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Return to Self: Impact of Long Term Acquired Brain Injury Rehabilitation on Community Reintegration

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RETURN TO SELF: IMPACT OF LONG TERM ACQUIRED BRAIN INJURY REHABILITATION ON COMMUNITY REINTEGRATION

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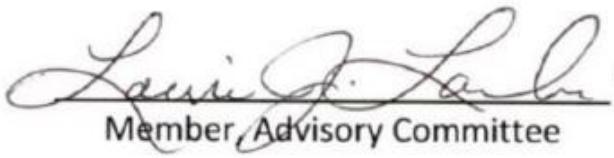

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DEDICATION

This thesis is dedicated to my co-author and mentor, Dr. Lindsey Jasinski. Without you, the ABI Program and this thesis would not be possible. Thank you for all the ways that you have inspired me, led me, and challenged me. I am lucky to work alongside you and to continue to learn from you every day!

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ABSTRACT

The purpose of this study is to examine the outcomes of a long term brain injury rehabilitation program and its impact on community re-integration. This unique facility is licensed as a Long-Term Care Facility, able to provide longer lengths of stay to treat medical and psychological needs. All residents of this facility have a diagnosis of Acquired Brain Injury (ABI) as well as a mental illness. The mental illness may have existed prior to the brain injury, or may have arisen or worsened as a result of the brain injury.

This program combines traditional rehabilitation therapy (Physical Therapy, Occupational Therapy, Speech Therapy, and Recreational Therapy) with skilled psychological services to provide holistic treatment of ABI. Quantitative assessment results were collected on a data form and combined with therapist observation via facility documentation to obtain the results of the study. Residents' skills, behaviors, and rehabilitation progress were observed in group therapy settings, individual therapy settings, and community outings. Assessment outcomes from admission to discharge were analyzed through statistical analysis. The hypothesis is that outcomes data and therapist feedback will show that this program improves functional abilities of individuals with ABI and provides them with the skills to successfully transition to a lower level of care.

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I. Introduction

Acquired Brain Injury (ABI) is a type of brain injury that occurs after birth. There are many different causes of ABI, including head trauma, hypoxia, infection, tumor, substance abuse, degenerative neurological disease or stroke (Parvaneh & Cocks, 2012). Depending on the severity, site and nature of the injury, many physical, cognitive, and psychological results can occur (Mahar & Fraser, 2012).

ABI can lead to small or large changes in personality and mood, which can affect relationships with family and friends (Parvaneh & Cocks, 2012). Many individuals with ABI experience psychosocial problems that hinder societal participation, often as a result of the deficits from their injury (i.e. unawareness of social inappropriateness, personality disorder symptoms, high levels of anxiety mixed with poor coping skills) (Mahar & Fraser, 2012).

Depending on the severity and nature of the brain injury, some skills and functions may never be fully recovered. Long term sensory deficits are not uncommon. For example, many individuals who experience traumatic brain injury lose their sense of smell. Other examples include bowel and bladder continence, paralysis, processing speed, and memory retention (Watanabe, Miller, & McElligott, 2003).

The purpose of this research study was to examine the physical and psychosocial outcomes of participation in a Long-Term Care Acquired Brain Injury Program, and to understand the impact of program participation on community reintegration. This program was available for individuals aged 18 and older who had a dual diagnosis, of both having an Acquired Brain Injury (ABI) along with a secondary

diagnosis of having a mental illness (ESH LTCF Handbook, 2016). Length of stay in the program varied by the severity of the brain injury as well as the related functional deficits of the participant, the average length of stay was 12-18 months. This facility is licensed as a nursing facility, able to provide longer lengths of stay to treat medical and psychological needs (LTCF Handbook, 2016). The hypothesis is that this program is effective at reducing psychological symptom burden, improving functional deficits related to brain injury and mental illness, and prepares residents well for discharge to a lower level of care.

Most rehabilitation facilities have psychology staff to combat common disability-related mental health issues such as post-injury depression, but do not specifically address pre-existing mental illnesses. The program being studied combined traditional rehabilitation therapy with skilled psychological services to provide holistic treatment of ABI. Each discipline seeks to meet their specific therapeutic goals as well as contributing to all-over community functioning. Community discharge was the ultimate goal for every resident, with varying levels of support. Residents were encouraged to take an active role in planning their discharge and encouraged to advocate for their personal needs and rights.

While various data collection methods were used in this process, the primary format was therapist observation and documentation. Other methods used were questionnaires, testing scores from various disciplines, and interviews with participants who were discharged to the community. Quantitative outcome data is presented in the form of neuropsychological testing results. Residents apply skills they

have learned in therapeutic groups and individual sessions to real life situations with the support of therapy staff. Each discipline was required to document their observations regarding residents' response to treatment through therapeutic session notes and verbal treatment team reports, and the combination of these along with multidisciplinary testing scores helped determine the residents' progress in community reintegration. Residents had 1 to 2 opportunities each week to practice community living skills based on goals set by their therapists.

The data for this topic were collected across several disciplines, allowing for a more accurate representation of how a resident performed in community settings. The combination of assessment results and therapist documentation allowed for greater accuracy in understanding how the participant was progressing as well as areas that still needed to be addressed. The key challenges were compiling the various discipline results together, as well as addressing how the participants would actually function after discharge as opposed to when they were out in the community with a therapist.

Quantitative assessment results were collected on a data form and combined with therapist observation via facility documentation to obtain the results of the study. Residents' skills, behaviors, and rehabilitation progress were observed in group therapy settings, individual therapy settings, and community outings. Assessment outcomes from admission to discharge were analyzed through statistical analysis.

II. Literature Review

Each year, there are about 2.4 million children and adults who sustain a traumatic brain injury (TBI). Most acquired brain injuries (ABI) fall under the classification of TBI, however about 795,000 people sustain an acquired brain injury from non-traumatic cases. In the United States alone there are currently more than 5.3 million people living with a disability as a result of a brain injury (BIAA, 2015). Brain injury is an extracranial force or impact that can lead to loss of consciousness, anterograde and/or retrograde amnesia, alteration in mental state, and loss of certain physical or cognitive functions (Kim, Lauterbach, Reeve, Ciniegas, Coburn, Mendez, Rummans, & Coffey, 2007). The most common mechanisms of TBI are motor vehicle collisions, falls, sports and recreational injuries, and assaults (Fann, Leonetti, Katon, Cummings, & Thompson, 2002). While direct, focal injuries can occur as the brain makes contact with the sharp bony surfaces of the skull, a majority of brain injuries result in widespread shearing and stretching of nerve fibers (diffuse axonal injury) cause by the rapid acceleration and deceleration of the brain. The frontal and temporal lobes are common sites of damage that may lead to disruption of limbic system (McAllister & Arciniega, 2002).

Brain injury severity is defined by the duration of loss of consciousness (LOC), altered mental status, or post-traumatic amnesia (Jennett, 1990). However, the severity of functional impairments after TBI is often not related to the severity of the injury (Sterr, Herron, Hayward, & Montaldi, 2006). Injuries are classified as moderate-to-severe TBI if the person had a LOC of over 30 minutes, altered mental status greater

than 24 hours, or a Glasgow Coma Score (GCS) below 12. Mild TBI is defined as a blow to the head followed by a LOC of less than 30 minutes, an altered mental status of less than 254 hours, or a GCS score of 13-15 (Kay, Harrington & Adams, 1993). The majority of TBIs are mild, and often no link is made between the blow to the head and the subsequent physical, cognitive, behavioral or emotional sequelae. TBI has been called the "silent" or "hidden" epidemic because many individuals are not identified by the healthcare system and their neurological, neuropsychological and neurobehavioral symptoms and functional difficulties are attributed to etiologies other than brain injury (Ashman, Gordon, Cantor, & Hibbard, 2006).

Depending on the specifics of the injury, ABI has a large impact on the functional abilities of the person who sustained the injury. There may be impairments that are not immediately visible, such as cognitive and physical fatigue, and difficulty making decisions. Often the individual with the brain injury is unaware of the severity of their deficits or unaware of the deficits at all (Long, Rager & Adams, 2014). These impairments are not only frustrating for the individual with an ABI, but also for their family and friends. People with brain injury often struggle to come to terms with their new abilities or disabilities, the loss of former familial and societal roles, and impatience with themselves. Some individuals have brain damage so extensive that, while they may be able to regain some skills, they will never be able to live independently. The following sections discuss the impact of brain injury on various domains of life, as well as rehabilitation and treatment options currently available.

Cognitive Impacts of ABI

Cognitive impacts can include difficulty with short- and long-term memory, deficits in abstract reasoning, concentration, problem solving, planning, sequencing, word finding, or reading and writing skills (Kwasnica, Brown, Elovic, Kothari & Flanagan, 2008). Executive functioning skills, necessary for the cognitive control of behavior, such as attention, inhibition, working memory, and cognitive flexibility are also affected (Ashman et al., 2006) (Diamond, 2013). Since a high percentage of TBIs cause damage to the frontal lobe or frontal system, impairments of higher level thinking and executive functioning are more common (McAllister & Arciniega, 2002). Executive dysfunction following traumatic brain injury has been reported across the range of severity: mild, moderate, and severe. Processing speed is the most vulnerable cognitive domain to the effects of brain injury (Batty, Frances, Thomas, Hopwood, Ponsford, Johnston, & Rossell, 2015). Often the severity of cognitive deficits does not become apparent until the individual tries to resume pre-injury daily activities (Hammond, Hart & Bushnik, 2004).

Cognitive deficits may make it difficult for individuals with TBI to participate actively in maintaining their health and managing their own healthcare. Attention deficits can make it difficult to remain focused in interactions with healthcare professionals, and common routines such as simultaneously providing one's medical history while being examined or filling out long forms can be particularly challenging. Memory impairments can impact healthcare treatment such as difficulty remembering one's medical history, remembering topics to discuss with the doctor or therapist, and

difficulty following through with prescribed interventions and medications. Reduced processing speed can impact the ability to absorb and respond to new information. Executive dysfunction can affect the ability to plan appointments and follow-up care, prioritize information, remain focused on the current topic, regulate emotional responses (such as withdrawal or anger). (Ashman et al., 2006).

Physical Impacts of ABI

With ABI there is often a deterioration in physical functioning, such as weakness (hemiparesis) or paralysis (hemiplegia) on one side of the body, poor motor skills, or bowel and bladder incontinence. Individuals who experience aphasia (usually a result of left side brain injury, though the right side can impact as well) may never fully regain the ability to speak fluidly or fully comprehend speech, or may lose the ability to write or read (Archer, 2012). Sensory loss has been reported as long as 10 years after TBI, with impairments in smell and hearing being the most commonly reported (O'Connor, Colantonio, & Polatajko, 2005).

Other significant physical impairments include headaches, sleep problems, blurred vision, dizziness, loss of hearing and sometimes seizure disorders. Fatigue is one of the most common physical symptoms reported after TBI (Ashman et al., 2006). Changes in appetite and temperature regulation may occur if the hypothalamus is impacted during injury (Brown, Gordon & Spielman, 2003). Physical impacts of brain injury can, in turn, have impacts on cognition, mood, and behavior.

Psychological, Emotional, and Behavioral Impacts of ABI

The most common post-TBI anxiety diagnosis is generalized anxiety disorder (GAD) (Fann et al., 1995). People with brain injury have a fourfold higher risk of death by suicide and a significantly higher lifetime prevalence rate of suicide attempts (Simpson & Tate, 2005). Simpson and Tate (2002) reported on a prevalence study of suicidality among outpatients with TBI that 10.4% of clients had a pre-injury history of suicide attempts, and 17.4% a post-injury history of attempts, resulting in a lifetime prevalence of 26.2%, indicating that suicide attempts were a significant clinical complication of the process of adjustment. They suggested that people who have made a suicide attempt post-injury need to be monitored closely for further signs of suicidality for at least 1 year after the initial attempt.

Chronic post-TBI affective disturbances have been associated with poorer rehabilitation outcomes, increased functional disability, reduced employment potential, elevated divorce rates, and increased caregiver burden (Hibbard, Uysal, Kepler, Bodgany, & Silver, 1998). Major adjustment issues as well as difficulties with transitional periods have an impact on emotional well-being and perceptions on quality of life (Geurtsen, Heugten, Martina, Rietveld, Meijer & Geurts, 2011).

Common behavioral impacts include socially inappropriate language or behavior, emotional lability, poor frustration tolerance, impulsivity, lack of empathy, apathy, aggression, and quick mood changes (Barman, Chatterjee, & Bhide, 2016). Emotional dysregulation, such as increased irritability, depression, or anxiety is often

reported by individuals who suffer from TBI, or identified by those close to the person (Ashman et al., 2006).

Social Impacts of ABI

Social participation in the community is of high salience after TBI, as it can be seriously compromised following brain injury. Brown, Gordon and Spielman (2003) reported that individuals with TBI had stronger unmet needs in areas relevant to social-recreational functioning than people with no disability. The level of unmet need for "close friends" is nearly twice as great for individuals with brain injury as in those without disabilities, and needs for "socializing," "active recreation," and "significant other," were 40-70% greater (Brown & Vandergroot, 1998). Social participation has been rated as more important to individuals with a disability than those without a disability (Brown, Gordon & Spielman, 2003).

The emotional and behavioral consequences of ABI can have a negative impact on the individual's social interactions, including friendships, relationships with family and significant others, and workplace interactions (Brown, Gordon & Spielman, 2003). Impaired interpersonal communication and social cognition (inability to follow conversations, being rude, interrupting others, talking too fast or too slow) can have an impact on the individual's ability to develop and maintain meaningful relationships (Ashman et al., 2006).

Barriers to community reintegration for individuals with traumatic and acquired brain injury can be both actual and perceived. Many people with TBI/ABI feel

a sense of loss of identity following their injury, and cannot accept the sudden and oftentimes irreversible implications of their changed lives (Mahar & Fraser, 2012). Other social barriers include socially unacceptable behaviors, isolation, substance and alcohol abuse, and other maladaptive behaviors.

Loss of Identity

Alterations in mood can arise as the individual with the brain injury recognizes that the impairments associated with the injury have not resolved, or as their insight into their deficits increases. This is often associated with a loss of identity or of defining personal attributes, as individuals with brain injury feel that they can never return to their previous "normal" life. This negative self-discrepancy (the thought that "who they were" is better than "who they are) often leads to increased feelings of depression, anxiety, frustration, and anger (Beadle, Ownsworth, Fleming, & Shum, 2017). This realization is often compounded by description of the individual by friends and family as a "different person" (Cantor et al., 2005).

Self-identity is broadly defined as the collective bodily and internal psychological characteristics we perceive as our own, which endure over time and are continuously under construction (Ownsworth, 2014). Conceptually, self-identity is closely related to self-concept, or the overarching thoughts and feelings a person has about him or herself, and self-esteem, which represents an evaluative component regarding one's own worth or value. Self-identity is an inherently subjective

construction that cannot be reported or verified by others (Beadle, Ownsworth, Fleming, & Shum, 2017).

Levels of self-discrepancy are not significantly related to demographic factors or injury severity. Rather, impairments in language and executive function reduce a person's capacity to participate in personally meaningful activities, which in turn disrupt their sense of inner sameness or self-continuity after TBI (Reddy, Ownsworth, King, & Shields, 2017).

Premorbid Mental Illness and Substance Abuse

Existence of premorbid psychiatric symptoms and disorders, particularly pre-existing personality disorders, has been associated with having a greater risk for developing additional psychiatric disorders after brain injury (Ashman, Spielman et al., 2004). Individuals with existing psychiatric illnesses are also at an increased likelihood of sustaining a brain injury. Individuals with a diagnosis of acute reaction to stress or adjustment reaction; alcohol or drug intoxication, withdrawal, or dependence; organic psychotic and non-psychotic disorders; and somatoform disorders are at significantly greater risk of TBI than individuals without these diagnoses (Fann et al., 2002).

Alcohol and substances place an individual at higher risk for TBI through their effects on cognition, coordination, and judgement. Organic mental disorders such as dementia, delirium, and frontal lobe syndrome also create increased risk for brain injury (Fann et al., 2002).

Pre-existing mental illness, substance or alcohol abuse, unemployment and poverty can affect related mental health issues following injury. Individuals with premorbid mental illness or substance abuse who have sustained a brain injury may complain of a greater number or more persistent post-concussive symptoms (Fann et al., 2002).

Post-Injury Mental Illness and Substance Abuse

Psychiatric disorders, such as major mood or psychotic disorders, and personality disorders occur more frequently in people with TBI, with reported rates often exceeding 50% (Elovic et al., 2008). Individuals with TBI may experience multiple concurrent psychiatric symptoms that would typically point to a single psychiatric diagnosis, however in this population is has been found that these symptoms are coupled less tightly than in those without TBI (Arciniega & Silver, 2011). This can make diagnosis difficult and it is therefore important to identify the symptoms that interfere the most with everyday function and target those symptoms first. Depression after TBI exacerbates cognitive impairments and increases the number and perceived severity of other post-concussive symptoms. Treatment of depression after TBI is associated with improvements in cognition and reduction in the total number of post-concussive symptoms (Fann et al., 2001). Functional problems resulting from cognitive impairments generate anxiety, affective lability, and agitation, and can impact effective use of remaining cognitive abilities (Arciniega & Silver, 2011).

Emotional distress, commonly in the form of depression and anxiety, is the most prevalent psychiatric disorder for many individuals immediately after injury. Some resolution in symptoms does occur over time, however longitudinal studies have suggested that a substantial proportion of individuals with TBI either continue to experience or develop late-onset psychiatric disorders for as long as 30 years after injury (Hibbard, Ashman & Spielman, 2004).

Major depression is the most prevalent psychiatric disorder after brain injury; other frequent psychiatric disorders after injury include substance abuse, post-traumatic stress disorder (PTSD), and other anxiety disorders (Ashman et al., 2006). While the risk for developing psychiatric symptoms is highest in the first year following injury (Warriner & Velikonja, 2006), the risk for developing these disorders remains elevated for decades after brain injury (Hoofien, Gilboa, Vakil & Donovick, 2001).

The development of psychiatric disorders following brain injury, particularly the comorbidity of psychiatric disorders and substance abuse, can increase the risk of other neurobehavioral problems, often creating obstacles for integration into the community (Warriner & Velikonja, 2006). Simpson & Tate (2005) reported that comorbid depression and substance abuse in individuals with brain injury increased the risk of suicide attempts 21 times, thus the comorbidity of an Axis I disorder significantly increases risk for suicidal ideation and attempt. Psychiatric effects of TBI/ABI can have implications on rehabilitation interventions and influence one's ability to function independently after discharge (Kim et al., 2007).

As many as 10% of patients who have suffered a TBI develop psychotic symptoms (Batty et al., 2015). Individuals who experience psychosis following a traumatic brain injury (PFTBI) live with a clinically complex dual diagnosis that is associated with considerable morbidity. Individuals with TBI and individuals with schizophrenia (SCZ) experience similar cognitive deficits, especially in areas of attention, poor mental inhibition, and impaired mental switching (Breton et al., 2011), however individuals with PFTBI scored worse on tests assessing executive functioning levels (Batty et al., 2015).

Both individuals with brain injury and with mental illness experience struggles with apathy, and often the combination of the two leads to high levels of apathy ratings on scales such as the Apathy Evaluation Scale (AES), making rehabilitation achievement difficult due to noncompliance. Besides delayed rehabilitation, high apathy ratings are also associated with reduced social interaction and increased caregiver burden. General difficulties related to apathy as identified on the AES include getting things done during the day, feeling like getting things done is important, motivation, and general lack of motivation (Sagen, Faerdan, et al., 2010).

Rehabilitation and Recovery

Individuals who have a dual-diagnosis of psychiatric illness and brain injury often face challenges finding care, as rehabilitation and long-term care facilities are not as equipped to handle behavioral outbursts, but they also may not be acutely ill enough to warrant treatment at a mental health facility (Schwarzbold et al., 2008).

There has been an established relationship between depression and the reduction of left pre-frontal grey matter volume, which is involved in functions such as muscle control, sensory perception, decision-making, self-control, emotions, memory, and speech (Jorge et al., 2004).

One of the primary goals, after restoration of functional ability, is successful community reintegration. Much community integration training for brain injury is performed in acute rehabilitation settings and continued in outpatient clinics. A community can be defined by the physical boundaries that describe where the person resides (streets or buildings), or by the social institutions, rituals, and traditions of a group of people (Stumbo, Wilder, Zahl, DeVries, Pegg, Greenwood & Ross, 2015). A community helps people form an identity (ex: identifying as a Virginian or an Italian) and gives them something in common to bring them together.

Community reintegration goals have many different terms and phrases, depending on the treatment model and ideology. Popular terms include independent living, employment, emotional well-being, and quality of life (Geurtsen et al., 2011). Millis et al. (2014) states that the areas of recreation, mobility, and engaging in social relations are important. Parvaneh and Cocks (2012) identified seven major themes for community reintegration: relationships, community access, acceptance, occupation, being at home, picking up life again, and heightened risks and vulnerability. Within each of these themes, individuals with ABI address deficits and establish desires for achievement within a community reintegration program. Other terms and phrases include independent living, normalization, deinstitutionalization, mainstreaming,

focusing on Activities of Daily Living (ADL's), hobbies, education, community mobility, and economic independence (Domac & Sobaci, 2014). All of these different goals seek to enhance the confidence, competence, and perceived quality of life of persons with ABI.

Cognitive remediation is a recommended evidence-based intervention for addressing the numerous cognitive sequelae of TBI. It is effective in managing specific domains of cognitive deficit such as attention and memory problems as well as improving functional and vocational outcomes and community integration. Remediation coupled with psychotherapy can be provided by rehabilitation psychologists or neuropsychologists, in conjunction with speech therapists, occupational therapists, and other rehabilitation professionals (Gordon et al., 2006).

There are many different treatment options for TBI/ABI. Some of these options are neurobehavioral programs, residential community reintegration programs, comprehensive day treatment programs, outpatient community reentry programs, and community-based continuity of care services, usually following inpatient rehabilitation (Elovic, Kothari, Flanagan, Kwasnica & Brown, 2008). Neuropsychologists and behavioral analysis typically lead these programs, and they use an interdisciplinary treatment team approach (Trudel, Nidiffer, & Barth, 2007). No matter the setting of care, all programs seek to allow individuals to become more productive members of society who are independent in their life choices, while also reducing the level of community expenditure and burden (Stumbo et al., 2015). Many of these programs complete testing before, during, and after treatment, such as the Glasgow Coma Scale,

the Community Integration Questionnaire and the Quality of Community Integration Questionnaire.

Individual treatment facilities for brain injury, at various levels of care, have an independent method of implementing community integration rehabilitation. Many of these programs use similar research findings, yet are able to make the results suit their own population, thus creating difficulty in finding clear, standardized evidence-based practice. There are also varying definitions for seemingly crucial outcome measures, such as perception of quality of life. The definition of quality of life varies between researchers and is difficult to establish a specific definition on which to base intervention results (Watanabe, Miller, & McElligott, 2003).

Community reintegration programs have shown significant positive changes from admission to discharge for participants who participate in and complete the recommended course of therapy and rehabilitation (Altman, Swick, Parrot & Malec, 2010). Residential programs saw improvements in balance of life demands, daily living skills, coping skills, social interaction, confidence and community living skills, with a decrease in mood related symptoms (Geurtsen et al., 2011). Intensive, holistic, post-acute treatment programs have shown significantly greater improvements in community integration skills over participants receiving standard rehabilitation treatment (PT, OT, SLP, and Psych). There have been varied results on self-reported measures of satisfaction with community functioning, based on how soon after injury the community integration rehabilitation took place (Cicerone, Mott, Azulay & Friel, 2004). However, individuals with mild TBI/ABI are not as likely to benefit significantly

from community integration interventions, generally because they are able to return to workplace environments with fewer problems. Individuals with moderate to severe TBI/ABI had greater improvement as a result of participation in community integration rehabilitation (Kim & Colantonio, 2010). One of the remaining issues within community integration rehabilitation is that there is no generalized measurement for success. There is a lack of correlation between key community integration behaviors and measures of problem behavior or quality of life. Given the breadth and complexity of TBI and ABI cases and the variety of treatment settings, it is difficult to standardize outcome measures on successful community integration. Common outcome measurements can include vocational status, physical, cognitive, and psychological functioning, burden of care or resource needs, functional abilities, and classification levels from the International Classification of Functioning, Disability, and Health (Trudel, Nidiffer, & Barth, 2007). It is possible that each level of care may need its own specific outcome measures, or that community integration rehabilitation as a whole needs to focus research within these areas to fine-tune the needs of the population.

One of the more significant issues affecting the field of community integration rehabilitation for TBI/ABI is the lack of standardized clinical manuals. According to Trudel, Nidiffer, and Barth (2007), progress for providing an evidence base has been hampered by, "the diversity of definitions, varied approaches, and lack of systematic, detailed descriptions of actual treatment activities, thereby limiting options for replications, randomized control studies, and multicenter studies." The TBI Outcome Measure Subcommittee (2010) stated that, because brain injury has a wide variety of

diffuse cerebral effects which in turn can cause an array of impairments and disabilities, that no single measure could capture the nature of the outcome of TBI. They found that multiple measures would be necessary to address the breadth of potential deficits and recovery following brain injury. Not only the multifaceted effects of brain injury but also the timing of outcome assessments presented a problem in research and clinical care of individuals with brain injury (Bagiella et al., 2010).

Residential community reintegration programs are suitable for individuals who suffer from psychiatric or behavioral problems as well as functional deficits. These programs provide "integrative cognitive, emotional, behavioral, physical and vocational rehabilitation to patients who cannot participate in outpatient programs either because of severe cognitive and behavioral impairments," (Geurtsen et al., 2011). Programs such as the Netherlands' Brain Integration Programme and Eastern State Hospital's (KY) Long Term Care Acquired Brain Injury Program take on patients with complex chronic brain injuries combined with other diagnoses such as mental illness that other facilities lack knowledge or resources to adequately treat. These programs seek to improve certain abilities, encourage independence, and implement learned skills in the community through a structured setting and environment (Geurtsen et al., 2011). These skills can be taught through skilled therapy groups (such as recreational therapy, occupational therapy, and speech therapy), psychological counseling, functional community outings, individual therapy sessions, meal planning and preparation, substance abuse counseling, and more (ESH LTC Handbook, 2016). Residential programs such as these treat functional needs and provide 24-hour

medical support and behavioral supervision. Patients participate in a more home-like environment, and the increased amount of time spent in therapies and supported community experiences eases the process of integration. Patients have more opportunities to feel competent and have success, and are able to spend more time processing experiences and deficits (Trudel, Nidiffer, & Barth, 2007).

Outpatient community programs for TBI and ABI have also had success. A 2005 study by Goranson, Graves, Allison & La Freriere showed that participants of an outpatient community integration program for TBI had higher total outcome scores on the Community Integration Questionnaire as well as higher scores in the Home Integration, Social Integration, and Productivity subscales. Participants in outpatient programs demonstrate greater achievement of rehabilitation goals, higher ratings of life satisfaction, decreased levels of disability, and improved use of positive coping strategies (Reistetter & Abreu, 2005).

Much like the inpatient and residential programs, outpatient programs use a combination of many different therapeutic interventions to ensure positive outcomes. Such interventions include visuospatial rehabilitation, cognitive therapies, neuropsychological therapy, memory retraining, attention improvement activities, and pragmatic interventions alongside the typical recipe of physical therapy, occupational therapy, and speech therapy (Elovic et al., 2008). One of the most important additions to these therapeutic interventions is the rapport and relationship between participants and staff. The participants must feel motivated and supported, have a working alliance

with the staff, and have enough trust to fully engage in facing and challenging their deficits.

The most commonly studied programs for community reintegration are day-treatment style programs, and are an important facet of continuity of care. They provide treatment based on recommendations from previous facilities, such as aforementioned inpatient or residential programs, and provide observation, support through individualized and group treatments, and routine assessments to ensure that progress is being achieved (Trudel, Nidiffer, & Barth, 2007). From this level of care, many patients might progress to home-based community integration care, which does not use a treatment team and focuses more on individual providers. At this point, staff cue participants as needed for self-monitoring and encourage them to be as independent as possible. Family and friends give support and continue to facilitate change, albeit on a smaller scale (Kim & Colantonio, 2010).

Skilled therapy treatment for traumatic brain injury and mental illness have a large impact on the reduction of symptoms. Neurocognitive assessments are used to establish cognitive skill levels and highlight deficits that can be addressed by multiple therapeutic services. Once the patient's baseline has been established, these therapies work alongside other disciplines such as physical, occupational, and recreational therapy to provide skilled care aimed at physical, cognitive, and emotional improvements.

Psychopharmacological Intervention

Clinical reports indicate that psychopharmacology can be effective in treating neurobehavioral symptoms after TBI, including maladaptive behaviors (e.g. aggression, irritability), and emotional turmoil. There is some evidence that depression after TBI is amenable to pharmacologic intervention, alleviating not only the mood disturbance but other physical and cognitive symptoms, such as fatigue or poor concentration.

Combining several therapeutic interventions together is a more effective approach to treating brain injury than using a single modality (Arciniega & Silver, 2011). Combining pharmacological intervention with skilled therapy increases the patient's ability to cope with their environment, comprehend and practice new skills, and increases their chances of overall recovery. Medication is used to treat neuroanatomical changes that occur, regulate chemical levels in the brain (such as neurotransmitters), and treat neuropsychiatric disturbances that arise as a result of brain injury (Struchen, Davis, McCauley, & Clark, 2009). Neurotransmitter disturbances impact post-injury neuroanatomic outcomes, and can interact with psychosocial or environmental factors to produce post-injury neuropsychiatric problems (Arciniega & Silver, 2011). Neurotransmitter and neuroanatomical changes can produce behavioral issues in individuals with ABI that are not directly related to a psychiatric illness. Examples of this include irritability and aggression, which are present in 29% to 73% of individuals with brain injury. These issues are often chronic and pervasive, contributing to social isolation, care burden, disrupted interpersonal relationships, and incomplete community integration (Hammond et al., 2014). Treatment of TBI-related irritability

and aggression with medication may lead to improvements in cognitive processing and suppression of limbic drive, however mechanisms of treatment in this area are not well-established. “Off-label” medications such as amantadine hydrochloride have shown clinically significant improvements in irritability and aggression ratings in controlled trials, but there has not been enough research to mainstream this treatment method (Hammond et al., 2014). Posttraumatic seizures are a common problem in individuals with TBI, and can develop for years after injury (Frey, 2003). Anticonvulsants are the primary method of treatment for these seizures, however in individuals with TBI they also carry risk of treatment-related cognitive, behavioral, and motor impairments. Prescription of anticonvulsants to a person with TBI does not effectively mitigate the risk of developing late post-traumatic seizures and does not reduce mortality or long-term neurological disability after brain injury (Schierhout & Roberts, 2000).

When treating neuropsychiatric symptoms, medication selection is crucial, as some medications may increase functional deficits, decrease cognitive functioning, or carry higher risk of seizures compared to someone without a brain injury. Typical antipsychotics exacerbates cognitive impairments in persons with TBI and may prolong post-traumatic amnesia (Rao et al., 1985). Benzodiazepines impair memory (Buffett-Jerott & Stewart, 2002), and use of opiate analgesia after TBI poses a risk of exacerbating posttraumatic cognitive impairments (McCarter et al., 2007). Medication-related interference with neurobehavioral and functional status is reversible upon discontinuation of the drug responsible for the issues, but it is encouraged to avoid or

eliminate medication whenever possible in the acute post-injury period. If medically necessary, it is best practice to use the minimum-necessary dose and discontinue use as soon as possible (Arciniega & Silver, 2011)

Arciniega & Silver (2011) recommend a full neuropsychiatric evaluation before prescribing any intervention, but especially for pharmacotherapy interventions. This assessment should include a complete developmental, medical (including medication), neurological, psychiatric (including substance use and family history), physical, and cognitive examination. The presenting complaints must be carefully assessed, defined, and operationalized, often through the use of objective rating scales (one example being the Neuropsychiatric Rating Scale-Revised). Repeated use of such scales throughout treatment improves the accuracy and subjectivity of symptom monitoring. Medication efficacy should be closely monitored throughout treatment as well to ensure that the medication continues to be necessary. Pharmacotherapy is sometimes implemented when another therapeutic intervention can provide the same desired outcome. Consistent re-evaluation ensures that the best therapeutic interventions are being used to address target symptoms. General principles for pharmacological treatment of neuropsychiatric symptoms are 1) Start with a lower dose than would be prescribed to a person without a brain injury, and raise doses more slowly; 2) Ensure dosages are employed to a therapeutic level to adequately treat symptoms; 3) Regularly reassess the clinical condition for which the medication is being prescribed; 4) Monitor closely for drug interactions, as patients with TBI are often on a high number of medications; 5) Consider augmenting drugs that are producing a partial

response with a second drug that has a different mechanism of action- this is preferable to switching over to an entirely different drug with the same pharmacological profile as the first medication; and 6) Lower the dose of the medication if targeted psychiatric symptoms worsen after initiating the drug, then discontinue if symptoms continue to intensify (Arciniega & Silver, 2011). When multiple medications are required, it is preferable to initiate medications sequentially, rather than concurrently, in order to understand which medication is best treating certain symptoms or causing side-effects.

Barriers to Long-Term Recovery

Mood symptoms and associated behaviors can lead to a decline in social relationships due to poor social, communication, and emotional regulation skills. Physical and cognitive fatigue can also be a barrier, especially in places where there may not be many opportunities for appropriate energy conservation (Merz, Van Patten & Lace, 2017). Cognitive fatigue can lead to an increase in problematic behaviors (e.g. irritability) and a reduction in memory and other cognitive skills. Because brain injury can be a "hidden" disability, many people lack knowledge and understanding into these issues, instead interpreting the behaviors as part of the person's personality. There remains a general stigma surrounding people with disabilities, which include physical and emotional barriers. Physical barriers in the community such as adequate resting places, hand rails, wheelchair ramps, doorways, and lighting and sound can all have an impact on how well someone interacts with their community (Jans, Kaye &

Jones, 2011). Emotional barriers can exist in the person with the disability or in those around them. They include feelings of hopelessness and apathy in the person with the disability, or feeling like a burden to those around them. Within society, emotional barriers can include judgement, pity, or resentment, often based in a lack of education and awareness about people with disabilities (Weiner & Cole, 2004).

Psychology and Neuropsychology Assessment

Psychology and Neuropsychology assess cognitive levels resulting from brain injury with a variety of tests. Testing ranges from cognitive testing to diagnostic and progressive ratings for symptoms of mental illness. Once baseline functioning is established, psychologists and neuropsychologists in this setting work with the individual to identify problem areas, coping skills, and compensatory strategies to aid in daily living with brain injury. They also meet with individuals one on one to provide psychological counseling to target pre-existing or new symptoms of emotional and psychological distress (Struchen, Davis, McCauley, & Clark, 2009).

The Repeatable Battery for Neuropsychological Status Update (RBANS) is a standardized screening tool used to measure neuropsychological status in adults aged 12 to 89 (Randolph, Tierney, Moore, & Chase, 1998). It measures the domains of immediate memory, visuospatial/constructional ability, attention, language, and delayed memory. While it was originally developed for assessment of dementia, it has expanded to include use with Parkinson's Disease, Schizophrenia, Traumatic Brain Injury, Huntington's Disease, Alzheimer's Disease, and more. The RBANS has

demonstrated satisfactory concurrent validity with other established neuropsychological measures used for moderate-severe TBI, and has demonstrated satisfactory concurrent validity with other established neuropsychological measures used for moderate-severe TBI (Pearson Clinical, n.d.).

The Mayo-Portland Adaptability Inventory-4th edition (MPAI-4), a commonly used outcome measure in post-acute brain injury rehabilitation, is used to determine how the subject interacts with problems they may encounter in the physical, cognitive, social, emotional, and behavioral domains (Malec, 2005). It has three subscales- the Ability Index, the Adjustment Index, and the Participation Index. Each of these sections yield an individual score, and all are combined for a Total (T) score. T scores are used for standard scores (Kean, Malec, Altman & Swick, 2011). The MPAI-4 is completed by the person with the brain injury (self-report), a family member, therapist, and any combination thereof; however, it is recommended that individuals with severe cognitive impairment not complete the MPAI-4 due to their inability to comprehend the questions (MPAI-4 Manual). Each question is rated 0 (no problem), 1 (mild problem but no interference with activities), 2 (mild problem; interferes with activities 5-24% of the time), 3 (moderate problem; interferes with activities 25-75% of the time) or 4 (severe problem; interferes with activities more than 75% of the time), thus higher scores indicate more interference in daily functioning for that specific section (MPAI-4 Rating Form). The Ability Index focuses on physical and cognitive functions such as mobility, motor speech, attention/concentration, and memory. Higher scores (and therefore more impairments) in this subscale are targeted first, as they are

barriers to improvements in the other subscales. The Adjustment Index focuses on psychological and behavioral patterns such as anxiety, irritability, fatigue, impaired self-awareness, and family/significant relationships. The Participation Index focuses on activities and abilities relating to community functioning, such as social contact and leisure participation. Having little to no leisure participation can directly impact mood, perceived quality of life, and the ability to create and maintain relationships with others. A person with rare activity participation is likely to have poor ratings in other subscale areas, such as depression or fatigue. Scores for each specific area help establish connections in symptom burden and help guide treatment for therapists. Separate norms are used depending on the rater to account for differences in insight (Malec, 2005). A Rasch analysis was completed in 2011 for the replication and extension of existing psychometric analyses of the MPAI-4. The results showed the MPAI-4 demonstrates excellent coverage of the range of abilities and activities among individuals with post-acute brain injury. The MPAI-4 meets the goals of clinical relevance, usability, and psychometric quality (Kean, Malec, Altman & Swick, 2011).

The Patient Competency Rating (PCRS) is a 30-item self-report instrument that targets the subject's ability to recognize his or her own strengths and weaknesses after brain injury, using a 5-point Likert scale to rate the degree of difficult on a variety of tasks and functions (Kolakowsky-Hayner, 2010). There are two identical forms, one for the subject and one for a close family member or therapist. The test administrator, generally a neuropsychologist, compares the two forms for discrepancies to determine possible functional deficits. Tasks and skills mentioned on the test are necessary for

successful community functioning, such as keeping appointments on time, driving a car, or requesting help when confused. Test-retest reliability of the PCRS has been reported as r= .97 for patients and r= .92 for relatives (Prigatano, 1996). Internal consistency is strong for both patient ratings (Cronbach's alpha= .91, n= 55) and family ratings (Cronbach's alpha= .93, n= 50) (Fleming et al., 1998).

The Satisfaction with Life Scale (SWLS) is a short 5-item questionnaire designed to measure how satisfied a person is with their life. Life satisfaction is one of the components of subjective well-being (Pavot & Diener, 2008). Higher scores indicate that a person perceives areas of their life they consider important to be going well. Lower scores reflect less life satisfaction, and thus higher scores are desired as a rehabilitation outcome (Corrigan, 2013). Test-retest reliability has been generally acceptable, though lower scores result when the time span between test and re-test is longer and situational influences affect responses, suggesting that the instrument is sensitive to changes that occur with life (Pavot & Diener, 1993). In correlation with ten other measures of subjective wellbeing, the SWLS has comparable or higher correlation. Initial and subsequent studies have examined the internal consistency of the SWLS with high coefficients each time (Corrigan, 2013).

The Beck Depression Inventory- 2nd Edition (BDI-II) is a 21-item standardized self-report of depression. Items measure a range of symptoms related to depression, including fatigue, low motivation, sad mood, tearfulness, appetite changes, and suicidal thoughts. It is the most widely used instrument for detecting depression and is

useful in tracking symptom changes over time (Pearson Clinical, n.d.). The 2nd edition shows improved clinical sensitivity and reliability over the BDI.

The Beck Anxiety Inventory (BAI) is also a 21-item standardized self-report of anxiety. Items measure primarily physiological symptoms often experienced with anxiety, such as heart palpitations, sweating, shaking, and feeling tense. Each item is descriptive of subjective, somatic, or panic-related symptoms of anxiety (Pearson Clinical, n.d.). Response options range from 0-3 for each question, and total scores range from 0-63 with higher total scores indicating more severe depressive symptoms. Standardized cutoffs are: 0-9 minimal anxiety; 10-16 mild anxiety; 17-29 moderate anxiety; and 30-63 severe anxiety. Construct validity ratings show good convergence of the BAI with other measures of anxiety and substantial correlations with depression scales. Internal consistency is high and has been tested in large samples of psychiatric patients, college students, and community-dwelling adults. It has been demonstrated to be responsive to change over time (Julian, 2011).

The Awareness Questionnaire (AQ) was developed as a measure of impaired self-awareness after traumatic brain injury. It consists of 3 forms- one form completed by the person with the brain injury, one by a family member or significant other, and one by a clinical familiar with the person with the TBI. On each form, the abilities of the person with the TBI to perform various tasks are compared to their pre-injury abilities. Each ability is rated on a five point Likert scale ranging from “much worse” to “much better” (Sherer, 2004). The AQ was developed as an alternative to the PCRS in order to capture the abilities of the person with the TBI prior to their injury as well as

after. Individuals who have impaired self-awareness with rate themselves as less impaired in cognitive, behavioral, and motor functioning than will family members or clinicians. The degree of impaired awareness is found by subtracting the family and clinician ratings from the self-ratings. The larger the difference in scores, the greater the impairment of self-awareness. Internal consistency for the entire scale is good at .88 for both client or family samples (Sherer et al., 1998a). Internal consistencies for 3 factors are adequate, given the small number of items, ranging from .68 to .80 for the client sample and .57 to .80 for the family sample. The AQ has shown to be sensitive to differences in self, family, and clinician ratings with the expected finding that persons with TBI rate themselves as less impaired than do family or clinicians (Scherer et al., 1998c). Criterion validity has been demonstrated as client vs. family/significant other differences and the direct clinician rating of accuracy of self-awareness have been shown to be predictive of eventual productivity outcome for persons with TBI (Sherer et al., 1998b).

Speech-Language Pathology Assessment

Speech-Language Pathology (or Speech Therapy for short) works with individuals with brain injuries to determine cognition status, assess communication deficits, identify swallowing and diet problems, and improve deficits in these areas. Common focus areas for treatment include attention and memory, confusion, cognitive fatigue, problem-solving, communication and social skills, behavior awareness and management, and hearing or speech related deficits (ASHA, n.d.).

The Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) assesses cognitive and linguistic abilities of adolescent and adult patients with brain injuries. The results can be used to establish severity of injury and can be tracked over time to show progress during recovery. It consists of five subtests: Perception/Discrimination, Orientation, Organization, Recall, and Reasoning. These cognitive processes are often impaired as a result of traumatic brain injury. The subtests use the same standard score scale and can thus be directly compared for performance. The SCATBI progresses in difficulty to levels that even some non-injured adults do no typically master. This permits patients who functioned at very high levels prior to injury to be measured with the same instrument as they regain the use of higher level abilities, such as complex organization and abstract reasoning. The SCATBI was standardized on a sample of head-injured patients and a sample of matched adults with no history of head injury. Internal consistency coefficients were high for all subtests, .90 or higher. Test-retest coefficients ranged from a low of .73 (Reasoning) to a high of .89 (Recall). Concurrent reliability was supported by correlations between SCATBI scores and Ranchos Los Amigos levels. Discriminant analysis showed that the five SCATBI scales accurately classified 79.2% of head-injured participants. (Pro-Ed website, n.d.).

Occupational Therapy Assessment and Treatment

For individuals with brain injury, Occupational Therapy (OT) provides services ranging from basic self-care (eating, bathing, dressing) to higher level skills such as money management, grocery shopping, and cooking. They assess safety at home, in

the community, and in the workspace or educational setting and make recommendations for modifications or adaptations if needed. This includes physical modifications but also appropriate signage for daily reminders, medication routine, setting up reminders on a phone or tablet, and education for family or household members on necessary skills for home living. If the individual with a brain injury demonstrates appropriate cognitive and physical skills, OT evaluates driving readiness or makes recommendations for public transportation utilization, including use of specialized transportation for people with disabilities (AOTA, n.d.).

The Kohlman Evaluation of Living Skills (KELS) is a standardized tool designed to determine the patient's ability to perform basic life functions. The 17 skills are tested under five areas: Self-Care, Safety and Health, Money Management, Transportation and Telephone, and Work and Leisure (Landa-Gonzalez, 2001). The tool is used to make general recommendations on appropriate training and living situations that will maximize safe occupational function (Thomson, 1992). Ilika and Hoffman (1981) reported interrater reliability correlations to be significant at $p<0.001$.

The Allen Cognitive Level Battery (ACL) is used to obtain a quick measure of global cognitive processing abilities, learning potential, and performance abilities. It is also used to detect unrecognized or suspected problems related to functional cognition. "Functional cognition" encompasses functional performance abilities and global cognitive processing capacities. It incorporates the complex, dynamic interplay between 1) a person's information processing abilities, occupational performance skills, values and interests, 2) the increasingly complex motor, perceptual and cognitive

activity demands of three graded visual-motor tasks and 3) feedback from performance of these tasks in context. The ACL consists of 3 visual-motor tasks with increasingly complex activity demands. Completion of the 3 tasks requires that the person attend to, understand, and use sensory & motor cues from material objects, verbal & demonstrated instructions or cues, and feedback from motor actions. There are 3 versions- the standard ACL, the ACL for persons with vision or hand function problems and the disposable ACL for persons with whom infection control is required. (Allen et al., 2007). In several studies, various versions of the ACL have demonstrated high interrater reliability (r=.98-.99) (Henry, Moore, Quinlivan, & Triggs, 1998).

Therapeutic Recreation Assessment and Treatment

Therapeutic Recreation (or Recreational Therapy; TR/RT) is a systematic process that utilizes recreation and other activity-based interventions to address the assessed needs of individuals with illnesses and/or disabling conditions, as a means to psychological and physical health, recovery, and wellbeing. It is a treatment service designed to restore, remediate, and rehabilitate a person's level of functioning and independence in life activities, to promote health and wellness, and reduce or eliminate the activity limitations or restrictions to participation in life situations caused by an illness or disabling condition (American Therapeutic Recreation Association, n.d.). For individuals with brain injury, TR primarily seeks to improve physical skills, such as fine and gross motor abilities, or cognitive skills, such as task sequencing, immediate or delayed memory, and attention (Special Tree Rehabilitation Service,

n.d.). TR assists in community integration by educating and practicing community skills through the use of community outings and provision of community leisure resources. TR also provides education about activity adaptation, whether to the game play or rules, or through the use of adaptive equipment. While engaging in therapeutic activities, TR also seeks to improve overall quality of life for people with disabilities (Gassaway et al., 2011).

The Idyll Arbor Leisure Battery (IALB) is a combination of four separate assessments that, when used as a whole, provide the therapist with a broad, accurate measure of an individual's leisure aptitudes (Bowtell, 1993). Its four subscales are the Leisure Attitude Measure, the Leisure Interest Measure, the Leisure Motivation Scale, and the Leisure Satisfaction Measure.

The Leisure Attitude Measure (LAM) reviews the client's attitude toward leisure on three different levels: affective, cognitive, and behavioral. It can be used to find one or more areas that are preventing the client from participating actively in leisure activities (Idyll Arbor, 1993). The cognitive component was designed to reflect the basic beliefs of the respondent about the properties of leisure. The affective component generally reflects the respondent's liking or disliking of leisure activities. The behavioral component addresses past and current participation and intentions towards leisure choices. Each of the 36 questions are scored based on a Likert scale of 1 "Never True," to 5 "Always True." Questions in each of the 3 categories are totaled and then divided by 12 to reveal an overall score for each section. Scores of 2.5 or less indicate a need for education or adjustment to allow the participant maximal progress

in their treatment goals. Pilot studies and subsequent revisions were made to the LAM until the current form was created. The alpha reliability coefficient for the total scale in able-bodied adults was .94. Testing was also done on the reliability of each component separately. The affective component proved to be the most reliable, with the behavioral component the lowest (but still good). The alpha reliabilities ranged from 0.89-0.93 (Ragheb & Beard, 1982).

The Leisure Interest Measure (LIM) helps identify the degree to which a client is interested in each of the 8 domains of leisure activities: physical, outdoor, mechanical, artistic, service, social, cultural, and reading. It can be used to point out areas where the therapist can provide education to make more domains of leisure activity interesting (Idyll Arbor, 1993). Each of the 29 statements are scored using a Likert scale ranging from 1 "Never True," to 5 "Always True." The questions for each domain are scored and then divided by 4 to reveal an overall score for that domain. Scores of 2 or less indicate low interest and a possible need for education. Low scores in all areas point to a definite need for education to develop interest in one or more areas of leisure activities. High scores in all areas may indicate a tendency toward mania, reading comprehension difficulties, or other problems. An alpha internal consistency reliability coefficient for all 29 items was .87, indicating that that this assessment tool could be depended upon to measure actual differences in leisure interests between individuals. The alpha coefficient for the subscales ranged from 0.75-0.93. The score achieved may be counted on to measure both the intensity and breadth of leisure interests. The internal consistency of items within each domain was acceptable, with

the artistic domain being the weakest. Pearson correlation coefficients were used to evaluate the degree to which domains interrelated with each other. The subscale scores from the social domain suggested that there is a social element in many, or perhaps most, leisure activities. According to the authors, only initial normative data have been reported, and further research is needed to confirm the initial normative trends (Ragheb & Beard, 1982).

The Leisure Motivation Scale (LMS) measures a client's motivation for participating in leisure activities. The authors identified 4 primary motivators: intellectual, social, competence-mastery, and stimulus-avoidance. This assessment aids in identifying what components of leisure activities need to be present for the client to be motivated to participate (Idyll Arbor, 1993). The intellectual component includes substantial mental activities such as learning, exploring, discovering, creating, or imagining. The social component includes the two basic needs of interpersonal relationships and the esteem of others. The competence-mastery component assesses the extent to which individuals engage in leisure activities in order to achieve, master, challenge, and compete. The stimulus-avoidance component assesses the drive to escape and get away from overstimulating life situations. Each of the 48 statements are rated using a Likert scale ranging from 1 "Never True," to 5 "Always True." The statements for each component are totaled and ranked from highest to lowest. The component with the highest score indicates the primary motivating force in the patient's leisure activities. The lowest scores indicate the least motivating, and a very low score indicates that those kinds of motivators may actually cause the person to

avoid the leisure activity. The authors (1983) state that a total score for all 48 statements does not have any clear meaning, and that the sub-scores should not be combined for a total score. In able-bodied adults the alpha coefficients for the subscales ranged from 0.89-0.91 (Ragheb & Beard, 1983).

The Leisure Satisfaction Measure (LSM) indicates the degree to which a client perceives that their general needs are being met through leisure. There are 6 subscales of satisfaction measured: psychological, educational, social, relaxation, physiological, and aesthetic (Beard & Ragheb, 1980). The psychological subscale includes sense of freedom, enjoyment, involvement, and intellectual challenge. The educational subscale includes intellectual stimulation and learning about self and their surroundings. The Social subscale includes rewarding relationships with other people. The relaxation subscale includes relief from daily stress. The physiological subscale includes means to develop physical fitness, staying healthy, controlling weight, and otherwise promote wellbeing. The aesthetic subscale indicates the degree to which the person derives satisfaction from the areas where they engage in their leisure activities (Idyll Arbor, 1993). Each of the 24 statements are scored using a Likert scale ranging from 1 “Almost Never True,” to 5 “Almost Always True.” Questions for each subscale are totaled and divided by 4 to reveal an overall score for that section. Subscales with higher scores indicate the areas the client finds the most satisfying about their leisure; lower scores indicate less satisfaction. A score of 2 or less in a section indicates a need for education and opportunities to increase satisfaction. It is important to determine if the low score is having negative impact on the client’s ability

to make progress in treatment. Overall the LSM received good face validity during field testing. Factor analysis was completed on the tool as a whole and each individual subtest to test for the degree of intercorrelation between subscales. These analyses showed that the psychological, educational, social, and environmental subscale were clearly defined. The other two subscales (relaxation and physiological) were less clearly defined but still within an acceptable range. The alpha coefficient for the LSM is .93 and ranges from 0.80-0.93 for the subscales (Beard & Ragheb, 1980).

Based on the literature, it is clear that more research is needed to assess the outcomes for those who participate in long-term, post-acute ABI rehabilitation, with an intensive focus on physical, cognitive, psychosocial, and emotional interventions. Since few programs of this nature currently exist, studying existing outcome data of the ESH Long-Term Care facility is crucial for this and future facilities that seek to treat these complex and underserved individuals.

III. Methodology

Participants

The study sample consisted of participants ("Residents") previously discharged from the Eastern State Hospital Acquired Brain Injury Program. Of the 22 discharges to date, not all residents had admission and/or discharge evaluation available given sensory difficulties or unwillingness to participate in the evaluation process. Residents who precipitously discharged Against Medical Advice (AMA) were also not concluded in this study. Thus, only those individuals with available information will be reviewed as part of the study. Fifteen residents with available admission and discharge data were selected for analysis. Residents were admitted using the following admission criteria: 1) having sustained a traumatic or other acquired brain injury, 2) having been diagnosed with a mental illness (the illness may have been present prior to the brain injury, or may have arisen or worsened as a direct result of the brain injury- however this primary diagnosis cannot be substance abuse), 3) scored a Ranchos Los Amigos Scale of Level 5 or higher, 4) passed the federally mandated Pre-Admission Screening and Resident Review (PASRR) to ensure appropriate placement, 5) be over the age of 18, and 6) documentation must have ensured that this is the least restrictive environment (usually meaning that they had failed other outpatient rehabilitation programs). Potential residents' ability to meet these criteria was determined by an admission application, face-to-face visit, and review of available information by admissions committee. Data collection was only planned for program evaluation, and thus this was not a prospective research study. Approval from the University of

Kentucky Institutional Review Board for retrospective analysis was obtained prior to data acquisition. Residents were evaluated upon admission to the program by all therapeutic services, which includes both objective, standardized measures and self-report or clinician-report questionnaires. Data was de-identified by the unit psychologist and analyzed by the authors.

The goal of the study was to explore the impact of rehabilitation participation on several variables that subsequently impact community reintegration, including cognitive functioning, psychiatric symptom burden, community roles/barriers, and satisfaction with life. Researchers explored previously conducted assessments in order to better understand the impact of rehabilitation on community reintegration, and will make recommendations for future improvements to the program based on literature review and current practices.

Assessment Measures

Assessments were used to determine appropriateness for individual therapy caseload, determine target areas and treatment interventions, or track change over time. These assessments were already in place prior to the beginning of this study, hence the retrospective analysis of the study.

The Awareness Questionnaire *(*Sherer, Boake, Levin, Silver, Ringholz, & High, 1998; AQ) was administered at admission to the resident and to a family member/guardian (provided the guardian knew the resident well prior to injury) and then periodically thereafter to observe changes in awareness for the resident. A score

difference of 20 points or more was considered clinically significant when compared to pre-injury functioning.

The Beck Anxiety Inventory (Beck, 1993; BAI) was administered periodically to assess frequency and severity of symptoms of anxiety. Scores falling in the “Moderate” to “Severe” range were considered clinically significant and impairing to progress.

The Beck Depression Inventory-II (Beck, Steer & Brown, 1996; BDI-II) was administered to assess frequency and severity of depression symptoms. Scores falling in the “Moderate” to “Severe” range were considered clinically significant.

The Idyll Arbor Leisure Battery (Ragheb & Beard, 1980; IALB) was administered to residents referred to Therapeutic Recreation (TR/RT) for individual caseload as a basic screening tool to understand current leisure interests, awareness, motivation, and satisfaction. On the Leisure Attitude Measure, any score less than 2.5 in any of the three domains was considered significant and indicated a need for education about the need for leisure and the importance of leisure related to quality of life. On the Leisure Interest Measure, scores of 4 or more in any of the eight domains indicated a high degree of interest, scores of 2-3.75 indicated a moderate interest with a need for education and instruction to develop interest and competence, and scores of less than 2 indicated low interest with a high need for education. On the Leisure Satisfaction Measure, scores of 4 or more in any of the six domains indicated high satisfaction, scores of 2-3.75 indicated the need for education and opportunities to increase satisfaction, and scores less than 2 indicated low satisfaction. Low scores were closely examined to see if that leisure component was having a negative impact on the

resident's ability to make progress in treatment. On the Leisure Motivation Scale, four domains were ranked, and the highest scores were identified as the primary motivating forces, and lower scores were identified as the least motivating forces. Very low scores indicated that the resident may intentionally avoid activities in that domain, but high Stimulus-Avoidance scores were compared to other assessment scores to determine possible patterns in coping methods. Low scores in multiple domains across the assessments indicated poor overall leisure functioning, with possible relationships to depression, anxiety, and apathy levels. The IALB was used in conjunction with the CERT-PD to determine appropriateness for TR individual therapy and to identify deficits related to leisure functioning.

The Mayo-Portland Adaptability Inventory, Fourth Edition (Malec, 2008; MPAI-4_ is a self-report measure of post-acute rehabilitation outcomes. There are 29 questions measuring three functional domains: Abilities (including use of hands, verbal and nonverbal communication, novel-problem solving), Adjustment (including anxiety, irritability, inappropriate social interactions), and Participation (including social contact, leisure and recreational activities, employment). In this setting, scores greater than 50 were considered clinically significant and each section with a score over 50 was considered a needed area of focus and above-average "problem area" when compared to other individuals with a brain injury. Scores were examined each month by the treatment team to identify areas that were new problems, resolved problems, and to examine overall score trends. The goal is to have fewer problem areas each month, as evidenced by lower scores over time.

The Patient Competency Rating Scale (Prigatano, 1986; PCRS) was given upon admission and then periodically across the course of treatment to address the residents' level of insight regarding his or her level of functional disability. Scores greater than 51 indicated severely impaired self-awareness.

The Repeatable Battery for the Assessment of Neuropsychological Status-Update (Randolph, 2012; RBANS) was used to track cognitive changes over the course of rehabilitation. Mean score on the RBANS is 100 with a standard deviation of 50. Sub-tests include Immediate Memory (list learning, story memory), Visuospatial/Constructional (figure copy, line orientation), Language (picture naming, semantic fluency), Attention (digit span, coding), and (Delayed Memory (list recall and recognition, story recall and recognition, story recall, figure recall). In this setting, RBANS Index scores less than 80 (two standard deviations below the mean) were considered clinically significant, and subtest scores less than 6 were considered clinically significant. Multiple formats were used to reduce test-retest effects after repeated administrations, and all residents were tested with at least two forms.

The Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; SWLS) was administered to examine changes in satisfaction with life and assisted in decision-making regarding medical care and therapy goals. Five statements were asked, with residents rating each score a Likert score of 1-7. Scores of 5-9 were considered "Extremely dissatisfied," scores of 10-14 were considered "Dissatisfied," scores of 15-19 were considered "Slightly below average life satisfaction," scores of 20-24 were considered "Average life satisfaction," scores of 25-29 indicated "High satisfaction,"

and scores of 30-35 were considered “very highly satisfied with life.” Scores falling in the “Extremely Dissatisfied” range were considered clinically significant. Scores in the “Dissatisfied” range, while not being considered clinically significant, were still considered impairing to recovery.

Assessment Procedures

Psychology, Speech Therapy, Occupational Therapy, Recreational Therapy, and Physical Therapy conducted discipline-specific assessments on each resident as they were admitted to the facility. Initial testing was completed over the first few weeks of residency in the program, with breaks taken as needed to reduce cognitive fatigue. Most testing was done on the ABI unit, however, some assessments were conducted off-unit when requiring specific equipment, such as kitchen/home safety assessments and physical therapy assessments. Many of these assessments were done to determine whether the resident met criteria for individual treatment from each discipline. Time between assessment re-administration varied based on the individual test, but most were done about every 1-3 months to assess progress, or when the Minimum Data Set (MDS) registered a “significant change” in the resident. If the resident was able to complete testing on their own, the tests were given either orally or on paper (with the exception of physical therapy). If the resident was unable to tolerate testing due to the nature of their injury, the guardian or close family members were contacted to give as much pertinent information as possible relating to the test questions. Over the course of treatment, therapists could decide to re-attempt testing

that had previously been unattainable due to cognition or refusals by the resident. Discharge data were collected as close to the actual discharge date as possible.

These scores reflect clinically significant changes over a variety of domains, resulting in functional improvements and lasting change. These changes are averaged across the residents, with significant variability. Statistical significance may be difficult to determine due to the small sample size.

Therapeutic Plan and Treatment

After initial assessment, each therapy discipline created a treatment plan for each resident. These treatment plans included goals and objectives for group therapy, individual therapy sessions, or a combination. These were updated monthly by each discipline, and updates were given to the resident and their family or guardian at quarterly care plan meetings. Residents and/or their guardian had the right to request information regarding their care at any time.

A therapist may decide that only group intervention was necessary and create goals for group engagement. Residents could be re-assessed at any time and placed on individual caseload after events such medication stabilization, significant behavior change, or other functional change. Individual therapy sessions occurred on a frequency determined by the therapist, and may have increased or decreased over time based on resident progress. Each session was spent using therapeutic interventions to target goals collaborative created by the resident and therapist. Therapy staff completed documentation for all group and individual therapy sessions,

noting progress towards goals as well as current barriers or status changes. As goals were achieved, the therapist created and documented new goals for the resident. The combination of therapist documentation with testing scores determined the resident's progress in community reintegration goal achievement.

Psychology facilitated several groups throughout the day. These groups included goal setting, daily exercise, mindfulness, sleep hygiene, cognitive activities, and education about brain functioning. They also provided individual psychotherapy sessions to residents to treat their mental illnesses and overcome barriers to successful community reintegration. In this setting, Social Work was also able to provide individual psychotherapy sessions to residents.

Speech therapy combined individual and group therapy sessions to target specific cognitive skills. Groups aimed to improve receptive and expressive language skills, skills relating to thought process and task execution, social skills, computer skills, and reading ability and comprehension. Individual sessions occurred about three times per week, and targeted cognitive deficits covering a variety of skills including mood regulation, attention, memory, language formation and comprehension, swallowing, and communication skills.

Occupational therapy facilitated three groups: a lower functioning snack preparation group, a higher-functioning meal preparation group, and a sensory intervention group. After individual assessment, residents were placed in the appropriate cooking group. Most residents began in the snack prep group, which required 1-3 step task completion, and then were moved to the meal prep group,

which required 4-7 step task completion. A sensory diet was developed for each resident, and each week a different activity was conducted to meet sensory needs and improve reception of sensory input.

Recreational therapy facilitated four groups per week. Three groups focused on targeting common skill areas such as attention, language skills, motor skills, and community living skills. One group each week comprised of gym time, with each resident participating in physical activity related to their skill level. Individual sessions focused on leisure education, community resources, individual physical or cognitive deficits, coping skills, and emotional regulation.

Residents who planned to live in the community, even in supported living communities, learned necessary skills such as public transportation navigation and how to locate resources. They also received ample community resources to match their needs and interests. Through skilled therapy sessions, they learned life skills such as time management, money management, cooking and other household tasks, memory strategies, and communication skills. These skills were targeted by all therapies via a transdisciplinary process, and focus areas were identified through global assessments such as the MPAI-4 and individual therapist assessment.

Residents had one to two opportunities each week to practice community living skills based on collaborative individual goals. The first outing was a weekly grocery shopping outing with the occupational therapist. Residents were each given a list with items they needed to gather using skills such as visual scanning, energy conservation, budgeting, multi-tasking, and communication skills. They were

encouraged to be as independent as possible with this task, only asking for therapist help if necessary or being cued after using learned techniques. The second outing was a weekly multi-disciplinary therapeutic outing. These outings were planned by the recreational therapist, and residents had the opportunity to suggest potential outing locations in the monthly resident council meetings. These outings ranged from leisure activities such as movie theatres, bowling alleys, and sporting events to museums, historical attractions, volunteer opportunities, and community support services. Residents practiced therapeutic goals in the community, but were also given time to enjoy being out and have fun. Functional tasks were given and goal achievement was still the primary reason for attending outings, but in a more relaxed environment. Therapist observations were gathered from these outings and reported to the treatment team. The primary goal of residents participating in these outings while still in the Long-Term Care Facility was that, upon return to the unit, they were able to process any barriers or difficulties they experienced, and process emotions that arose during the outing such as anxiety or frustration, thus enhancing community reintegration.

Data Analysis

Available scores for each assessment were averaged together to obtain the mean overall change during rehabilitation, as well as individual change over time. Scores will also be examined in comparison to length of stay, number of outings attended, date of injury, and other variables to explore their impact on community

reintegration. Since most day-to-day clinical information is obtained from therapy documentation, narrative analysis is also used to describe outcomes. The goal of this analysis is to understand how this small, unique program rehabilitates residents with their brain injury and psychiatric symptoms to be able to transition to a lower level of care.

IV. Results

Sampling- Residents

The study group consisted of 15 residents who sustained either a severe traumatic brain injury (n= 9, 60%), an anoxic injury (n= 3, 20%) or stroke (n= 3, 20%). Participants were predominantly male (n= 13, 87%) and Caucasian (n= 10, 67%). The demographic makeup of this sample was consistent with ABI population trends (Geene, Kernic, Vavilala, & Rivara, 2018). The average age was 36 years old (SD= 4.95), the average number of years of education was 13 (SD= 1.414), and 53% (n= 8) were unemployed prior to injury. The average time from date of injury to the data collection cutoff date was 37 months.

Table 1 represents the diagnostic information of the residents included in this study. All residents were diagnosed with a psychiatric disorder in order to meet admissions criteria. A large proportion of residents had a diagnosis of Major Depressive Disorder (n= 5, 33.3%). Other psychiatric diagnoses (66.7%) included Bipolar Disorder (n= 1), Generalized Anxiety Disorder (n= 1), Factitious Disorder (n= 1), Mood Disorder Not Otherwise Specified (n= 4), Depression Not Otherwise Specified (n= 2), Personality Change Secondary to Brain Injury, (n= 1) and Adjustment Disorder (n= 1). Thirteen residents (87%) had a history of substance abuse prior to injury. Due to the residential nature of the program, 0 residents were known to abuse drugs or alcohol immediately following discharge. Three (20%) residents did not have a medical diagnosis beyond their brain injury. One resident (7%) had Hydrocephalus, two (13%)

had a seizure disorder, three (20%) had thyroid issues, and six (40%) had multiple comorbid medical diagnoses.

Table 1. Psychiatric Diagnosis and Brain Injury Type by Race and Gender

		Gender		Race	
		Female	Male	Caucasian	African American
Primary Psychiatric Diagnosis	Major Depressive Disorder	1	4	4	1
	Bipolar Disorder	0	1	0	1
	Schizophrenia/ Schizoaffective Disorder	0	0	0	0
	Generalized Anxiety Disorder	0	1	1	0
	Other	1	7	5	3
Injury Type	TBI	2	7	6	3
	Anoxia	0	3	1	2
	Stroke	0	3	3	0

The average length of stay for successful discharges was 206 days, with a range of 49-481 days (SD=133.62). Nine (60%) residents discharged to their home or other independent living, three (20%) discharged to a post-acute brain injury residential program, and three (20) discharged to locations such as personal care homes or halfway houses. Fourteen (93%) residents had family support throughout treatment and discharge, however it is important to note that the “family support” was usually one or two people, and most of those relationships had a history of significant conflict. All residents (100%) were able to engage in meaningful activities at discharge, regardless of functional level. No (0%) residents were employed at discharge, also due to the residential nature of the program as well as severity of functional deficits. All 15 residents were considered “disabled” at the time of discharge, meaning that Social Security Disability Insurance (SSDI) was their primary form of income.

Score Change for Assessments

Repeatable Battery for the Assessment of Neuropsychological Status- Update (n=13; Figure 1) scores showed an average increase of 13.3 points for Immediate Memory, 5.6 points for Visuospatial/Construction, 10.9 points for Language, 8.4 points for Attention, and 10.2 points for Delayed Memory, for a total average of 10.91 points increase. These scores are standard scores based on a mean of 100 and SD of 15; thus, on average, residents improved in nearly all cognitive domains by .75 SD

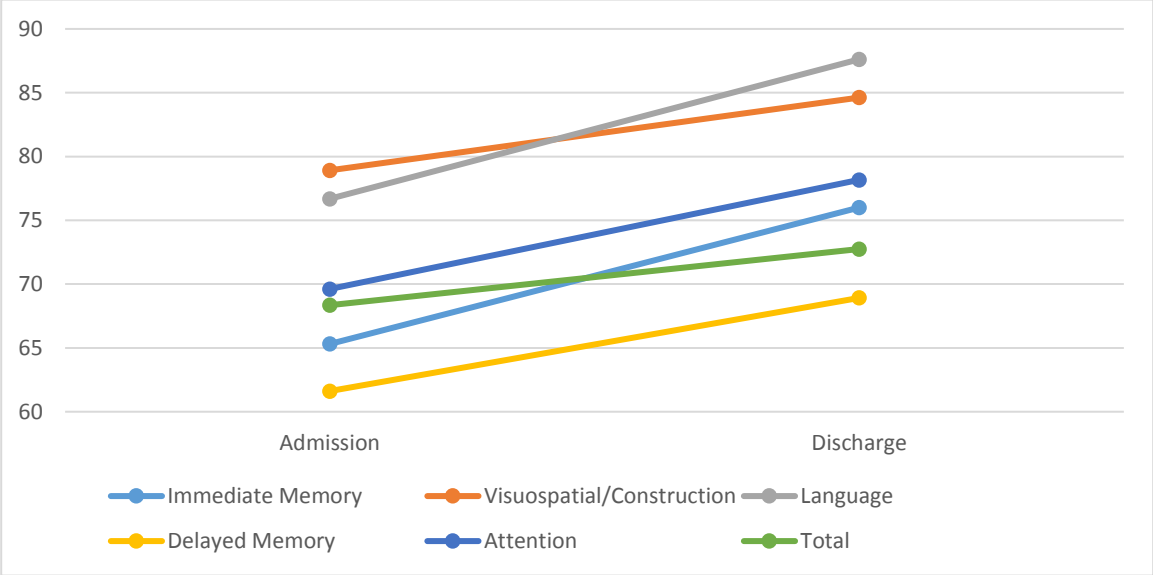

Figure 1. RBANS Average Standard Score Changes

Mayo-Portland Adaptability Inventory- 4th Edition (n=7; Figure 2) scores showed an average overall decrease of -7.71 points. The Participation index scores showed an average decrease of -3.14 points, the Adjustment index showed an average decrease of -9.43 points, and the Ability index showed an average decrease of -12.29

points. Scores are T scores, with a mean of 50 and SD of 10. On the MPAI, decreasing scores indicate a decrease in the severity of brain injury symptom burden, and are thus desirable.

Figure 2. MPAI-4 Average T Score Changes

Beck Depression Inventory-II (n=8; Figure 3) scores showed an average change of -16.37 points, and BAI (n=6) scores showed an average change of -7.16 points. In these two scenarios, decreasing scores indicate a decrease in symptoms of depression and anxiety. Satisfaction with Life (n=8) scores showed an average change of .57 points. PCRS (n=7; Figure 4) scores showed an average change of 1.77 points, and AQ (n=6) scores showed an average change of .99 points.

Figure 3. BDI-2, BAI, and SWLS Average Score Changes

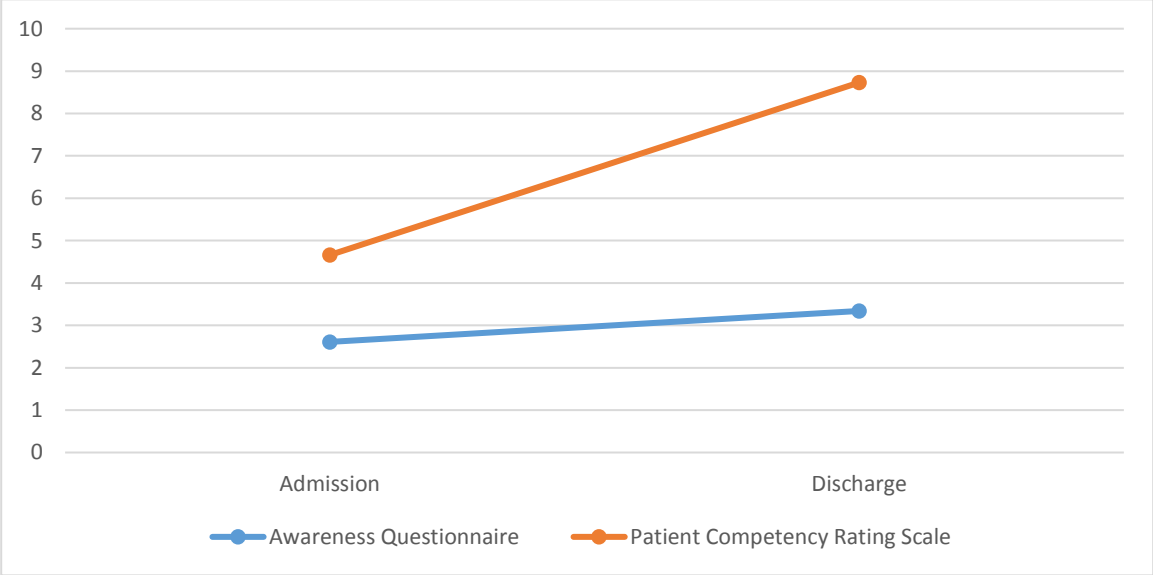

Figure 4. AQ and PCRS Average Score Changes

Leisure Interest Measure (n=2; Figure 5) scores showed an average change of .63 points for Physical, .38 points for Outdoor, -.25 points for Mechanical, -.50 points

for Artistic, .50 points for Service, .38 points for Social, 0 points for Reading, and 0 points for Cultural. Leisure Attitude Measure (n=2; Figure 6) scores showed an average increase of .59 points for Cognitive, .74 points for Affective, and .84 points for Behavioral, with a total average increase of 2.15 points. Leisure Motivation Scale (n=2; Figure 7) scores showed an average change of -2 points for Intellectual, 3 points for Social, -3.5 points for Competence-Mastery, and 10 points for Stimulus-Avoidance. Leisure Satisfaction Measure (n=2; Figure 8) scores showed an average change of .63 points for Psychological, 1.13 points for Educational, -.63 points for Social, -.13 points for Relaxation, .38 points for Physical, and .75 points for Aesthetics. The above scores only reflect data available at admission and discharge, however, and does not account for residents unable or unwilling to complete full testing.

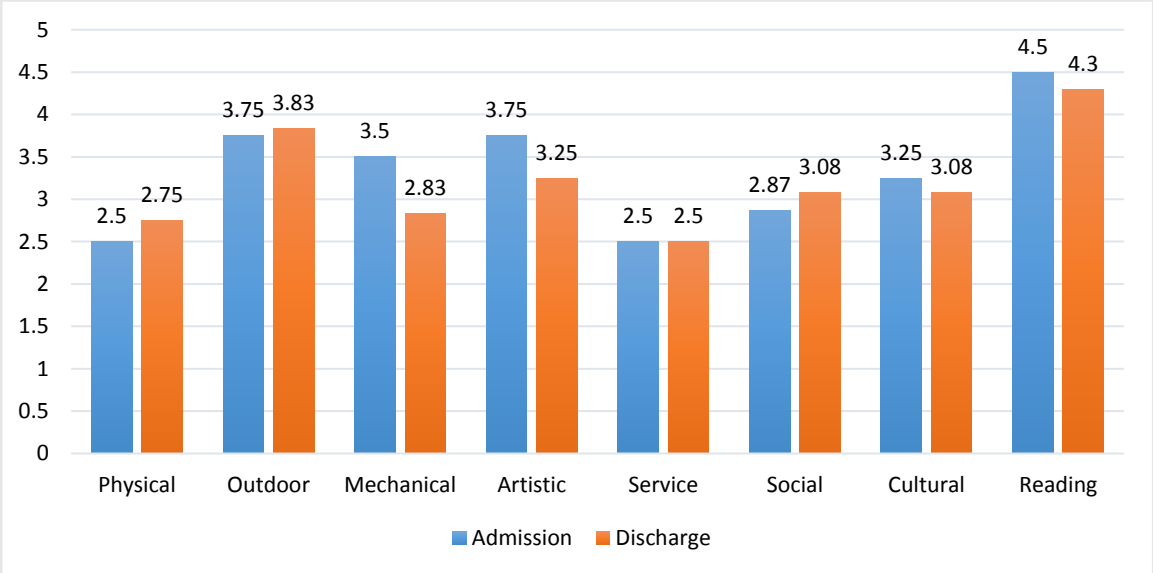

Figure 5. Leisure Interest Measure Average Score Changes

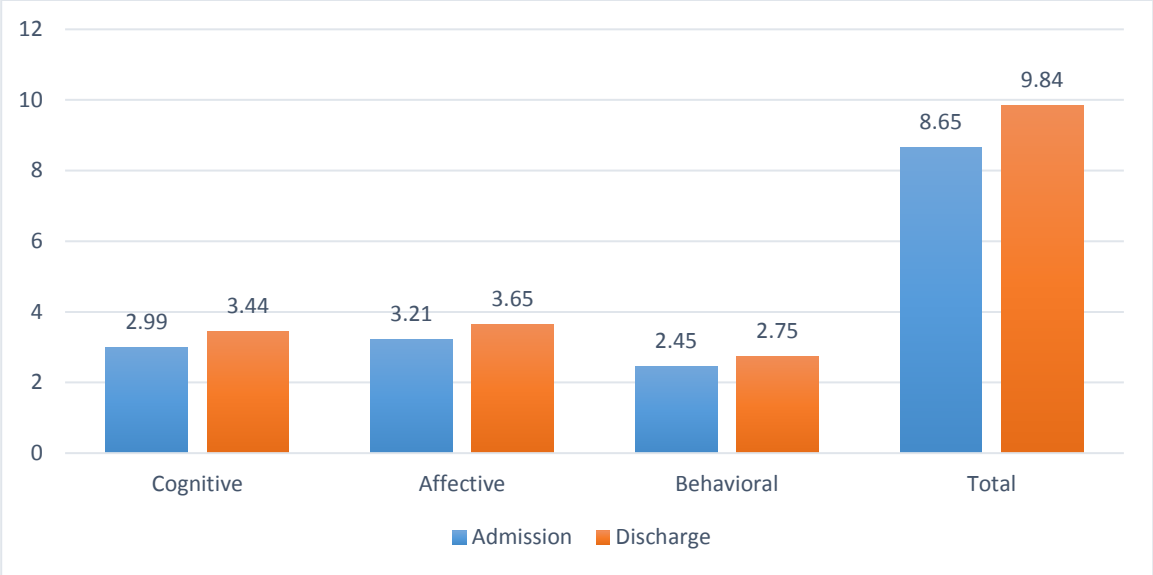

Figure 6. Leisure Attitude Measure Average Score Changes

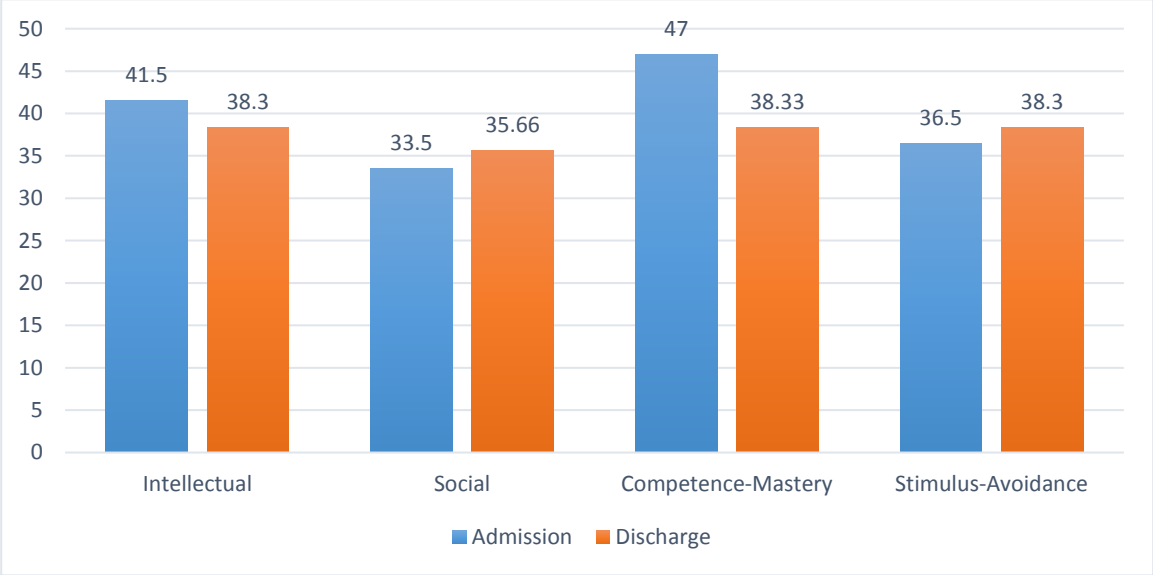

Figure 7. Leisure Motivation Scale Average Score Changes

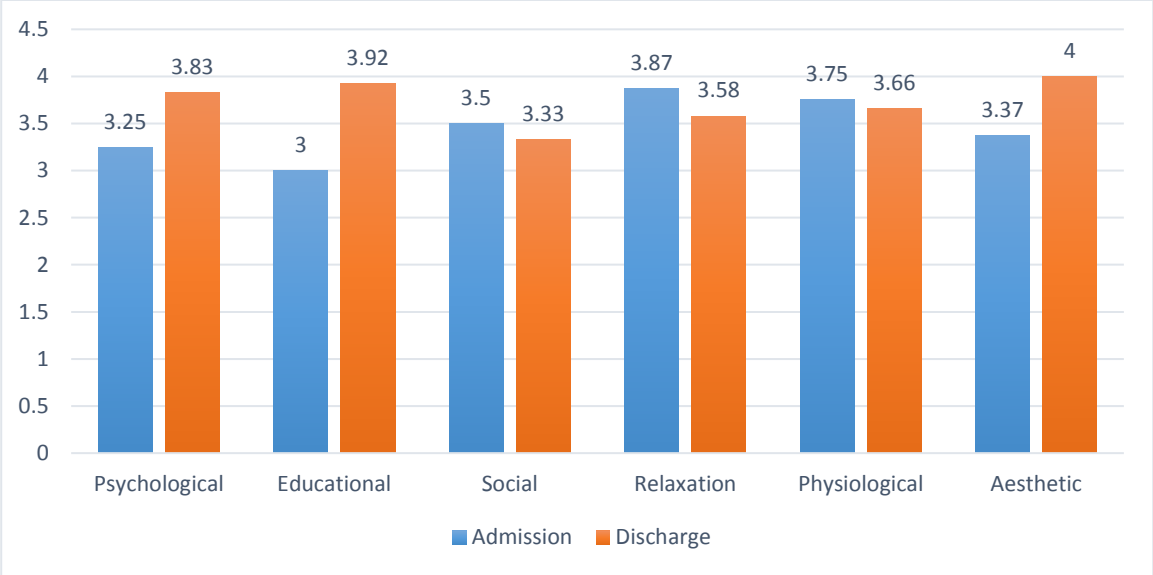

Figure 8. Leisure Satisfaction Measure Average Score Changes

Statistical Analyses

ANCOVA (Table 2) was calculated to determine the effect of injury type on MPAI-4 total T scores and all subscale T scores at discharge, after controlling for admission scores. Using adjusted means, there were no significant differences present between injury groups at discharge for the Total MPAI-4 (F= .040, *p*= .961, partial η^2= .020), Ability Index (F= 1.036, *p*= .434, partial η^2= .341), Adjustment Index (*F*= .111, *p*= .898, partial η^2= .052) and the Participation Index (*F*= 1.837, *p*= .272, partial η^2= .479), likely due to the small sample size.

Another ANCOVA was calculated to determine the effect of psychiatric diagnosis on MPAI-4 total T scores and all subscale T scores at discharge, after controlling for admission scores. Using adjusted means, there was a statistically significant difference between psychiatric diagnoses for the Total MPAI-4 (F= 9.447, *p*= .031, partial η^2= .825). There were no significant differences between psychiatric

diagnoses at discharge for the Participation Index (F= .912, *p*= .472, partial η^2= .313), the Ability Index (F= .114, *p*= .895, partial η^2= .054), or the Adjustment Index (F= 6.430, *p*= .056, partial η^2= .763), though the Adjustment Index differences may be clinically significant, and are likely driving the significant difference found within the total MPAI-4 score.

Table 2. One-Way Analysis of Covariance of MPAI-4 Discharge scores by Psychiatric Diagnosis and Brain Injury Type

	Psychiatric Diagnosis			Brain Injury Type		
	F	*p*	partial η^2	F	*P*	partial η^2
Total T Score	9.447	.031	.825	.040	.961	.020
Ability Index T Score	.114	.895	.054	1.036	.434	.341
Adjustment T Score	6.430	.056	.763	.111	.898	.052
Participation T Score	.912	.472	.313	1.837	.272	.479

Correlation tests (Table 3) were used to determine the strength of association, if any, between scores for assessments as well as demographic variables such as injury type and length of stay at ESH. AQ change scores were negatively associated with change in SWLS scores (*r*(5)= -.748, *p*= .146). However, AQ score changes did not significantly predict SWLS score changes (*F*(1,3)=3.815, *p*= .146). AQ change scores were significantly correlated with RBANS Delayed Memory change scores (*r*(5)= .938, *p*= .018). RBANS Attention change scores were most significantly correlated with MPAI Adjustment score changes, (*r*(6)= -.842, *p*= .036); RBANS Attention change scores also

statistically significantly predicted MPAI Adjustment change scores ($F(1,4)= 9.722$, $p= .036$). MPAI-4 Participation Index score changes were significantly correlated with SWLS score changes ($r(6)= .972$, $p= < .005$), PCRS change scores ($r(7)= -.804$, $p= .029$). BAI scores significantly correlated with RBANS Visuospatial/Constructional change scores ($r(6)= .825$, $p= .043$), and RBANS Visuospatial/Constructional change scores were able to statistically significantly predict BAI change scores ($F(1,4)= 8.511$, $p= .043$). PCRS change scores significantly correlated with length of stay ($r(7)= .769$, $p= .044$l); length of stay also statistically significantly predicted PCRS change scores ($F(1,5)= 7.215$, $p= .044$).

Table 3. Correlations Between Psychological Assessments

	Length of Stay in days at ESH	BAI Change	SWL Change	PCRS Change	AQ Change	MPAI Adjustment Change	MPAI Participation Change	RBANS VC Change	RBANS DM Change	RBANS A Change
Length of Stay in days at ESH	1									
BAI Change	.416	1								
SWL Change	-.320	-.621	1							
PCRS Change	.769*	-.073	-.710	1						
AQ Change	-.041	.898	-.748	-.245	1					
MPAI Adjustment Change	.470	.020	.162	-.032	-.154	1				
MPAI Participation Change	-.407	-.887	.477	-.804*	-.070	.057	1			
RBANS VC Change	.291	.825*	.021	-.204	.383	.212	-.069	1		
RBANS DM Change	.265	.827	.221	-.403	.938*	.199	.437	.781**	1	
RBANS A Change	-.282	-.659	-.207	.579	-.204	-.842*	-.223	.064	-.216	1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Although not statistically significant (Table 4), MPAI-4 Adjustment change scores strongly correlated with RBANS Immediate Memory change scores ($r(6)= .706$, $p= .117$), and BDI change scores ($r(3)= .747$, $p= .174$). AQ change scores were strongly correlated with RBANS Total change scores ($r(5)= .858$, $p= .063$). MPAI-4 Participation change scores were strongly associated with BAI change scores ($r(4)= -.887$, $p= .113$). MPAI-4 Ability Index change scores most strongly correlated with with BDI change scores ($r(5)= .629$, $p= .255$) and RBANS Delayed Memory change scores ($r(6)= -.582$, $p= .226$). MPAI Total change scores were most strongly associated with RBANS Immediate Memory change scores ($r(6)= .703$, $p= .12$), RBANS Attention change scores ($r(6)= -.64$, $p= .171$), and BDI change scores ($r(5)= .787$, $p= .114$). BAI scores strongly correlated with RBANS Delayed Memory scores ($r(5)=.827$, $p= .084$). PCRS change scores strongly correlated with SWLS change scores ($r(6)= -.71$, $p= .114$).

Correlations for the Idyll Arbor Leisure Battery were not able to be run due to the small sample size (n= 2).

Table 4. Pearson Correlations of Psychological Assessments

	BAI Change	SWL Change	PCRS Change	AQ Change	MPAI Adjustment Change	MPAI Participation Change	RBANS DM Change	RBANS A Change	BDI Change	MPAI Ability Change	MPAI Total Change
BAI change	1										
SWL change	-.621	1									
PCRS Change	-.073	-.710	1								
AQ Change	.898	-.748	-.245	1							
MPAI Adjustment Change	.020	.162	-.032	-.154	1						
MPAI Participation Change	-.887	.477	-.804*	-.070	.057	1					
RBANS DM Change	.827	.221	-.403	.938*	.199	.437	1				
RBANS A Change	-.659	-.207	.579	-.204	-.842*	-.223	-.216	1			
BDI Change	.266	-.124	.198	-.128	.747	.070	-.216	.138	1		
MPAI Ability change	-.363	.342	.326	-.514	.621	-.037	-.582	.419	.629	1	
MPAI Total change	-.063	.044	.025	-.429	.896**	.188	-.237	-.640	.787	.652	1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

One-way ANOVA (Table 5) was conducted to determine if assessment change scores were significantly different between psychiatric diagnoses and between injury types. MPAI Adjustment Index change scores were classified into three psychiatric diagnosis groups: Major Depressive Disorder (n=2), Bipolar Disorder (n=1), and Other (n=5). There was greater change with Major Depressive Disorder (M= -20.500, SD= 12.021) than with Other (M= -9.200, SD= 3.271), with no changes for Bipolar Disorder (M= 12.000) due to sample size. Differences between the diagnoses were statistically significant, $F(2,5)= 9.404$, $p=.020$. Similarly, MPAI Total change scores were greater for Major Depressive Disorder (M= -11.000, SD= 4.243) than for Other (M= -8.400, SD= 1.949), to, with no changes for Bipolar Disorder (M= -1.000) due to the sample size.

Differences between the diagnoses were not statistically significant ($F(2,5)= 5.096$), $p= .062$, but may be clinically significant.

Table 5. One-Way Analysis of Variance of Change Scores by Psychiatric Diagnosis

	Sum of Squares	df	Mean Square	F	Sig
MPAI-4 Adjustment Index Change Score	704.575	2	352.288	9.404	.020
MPAI-4 Total T Change Score	67.675	2	60.188	.859	.478

SWLS change scores (Table 6) were classified into three psychiatric diagnosis groups: Major Depressive Disorder (n=2), Generalized Anxiety Disorder (n=1), and Other (n=5). Score changes increased from Major Depressive Disorder (M= -2.700, SD= 1.556), to Other (M= 2.480, SD= 1.901), with no changes for Generalized Anxiety Disorder (M= 1.600) due to sample size. Differences between the diagnoses were not statistically significant ($F(3,5)= 3.920$, $p= .088$), but may be clinically significant. For brain injury type, SWLS scores were classified into three groups: TBI (n=5), Anoxia (n=1), and Stroke (n= 3). Score changes increased from TBI (M= .840, SD= 2.317) to Stroke (M=2.733, SD= 1.206), with no changes for Anoxia due to sample size. Differences between injury type groups for SWLS change scores were not statistically significant ($F(2,6)= 3.958$, $p= .080$), but may be clinically significant.

Table 6. One-Way Analysis of Variance of Satisfaction with Life Change Scores by Psychiatric Diagnosis and Brain Injury Type

	Sum of Squares	df	Mean Square	F	Sig
Psychiatric Diagnosis	39.674	3	13.225	3.920	.088
Brain Injury Type	32.164	2	16.082	3.958	.080

V. Discussion

The MPAI-4 was used as the overall assessment driving therapeutic focus, but other assessments were used by ABI Program therapists to highlight specific needs and focus areas. The researchers examined the relationship between various assessments and the MPAI-4, and were able to identify areas of overlap. The RBANS Attention, Immediate Memory, and Delayed Memory scores all strongly correlated with MPAI-4 Adjustment scores. What is peculiar about this is the fact that the Ability Index on the MPAI-4 directly measures cognitive abilities (including, specifically, memory and attention), yet the corresponding RBANS subtests do not correlate with the Ability Index. The Adjustment Index measures anxiety, depression, irritability/anger, pain, and fatigue among other behaviors connected to mood. It is likely that residents with higher levels of frustration, anxiety, or fatigue would not do as well on cognitive tests as their peers, as these heightened emotions hinder the ability to absorb new concepts or form memories (Ashman et al., 2006).

Therapists observed that residents who displayed higher levels of anxiety, frustration, and depression were hindered by these mood symptoms in their therapies. They were unable or unwilling to focus their attention, thus their scores in domains related to attention and memory were lower. Similarly, residents displaying physical or cognitive fatigue were unable to reap full therapeutic benefit. Cognitive fatigue is common in individuals with brain injury and has been observed in the basal ganglia (primarily responsible for motor control), superior parietal cortex (involved in directing attention), and the anterior cingulate cortex (involved in emotion formation

and processing, learning, and memory) (Kohl, Wylie, Genova, Hillary, & Deluca, 2009). Therapists had to carefully plan out when to see residents who fatigued easily in order to maximize benefit and obtain the most accurate responses. Residents who were unable to maintain attention to task often displayed inappropriate behaviors, such as frequently interrupting others, getting up and leaving the table, or complaining of boredom. Inattention also hinders memory- there is no way for the brain to hold onto information if it is unable to receive it in the first place (Barman, Chatterjee, & Bhide, 2016). Memory deficits are among the most frustrating for residents of the ABI program, which can lead to increased depression symptoms or expressions of anger, both mentioned in the Adjustment Index. Since RBANS Attention scores also significantly predicted Adjustment Index scores, the researchers believe that improved attention has a strong role in reducing problematic behaviors.

MPAI-4 Adjustment Index scores correlated with BDI-2 scores, though not statistically significantly. Visual inspection of a line graph showed that smaller decreases on the BDI-2 were somewhat associated with higher scores (or smaller score changes) on the MPAI-4 Adjustment Index. However, the line chart also demonstrated that large score decreases on the BDI were also strongly associated with large score decreases on the MPAI-4, thus depression may be driving the MPAI-4 Adjustment Index scores. Although both tests measure symptoms of depression, they have two different focus areas. The BDI-2 measures the presence of symptoms, but The Adjustment Index captures how impairing the symptoms are to daily living. The BDI-2 is useful for selecting specific treatment interventions, whereas the MPAI-4 only gives

a global impairment rating. The Adjustment Index only had one question regarding depression symptoms with a rating from 0-4, while the BDI-2 had twenty-one questions, with a total score of 0-63. Considering both scores allowed for therapists to have a better understanding of the severity of residents' depression.

Similarly, the BAI had twenty-one questions that examined the severity of anxiety symptoms, whereas the Adjustment Index had one question that measured how impairing the symptoms are. At the time of discharge, no residents fell above "Moderate" level scores on the BDI-2 and BAI. Targeting these depression and anxiety ratings is crucial, as they are often the most inhibiting factors to rehabilitation potential, particularly in this setting. The BAI measures more physiological symptoms of anxiety, compared to other anxiety measures. High anxiety ratings significantly prevent interest and engagement in activities.

The researchers noted a relationship between MPAI-4 Adjustment Index scores and LMS Stimulus-Avoidance section scores. Avoidance-based coping strategies are often a result of high anxiety levels, and individuals with this kind of coping strategy tend to function worse overall compared to others. These individuals tend to have low levels of self-efficacy and distress tolerance, and will often seek ways to quickly escape from their feelings, usually in the form of substance abuse (McHugh, Reynolds, Leyro, & Otto, 2012). In this population specifically, avoidance-based coping was strongly tied to substance abuse, and residents who presented with this form of coping often stayed in their room, made frequent complaints about being too sick, tired, or anxious to engage in therapies. They were the most resistant to treatment, and often made

the slowest or least significant progress in the program. These residents also frequently presented with signs of Cluster B personality disorders. Both residents being assessed on the IALB had histories of substance abuse prior to injury.

The researchers also noted a relationship between AQ scores and SWLS scores. As AQ scores went up, SWLS scores tended to go down. While this is not desirable, it makes sense when considering the change in cognitive functioning. Residents who were unaware of the amount or severity of their deficits were less likely to be concerned with them, however as their insight improved they became aware of their limitations, thus causing their SWLS scores to fall. Self-awareness is an important construct in quality of life and satisfaction with life, and higher levels of self-awareness are associated with reports of low satisfaction with life (Goverover & Chiaravalloti, 2014). Fleming, Strong, & Ashton (1998) noted that levels of emotion and motivation intertwine with self-awareness to influence components of behavior, such as the willingness to engage in rehabilitation. While changes in these scores did not currently predict each other significantly in this study, the researchers believe based on the literature that this trend would continue if more residents' scores were examined.

The largest mean score change on the MPAI-4 was in the Ability Index. This section contains physical and language skills, which are the main targets for brain injury rehabilitation. Deficits in these areas are often targeted first, as they may pose significant barriers to progress in other areas pertinent to community functioning. Within this category, residents with TBI and Major Depressive Disorder had the largest mean changes of -13.200 points and -18.500 points, respectively. The Minimal

Clinically Important Difference (MCID) value for the MPAI-4 is 5 T score points (in either direction), and therefore change scores for both injury type and psychiatric diagnosis in all MPAI-4 indexes were clinically significant, with the exception of "Other" psychiatric diagnosis and "TBI" injury type, both on the Participation Index (Malec, Kean, & Monahan, 2017).

The Participation Index had the smallest overall change of -10.00 points and the highest mean discharge scores at 44.92 points. The Participation Index contains the most questions that are directly related to community reintegration, such as the individual's ability to hold a job, manage their money, or complete household tasks such as meal preparation or home repairs. Low scores on this index were directly related to the overall goal of the ABI program, yet remain the highest at discharge. When examining specific questions, Transportation and Employment scores remained high for all residents, as these skills are often targeted in outpatient therapy or through Vocational Rehabilitation. Occupational Therapy assists appropriate residents in learning the public bus system in Lexington, especially those that are discharging to independent or supported living. At discharge, none of the residents were able to hold a driver's license due to their disability, automatically rating them a 2 or higher for Transportation. Since all residents were considered "Disabled" at discharge and were receiving SSDI, they cannot hold a full-time job. Per the MPAI-4 instructions, anyone "Retired" or "Disabled" is automatically scored a 4 under Employment. While longer length of stay may not improve scores in this area, it is possible that an increase in the

amount of time spent in the community may contribute to more significant score changes in this domain.

PCRS, AQ, and SWLS scores all increased from admission to discharge, showing that, although some residents may have smaller score changes, in general they are showing improvements in awareness, competence, and overall life satisfaction. Awareness and overall life satisfaction are crucial when considering community living skills. Lack of awareness poses significant safety risks to the resident and those around them, and is thus a key factor when considering discharge location. Life satisfaction has been consistently associated with sense of community in general population studies (Burleigh, Farber, & Gillard, 1998). Leaving the house, socializing with others, and engaging in meaningful activities are all hindered if a person has low satisfaction with their life. They are at higher risk for social isolation, loneliness, and restricted community integration, putting them at higher risk for negative coping skills such as substance abuse (Ditchman, Keegan, Batchos, Haak, & Johnson, 2017). Level of competence aids in determining what kind of living situation is most appropriate for discharge. Residents with lower PCRS scores are going to need frequent or constant supervision for daily living tasks as well as assistance with tasks such as grocery shopping or remembering their daily schedule.

Occupational Therapy is able to assess how well someone will perform in domestic and community activities through the use of the Allen Cognitive Level Test (ACL) and the Kohlman Evaluation of Living Skills (KELS). While these scores are difficult to analyze in comparison to assessments such as the PCRS, therapist observation

confirmed the belief that residents scoring “Needs Assist” on KELS sections or scoring low on the ACL demonstrated lower levels of competence. These areas were targeted in OT groups, individual sessions, and grocery shopping outings alongside daily ABI therapeutic programming, contributing to the change in scores. The positive trend on these assessments means that the ABI program is targeting these areas well.

While there is only one significant correlation between psychiatric diagnosis and change scores (SWL), and no significant correlations between injury type and change scores, there do seem to be a few trends present. Residents with Major Depressive Disorder had higher change scores on the all sections of the MPAI-4, SWLS, PCRS, and AQ than other diagnoses. Residents who had a stroke had higher change scores on RBANS Total, Visuospatial/Constructive, and Delayed Memory sections, as well as Total MPAI-4 scores, BAI scores and Satisfaction with Life scores. Residents whose length of stay in the program was around 150 days tended to have better change scores, though this did vary widely based on the sample size for each assessment. Medication plays a large role in treatment of many mental illnesses, which in turn can impact the rate of improvement in brain injury rehabilitation. Psychiatric symptom burden, especially in residents with personality disorders, played a large role on how quickly they were able to improve (and maintain their improvements). More frequent visits with a psychiatrist decreased length of stay.

At the time of data collection cutoff, only two residents had complete admission to discharge data for the Idyll Arbor Leisure Battery. While this makes statistical analysis difficult, there are still observations that can be made based on

scores and overall outcomes. Of the twenty-two subsections among the four tests, only six subsections showed a negative change in scores. The Outdoor and Mechanical sections of the LIM, and the Social and Relaxation sections of the LSM showed small decreases in scores, while the Intellectual and Competence-Mastery sections of the LMS showed larger decreases. Negative change in scores is not ideal, however the researchers are not concerned by the Outdoor and Mechanical changes, as these scores (along with the entire LIM) only reflect *what* the residents are interested in. Lower scores throughout the entire LIM would indicate a high need for leisure education, but average scores were all at or above 2.5. General leisure education was provided through activities used in therapy. While Social and Relaxation score changes were negative, average scores were still above a 2.5 from admission to discharge, and these small changes were likely the result of resident's mood at the time of assessment.

The majority of questions in the Competence-Mastery section were physical in nature. Both residents had expressed low general interest in physical activities, and this likely brought their scores in this section down. However, it is worth noting that the Competence-Mastery section had the second highest scores at discharge, second to Stimulus-Avoidance. Intellectual scores were likely impacted by levels of apathy, as questions in this section generally related to the desire to learn new things. Neither resident displayed characteristics of intrinsic motivation, and overall demonstrated little initiation in leisure activities, especially those that were cognitively challenging. They demonstrated poor frustration tolerance that did not greatly improve over the

course of rehabilitation, thus intellectually challenging activities would not have been of interest to them.

Stimulus-Avoidance showed the largest mean increase in scores, however LMS scores are calculated differently from the rest of the IALB. Total scores in each section are ranked in order to determine what is most motivating to a person, whereas the other tests give scores on a scale from 1 to 5. After Stimulus-Avoidance, LMS Social scores and LAM Total scores showed the greatest increases. This shows that the residents found social situations to be more motivating than they had been at admission, and had better understanding of the benefits of leisure. There are a few possible reasons for the Social score change- mood changes secondary to medication adjustment, improvements in cognition or sensory regulation, even the social environment on the unit at the time. While anxiety levels are typically high as a resident approaches discharge, they also express feelings of excitement and happiness about leaving. The emotion that is more prominent at the time of assessment could likely impact scores in either a positive or negative direction. Residents who are unhappy with their location of discharge (brain injury residential program as opposed to their home) may rate themselves lower than their true beliefs or attitudes.

Addiction has a strong influence on level of engagement in leisure activities, as leisure and recreation are some of the first things that get “replaced” by substances. The more a person protects their addiction, they lose positive emotional response from leisure activities because they are so consumed by their cravings. Depression symptoms are a significant barrier to leisure participation. If a person comes in with

little to no leisure lifestyle, it may be a result of years of depression keeping them from engaging or from understanding the benefits of meaningful leisure. Just as counseling and medication aid in decreasing symptom burden, recreation and leisure aid in increasing the ways that someone might find meaning and satisfaction with their life. It is important for the Recreational Therapist to know both the symptoms themselves and how impairing those symptoms are to daily functioning. Having assessments that identify how mental illness and addiction impact leisure functioning becomes crucial, as this will guide therapeutic intervention and drive outcomes-based treatment. Assessments that specifically understand the relationship between mental illness and recreation should be repeated periodically in order to understand how a patient is progressing and aid in goal formation and modification.

Recreational Therapy can be key in breaking the cycle of addiction. Substances are often used to self-medicate mental health symptoms, which in turn lead to a breakdown of healthy living and leisure lifestyle. When a resident is admitted to the ABI program (or any other mental health facility), their mental health symptoms and cravings are treated, at which point RT services come into play to replace negative activities by providing new meaning to leisure and recreation. Some people with mental illness have difficulty using their free time constructively, and this boredom can also lead to substance abuse. One of the primary components of RT is leisure education, helping people find positive leisure activities that make life enjoyable (Iwasaki et al., 2013). Depending on what feelings the person is trying to seek out or avoid through substances, leisure activities can be provided to meet those needs and

modified as the person moves along the spectrum of recovery. A 2007 study by Lloyd, King, and McCarthy of individuals living with mental illness found that motivation to engage in leisure was significantly associated with recovery. Substances are often used as a way to cope with anxiety, as mentioned previously, and leisure activities can be used as a coping skill during moments of anxiety, rather than substances. As a person learns to work through their feelings instead of avoiding them, they can add in leisure activities such as music, meditation, or exercise to give themselves something else to focus on besides their emotions. Studies of individuals living with mental illness reported that satisfaction with leisure was strongly associated with global well-being (Trauer, Duckmanton, & Chiu, 1998).

Due to the low sample size for these assessments, there was no way to indicate if a resident stayed on caseload through facility discharge or was discharged from caseload due to noncompliance or goal achievement. As the number of residents who take the IALB grows, it may be beneficial in the future to delineate scores for residents who were not on individual caseload, stayed on caseload through facility discharge, were discharged due to noncompliance, or were discharged due to goal achievement. This could reveal score trends based on the level of participation in RT services, impacting how RT is delivered in this setting. RT is currently group-heavy, with a few residents on individual caseload, but scores that are separated out by participation may signal that an increase or decrease in group versus individual therapy is needed. This means that the frequency of assessment may need to be increased in order to understand how scores are changing over time, and identify links between significant

score changes and how the resident is engaging in their rehabilitation at that time. Common trends on assessments can be targeted in both groups and individual therapies. For example, if a lot of residents are scoring low on sections of the LAM, the RT could dedicate time during group over the next month to education about leisure's benefits and impacts, then judge changes in attitudes by re-administering the LAM. Results from the Leisure Battery as well as general observation can be combined on tests such as the Leisure Competence Measure to give an objective, quantifiable look at how the person is functioning in their leisure and identify specific areas for improvement. Results from RT testing should be examined alongside testing from other disciplines to establish links between outcomes and identify best treatment practices. For example, a resident scoring high on the LMS Stimulus-Avoidance section will likely have similar results on the BAI or the MPAI-4 Adjustment Index. After examining scores for each and combining that with a chart review, the RT has a strong picture of the resident's patterns in relation to coping skills and negative leisure habits. They can then identify evidence-based interventions for avoidance, such as exposure therapy, and identify the best way to utilize that intervention. This may be through adapting an activity to include components of exposure therapy, or co-treating with a psychologist trained in exposure therapy. This maximizes therapeutic benefit for the resident and maximizes the scope of treatment for the therapist.

The relationship between mental illness and brain injury presents a double challenge for all therapeutic disciplines, including RT. Impairment from the brain injury may impact how well a person is able to pay attention or their ability to grasp objects,

which in turn affects their mood and behaviors. Some mental illnesses may be disguised in the form of brain injury related deficits. For example, amnesia may initially appear to result from the brain injury, as is common, but may in fact be a product of a personality or dissociative disorder. When this is the case, the most effective treatment interventions might not be chosen because the treatment team is unable to identify the correct cause. However, as the resident progresses through their recovery, the true cause can become more apparent and treatment can be modified accordingly. When situations like this occur, the RT must be flexible and ready to change their treatment methods quickly. Apathy is a common result of both brain injury and mental illness, which in turn drastically impacts how well someone is able to engage in leisure, if they engage at all. The RT must develop therapeutic rapport with the resident in order to identify what motivators are present, if any, and work within the resident's abilities to increase their level of engagement in therapy. Working with unique populations such as this require therapists to have knowledge of two different treatment specialties, distinguish the underlying cause of behaviors or deficits, and be comfortable with redirection and de-escalation techniques. Every brain injury is different, just as every mental illness is different, and no two residents will ever present with the exact same strengths and weaknesses. RT must have a strong presence in the interdisciplinary team, as their creativity and wide array of treatment modalities make them well suited to such populations.

Participation in outings has proven to be highly beneficial to both the residents and staff of the ABI program. Residents express improved mood when out in the

community, and the ability to apply learned skills in real-life settings allows for therapists to get a true picture of how the resident is growing and improving in the program. Residents engage in therapy on outings, but are also given time to simply enjoy being out of the facility and having fun in the community. It is common to see them behave differently on these outings because they have a higher sense of perceived freedom once they leave the facility grounds. Functional tasks are still given and goal achievement is still the main focus, but doing so in a more relaxed environment allows for both work and fun to take place. Not all residents in the program attend these outings due to safety concerns, but attendance is a long-term goal for all. The strength of these outings is that staff are able to assess skills in a real-life setting and are able to "step back" to encourage freedom. The weakness is that not every community life situation can be practiced, and the limitation of some participants due to safety concerns means they will not be able to utilize learned skills as often.

The nature and severity of the brain injury has a unique relationship with the nature and severity of the mental illness. No two residents will have the same strengths and deficits. Two residents with major depressive disorder and having suffered a stroke may have vastly different abilities. One resident may have significant language deficits and isolate in their room most of the day, while the other may present with right side hemiparesis and cry frequently for no identifiable reason. The interaction of their psychiatric symptoms and brain injury-related deficits determines how treatment is given, and thus therapist observation and interdisciplinary

communication is of the utmost importance. Other disciplines' interactions with residents during individual sessions lend valuable insight to decisions made by the treatment team. Documentation of resident behaviors during outings gives a better understanding of what the resident's true functioning is in the community, and allows for therapies to modify their approaches as necessary to maximize therapeutic benefit.

The overall goal of this study is to understand and make recommendations for this relatively new program. Ultimately the goal is successful community reintegration that is supported by outcomes on assessments. Despite the small size, the researchers believed that analyzing the results of the program thus far will drive specific therapeutic process and overall program improvements. The ABI program has already begun making adjustments with current residents in order to improve outcomes as the program continues to grow. Psychology has added new assessments for anxiety and depression, and Speech Therapy has added an assessment that quickly analyzes cognitive and linguistic abilities. Occupational Therapy continues to perform assessments of various living skills as needed, and has developed a few informal screening tools to aid in initial assessment of residents' abilities. Recreational Therapy has begun implementing the Idyll Arbor Leisure Battery on a quarterly basis during group time, and uses the Comprehensive Evaluation in Recreational Therapy- Physical Disabilities to determine if residents who have been referred to RT are appropriate for individual treatment. Unit programming is changed slightly from month to month in order to best meet the needs of the current residents. Some of these newer groups include "Improving Your Sleep," "All About the Brain," and "Outing Planning Group."

These new groups, assessments, and interventions are the result of constant examination of current trends in brain injury and mental health treatment in order to identify best practices. Further study of outcomes in this program will help build evidence for the efficacy of programs like this, and hopefully inspire other states to implement programs of this kind. Community integration for brain injury and mental health respectively have little research, and almost none when the two are combined. The more this program is studied and modified, the more the outcomes will reflect significant improvements in resident functioning at discharge.

Based on the results of this study and previous studies, the researchers believe that community reintegration programs positively affect participants. Regardless of their cognitive level, residents have gained skills relevant to community participation. They have achieved improved balance in activities of home life, work, leisure, and social interaction. The group of residents in this study represent a small portion of the population who are underserved due to their complex needs and severity of problems. Yet, despite these barriers, they continue to make progress toward therapeutic goals.

With this information, facilities can better understand how to treat individuals who have a brain injury and a mental illness. There is currently little conversation about the combined impacts of mental illness and physical disability. Current Long-Term Care facilities can adapt their programs to care for residents of this type, and brain injury facilities will have a better understanding of patients who come in with a diagnosis of mental illness and how that impacts rehabilitation. New facilities do not necessarily need to be opened to accommodate individuals with this diagnosis; current

facilities would benefit from training about these complex individuals, and, depending on the current staffing of the facility, may not need to hire additional staff. There are currently neurobehavioral programs that exist with similar admission criteria to the ABI unit, but upon further examination the programs do not match up exactly, having differences in rehabilitation goals or program structure.

The complex relationship between brain injury and mental illness could lead to changes in therapeutic modalities for Speech, Physical, Occupational, and Recreational Therapy. An understanding of the individual diagnoses as well as their interactions with each other could lead to improvements in best practice. Further study on this topic is encouraged for anyone who work with people who have complex diagnoses, as well as anyone who may have patients of this kind in the future. Currently, most therapies have a unilateral approach in treatment, focusing on techniques and interventions for specific disability groups. Those seeking a holistic approach to treatment should work to target all symptoms in a person, rather than just problems stemming from just the brain injury or just the mental illness.

While this program does extensive testing and treatment while participants are in the facility, there is little to no follow-up evaluation once the participant has discharged from the program. Some participants call or email to give updates on how they are doing, but many do not communicate with the program staff after they have been discharged for a few weeks. The researchers suggest a follow-up evaluation that former participants, their guardians, or caregivers complete at certain time periods after discharge- one week, one month, three months, and six months. This allows

program staff to understand what the former participants are doing, if they are continuing to receive outpatient support (if discharged to the community), and how that progress is maintained in the longer periods following discharge. Further assessments could be given at the one and three-year marks to track long-term progress. The results of these could give indications as to how the program can be changed and improved upon to create better success once the participants leave.

Community reintegration programs are beneficial for anyone with a life-altering disability or illness. However, many individuals go untreated because they have a complex diagnosis, or do not meet criteria for admission to a program because they have too many behavioral outbursts, do not fit inpatient rehabilitation criteria, or because they require too much skilled nursing care. The results from this program can show how implementation of a program of this kind reaches those individuals and ensures that they receive the care they need and can continue to have a good quality of life.

Malec (2011) noted that every post-acute brain injury program has different emphases and pursues different goals for participants and their residual problems. This program is still young and undergoing frequent changes, but with continuous study and work could help researchers understand the complex and challenging population of ABI/MI. Improvements in group therapy programming, resident admission criteria, and treatment characteristics will help promote wider understanding and interpretation of results. This should be done in the near future, perhaps with larger samples of individuals.

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