause falls or a fear of falling, which can lead to limitations in occupations (American Occupational Therapy Association, 2012). Falls or an increased risk of falls will influence the individual's need for supervision and assistance when performing occupations (Mullin, et al. 2002). The fear of falling can cause an individual to avoid activities that he or she is still capable of doing, which limits the individual's independence (American Occupational Therapy Association, 2012). Thus, it is important to have assessments that can detect fall risk, so OTs can educate the at-risk population.

Fall Risks in Individuals with Acquired Brain Injuries

Individuals with ABI are at a greater risk for falls than other populations because of their deficits from the brain injury (Brown, Elovic, Kothari, Flanagan, & Kwasnica, 2008). These deficits can impair cognitive function, visual functions, and balance, which can lead to an increase in fall risk. Cognitive deficits can include

impairments in attention, judgment, and executive functioning (Tipton-Burton, McLaughlin, & Eglander, 2013). Deficits in attention can lead to falls because the individual may need to use an increased amount of attention to perform daily tasks that previously required little or no attention. Falls can occur due to the inability to recover from stumbling during dual attention-demanding tasks (Yamada et al., 2011). For example, an individual with an ABI may have more safety risks while walking and preforming another task due to the inability to effectively divide his/her attention between the two activities (McCulloch, Buxton, Hackney, & Lowers, 2010). Impairments in judgment can lead to poor safety awareness (Tipton-Burton et al., 2013). For example, an individual may rise out of a wheelchair without locking the wheelchair brakes, which increases their chance of falling. Executive function involves the ability to plan, organize, and modify behavior due to changes in the environment. Deficits in executive function can lead to falls if an individual does not plan or change their behaviors based on the environmental context (Tipton-Burton et al., 2013). For example, an individual may continue to walk on an uneven sidewalk even though the path may be unsafe. Individuals who have deficits with executive function may have a difficult time with attention, thus they may not pay attention while stepping off a curb, which may lead to a fall.

Individuals with ABI may have deficits in visual perception. Deficits in visual perception processing can include changes in visual cognition, visual memory, visual scanning, and visual attention. Oculomotor control, visual fields, and visual acuity support the visual perception processes (Warren, 2013). A deficit in any of these areas can lead to an increased fall risk due to the inability to accurately see and/or perceive hazards. Visual cognition is the ability to formulate plans and make decisions by

integrating vision and other senses; it cannot occur without visual memory (Warren, 2013). Visual scanning is the ability to direct eye movement towards an object in the environment. It is both an autonomic and a voluntary process and is a product of visual attention (Warren, 2013). Visual attention determines what an individual focuses on and how they use the information. Visual attention requires large amounts of neural processing, thus it can easily be disrupted by a brain injury (Warren, 2013). The ability to take in information is done through oculomotor control to move the eyes and scan the environment. Visual fields encompass what is being seen both centrally as well as peripherally, and visual acuity is the ability to send visual information to the brain with clarity. Vision plays an important role in falls, and the ability to see and perceive objects sometimes is lost or damaged in individuals with ABI.

Damage to the brain can also affect balance, which is the ability to remain in an upright position while maintaining center of gravity over the base of support (Preston, 2013). Balance involves the integration of the motor, musculoskeletal, and sensory systems (Pickett, Radfar-Baublitz, McDonald, Walker, & Cifu, 2007). The motor system allows an individual to engage in purposeful activities by adjusting posture and moving limbs. Deficits in the motor system can be caused by abnormal muscle tone and incoordination (Preston, 2013). Individuals who have deficits in the musculoskeletal system may have impairments in: muscle strength, endurance, joint stability, mobility, and posture (Vidal & Huijbregts, 2005). Balance can be affected by impairments in any of these systems. Impairments in the sensory system can also lead to decreases in the ability to perceive the physical environment. The sensory system allows an individual to see, feel, hear, and interact with their environment. Deficits within one or more of these

systems can increase the individual's fall risk. Community-dwelling individuals with ABI, who have balance instability, may have increased a risk of falling and reduced participation in occupations.

Fall Risk in Community-Dwelling Elderly

Studies within the community-dwelling elderly find that falls are usually multifactorial and cannot be identified by a single specific cause (Rubenstein & Josephson, 2002). For this, community-dwelling elderly may experience falls as a result of: muscle weakness, history of falls, walking deficits, balance deficits, use of assistive devices, visual deficits, arthritis, impaired activities of daily living, depression, cognitive impairments, use of psychotropic medications, and individuals who are over the age of 80 (Rubenstein & Josephson, 2002). The more risk factors a community-dwelling elderly has, the higher the chance he/she will experience a fall. Each elder dwelling in the community can have different intrinsic and extrinsic risk factors (Scott et al., 2007). Among the active elderly living in the community, fall risk factors are mostly related to mobility, exposure to hazardous environments, and risk-taking behaviors such as climbing a ladder (Scott et al., 2007).

Moreover, community-dwelling elderly are more likely to experience a fall when completing dual tasks. When completing dual tasks an individual engages in two activities at the same time; this is done frequently in everyday living (Yamada et al., 2011). Dual-tasking is measured by the amount of attention needed for each task. Nordin, Moe-Nilssen, Ramnemark, and Lundin-Olsson (2010) found that individuals had changes in gait pattern while performing dual tasks. This may implicate an increased risk

of falling. Hence, community-dwelling elderly who engage in other tasks while walking may be at higher risk for falls.

Functional mobility is used to describe balance and walking within the community to complete everyday activities such as rising from a chair, walking, and turning (Shumway-cook, Brauer, & Woollacott, 2000). Walking and balance difficulties were also found to be significant risk factors in many studies (Rubenstein & Josephson, 2002). Most healthy older individuals have stiffer, less-coordinated, and more-precarious gait than younger individuals. Posture control, speed of body-orienting reflexes, muscle strength and tone, and stepping height all decrease with aging. These reductions in ability can increase an individual's chance of falling after an unexpected trip or while reaching or bending (Rubenstein & Josephson, 2002).

Drug use has frequent side effects that can impair the community-dwelling elderly mental activity, stability, and ability to walk (Rubenstein & Josephson, 2002). Rubenstein and Josephson (2002) found multiple studies that showed a strong relationship between the risk of falls and the use of three or more medications. The drugs that can increase risk of falls are sedatives, antidepressants, and antihypertensive effects, particularly diuretics, vasodilators, and beta-blockers (Rubenstein & Josephson, 2002).

Community-dwelling elderly who have a fear of falling or who have fallen, have an increased risk for more falls (American Occupational Therapy Association, 2012). Fear of falling has been identified as a negative consequence of falls and multiple surveys have reported 30%-70% of community-dwelling elderly who had fallen admitted they were afraid to fall (Rubenstein & Josephson, 2002). The fear of falling can be so powerful that the elderly residing in the community may avoid activities altogether, in

spite of their capabilities of completing the activity themselves. By avoiding activities, the community-dwelling elderly may experience a decrease in their physical function, which increases their risk of falling (American Occupational Therapy Association, 2012). For example, an elderly individual residing in the community may avoid walking up a flight of stairs because they may have tripped, fallen down, and sustained an injury.

Similarities in Individuals with Acquired Brain Injuries and Community-Dwelling Elderly

Falls can be a result of intrinsic factors or extrinsic factors. Intrinsic factors include: history of falls, muscle tone, gait and balance difficulties, impairments in vision, functional limitations, depression, joint condition, and use of psychotropic medications (Scott et al., 2007). Extrinsic factors also known as environmental factors include: poor lighting, uneven surfaces, items left on the floor and other tripping hazards (Bouldering, Adler, Tipton-Burton, Verran, & Lillie, 2013). Both community-dwelling elderly and individuals with ABI share similar intrinsic and extrinsic factors for fall risk. Individuals with brain injuries often have the same cognitive and balance deficits as seen in community-dwelling elderly (McCulloch et al., 2010). These similarities imply that individuals with ABI might have the same risks for falling as elderly living in the community.

Risk Assessments

FRETT. Fall risk assessments can help identify those that are at risk of falling. Even though falls cannot be completely eliminated, they can be reduced through elevated awareness. The Fall Risk Evaluation Tool for TBI (FRETT) is a standardized assessment that determines fall risk in individuals with high functioning TBI, and

previous occupational therapy students at Dominican University of California created the assessment (Mertle et al., 2012). FRETT is a multifactorial evidence-based assessment. Seven areas were assessed in FRETT: a) fall history, b) use of psychotropic medications, c) Timed Up and Go Cognitive, d) Trail Making Test Part B, e) Gross Test of Peripheral Visual Fields (Confrontation Testing), f) Functional Depth Perception Test, and g) the Hamilton-Veale Contrast Sensitivity Test.

Utilizing clinical reasoning, Mertle et al., (2012) classified fall risk as low (0-25), moderate (30-45), and high (50 or higher) from the sum total of FRETT. An individual who is at risk for falling would then benefit from interventions, possibly preventing future falls and further brain injuries (Medley et al., 2006). As a multifactorial fall risk assessment, FRETT can help identify individuals who are at risk of falling. These individuals can then participate in programs to reduce their risk of falls.

fall history. Individuals with ABI frequently have cognitive and balance impairments that increase their risk of falling. A study conducted by McCulloch et al., (2010) examined attention, balance, and dual-task performance through a cross-sectional study, in a group of 24 individuals after they had an ABI. These individuals were able to ambulate 40 feet with or without assistive devices; 54% had fallen in the past six months and 42% reported feeling unsteady with standing or walking. The researchers explored the associations of balance, attention and dual-task assessments with their fall history. As expected, fallers had greater balance impairment. Individuals who reported at least one fall (n=13) in the past six months had lower scores on the Berg Balance Scale ($p \leq .03$) and longer times on the Four Square Step Test ($p \leq .01$) than individuals who did not report falling (n=11) (McCulloch et al., 2010). Forty-eight percent showed motor slowing, 9%

had reduced cognitive accuracy without motor slowing and 35% showed decline in both areas (McCulloch et al., 2010). The research concluded that the relationship between balance and fall history was stronger than measures of attention or dual-task performance (McCulloch, et al., 2010). Thus, individuals who have previously fallen are at an increased risk for falls.

use of psychotropic medications. Psychotropic drugs are broadly defined as drugs that cross the blood brain barrier and act directly on the central nervous system (Hill & Wee, 2012). Several drugs have effects that increase an individual's fall risk: benzodiazepines, antidepressants, antiepileptic, antipsychotics, antiparkinsonian drugs, opioids and urological spasmolytic. Psychotropic and benzodiazepine drug use are consistently the most associated with falls (Huang et al., 2012) due to the side effects which include: decreased attention, increased lethargy, varying degrees of lightheadedness, weakness, dizziness, drowsiness, joint pain, lack of coordination, decreased alertness, and muscle relaxation (Charney, Mihic, & Harris, 2006). Drug use is one of the most adjustable risk factors for falls. Reviewing an individual's medications is a start to decreasing their risk of falling (Van Leuven, 2010). An active screening by a multidisciplinary team along with appropriate interventions to address medication management, as well as gait, strength and balance training may reduce the risk of falls (Van Leuven, 2010).

Timed Up and Go Cognitive. Timed Up and Go (TUG) Cognitive assessment assesses individuals' balance, gait speed, functional gait and cognitive level (Shumway-Cook et al., 2000). The test was originally used with community-dwelling elderly. This test requires the individual to stand up from a seated position, walk 10 feet, turn around,

walk back 10 feet, and sit down. Individuals are allowed to use an assistive device (cane or walker) during the test. Moreover, a study by Shumway-Cook et al. (2000) confirmed that simultaneous performance of a secondary task had a deleterious effect on functional mobility. The addition of a secondary task increased the time taken to complete the TUG by 22% - 25% (Shumway-Cook et al., 2000). By adding the secondary task of cognition, mobility is affected, increasing individuals' risk of falling. Shumway-Cook et al. (2000) established that TUG Cognitive has a sensitivity of (% fallers) 12/15 (80%), and a specificity of (% non-fallers) 14/15 (93%). This shows the TUG Cognitive is a good predictor for falls for those that have difficulty with dual-tasks context in functional mobility.

Trail Making Test Part B. Trail Making Test Part B is an assessment that measures cognitive function. More specifically, this assessment looks at visual processing, visuospatial skills, visual search, divided attention, working memory, and psychomotor coordination. Trail Making Test Part B consists of 25 circles distributed over a sheet of paper. The circles include both numbers (1–12) and letters (A – L). The individual is instructed to connect the circles as quickly as possible alternating between numbers and letters (i.e., 1 – A, then 2 – B, then 3 – C, etc.), without lifting the pen or pencil from the paper. Greany and Di Fabio (2010) conducted a study and compared fall-risk models for the prediction of one-year fall history in community-dwelling elderly individuals. Their results showed that the Trail Making Test Part B has a 75% sensitivity and a 76% specificity (Greany & Di Fabio, 2010). It is common for individuals with ABIs to have deficits in the areas of visual processing, divided attention, psychomotor coordination,

working memory, visual spatial skill, and visual search. Hence, Trail Making Test Part B can be used to discern these deficits.

Confrontation Testing. Individuals may run into objects, which may cause a fall. Confrontation testing detects the presence of gross deficit in the peripheral visual fields. A study conducted by Connelly and Oczkowski (2010) screened 172 individuals for effectiveness in visual field abnormalities using confrontation testing. The researchers conducted a blind random-order comparison of seven confrontation visual field tests: face description, finger counting, finger comparison, red comparison, static finger wiggle, kinetic finger wiggle, and kinetic red target. Connelly and Oczkowski (2010) had two neuro-ophthalmologists administer the seven tests in a random order. The study concluded that confrontation visual field tests had low-to-moderate sensitivity (finger comparison 71%, face description 35%, static finger wiggle plus kinetic red target 78%, finger counting 25%), but generally high specificity (finger comparison 57%, face description 99%, static finger wiggle plus kinetic red target 90%, finger counting 100%) for diagnosing visual field abnormalities. This means that the test is generally a good detector for individuals who have visual field abnormalities. Individuals with visual field deficits are at an elevated fall risk (Freeman, Munoz, Rubin, & West, 2007). Moreover, with a decrease in their visual fields the individuals' ability to detect steps or alterations in surfaces such as curbs, stairs, sidewalk cracks, potholes, or changes in elevation may also be affected, leading to an increase in fall risk.

Functional Depth Perception Test. This test assesses an individual's ability to perceive the relative distance of objects within their visual field. Functional depth perception is an important test because this determines if an individual can safely

navigate and perceive objects in their surrounding environment, especially dealing with changes in surface gradient (e.g. curbs). The students who created FRETT chose a distance of six inches for the functional depth perception test to simulate curb height differences. This test is meant to assess fall risk in a visual functional context and no specificity and sensitivity have been established. Individuals with ABI can have decreases in functional depth perception and are unable to compensate for changes in depth, which increases their risk of falling.

Contrast Sensitivity Test. This test measures an individual's visual contrast sensitivity by varying the color intensity of the letters against a white surface. It ultimately measures the peak visual contrast sensitivity of an individual and provides information on the individual's overall visual acuity in both high contrast and low contrast environments. Contrast sensitivity varies among individuals. An assumption underlying the use of contrast sensitivity testing is that it predicts whether a patient has difficulty seeing objects encountered in everyday life, especially in low light environment or low illumination (Owsley & Sloane, 1987). An individual with deficits in contrast sensitivity may have decreased ability to see faces, road signs, and various objects in low lighting context. When an individual is unable to see items due to visual defects their risk of falling increases.

Riolo (2003) conducted numerous tests in various areas that contribute to fall risk: a) functional reach, b) physical measures: TUG and ankle dorsiflexion and knee extension strength, c) attention measures: visual attention, spatial and verbal working memory, and d) visual measures: acuity, contrast sensitivity, and field performance. Riolo gathered 157 community- dwelling older adults that had a history of

falls. Measurement of visual function used within the study were highly standardized and found to be both reliable and valid. These studies helped establish the validity of using contrast sensitivity as an indicator of the visibility of objects encountered in everyday life (Owsley & Sloane, 1987).

Reliability and Validity

Reliability and validity are the two most important and fundamental characteristics of a measurement. Kirk and Miller (1986) recognized three types of reliability within quantitative research. The types of reliability of interest include that the measurements will remain constant when given repeatedly, measurements will remain stable, and measurements will remain similar over the period when the test is given. Additionally, for results to be reliable they need to be consistent over time and have an accurate representation of the total population (Joppe, 2002, as cited in Golafshani, 2003). Moreover, for reliability to occur within the study the results can be reproduced under similar methodologies (Joppe, 2002, as cited in Golafshani, 2003). Having a high degree of stability indicates a high degree of reliability, which in turn proves the results of the study to be reliable (Golafshani, 2003).

Whenever participants are used within a study as part of the measurement procedure, the researchers have to ensure that their results are reliable and consistent. Inter-rater reliability is a measurement of how consistent the ratings are when two or more individuals are providing the assessments (Holah, 2006). An inter-rater reliability coefficient reports how much raters agree on particular ratings (Gwet, 2002).

For a test to be reliable, it must be valid. Validity is met when the research questions are answered (Golafshani, 2003). Furthermore, validity assess if the research is

actually measuring what it is supposed to measure (Golafshani, 2003). The intended purpose of the research study is measured by validity and was answered by the research questions: Does the Fall Risk Evaluation Tool (FRET) for ABI truly measure fall risks?

Sensitivity and Specificity

To evaluate a clinical test, sensitivity and specificity are used because they are independent of the population of interest (Lalkhen & McCluskey, 2008). Sensitivity is the probability that the individual has the condition when in fact they do have the condition (the proportion of true positives out of all positives) (NCSSM, 1999). Sensitivity is a measure of how likely it is for a test to pick up the presence of the condition (NCSSM, 1999). A test with 100% sensitivity correctly identifies all individuals with the condition (Lalkhen & McCluskey, 2008). Whereas, specificity is the probability the test says the individual is condition free, when in fact the individual is condition free (the probability of true negatives out of all negative test results) (NCSSM, 1999). A test with 100% specificity correctly identifies all individuals without the condition (Lalkhen & McCluskey, 2008). Sensitivity and specificity are important within testing in order to correctly identify individuals who have the condition that is being tested for and to identify those who do not have the condition. Even though high sensitivity and specificity are desired for any assessment, when dealing with fall risk it is important to have a higher specificity in order to identify any possible fall risk.

Conclusion

Individuals with ABI may have deficits in areas such as balance, vision, and cognition. These deficits are similar to those of the community-dwelling elderly. Both populations are at risk for falls due to these deficits. Fall risk assessments can be used to

predict who is at risk of falling. While both the community-dwelling elderly and individuals with ABI have a high risk of falling, only the community-dwelling elderly population has been studied extensively and has validated multifactorial assessments.

Currently, there are no valid or reliable multifactorial assessment tools to assess fall risks in individuals with ABI. In 2012, occupational therapy students at Dominican University of California in the occupational therapy department developed a Fall Risk Evaluation Tool for TBI (FRETT). Since fall risk characteristics in the population with TBI are very similar to those with ABI, the evaluation tool is believed to be applicable to the larger population of ABI. Hence, the name change from FRETT to Fall Risk Evaluation Tool (FRET) to be applicable for the larger population of ABI.

Statement of Problem

Currently there are no valid and reliable multifactorial assessment tools to assess fall risk in individuals with ABI. FRET was developed as a multifactorial assessment tool to specifically test individuals with TBI and will be applied to the larger population of ABI. A multifactorial tool allows for a broader assessment of internal factors that can lead to falls. Some of the components of FRET have established reliability and validity, but the test as a whole has not been investigated.

Purpose of Study

The purpose of this research project was to assess the validity, inter-rater reliability, specificity, and sensitivity of the Fall Risk Evaluation Tool (FRET) for high functioning individuals with ABI.

Research Question

1. Is FRET a valid and reliable multifactorial tool to assess the fall risks in community-dwelling adults with high functioning ABI?

2. What is the sensitivity and specificity of FRET in identifying fallers versus non-fallers?

Theoretical Framework

Person Environment and Occupation

The Person Environment Occupation (PEO) frame of reference is used to describe a person's occupational performance. The major concepts in the PEO model are the person, the environment, and the occupation. The PEO frame of reference uses a holistic approach to look at how a person performs occupations in their environment and how well these three components fit together to increase occupational performance. PEO focuses on the complex relationship between people and their occupations within the environment (Letts, Baum, & Perlmutter, 2003). The quality and level of functioning of the individual is determined by the interaction, which is also known as the "fit" between the person, environment, and occupation (Strong et al., 1999).

Person. The PEO frame of reference views the person as a holistic being that is comprised of mind, body, and spirit. Characteristics of the person include life experiences, attributes, culture, self-concept, social skills, personal needs, preference, cognitive status, and personal competencies (Law et al., 1996). In this study, the person refers to both the FRET administrators and the individuals who were receiving the FRET. Both the administrator and the individual with an ABI were interacting with the environment. They each have factors that would influence the outcome of the

assessment. Intrinsic factors of the individual with ABI include: age, gender, general health, their ABI condition, fear of falling, and past falls. The administrator intrinsic factor of experience could also influence the outcome of the assessment.

Environment. The environment is anything outside the person that causes a response (Law et al., 1996). Both the environment and the person interact with each other. For example, an individual with decreased vision can alter their environment to reduce the possibility of falling. If the environment cannot be changed, the person may become more vigilant about tactile cues that can then warn them about potential hazards. The environment is not static and is more likely to change than the person is. The environment is broken up into seven categories: cultural, physical, personal, social, spiritual, temporal, and virtual (Strong & Gruhl, 2011). These categories interact with a person throughout their lives. The interaction between the person and their physical environment is more likely to produce falls in individuals with ABI. In this study, FRET administrators set up the assessment environment according to the standardized procedure. Individuals with ABI interacted with the assessment environment to perform at their optimal level.

Occupation. Occupations are tasks and activities that a person engages in over a lifetime. These tasks and activities are self-directed and functional. Law et al., (1996) described occupations as necessary functions of living that are varied and complex. Occupations can change over time and a person may change the importance they give to a certain occupation (Law et al., 1996). Fall risks can hinder occupations because individuals may refrain from participating in meaningful occupations due to fear and anxiety of subsequent falls.

PEO related to the current study. Our study aimed to find out the inter-rater reliability, validity, specificity, and significance of FRET as it relates to assessing the fall risk of individuals with ABI. Using the PEO model as a framework for our study the person is the individual with an ABI who will be tested using FRET as well as the administrators of the assessment. The environment in relation to the study is the setting in which FRET takes place. FRET is a standardized assessment. Therefore, the set up and the way in which the test is administered must be the same for every individual who will be tested. The occupation for the individuals with ABI is what is required of them while partaking in FRET. These occupations include: providing a fall history and use of psychotropic medications, participating in Time Up and Go Cognitive test, Trail Making Test Part B, Gross Test of Peripheral Visual Fields (Confrontation Testing), Functional Depth Perception Test, and The Hamilton-Veale Contrast Sensitivity Test. When these components interact, they should be able to determine the risk level of an individual (Figure 1). The fit is determined by how well FRET detects the risk of falls. If FRET is a valid and reliable multifactorial tool with high sensitivity and specificity then it will have the best fit.

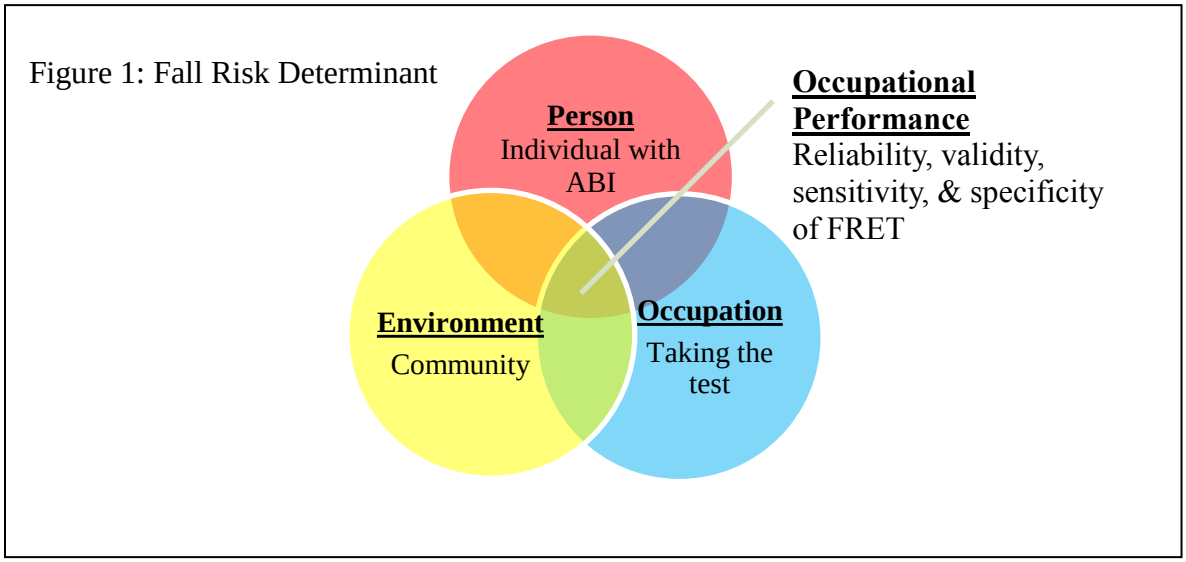

Figure 1. The best fit is how reliable and valid FRET is in determining the risk of falls in individuals with ABI. This is determined by the interaction between the individual with ABI, the community in which they dwell and complete occupations, and occupation of taking the assessment.

When the administrators implemented FRET, the goal was to have the measurements consistent in every trial, in any given environment. Inter-rater reliability refers to the stability of the measurement of the administrators. The closer the scores are to each other the higher the inter-rater reliability and the better the fit (Figure 2). When the inter-rater reliability increases, so does the fit between the person (the administrator), the environment (test location), and the occupation (administering the test). Changes in the environment and occupation should be kept to a minimum to produce a higher inter-rater reliability, thus increasing the occupational performance and creating a best fit. There is only one component, the Confrontation Test, that is open for interpretation.

Figure 2: Fit for Inter-Rater Reliability

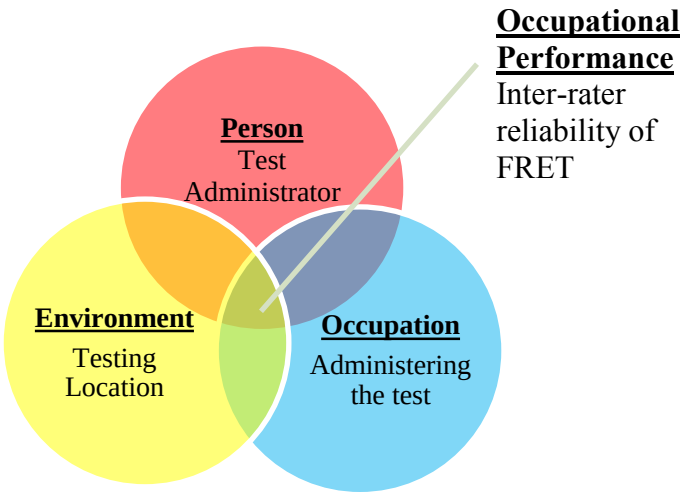

Figure 2. Occupational performance is the result of the relationship between each administrator, the testing location and how the test is administered. A best fit is when the inter-rater reliability is high.

Definitions and Variables

Definitions

fall. A fall is an event that results in an individual coming to rest unintentionally on the ground or lower level, as a result of either internal or external risk factors (Tinetti, Speechley, & Ginter, 1988).

high functioning. High functioning as defined by Mertle et al., (2012) is an individual with an ABI who is ambulatory with minimum supervision assistance with or without an assistive device, who is not globally confused, and is placed at a minimum level VI on the Rancho Los Amigos Scale for the TBI population.

***inter-rater reliability*.** Inter-rater reliability is a measurement of consistency of the ratings when two or more individuals are providing the same assessments (Holah, 2006).

***sensitivity*.** Sensitivity measures the proportion of actual positives, which are correctly identified as positives (Portney & Watkins, 2009). For our study, it is the percentage of individuals with ABI who are correctly identified as having the fall risk. A high sensitivity rules out the condition, and therefore allows for accurate identification of true non-fallers.

specificity. Specificity measures the proportion of true negatives, which are correctly identified as negatives (Portney & Watkins, 2009). For our study, it is the percentage of individuals with ABI who are correctly identified as not at fall risk. A high specificity rules in the condition and allows for accurate identification of true fallers.

validity. Validity assesses whether the measurements are accurate and if the assessment is actually measuring what is intended to be measured (Golafshani, 2003).

Variables

independent. The number of falls over a three-month period as indicated by the fall journal is the independent variable.

dependent. FRET scores are the dependent variables.

Ethical and Legal Considerations

We obtained approval from Dominican University of California Institution Review Board for Protection of Human Service, approval number 10104 on March 4, 2013 (Appendix A). This process ensured that all individuals were protected from any intended harm and were provided with the proper informed consent forms. We also obtained approval from the Brain Injury Network of the Bay Area (BINBA) to utilize their site for recruitment and conduction of the study activities (Appendix B).

The American Occupational Therapy Association (AOTA) code of ethics states that all therapists should act with beneficence and non-maleficence when working with individuals. Beneficence is the act of preventing harm to individuals. Clinicians, researchers, and students should ensure that individuals benefit from all actions. This can be done by promoting good, by preventing harm, and by removing harm (Reed et al., 2010). To ensure the safety of all participants, the administrators abided by safety precautions while administering the FRET. The administrators walked and guarded the participants for falls during the Time Up and Go Cognitive test and when the participants transferred between testing stations. Participants were also allowed to stop their participation in the study at any time without any punishment or being coerced to continue with the study. The researchers also held a fall risk reduction education workshop after the study was concluded to help individuals gain more awareness in fall

risk reduction strategies. The workshop was open to all participants, BINBA members, and caregivers.

Under the principle of confidentiality and autonomy, practitioners have a duty to protect clients' confidential information. Practitioners also have to respect the client's desires, within the boundaries of accepted standards of care (Reed et al., 2010). Before obtaining any information from each participant, the three researchers obtained consent from the individual and if necessary, from his or her guardian. Consent for the individual given by the guardian was done through a proxy-consent form. To protect the confidentiality and autonomy of all participants, all personal information was protected. All identifying information was stored in a locked cabinet at BINBA. Pseudonyms were used whenever possible to insure confidentiality.

Assessors have a duty to be honest and truthful with each participant. The assessors **"**shall provide comprehensive, accurate, and objective information when representing the profession" (Reed et al., 2010). This is known as veracity. The assessors upheld the principle of veracity and were honest, accurate, respectful and timely when informing each participant of his/her fall risk upon completion of the study and when the IRB violation that occurred.

Methodology

Design

A cohort longitudinal design was chosen because the research followed community-dwelling individuals with mild-to-moderate ABIs for three months to collect data on fall incidence. Fall risk was assessed using FRET, and was validated by self-report fall data through journals completed by each individual. This study took place

over a five-month period at BINBA. The Brain Injury Network of the Bay Area is a community organization for ABI survivors, friends and family, and concerned individuals. Rehabilitation, supportive, creative, and educational services are offered on site as well as in the community to all who are eligible to attend and participate (BINBA, 2012).

Subjects Recruitment

English-speaking, community-dwelling individuals who were 18 years or older, and who had sustained an ABI at least one year prior to the assessment date were included in the study. There were no gender or racial enrollment restrictions. To be included in the study, individuals had to be able to ambulate with or without an assistive device independently or with supervision. Individuals who required the use of a wheelchair could only use the wheelchair for 25% or less of the day. Enrollment conditions included: cerebral vascular accidents, TBI, tumors, hypoxia, concussions, and encephalopathy. Individuals with neurodegenerative diseases such as, dementia and Alzheimer's were excluded from the study because of the degenerative nature of the conditions. Individuals who lived in a skilled nursing facility or were globally confused were excluded from our study. Global confusion was assessed using the Saint Louis University Mental Status Examination (SLUMS) (Appendix C). If individuals answered any of the first three questions on orientation from the SLUMS incorrectly, they were classified as globally confused and were excluded from the study.

Individuals were recruited through fliers/announcements placed at BINBA (Appendix D), and around the Marin County community. Advertisements were also posted on the Craigslist website and other website for survivors of related conditions

(Appendix E). Examples of such websites were www.stroke-network.com and www.stroke-for-stroke.com. Individuals were screened to ensure that they met the inclusion criteria. They were asked to bring a list of their medications to the assessment. After an explanation of the Bill of Rights (Appendix F) and the assessment process, individuals were asked to sign a consent form (Appendix G). If the individual was unable to sign the consent form, proxy consent was obtained from his/her guardian (Appendix H). Individuals were also informed that they were allowed to withdraw from the study at any time in the consent (Appendix G & H).

Data Collection Procedures

instrument. The SLUMS is an assessment with a total of 30 points. It is used to screen for: orientation, memory, attention, and executive functions (Tariq, Tumosa, Chibnall, Perry, & Morley, 2006). The SLUMS assessment is in public domain and can be downloaded online. Fall Risk Evaluation Tool (Appendix I) for ABI was used to assess for fall risk. The FRET comprises seven subtests: 1) fall history, 2) use of psychotropic medications, 3) Time Up and Go Cognitive, 4) Trail Making Test Part B, 5) Gross Test of Peripheral Visual Fields (Confrontation Testing) 6) Functional Depth Perception Test, and 7) The Hamilton-Veale Contrast Sensitivity Test. The FRET is a standardized assessment and the administrators familiarized themselves with the test manual and ran simulated tests before recruitment to ensure adherence to the standardized format and inter-rater reliability of FRET.

procedures. After individuals completed the consent procedures, demographic information was obtained (Appendix J). The SLUMS was administered and as stated previously, individuals who failed to answer the first three questions on orientation in the

SLUMS correctly were classified as globally confused, and were excluded from the study. After the administration of the SLUMS, one of the three trained administrators administered FRET to all qualified participants. Upon completion of FRET, each individual was provided with a fall journal (Appendix K) and instructed to document when they fell in the following three months. The administrators explained to both the participants, as well as caregivers if available, on how to complete the fall journal. The researchers educated the individuals on the fall history journal, what constitutes a fall, and how to record falls in the journal. Telephone calls were made to each participant every two weeks to remind them about fall journal documentation. A standardized phone call script was created and used throughout the study period (Appendix L). Participants were provided with a stamped self-addressed envelope. When the three-month period ended, individuals mailed the journal to the administrators in the provided envelope.

Fall Risk Reduction Education Workshop

After the observation period and the completion of the study, all participants, BINBA members, and caregivers were invited to attend the fall risk reduction workshop. The workshop was delivered at BINBA. Fall risk reduction strategies with written handouts (Appendix M) as well as exercises that could be completed at home were provided to all participants.

Results

Population

A total of 12 participants were recruited for the study. One participant was excluded due to incorrect responses on the orientation questions of the SLUMS assessment and one was excluded due to being in a wheelchair for more than 25% of the time. Of those who were included in the study, eight were male and two were female (Table 1). The ages of the participant ranged from 34 to 70. The mean age was 48.5 (SD =11.9)

Table 1: Participant Demographics

Participant	Age	M/F	Diagnosis	Education Level	Fallen in the Last 30 Days
A	40	M	Motor Vehicle Accident	H/S grad	Y
B	35	F	Encephalitis	College grad	Y
C	36	M	Skateboard accident	H/S grad	Y
D	70	M	Stroke	College grad	Y
E	56	M	Brain Surgery	Some college	N
F	58	M	Motor Vehicle Accident	H/S grad	N
G	34	M	TBI	Some college	N
H	51	M	TBI	Some college	N
I	50	F	Motor Vehicle Accident	Some college	N
J	55	M	Motor Vehicle Accident	Some college	Y

Inter-Rater Reliability

During the first two weeks of the study, six participants were assessed by at least two of the assessment administrators. Inter-rater reliability was established by comparing the FRET scores between two assessment administrators for each of the participants. There were no disagreements in any of the scores, which gave us an absolute inter-rater reliability.

Validity

Two of the 10 participants did not return their journals. Although, only eight participants returned their journals, researchers were able to verbally confirm at least one fall in one of the participants with a missing fall journal.

Due to the small sample size a Chi Square analysis could not be performed. A Spearman's Rank correlation was used to analyze the data using Microsoft Excel and Statistical Package for Social Sciences 12.0 (SPSS 12.0) software. Of the participants who were included in the analysis, two were rated as high fall risk, four were rated as moderate fall risk, and three were rated as low fall risk. The two participants who were rated as high risk both fell more than once. One fell four times and the other fell twice. Of the participants who were rated moderate fall risk, researchers confirmed that two participants fell and two did not. One of the participants in the moderate group who fell verbally confirmed the fall to the researchers but did not return the fall journal, thus the number of falls could not be verified. The other participant rated as a moderate fall risk fell once. None of the participants who were rated as being a low fall risk fell (Table 2).

Table 2: Fall Risk and Incidence

Participant	SLUM Score	FRET Score	Fall Risk	Number of Falls	Risk Rank	Fall Incidence Rank
A	28	100	High	2	7.5	7
B	17	35	Moderate	Verbally Confirmed	--------	--------
C	17	40	Moderate	0	5	3
D	13	40	Moderate	1	5	6
E	19	40	Moderate	0	5	3
F	18	25	Low	0	2	3
G	14	0	Low	0	2	3
H	10	30	Moderate	Not Reported	--------	--------
I	28	25	Low	0	2	3
J	20	60	High	4	7.5	8

Note. Journals were not returned for participants B and J; SLUMS= Saint Louis University Mental Status Examination; FRET= Fall Risk Evaluation Tool for ABIs.

A Spearman's Rank correlation was conducted to see if there was any correlation between the risk rank as determined by FRET and the fall rank as determined by the number of times a participant fell. There was a positive relationship between the risk rank and the fall rank r_s,(8) = 0.8227, p <.02 (Figure 3).

Figure 3: Risk Rank vs. Fall Incidence Rank

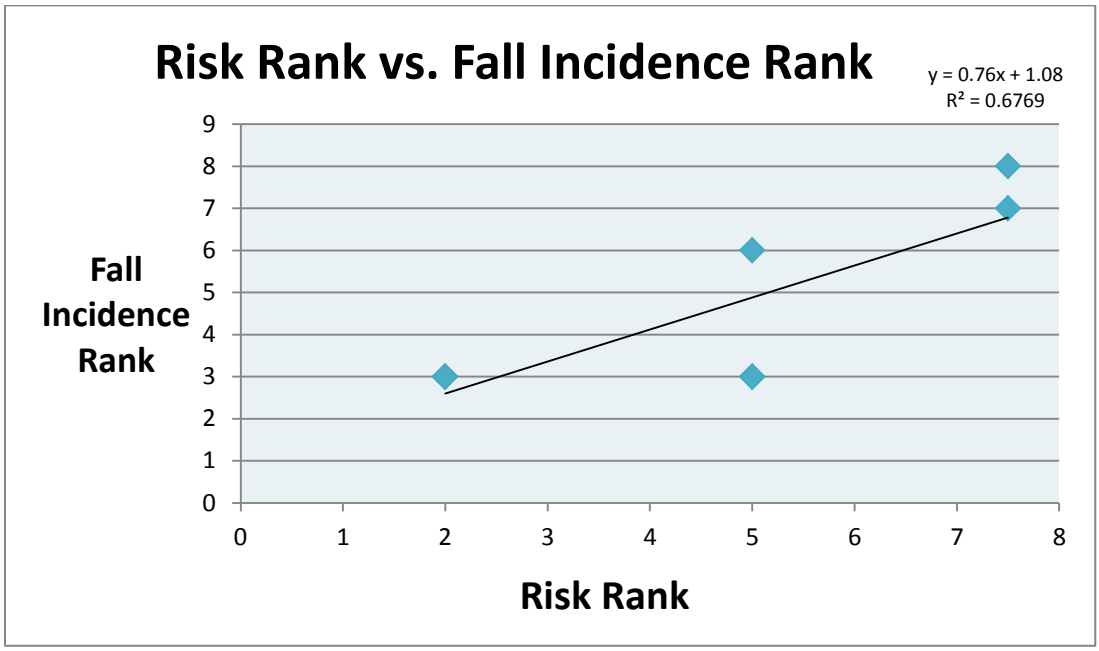

Figure 3. The correlation between the Risk Rank as determined by the FRET scores and the Fall Incidence Rank as determined by how many times a person fell.

Discussion

This pilot study examined the relationship of falls in individuals with ABI and their risk for falling as characterized by FRET. Participants were recruited from BINBA and on Craigslist. Although several individuals who responded to the Craigslist announcement expressed interest in the study, they did not participate due to lack of compensation. Thus, all participants were attendees at BINBA. The researchers conducted a pre-assessment, which included a questionnaire on the clients' demographic information, and the SLUMS assessment was used to rule out global confusion. Though the SLUMS was given in its entirety, participants had to correctly answer the first three questions in order to be included in the study. Only two individuals were excluded for not being able to meet the inclusion criteria. One did not pass the orientation section of the SLUMS and the other was in a wheelchair over 25% of the day. Due to time constraints, the recruitment period only lasted for two months, and a total of 10 participants were included in the study.

To increase inter-rater reliability, the assessment administrators were all trained and tested on the administration of FRET. The FRET assessment is a scripted assessment and only has one item that is open to interpretation. These three factors lead to high inter-rater reliability. Due to the limited amount of participants, intra-rater reliability was not assessed.

All of the included participants were assessed using FRET and were instructed to keep a fall journal for three months. Participants were called every two weeks to remind them to fill out their fall journals. A strict call-schedule was kept and none of the calls were missed. During the three-month period, researchers had face-to-face contact with

the participants. Thus, participants were able to inform the researchers about current falls and the researchers were able to remind participants to fill out their journals in person. At the end of the three months, participants were reminded to return the fall journal in the stamped and self-addressed envelope. Collection of the journals was found to be difficult, and it took several weeks. In some cases researchers had to contact the occupational therapist at BINBA or the caregivers to remind the participants to return their journals. Memory impairments may have affected the participants' ability to remember to return the journals. Memory impairments are a common deficit in individuals with ABI.

Of the 10 participants included, only eight returned their journals. Although there were more men (seven) than women (one) in the study, this is indicative of the population with ABI. Studies report that men are three times more at risk for ABI's than women (Greenwald, Brunett, & Miller, 2003). Since the researchers were in contact with the participants, the researchers were able to confirm that nine of the participants had fallen in the three-month fall recording period. The ranking for the number of high, moderate, and low risk fallers was taken from the returned journals corresponding to the number of falls in a three-month period. However, the number of falls for the moderate rated risk group may not be valid due to one participant not returning her journal and only verbal confirmation was obtained.

Research Question #1: Is FRET a valid and reliable multifactorial tool to assess the fall risks in community dwelling adults with high functioning ABI?

As a pilot study, FRET indicated that the assessment may be a valid and reliable multifactorial tool because all the participants who were classified as high fall risk fell,

some who were classified as moderate fall risk fell, and none of the participants in the low fall risk group fell. However, the findings of this study should be reviewed cautiously due to the limited number of participants and the amount of attrition. Nevertheless, we believe the data indicates that FRET can be a reliable and valid multifactorial assessment that can be used to assess the fall risk of individuals who have an ABI.

Research Question #2: What is the sensitivity and specificity of FRET in identifying fallers versus non-fallers?

Due to the limited amount of recruiting time and participants, the sensitivity and specificity of FRET was not completed.

Limitations

There were several limitations for this study. Due to unforeseen circumstances, there was limited time for recruitment. The researchers addressed this issue by using multiple methods of recruitment with the hope of gathering a sufficient amount of participants. Our sample size was small even with all of the recruitment methods used. A small testing group did not give us adequate numbers to calculate for sensitivity and specificity.

All of the participants that were recruited for the study attended the same agency. This could limit the generalizability of the study to other individuals with ABI. Another factor that contributed to the accuracy of the true data was the possibility of intervention from outside the study and increased awareness of falls when completing the fall journals. In addition, the accuracy of the fall journal is also questionable. Our participants, could have been affected if the individuals forgot to record falls during the

three-month period. To prevent individuals from forgetting to record falls in their journal we implemented standardized phone calls two times a month for the full three-month duration. The use of a fall journal to document falls is a subjective approach to gathering data and can therefore be subject to recall bias. A Hawthorn effect could have occurred due to the researchers' attendance and in person contacts with the participants at the agency during the three-month observation period. Those individuals who did not fall could have been more vigilant about their activities. The heightened awareness could have prevented potential falls. The rate of return of the fall journals may also be higher due to the researchers' attendance at the agency during the three-month period. The researchers' presence could also have affected the rate of reports of falls. Participants who may have regularly forgotten to write down falls could have remembered due to the presence of the researchers.

Conclusion

Individuals with ABI have increased fall risk. Falls and fear of falling can lead to a decrease in participation in occupations. There is a lack of valid and reliable multifactorial assessments to assess fall risks in individuals with ABI. FRET was developed to assess fall risks in individuals with ABI. The aim of this study was to test the validity and reliability of FRET. Although we had a small sample size, our pilot study returned significant data that FRET may be a valid and reliable multifactorial tool for assessing individuals with ABI who are at risk for falling. As OTs, we try to insure the safety of our clients. Thus if we are able to accurately predict who is at a greater risk of falling, we can implement measures to reduce this risk and help increase participation

in occupations. We believe FRET will be a useful multifactorial tool for OTs and other professionals to help assess individual with ABI at fall risk.

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Appendix A

March 4, 2013

Tanya Marshall

Dear Tanya:

I have reviewed your proposal (entitled, A Study on the Reliability and Validity of the Fall Risk Evaluation Tool for Individuals with Acquired Brain Injury) submitted to the Dominican University Institutional Review Board for the Protection of Human Subjects (IRBPHS Application, #10104). I am approving it as having met the requirements for expedited review.

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

I wish you well in your very interesting research effort.

Sincerely,

Martha Nelson, Ph.D.
Chair, IRBPHS

cc: Kitsum Li

Appendix B

LETTER OF PERMISSION FROM AGENCY DIRECTORS

Ms. Patricia Gill
Executive Director of Brain Injury Network of the Bay Area
1132 Magnolia Avenue
Larkspur, CA 94939

Dear Ms. Gill:

This letter confirms that you have been provided with a brief description of our senior thesis research project, which concerns a study on the reliability and validity of a fall risk assessment, and that you give your consent for us to utilize your facility to assess individuals with acquired brain injuries. This project is an important part of our graduate requirements as occupational therapy major, and is being supervised by Dr. Kitsum Li, OTR/L, Professor of the Occupational Therapy department at Dominican University of California. As we discussed in our conversation, we will make every effort to ensure that our data collection does not interfere 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 415-458-3753 or by email duoc.fret@gmail.com. If you have further concerns you may contact our research supervisor, Dr. Kitsum Li, at 415-458-3753 or the Institutional Review Board for the Protection of Human Subjects at Dominican University of California by calling (415) 482-3556. After our research project has been completed in May 2014, we will be glad to send you a summary of our research results. If our request to utilize your establishment and to assess your clients meets with your approval, please sign and date this letter below and return it to me in the enclosed self-addressed, stamped envelope as soon as possible. Please feel free to contact us if you have any questions about this project. Thank you very much for your time and cooperation.

Sincerely,

Tanya Marshall, Amanda Woods & Josue Zamora

415-458-3753 or by email duoc.fret@gmail.com

I agree with the above request

Maggie Gill

Appendix C

VAMC
SLUMS EXAMINATION

Questions about this assessment tool? E-mail aging@slu.edu

Name_____ Age_____

Is the patient alert?_____ Level of education_____

__/1 (1) 1. What day of the week is it?

__/1 (1) 2. What is the year?

__/1 (1) 3. What state are w[illegible]in?

4. Please remember these [illegible] objects. I will ask you what they are later.
Apple Pen Tie House Car

5. You have $100 and you [illegible] to the [illegible]ore and buy a dozen apples for $3 and a tricycle for $20.
(1) How much did you spend?
__/3 (2) How much do you have le[illegible]?

6. Please name as many animal[illegible]s you ca[illegible]n in one minute.
__/3 (0) 0-4 animals (1) 5-9 animals (2) 10-14 animals (3) 15+ animals

__/5 7. What were the five objects I aske[illegible] you to r[illegible]ember? 1 point for each one correct.

8. I am going to give you a series of nu[illegible]s and I would like you to give them to me backwards. For example, if I say 42, you w[illegible] say 24.
__/2 (0) 87 (1) 649 (2) [illegible]37

9. This is a clock face. Please put in the hou[illegible]r mar[illegible]s and t[illegible]ime at ten minutes to eleven o'clock.
(2) Hour markers okay
__/4 (2) Time correct

(1) 10. Please place an X in the triangle.

__/2 (1) Which of the above figures is largest?

11. I am going to tell you a story. Please listen carefully because afterwards, I'm going to ask you some questions about it.
Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met Jack, a devastatingly handsome man. She married him and had three children. They lived in Chicago. She then stopped work and stayed at home to bring up her children. When they were teenagers, she went back to work. She and Jack lived happily ever after.

__/8 (2) What was the female's name? (2) What work did she do?
(2) When did she go back to work? (2) What state did she live in?

_____ TOTAL SCORE

SCORING		
High School Education		Less than High School Education
27-30	Normal	25-30
21-26	Mild Neurocognitive Disorder	20-24
1-20	Dementia	1-19

CLINICIAN'S SIGNATURE DATE TIME

SH Tariq, N Tumosa, JT Chibnall, HM Perry III, and JE Morley. The Saint Louis University Mental Status (SLUMS) Examination for detecting mild cognitive impairment and dementia is more sensitive than the Mini-Mental Status Examination (MMSE) - A pilot study. *Am J Geriatr Psych* 14:900-10, 2006.

Appendix D

Have you experienced a fall episode or feel like you are at risk of falling?

You may be eligible for a research study about fall risk! Help students at Dominican University of California to better understand fall risk. The study involves: two assessment tests, completing a journal, and a fall risk workshop. To participate you must be: 18 years or older, english speaking, and have an acquired reduction brain injury for over one year. Cerebral vascular accidents, traumatic brain injuries, tumors, hypoxia, concussions, and encephalopathy are all eligible enrollment conditions.

We look forward to hearing from you!

To participate contact the FRET @

Phone: (415) 458-3753

Email: duoc.fret@gmail.com

Appendix E

Craigslist Post

Have you experienced falls or feel that you are at risk of falling?
Dominican University needs participants! (San Rafael, CA)

Help students at Dominican University of California to understand fall risk.

You may be eligible for a research study about fall risk!

The study involves:

- Two assessment tests
- Completing a fall journal
- Fall risk reduction workshop to learn new strategies to prevent fall

To participate you must:

- 18 years old and over
- English speaking
- Able to understand and follow instructions
- Have sustained an acquired brain injury: cerebral vascular accidents, traumatic brain injuries, tumors, hypoxia, concussions, and encephalopathy.
- Had the acquired brain injury condition for at least one year
- May or may not have fallen in the past 6 months
- Must be able to ambulate with or without the use of assistive devices
- May or may not have difficulties in expressing yourself verbally

Please contact us: either by phone or email

(415) 458-3753

duoc.fret@gmail.com

We look forward to hearing from you!

Appendix F

DOMINICAN UNIVERSITY of CALIFORNIA

RESEARCH PARTICIPANT'S BILL OF RIGHTS

Every individual who is asked to be in this 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, drugs or devices are different from what would be used in standard practice;

3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;

4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;

5. To be told what other choices s/he has and how they may be better or worse than being in the study;

6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;

7. To be told what sort of medical treatment is available if any complications arise;

8. To refuse to participate at all before or after the study is stated without any adverse effects. If such a decision is made, it will not affect his/her 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/s

10. To be free of pressure when considering whether s/he wishes to agree to be in the study.

If you have other questions regarding the research study, you should ask the researchers (Ms. Tanya Marshall, Ms. Amanda Woods, and Mr. Josue Zamora) at duoc.fret@gmail.com or their advisor Dr. Kitsum Li, OTR/L, at Kitsum.li@dominican.edu or 415-458-3753. You may also contact The Dominican University of California Institutional Review Board for the Protection of Human Subjects by telephoning the Office of Academic Affairs at (415) 257-0168 or by writing to the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA. 94901.

Appendix G

DOMINICAN UNIVERSITY of CALIFORNIA

CONSENT TO BE A RESEARCH SUBJECT

Purpose and Background:

Ms. Amanda Woods, Ms. Tanya Marshall and Mr. Josue Zamora, students in the Department of Occupational Therapy at Dominican University of California, are conducting a research study on the Fall Risk Evaluation Tool (FRET). The researchers are interested in understanding if the FRET is an accurate tool in predicting fall risk in individuals with a brain injury. I am being asked to participate because I am an individual who has had a brain injury.

Procedures:

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

1. I will participate and give information to complete demographic data collection.

2. I will participate in the St. Louis University Mental Status Examination

3. I will give a fall history within the last 30 days

4. I will participate in the 7-step fall risk evaluation.

5. I will be given a Fall Journal and be instructed on when and how to document in it.

6. I will record any fall I may have experienced at home or in the community in the journal for the next 3 months

7. I will be called once every other week and be reminded to write in the Fall Journal whenever I have had a fall.

8. I will return the fall history journal by mail upon completion of the 3-month journaling

9. I will participate in the "Fall Risk Reduction" workshop upon completion of the study to learn strategies in preventing future falls.

Risks and Discomforts:

I understand that my participation in this study involves receiving phone call reminders once every other week. If at any time I decide that I do not wish to be contacted by phone I will inform the researchers. I will be required to record any falls within the three-month observation period in the provided Fall Journal. If I prefer to not record my fall in the provided Fall Journal I can contact the researchers to either complete the journal by phone or withdraw from the study. I understand that there is a slight risk of falling during the assessment and that the researchers will make every effort to insure my safety. Should I feel fatigue during the assessment, I will inform the examiners so that I may take a break or reschedule the assessment for another date.

Benefits:

Upon completing the 3-month Fall Journal, I will receive education on how to reduce fall risks. I may also feel satisfied that I have contributed my time to help create an assessment tool that will help health care professionals provide better care for survivors of brain injuries.

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 duoc.fret@gmail.com or through their research supervisor, Dr. Kitsum Li, OTR/L Occupational Therapy Department, 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) 257-1389 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:

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 SIGNATURE	DATE
_____	_____
PARTICIPANT'S NAME (PRINT)	DATE
_____	_____
SIGNATURE OF RESEARCHER	DATE

Appendix H

DOMINICAN UNIVERSITY of CALIFORNIA

PROXY CONSENT FOR RESEARCH PARTICIPATION

Purpose and Background

Ms. Amanda Woods, Ms. Tanya Marshall and Mr. Josue Zamora, students in the Department of Occupational Therapy at Dominican University of California, are conducting a research study on the Fall Risk Evaluation Tool (FRET). The researchers are interested in understanding if the FRET is an accurate tool in predicting fall risk in individuals with a brain injury. My ward is being asked to participate because he/she is an individual who has had a brain injury.

Procedures

If I agree to allow my ward to be in this study, the following will happen:

1. My ward or myself will participate and give information to complete demographic data collection.

2. My ward will participate in the St. Louis University Mental Status Examination

3. My ward or myself will give a fall history within the last 30 days

4. My ward will participate in the 7-step fall risk evaluation.

5. My ward will be given a Fall Journal and be instructed on when and how to document in it. The caregiver will be asked to help my ward completing this fall journal, as needed.

6. My ward or his/her caregiver will record any fall he/she may have experienced at home or in the community in the journal for the next 3 months

7. My ward or his/her caregiver will receive call once every other week and be reminded to write in the fall journal whenever he/she have had a fall.

8. My ward or his/her caregiver will return the Fall Journal by mail upon completion of the 3-month journaling.

9. My ward, his/her caregiver or I will participate in the "Fall Risk Reduction" workshop upon completion of the study to learn strategies in preventing future falls.

Risks and/or discomforts

I understand that my ward participation in this study involves receiving phone call reminders to once every other week. If at any time we decide that we do not wish to be contacted by phone I will inform the researchers. I and/or my ward will be required to record any falls within the three-month observation period in the provided Fall Journal. If my ward prefers to not record his/her fall in the provided Fall Journal, we can contact the researchers to either complete the journal by phone or withdraw from the study. I understand that there is a slight risk of falling during the assessment and that the researchers will make every effort to insure the safety of my ward. Should my ward feels fatigue during the assessment, he/she will inform the examiners so that he/she may take a break or reschedule the assessment for another date.

Benefits

Upon completing the 3-month Fall Journal, my ward and his/her caregiver or I will receive education on how to reduce fall risks. We may also feel satisfied that we have contributed our time to help create an assessment tool that will help health care professionals provide better care for survivors of brain injuries.

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 duoc.fret@gmail.com or through their research supervisor, Dr. Kitsum Li, OTR/L Occupational Therapy Department, 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) 257-1389 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

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 ward to participate in this study, or to withdraw from the study at any point. My ward is free to decline to be in this study or withdraw his/her participation at any time without fear of adverse consequences

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

_____

PARTICIPANT'S NAME

_____ _____

GUARDIAN'S SIGNATURE DATE

_____

GUARDIAN'S NAME (PRINT)

_____ _____

SIGNATURE OF RESEARCHER DATE

Appendix I

FRETT *Fall Risk Evaluation Tool for Traumatic Brain Injury*

Heidi Mertle, OTS
Kiley Richter, OTS
Louis Scirica, OTS

Dominican University of California, Department of Occupational Therapy

Table of Contents

Disclaimer: *FRETT is an evaluation tool that can be used to determine fall risk in individuals with high functioning TBI. FRETT was developed using evidence-based research. The developers' clinical reasoning was also utilized in order to determine the risk factors of falls that were deemed most significant to assess based on the literature findings. The risk factors included in the evaluation tool have all been shown in the literature to increase an individual's risk for falling. It is advised that FRETT is not used as a single tool to determine an individual's risk for falling, but as a collaborative tool along with the clinician's clinical reasoning.*

Special Considerations for Clients with Speech Difficulties

Portions of FRETT require that the client verbalize a response to an assessment. Because sustaining a TBI often encompasses speech difficulties such as expressive aphasia, the following assessments include a brief section on ways to accommodate for speech difficulties:

- **TUG Cognitive (pg. 7-9)***
- **Gross Test of Peripheral Visual Fields (pg. 13-14)**
- **Functional Depth Perception Test (pg. 15-16)**
- **The Hamilton-Veale Contrast Sensitivity Test (pg. 17-19)**

* ***Denotes assessments that have accommodations for speech difficulties***

Fall History

Fall history can be obtained in a few different ways:

- Medical history or transfer summary in the client's chart
- Information from a family member and/or caregiver
- Nursing notes
- Incident reports, if the chart and/or facility has this

A fall history is important for the administrator to be aware of in terms of the client's safety and current level of function.

Scoring:

- Mark **"Yes"** on FRETT if client has fallen during the last 30 days since onset of TBI. Score as 10.
- Mark **"No"** on FRETT if client has not fallen during the last 30 days since onset of TBI. Score as 0.
- If client has fallen during the last 30 days, but before sustaining TBI injury, mark **"No."** Score as 0.

Fall Risk Medications in TBI

This chart is a ***general*** informational guide to the medications that could be considered a fall risk in clients with TBI. When consulting with client about the current medications he/she is taking, consider this chart. If you do not see a medication on this chart or are unsure of a particular medication's side effects, it is recommended to research the medication. When a client is taking fall risk medications, close monitoring during functional activities is advised.

Classification	Common Names	Type
Psychotropic		
• Dopaminergic agents	• Amantidine • Bromocriptine • Levodopa	Cognitive deficits
• Selective serotonin reuptake inhibitors	• Fluoxetine • Sertraline • Paroxetine • Fluvoxamine • Citalopram	Anti-depressant
• Tricylcic agents	• Desipramine • Amytriptyline	Anti-depressant
• Typical anti-psychotics	• Haloperidol • Fluphenazine	Psychosis
• Atypical anti-psychotics	• Clozapine • Risperdone • Olanzapine • Quetiapine • Ziprasidone • Aripiprazole	Psychosis
Anticonvulsants	• Sodium Valprotate • Neurontin • Topirimate • Carbamazepine	

General fall risk side effects from these medications include:

- Dizziness
- Hallucinations
- Orthostatic hypotension
- Blurred vision
- Confusion
- Sedation

Scoring:

- Mark **"Yes"** on FRETT if client is taking any fall risk medications. Score as 15.
- Mark **"No"** on FRETT if client is not taking fall risk medications. Score as 0.

TBI Medication Chart. (n.d.) In *Trauamtic brain injury: The journey home online*. Retreived from http://www.traumaticbraininjuryatoz.org/Moderate-to-Severe-TBI/Treament-Stages-of-Moderate-to-Severe-TBI/TBI-Medication-Chart.aspx.

Rao, V., & Lyketsos, C. (2000). Neuropsychiatric sequelae of traumatic brain injury. *Psychosomatics, 41*(2), 95-103. doi:10.1176/appi.psy.41.2.95

* Timed Up and Go "TUG" Cognitive

What test measures:

- The time (in seconds) it takes an individual to stand up from a standard arm chair and walk a measured distance while counting backwards from a randomly selected number between 20 and 100.
- Measures dual-task performance with a focus on cognition while maintaining dynamic balance in walking, transferring, and making turns.

Materials needed:

- Arm chair (seat height ~18 in, arm height ~26.5 in)
- Timer (stop watch measuring seconds)
- Measuring tape to measure 10 feet
- Tape to mark 10 feet
- Walking aids, if applicable

Time to complete test:

- Varied; less than 5 minutes.

Instructions for Administrator:

- **See page 7 for diagram of setup**
- Procedure to assess: sit → stand from arm chair, walk 10 feet, turn around, walk back 10 feet to the chair, sit down ***while counting backwards from a randomly selected number between 20 and 100***
- Details:
  - Make sure client is wearing regular footwear and using customary walking aid during assessment (cane, walker, etc.).
  - No physical assistance is to be given.
  - Client starts with their back against the chair and their arms resting on the armrests.
  - The client is to walk through the test once before being timed in order to become familiar with the test.

Instructions for Client:

- *"When I say 'go' I want you to stand up and walk to the line, turn, and then walk back to the chair and sit down again.* ***While walking, please count backwards from the number I will give you, starting from number*** _____ (assign a number 20-100). *Walk at your normal pace."*
- *"Go."*

Scoring:

- Time for 'Up and Go' test _____sec.
- Walking aid used?
  - Type of aid: _____

- Mark the "< 15 sec" box on FRETT if client's time is less than 15 seconds. Score as 0.
- Mark the "≥ 15 sec" box on FRETT if client's time is greater than15 seconds. Score as 25.

TUG Cognitive Setup

Seat height ~18 in.
Arm height ~26.5 in.

Tape marking distance of 10 ft. from chair

*** Speech Considerations:**

- If client is having a hard time verbalizing the counting of numbers, substitute the **TUG Manual**.
- The directions are primarily the same, except the administrator will instruct the client to hold a glass filled with water, walk 10 feet, turn around, and walk back to the chair and sit down.
- **Scoring**:
  - Time for 'Up and Go' test _____sec.
  - Walking aid used?
  - Type of aid: _____

  - Mark the " < 14.5 sec " box on FRETT if client's time is less than 14.5 seconds. Score as 0
  - Mark the " ≥ 14.5 sec " box on FRETT if client's time is greater than 14.5 seconds. Score as 25

Podsiadlo D, Richardson S. The timed "up and go": a test of basic functional mobility for frail elderly persons. *JAGS* 1991; 39: 142-148.

Trail Making Test Part B

What test measures:

- This assessment measures cognitive function.
- More specifically, this assessment looks at visual processing, visuospatial skills, visual search, divided attention, working memory, and psychomotor coordination.

Materials needed:

- Pen or pencil
- Timer (stop watch measuring seconds)
- Sample Trail Making Test Part B (see handout)
- Trail Making Test Part B (see handout)
- Table, desk, or any smooth surface to write on
- Chair to sit in while taking test

Time to complete test:

- Varied; less than 5 minutes.

Instructions for Administrator:

- Trail Making Test B consists of 25 circles distributed over a sheet of paper. The circles include both numbers (1 – 13) and letters (A – L).
- Instruct the client to draw lines to connect the circles in an ascending pattern, by alternating between the numbers and letters (i.e., 1 – A, then 2 – B, then 3 - C, etc.)
- The client should be instructed to connect the circles as quickly as possible, ***without lifting the pen or pencil from the paper.***
- Time the client as he or she connects the "trail." ***If the client makes an error, point it out immediately and have them return the pen or pencil to the place from which he/she began drawing an incorrect line and continue while the clock remains running.***
- Errors affect the patient's score only in that the correction of errors is included in the completion time for the task.
- It is unnecessary to continue the test if the client has not completed the task after five minutes has elapsed.
- If client lifts the pen off the paper, instruct him/her to lower pen back down to the paper at the last correct number/letter and continue.

Instructions for Client:

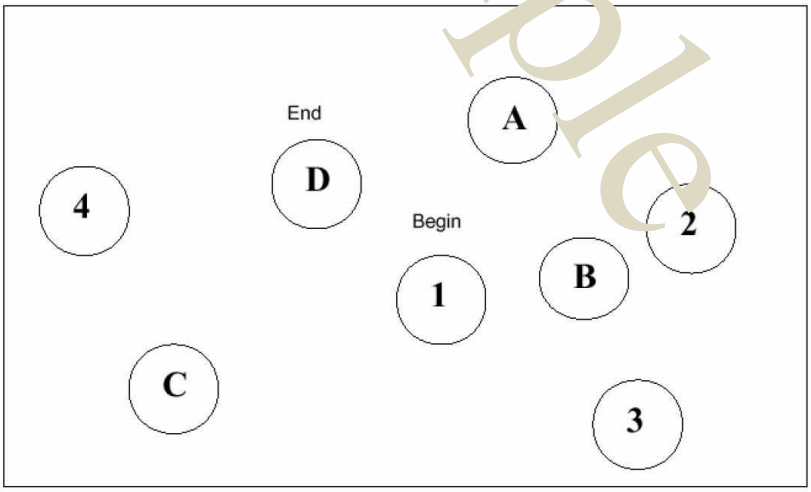
- *"I am going to give you a test that measures your attention and ability to think. I am going to demonstrate how to complete this test using this sample sheet."* (Demonstrate using Trail Making Part B SAMPLE).
- *"Now I will give you a paper and pencil* (or pen).

- *On the paper are the numbers 1 through 12 and the letters A through L, scattered across the page. Starting with 1, draw a line to A, then to 2, then to B, and so on, alternating back and forth between numbers and letters until you finish with the letter L. I'll time how fast you can do this. Are you ready?"*
- *"Go."*

Scoring:

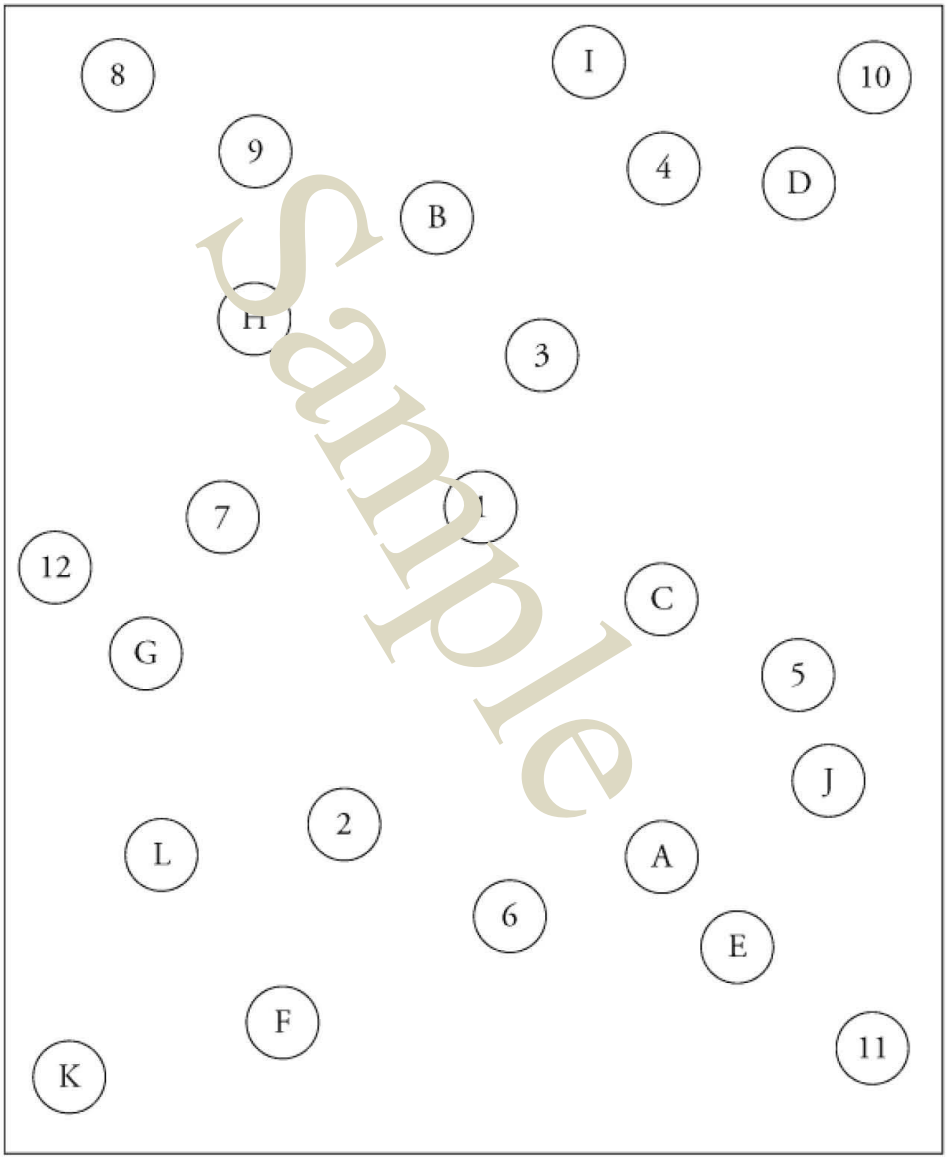
- Results are reported as the number of seconds required to complete the task. Higher scores reveal greater impairment.
- Time to complete test: _____ seconds.
- Mark the " 0 – 180 sec " box on FRETT if client's time is in this range. Score as 0
- Mark the " > 180 sec " box on FRETT if client's time is greater than 180 seconds. Score as 25.

Trail Making Test Part B – *SAMPLE*



Trail Making Test Part B

Patient's Name: _____ Date: _____



Bowie, C.R. & Harvey, P.D. (2006). Administration and interpretation of the trail making test. *Nature Protocols 1*(5): 2277-2281.

* Gross Test of Peripheral Visual Fields

What test measures:

- Assesses or detects if a gross deficit in the peripheral visual field is present.

Materials needed:

- Popsicle stick with black tape on end
- Stable chair (or wheelchair with brake on)
- One pirate eye patch
  - An eye patch can be purchased at (http://www.eyepatchstore.com/id2.htm) or a local drug store.
- Adhesive putty for attachment of target (large black circle) to back of the Hamilton-Veale Contrast Sensitivity Chart

Time to complete test:

- Varied; 1- 5 minutes

Instructions for Administrator:

- Perform test in a well-lit room.
- Have the client sit in a chair and remove eyeglasses if worn.
- The administrator stands (or sits) to the side of, and slightly behind the client. The side that the administrator stands on is the same side as the eye being tested.
  - For example, the administrator stands at the 8 o'clock position relative to the client if the L eye is being tested. For the R eye, administrator stands at the 4 o'clock position relative to the client.
- Instruct the client to occlude one eye with the pirate eye patch.
- Instruct the client to fixate on a target at eye level 40 inches in front of them.
- As the client fixates on the target, the administrator brings the stick from behind the client to the front of the client moving slowly in an arc. (Note: if the stick is moved too fast, the client will not be able to respond quickly enough to obtain an accurate field measurement).
- The client is instructed to indicate as soon as he/she sees the object move into his/her field either by saying "now" or raising a hand.
- The administrator observes the client's eye during the assessment to ensure that the client maintains fixation on the target and does not look for the stick being presented.
- The examiner moves the stick forward/up/down in an arc (depending on the field being tested) across the client's visual field using the positions of the clock as a guide. Mix the positions up and perform them randomly to

prevent the client from predicting the direction of the stick. Do not touch the client or give any cues as to the direction of the stick. The test positions are as follows:
    - 3 o'clock 12 o'clock 9 o'clock 6 o'clock
- Repeat steps for the other eye.

Instructions for Client:

- *"I am going to give you a test that evaluates your peripheral vision. I want you to look at this target in front of you (point to target). Can you clearly see the target?"* (Make sure the client confirms they know where the target is).
- *"While you look at the target, I am going to stand behind you and move this stick with the black tape on it from behind towards the front of you."* (Show the client the popsicle stick that you are going to use).
- *"As soon as you see any part of the stick please raise your hand or say 'now'."* (Put the stick close to the middle of the visual field and close to client, make sure client produces appropriate response by raising hand or saying "now")
- *"It is **VERY IMPORTANT** that you keep your eye focused on the target at all times during the test and that you do not try to look for the stick. I will be watching your eye to make sure that you do not move your eye to look for the stick. Are you ready?"*

Scoring:

- The normal visual field for each eye is 60° superior, 75° inferior, 65° nasal, 100° temporal. This method of testing cannot provide an exact degree measurement of the peripheral visual field. It is up to the administrator to determine if the client has a gross deficit in peripheral vision based on their performance during the exam.

- Mark **"Yes" (WNL)** on FRETT is no peripheral vision deficit is detected. Score as 0.
- Mark **"No" (not WNL)** on FRETT if any peripheral vision field deficit is detected. Score as 5.

*** <u>Speech Considerations:</u>**

- If client is having a hard time verbalizing "now", instruct the client to raise their hand when they can <u>first see</u> the popsicle stick enter their visual field.
- **Scoring is the same.**

Warren, M. (1998). *Brain injury visual assessment battery for adults test manual.* Birmingham, AL: visAbilities Rehab Services.

* Functional Depth Perception Test

What test measures:

- This test assesses a client's ability to perceive their surroundings in three dimensions.
- This test is important in determining if clients can safely navigate objects in their environment (e.g. curbs).

Materials needed:

- Stable chairs (or wheelchair with brake on)
- 2 Popsicle sticks, each 6 inches long
  - 1 stick with black tape on top 2 inches of stick
  - 1 stick with silver/grey tape on top 2 inches of stick

Time to complete test:

- Varied, expected time about 5 min or less.

Instructions for Administrator:

- Perform test in a well-lit room.
- Client will wear glasses/contacts, if applicable.
- Have client sit in a chair for the test.
- Administrator sits five feet away from client.
- Administrator holds sticks up side-by-side so the sides of each stick are touching, but not overlapping. Administrator holds the bottom 1 inch of each stick (non-tape end).
  - 4 trials are performed.
  - During each trial, the administrator randomly moves one stick forward or backward about 6 inches, the length of 1 popsicle stick.
  - Client is instructed to close eyes between trials so administrator can position sticks 6 inches apart.
  - Client is asked to open eyes once administrator has sticks spaced 6 inches apart.
  - Client identifies which stick, black or silver/grey, is closest to him or her.
  - All 4 trials must be completed regardless of the number of mistakes being made.

Instructions for Client:

- *"I am going to assess your ability to perceive depth. Can you identify what color tape is on the end of each of the sticks I am holding?"* (Administrator holds sticks up individually and asks client to identify color of tape on ends).

- *"I want you to close your eyes and only open them when I tell you to. When I tell you to open them, I would like you to tell me which color stick I'm holding is closest to you. Please close your eyes now."* (Administrator adjusts distance between the two sticks).
- *"Open your eyes. Which stick is closest to you?"* (Client states his/her answer)
- *"Please close your eyes again."* (Administrator adjusts distance between sticks again) *"Open your eyes. Which stick is closest to you?*
- Repeat for a total of four trials

Scoring:

- Mark **"Yes" (WNL)** on FRETT if client makes correct identification in each trial. Score as 0.
- Mark **"No" (not WNL)** on FRETT if client makes an incorrect identification during any trial. Score as 10.

*** Speech Considerations:**

- If client is having a hard time verbalizing the color corresponding to the popsicle stick closest to them, simply hand them a pair of popsicle sticks that match the administrator's pair (one stick with grey on the end, one stick with black on the end). Instruct the client to raise the color stick that corresponds with the color they feel is closest to them.
- **Scoring is the same.**

* The Hamilton-Veale Contrast Sensitivity Test

What test measures:

- This test measures an individual's contrast sensitivity by varying the contrast of the letters against a white surface. It ultimately measures the peak contrast sensitivity of an individual and gives an idea of the individuals' overall visual acuity in various contrast environments.

Materials needed:

- The Hamilton-Veale contrast sensitivity chart
  - The chart can be purchased from (http://www.contrast-sensitivity-test.com/)
- One pirate eye patch
  - An eye patch can be purchased at (http://www.eyepatchstore.com/id2.html) or local drug store.
- Stable chair (or wheelchair with brake on)
- Adhesive putty for attachment of chart to the wall

Time to complete test:

- Varied; less than 3 minutes.

Instructions for Administrator:

- The chart has 8 lines, with 4 letters in each line. The 2 letters on the left of each line have a greater contrast than the 2 letters on the right of the same line.
- Test should be performed in a well-lit room.
- Hang the chart on a wall at the eye level, 40 inches in front of the client.
- Sit the client 40 inches away from the chart. (If client is seated, the chair will be stable. Remember to lock the wheelchair if the client is sitting on a wheelchair).
- Instruct the client to occlude the L eye using the pirate eye patch, using the R eye to read chart.
- Instruct client to read the letters across each line, starting from line 1, and reading letters from L to R.
- If needed, the administrator may point to the line that the client is to read from. If the client skips a line, instruct him/her back to the appropriate line and continue testing.
- ***Threshold: the last group of 2 letters (at the same level/line, that are both correctly identified).*** Record level achieved.
- Repeat with the R eye occluded. Record level achieved.
- Repeat with two eyes open. Record level achieved.

Instructions for Client:

- *"I am going to give you a visual test that will evaluate your ability to differentiate between light and dark in each of your eyes. I want you to look at this chart in front of you. Please cover your L eye with the eye patch. Starting at line 1 and reading left to right, please read each letter out loud as you come to it. I will tell you when to stop. Are you ready?"*
- Administer R eye reading. Record score.
- *"Now we will do the same thing, but using your L eye. Please cover your R eye with the eye patch."*
- Administer L eye reading. Record score.
- *"Now we will do the same thing, b[illegible] using both eyes."*

Scoring

- **Right eye open: Level _____**
- **Left eye open: Level _____**
- **Both eyes open: Level _____**

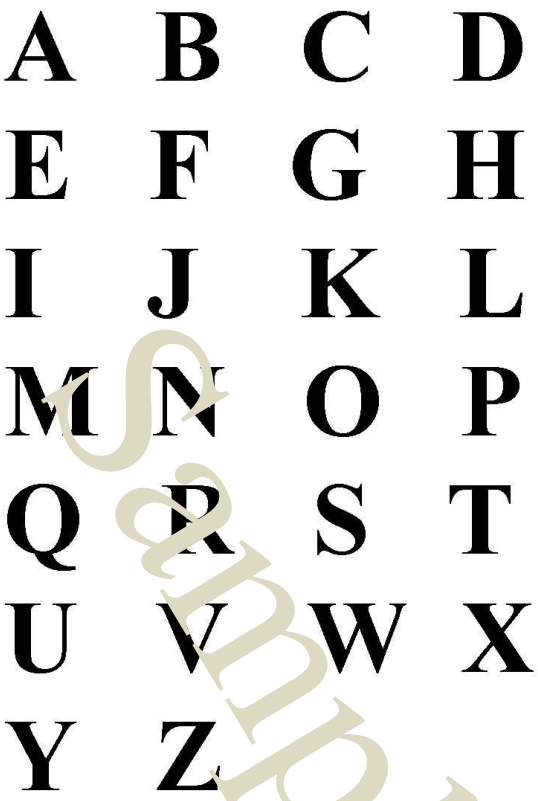
- Mark **"Yes" (WNL)** on FRETT if client c[illegible] see Level 13 or above in 1 or both eyes. Score as 0
- Mark **"No" (not WNL)** on FRETT if client [illegible] not se[illegible] Level 8 or below in 1 eye. Score as 10.
- Mark **"No" (not WNL)** on FRETT if client ca[illegible] see L[illegible]vel 12 or below in both eyes. Score as 10.

Those that cannot see to:

Level 4	**Level 5 to 8**	**Level 9 to [illegible]**	**[illegible]Level 13 to 16**
Severe loss of contrast sensitivity function and/or blindness	Significant loss of contrast sensitivity function	Noticeable loss of contrast sensitivity function	N[illegible] normal to [illegible]ormal contrast sen[illegible]tivity function

* **Speech Considerations:**

- If client is having a hard time verbalizing each letter on the contrast chart, provide client with a chart of the alphabet and instruct them to keep it on their lap (see example of alphabet chart below). Instruct the client to point out the letter on the alphabet chart that corresponds to the letter they see on the contrast chart. ***See below.***
- **Scoring is the same.**
- Warning: the time for this accommodation may take longer than stated under the directions.



Hamilton Veale, J. (n.d.) The Hamilton Veale contrast sensitivity test. Published instrument. Retrieved from http://www.contrast-sensitivity-test.com/.

FRETT

Fall Risk Evaluation Tool for Traumatic Brain Injury

Client Name:
Date:

1. Has client fallen during the past 30 days since onset of TBI?
   - ☐No (score as 0) ..... _____
   - ☐Yes (score as 10) ..... _____

2. Is client taking any fall risk medications?
   - ☐ No (score as 0) ..... _____
   - ☐ Yes (score as 15) ..... _____

3. Balance & Gait
   - a. TUG cog/*(man) time _____
   - b. Walking aid used_____
   - ☐ < 15 sec *(<14.5) (score as 0) ..... _____
   - ☐ ≥15 sec *(≥14.5) (score as 25) ..... _____

4. Cognition
   - a. TMT B time _____
   - ☐ < 180 sec (score as 0) ..... _____
   - ☐ ≥ 180 sec (score as 10) ..... _____

5. Vision

   WNL

   a. Visual Field
      - ☐Yes (score as 0) ..... _____
      - ☐No (score as 5) ..... _____

   b. Depth Perception
      - ☐Yes (score as 0) ..... _____
      - ☐No (score as 10) ..... _____

   c. Contrast sensitivity
      - ☐Yes (score as 0) ..... _____
      - ☐No (score as 10) ..... _____

   R eye open: Level ____
   L eye open: Level ____
   Both eyes open: Level ____
   *Level ≤ 8 in 1 eye is not WNL – mark "No"
   *Level ≤ 12 in both eyes is not WNL – mark "No"

Low Risk = 0-25 Mod Risk = 30-45 High Risk = 50 or higher **TOTAL SCORE: _____**

Appendix J

Demographic Form

Please Complete this form. Place N/A in the space for items that do not apply.

Name: _____ Date of Birth: (mm/dd/yyyy)_____

Sex: ☐ M ☐ F Primary Language_____

Address_____ Apt. No_____

City_____ State _____ Zip Code _____

Home phone_____ Cell phone _____

Emergency contact

Name: _____ Phone number:_____

Do you have an acquired brain injury? Y ☐ N ☐

If yes what was the cause? (i.e. trauma, stroke, brain tumor, traumatic brain injury)

_____

Have you fallen in the past 30 days? Y ☐ N ☐

If yes, please provide the fall date (approximate)

_____

Please describe your current living situation?

_____

Appendix K

FALL

JOURNAL

Fall Journal Instructions:

Please answer all the questions in the journal when you have had a fall.

Examples of what constitutes a fall:

1. A fall is any event that results in coming to rest unintentionally on the ground,
2. A fall is an unintentional loss of balance causing one to make unexpected contact with the ground or floor.
3. A fall includes falling out of bed or a chair, slipping in the bath, falling down stairs.

Examples of what is not considered as a fall:

1. Tripping but able to correct self without ending up on the ground
2. Banging into a wall
3. Being pushed or knocked over by others
4. Lying on the floor on purpose

Date:_____

Time:_____

Cause of fall: (Check all that apply)

- ☐ Lack of attention
- ☐ Decreased vision
- ☐ Wet floors
- ☐ Reflection off surface
- ☐ Doing more than one task at once
- ☐ Stairs
- ☐ Dizziness
- ☐ Fatigue

Other: _____

_____

Location the fall occurred

- ☐ Home
- ☐ Restaurants
- ☐ Parks
- ☐ Community
- ☐ Schools
- ☐ Stores

Other: _____

_____

Was someone with you at the time of the fall?

No: _____ Yes: _____

If yes:

1. How many people?_____
2. How much assistance was given to help you up from the floor? (Check those that apply)

- ☐ Total Assistance
- ☐ Moderate assistance
- ☐ Minimum assistance
- ☐ No assistance

Did you experience an Injury?

No:____

Yes:____

Explain: _____

_____

Did you seek medical assistance?

No:_____

Yes:_____

Explain:_____

☐ Primary care doctor

☐ Urgent care

☐ The ambulance was called

Other:_____

_____

_____

Appendix L

Standardized phone call reminders

Hello Mr., Mrs., or Miss_____.

My name is _____. I am calling from the research study you are participating in. I wanted to check in with you to make sure you are completing your fall journal. Have you fallen recently?

If answered yes to falling: Did you record the fall in your fall journal that we provided to you?

-Yes, recorded in fall journal: go to conclusion sentence.

-No, did not record in fall journal: I would like to ask you to refer back to your fall journal instructions listed in the front of your journal and record the fall information in the journal. Do you think you still remember how the fall happened? Will you be able to answer those questions to the best of what you remember? (Continue with conclusion sentence.)

Conclusion sentence: We will check in with you again in two weeks. We appreciate your participation. Thank you for your time.

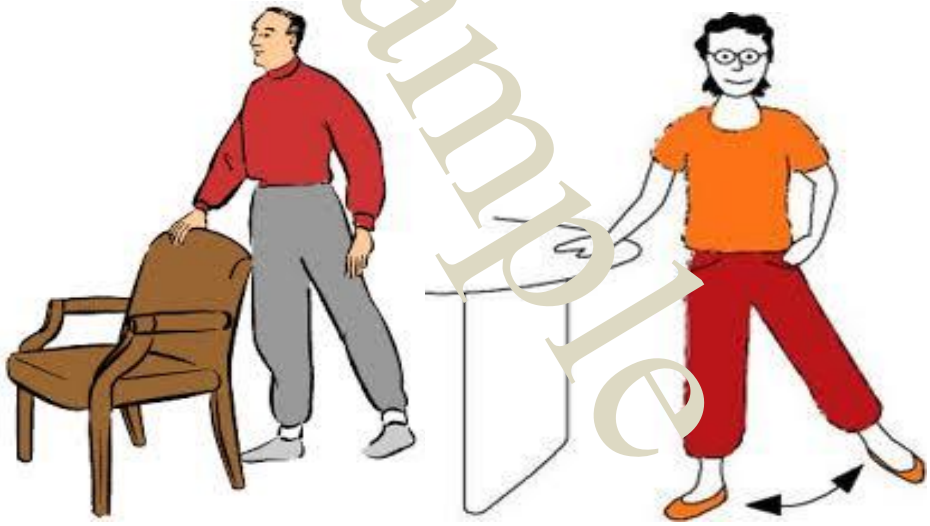
Appendix M

Fall Intervention Workshop

Exercises to improve balance:

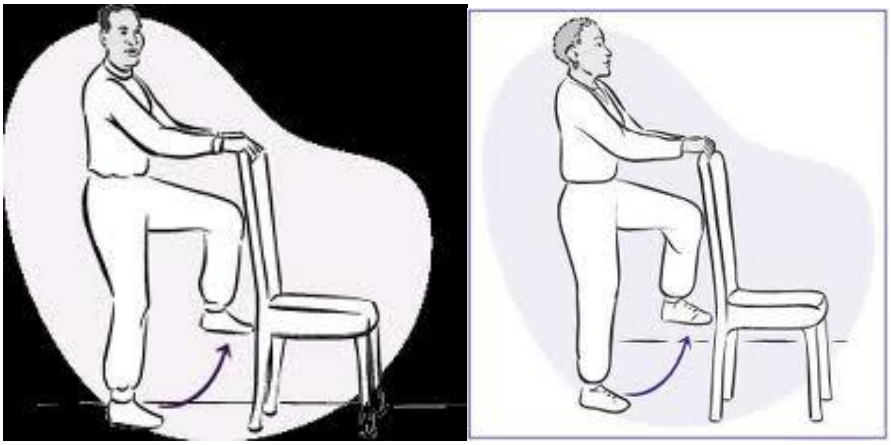
Side leg raises- to strengthen sides of hips and thighs

- Stand straight, directly behind table or chair, feet slightly apart.
- Hold table or chair for balance.
- Slowly lift one leg to side, 6 to 12 inches out to the side.
- Keep your back and both legs straight.
- Don't point your toes downward; keep them facing forward during this exercise. Hold this position.
- Slowly lower leg. Repeat with other leg.
- Keep back and knees straight throughout exercise.
- Alternate legs until you repeat exercise 5-10 times with each leg.
- Rest. Do another set of 5-10 alternating repetitions.



Hip Flexion- strengthen thigh and hip muscles

- Stand straight; hold onto a table or chair for balance.
- Slowly bend one knee toward chest, without bending waist or hips.
- Hold position for 1 second.
- Slowly lower leg all the way down. Pause.
- Repeat with other leg.
- Alternate legs until you have done 5-10 repetitions with each leg.
- Rest; then do another set of 5-10 alternating repetitions. Add weights as you progress.



Hip Extension- strengthens buttocks and lower back muscles

- Stand 12 to 18 inches from a table or chair, feet slightly apart
- Bend forward at hips at about 45-degree angle; hold onto a table or chair for balance.
- Slowly lift one leg straight backwards without bending your knee, pointing your toes, or bending your upper body any farther forward.
- Hold position for 1 second.
- Slowly lower leg. Pause.
- Repeat with other leg.
- Alternate legs until you have done 5-10 repetitions with each leg. Remember to rest between sets.

Exercises you can do anywhere:

- Practice walking heel to toe for short distances at a time
- Work on endurance by going on walks, swims, or bike rides

Fall Safety Check List

Please answer the following questions by circling Yes or No.

1. Are the stair edges easily visible? Is there enough light over the stairs?

YES NO

2. Are there guardrails on the sides of the stairs for support?

YES NO

3. Are there loose mats or rugs throughout the house?

YES NO

4. Is the carpet in the home long or shaggy?

YES NO

5. Do you have to walk around furniture?

YES NO

6. Do you have to walk around cords or wires?

YES NO

7. Is the tub or shower floor slippery

YES NO

8. Are there pets that live in the home?

YES NO

9. Does your clothes fit securely? (no dangling hems)

YES NO

10. Do you avoid wearing loose fitting shoes or slippers?

YES NO

11. Are there areas within the home that you have trouble walking in because of dim lighting?

YES NO

12. Do you wear glasses during the day?

YES NO

13. Are you easily distracted or bothered by light?

YES NO

Suggestions:

1: Place a bright strip of tape on the stair edge so that you can see the steps, clearly.

2: You should hold the guardrail while going up or down stairs to conserve energy and maintain better balance.

3: You should secure any mats or rugs placed in front of doorways or placed in rooms by adding a small strip of Velcro underneath the mat and on the floor to secure them and keep them from slipping.

4: if the carpet is long or shaggy, consider replacing it to avoid any tripping on the longer carpet fibers.

5: Arrange furniture so that there are clear pathways to the rooms in the home and to avoid walking more than necessary in the home.

6: Cords or wires should be put away or placed as far against a wall as possible to avoid tripping.

7: A tub or shower mat can help improve the grip of the tub or shower surface. You can also use a shower or tub chair to help avoid any fatigue while showering.

8: Make sure you are aware of where the pets are when walking around the home to avoid tripping over them.

9: Wear clothes that fit correctly and do not drag on the floor or cover your feet.

10: Make sure you always tie your shoes properly before walking and that you wear the correct size shoes or slippers.

11: If there are dimly lit areas in the home try adding a standing lamp or plug in a hallway light to provide more light when needed.

12: If you wear glasses make sure to always have them with you and check with your optometrist to make sure you have the correct prescription for the glasses.

13: You should wear sunglasses to help shield the light. If you use glasses there are prescription sunglasses available or larger sunglasses that are made to fit over everyday glasses.