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Traumatic Brain Injury: Cognitive Rehabilitation and Supported Employment

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TRAUMATIC BRAIN INJURY: COGNITIVE REHABILITATION AND SUPPORTED EMPLOYMENT

A Scholarly Project

by

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for the degree of

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ABSTRACT

A traumatic brain injury (TBI) is an injury to the brain, which results in dysfunction in an individual’s physical, cognitive, and psychosocial functioning. Currently, information on the effectiveness of therapeutic interventions for clients post-TBI is limited. Research has been conducted to develop overall recommendations for clinical practice with this population. It is of interest to the occupational therapy community and the clients that they serve to have a description of effective occupation-based activities, based on current literature, that also consider the functional gains made by clients overtime. This protocol considers the functional gains of the TBI client with a focus on supported employment. This protocol highlights a case study to demonstrate the use of cognitive rehabilitation and supported employment as an effective approach for decreasing dysfunction.

The methodology used to develop this researched based protocol of interventions begins with a review of neuroscience, followed by literature on unmet needs, cognitive rehabilitation, and supported employment. The result is a protocol using a case study format that focuses on cognitive rehabilitation and supported employment interventions. It is designed to be reactive and flexible to meet the needs of each individual client. This information will add to the body of knowledge and will assist in directing the choice of interventions used by occupational therapist for the adult traumatic brain injury population.

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CHAPTER I
INTRODUCTION
Traumatic Brain Injury

The effects of traumatic brain injuries (TBI) can cause lifelong consequences and can disrupt anyone’s life. The National Institutes of Health (1998) defines a TBI “as a brain injury from externally inflicted trauma which may result in significant impairments of the individual’s physical, cognitive, and psychosocial functioning (p. 4).” The TBI client has complex needs because this physical injury creates deficits in physical and cognitive abilities. The effects of a TBI are felt not only by the individual but family, friends, and the community. When an individual experiences a TBI there is the definite possibility of it affecting many areas of the individual’s life. Neurological impairments are complex and can change sensory, motor, and autonomic functions. Memory, attention, language, and visual perceptual deficits are all common cognitive consequences of a TBI (Khan, Baguley, & Cameron, 2003). Behavioral deficits include agitation, learning difficulties, impulse control difficulties, and poor self-awareness. In addition, personality change, mood changes, anxiety and altered ability to control emotions are common among individuals’s that have sustained a TBI. Social and economic consequences of TBI such as divorce, drug use, unemployment, and economic strain are common. The National Institutes of Health (1998, p. 9) estimate that “average lifetime cost of care for persons with severe TBI range from $ 600,000 to $1,875, 000.” Thus brain injuries have a wide variety of consequences including financial. Khan, Baguley, and Cameron (2003, p. 290) noted that a TBI is, “a relatively higher prevalence injury being ten times more common than spinal cord injury.”
The causes of brain injuries include automobile/motorcycle accidents, objects falling on the head, or a bullet entering the skull. Head injuries “cause more death and disability than any other neurologic condition before age 50 and occurs in >70 % of accidents, which are leading cause of death in men and boys under the age 35 years of age” (Reed, 2001, p. 503). In addition, “approximately 50 percent of TBI’s are the result of motor vehicle, bicycle, or pedestrian-vehicle incidents” (National Institutes of Health, 1998, p. 6). Among the elderly and young children, falls are a risk factor for a TBI. It is estimated that about “150 people are admitted to the hospital with TBI per 100,000 population per year” (Khan, Baguley, & Cameron, 2003, p. 2). Investigating the causes, consequences, and rehabilitation is worth the time and effort due to high incidence of traumatic brain injuries and the wide range of devastating results.

**Occupational Therapy**

The practice of occupational therapy involves the therapeutic use of purposeful and meaningful occupations. It includes the evaluation and treatment of persons who have disease or disorder, impairment, activity limitation, or participation restriction that interferes with their ability to function independently in daily life roles; and to promote health and wellness (Radomski, 2001). The research contained within this scholarly project is of value to the field of occupational therapy. For example, “occupational therapists and occupational therapy assistants focus on assisting people to engage in daily life activities that they find meaningful and purposeful,”such as employment (AOTA, 2002, p. 610). Occupational therapy intervention include remediation, adaptation, disability prevention, and health promotion strategies. Services provided by
occupational therapists include but are not limited to: evaluation, development, improvement, and restoration of occupations, performance components or performance skills, client factors, performance patterns or roles, adaptation of the environment or context, family and/or client education, and consultation. Researched interventions and assessment are of value to the occupational therapist in order to provide up-to-date, effective, and needed therapeutic interventions. Currently, there is a need for quality interventions readily available to increase functional outcomes for clients through occupational therapy services. The information provided in this scholarly project will add to the current knowledge base which therapists use to practice and will assist in meeting the needs of the TBI population.

Purpose

Research has been done to develop overall recommendations for clinical practice with the TBI population (Keith et al., 2000) However, this information has not been combined in an organized format to assist the occupational therapy clinician with incorporating evidence-based research into their practice. In order to increase the usefulness of this information it is essential to develop a protocol of effective occupation-based activities that consider the functional gains of the TBI client that may continue for years post injury. This information organized in a usable manner is of benefit not only to the occupational therapist but also to the TBI client, their families, and the community at large. This protocol has the potential to increase functional outcomes, fill current gaps in treatment, add to the knowledge base of occupational therapy, decrease financial barriers, and improve quality of life. This protocol is based on research that is current
and reliable. For example, it has been shown that long-term supported employment has assisted the client with a TBI maintaining quality of life. Cognitive rehabilitation with an emphasis on supported employment forms the foundation of this protocol because interventions in these areas will increase functional outcomes.

Specific interventions explored include cognitive rehabilitation and supported employment. Cognitive rehabilitation uses specific techniques to modify and prevent cognitive dysfunction, as well as promote, establish, and maintain cognitive function (Cirerone et al. 2000; Ashely & Persel, 2003). Supported employment is an intervention used to assist the TBI client with community reintegration through the environmental context and other support services (Wehman et al., 2003). Quality of life refers to one’s satisfaction with various areas such as employment, education, and relationships (Huebner, Johnson, Bennet, & Schneck, 2003). All of these topics are of interest to or fall within the domain of occupational therapy practice. This protocol is designed for the adult TBI population due to its focus on employment.

**Theory**

In order, to provide sound treatment the occupational therapist carefully selects a model in which to practice. The model guides treatment interventions that have been researched thus providing a knowledge base. The Dynamic Interactional Model to Cognitive Rehabilitation by Joan P. Toglia (1998) justifies current interventions that have been proven effective for the TBI population. For example, current literature emphasizes the use of clinical observation to assess client deficits instead of testing each cognitive skill separately.
The Dynamic Interactional Model of Cognitive Therapy stresses cognition as an interactive process that is dynamic and places little importance on performance tests. Processing strategies and behaviors are an approach to learning information and range from surface level to deep processing strategies: for example, memorizing words to being able to generalize information to another experience. Tasks are made up of parameters that can be changed for assessment and intervention; for example, body position, lighting, and number of stimuli. Individual characteristics such as motivation and past experiences also influence learning. Another individual characteristic is metacognition. “Metacognition refers to knowledge and regulation of one’s own cognitive processes and capacities” (Toglia, 1998, p. 11).

The Dynamic Interactional Model of Cognition highlights a dynamic relationship between the person, environment, and task. Toglia (1998) stresses that the person, task, and environment influence how one processes information and learns (see Appendix C). When dysfunction occurs it is due to deficits in processing strategies and metacognition not a specific cognitive skill. Cognitive problems can be identified by a reduced ability to anticipate performance, monitor performance, access knowledge and generalize. For example, “brain-injured individuals often display inflexible and inefficient strategy use. There is a failure to initiate and apply use of self-regulatory or metacognitive behaviors such as anticipating, monitoring, checking, and revising solutions” (Toglia, 1998, p. 15). Thus this scholarly project focuses on interventions the dynamic interaction between the individual, task, and environment. The Dynamic Interactional Model of Cognition is guided by the client’s response to intervention; thus
there is not a predetermined sequence of interventions for the therapist to follow when providing interventions (Toglia, 1998). This scholarly project does not follow a predetermined sequence of interventions but provides an explanation of how to use the latest evidence-based interventions when selecting interventions for the client with a traumatic brain injury.

The methodology used to develop this scholarly project protocol of care begins with a brief review of neuroscience literature, followed by literature on the needs of the TBI client, cognitive rehabilitation, supported employment, and occupational therapy practice guidelines, as well as additional relevant sources. The result of this inquiry is an occupation-based protocol of interventions based on this extensive literature review which will assist with meeting the long-term needs of the TBI client. In addition, this information will assist in directing the choice of interventions used by occupational therapist when serving TBI clients.

According to Ashley and Persel, "The American Occupational Therapy Association provides specifically for cognitive rehabilitation within professional practice guidelines” (2003, p. 24). Thus occupational therapists are well within their scope of practice when providing cognitive rehabilitation. Also, because most cognitive rehabilitation exercises are developed within individual programs, occupational therapists should be further developing and expanding cognitive rehabilitation interventions and educating other clinicians in their use. Occupational therapists have the educational background that will assist in the development of effective cognitive rehabilitation interventions. As this scholarly project will demonstrate, cognitive rehabilitation
improves many areas of function such as activities of daily living in addition to cognitive functioning. This again illustrates the importance of cognitive rehabilitation as part of the recovery process for clients with a traumatic brain injury and that occupational therapy practitioners are well suited to provide these services.

Supported employment is defined as, “paid work, occurring in integrated settings, with the provision of ongoing support services” (Wehman et al., 2003, p. 192). It should be noted that, “cost efficiency provides a comparison of the monetary benefits of a program versus the cost,” and “cost effectiveness measures the long-term results and achievements of services” (Wehman et al., 2003, p. 192). This distinction is important to consider when comparing long-term benefits of supported employment.

As will be discussed further in Chapter II, persons with TBI have difficulty finding and maintaining employment due to cognitive deficits leading to decreased community involvement, lowered self-esteem, and quality of life. Cognitive limitations are the number one reported limitation by TBI clients and caregivers; particularly executive functions such as memory and problem-solving. Cognitive rehabilitation, including establishing and compensatory techniques, have been proven to increase quality of life, employability, and community integration. The occupational therapist’s expertise lies in the knowledge of occupations and the use of occupations to improve dysfunction. The occupational therapist has the educational background that allows for the evaluation of the individual and the occupation to create a meaningful fit. This skill combined with current research will allow for cognitive rehabilitation to be used to create
compatibility between the individual and the occupation by decreasing cognitive
dysfunction (see Appendix D).

CHAPTER II
REVIEW OF LITERATURE

Overview

This extensive literature review begins with a review of neuroscience, common
traumatic brain injury (TBI) interventions and assessments, specific needs of the adult
TBI client, cognitive rehabilitation, supported employment, limitations, and ends with a
summary of inquiry results. The literature focuses on the adult TBI population and on
interventions, particularly those cognitive skills that are needed to acquire and/or maintain employment.

Review of Neuroscience

To understand the consequences and rehabilitation of the TBI client it is beneficial to have an understanding of the neuroanatomy of the human brain and related functions. The brain has many parts and these parts have different functions; yet they are all interrelated. It is important to examine the performance operations of the brain such as executive functions, learning/memory, attention, and language. As noted by Bear, Connors, and Paradiso (2001), the brain consists of the central nervous system, cerebrum, cerebellum, brain stem, and retina. The functions and location of each lobe will be discussed (Bear, Connors, & Paradiso, 2001; Lehr, 2003). The cerebrum is made up of the frontal lobes, parietal lobes, occipital lobes, and temporal lobes. The functions of the frontal lobe include: consciousness, initiation of activity, judgments, emotional response, expressive language, word associations, and memory for habits and motor activities. The frontal lobe is the most anterior portion of the cerebrum. The parietal lobe is located at the posterior portion of the cerebrum. Functions that occur within the parietal lobe include: visual attention, touch perception, goal directed voluntary movements, manipulation of objects, and integration of senses into a single concept. Hearing ability, memory acquisition, some visual perception, and categorization of objects are all functions of the temporal lobe which is located on the lateral sides of the cerebrum. The occipital lobe, located at the most posterior aspect of the cerebrum is mainly responsible for vision. The cerebellum, located at the base of the skull, functions
to coordinate voluntary movement, balance, and contains some memory for reflexive motor acts. Breathing, heart rate, swallowing, startle response, autonomic nervous system, level of alertness, ability to sleep, and vestibular functions are all controlled by the brain stem. The brain stem is located in the spinal cord and reaches into the center of the brain. In summary, the brain is responsible for an incredible amount and variety of functions, all of which have the potential to be disrupted when injury to the brain occurs.

Damage to particular regions of the brain may cause temporary and/or permanent changes in the individual’s performance which can be traced back to the functional aspects of a particular part of the brain. Specific functional deficits will be discussed in the following sentences (Bear, Connors, & Paradiso 2001; Lehr, 2003). Problems observed from damage to the frontal lobes include: inability to sequence, attend, problem solve, spontaneously interact with others and express language (i.e. known as Broca’s aphasia). Also, changes in social behavior, personality, flexibility in thought process, and paralysis are common deficits associated with frontal lobe damage. The parietal lobe is associated with difficulties in drawing objects, distinguishing left from right, doing mathematics, and hand-eye coordination. Damage to the parietal lobe causes inability to attend to more than one object, locate the words for writing, name an object, and focus for visual attention. Apraxia is common with damage to the parietal lobe which is, “the inability to perform certain skilled purposeful movements in the absence of loss of motor power, sensation or coordination” (Zoltan, 1996, p. 53). Difficulties with reading and writing, locating objects in a room, identifying colors and recognizing
drawn objects are deficits caused by occipital lobe damage. Visual field cuts, hallucination, visual illusions, and word blindness are also problems with occipital lobe dysfunction. Problems observed with temporal lobe damage include: difficulty recognizing faces, understanding spoken word, and identification and verbalization about objects. Increases in aggressive behavior as well as changes in level of interest and sexual behavior can also occur. In addition, disturbances with selective attention, inability to categorize objects, short-term memory loss, and interference with long-term memory are associated with temporal lobe dysfunction. Damage to the right temporal lobe can cause persistent talking. Damage to the cerebellum causes inability to reach accurately for objects, coordinate fine movements, and walk with coordination. Dizziness, slurred speech, tremors and rapid eye movements are associated with cerebellum dysfunction. Decreased ability to sleep, swallow, balance and breathe are due to damage to the brain stem. This information can assist in guiding the occupational therapist to plan interventions and encourage functional gains for clients that have experienced a TBI.

Executive Functions

A planned action such as preparing a meal, driving, house cleaning, balancing a checkbook, and filling out an application require goal-directed and purposeful behavior known as executive functions. The frontal lobe is responsible for many executive functions including “ability to formulate goals, to initiate behavior, to anticipate consequences of actions, to plan and organize behavior according to spatial, temporal, topical or logical sequences, and to monitor and adapt behavior to fit a particular task or
context” (Cicerone et. al., 2000, p. 1605). Basically, someone with these difficulties might not be able sequence the steps to complete an activity such as putting together a simple meal. Also, if an individual was to run out of an ingredient he/she may have difficulty solving this problem, not realizing the need to buy more which could cause frustration and confusion. Executive functions, simply put, are one’s ability to solve everyday problems, reason, and make decisions (Copstead & Banasik 2002; Bear, Connors, & Paradiso 2001; Cicerone et al., 2000).

Learning/Memory

Memory is being able to retain information learned (Bear, Connors, & Paradiso, 2001). “Memory is a synaptic phenomenon in which neurons in the memory circuit alter the efficiency of synaptic transmission” (Copstead & Banasik 2002, p. 1001). Experiences that are pleasant or painful increase the brain’s ability to remember because it stimulates a greater number of neurons. To think and learn, an individual must be able to remember past events and link them to a current situation. Memory is not the responsibility of one single brain structure or mechanism; and how it is stored may change. There are two main types of memory which are declarative memory and nondeclarative memory. Declarative memory is used to remember facts, is generally available for conscious recollection, and is easily formed and easily forgotten. Examples of declarative memory are remembering your phone number or the name of the town in which your grandmother lives. Nondeclarative memory falls into several categories the most relevant one being procedural memory, or memory used to remember how to do a skill, habit or behavior. Nondeclarative memory helps us to do things smoothly using
reflexes and emotional associations; however, this information is not for conscious recall. For example, nondeclarative memory is used to swim, and play an instrument once one has learned these skills initially. These skills are not easily forgotten but the procedures for doing them are held within our subconscious (Bear, Connors, & Paradiso, 2001; Copstead & Banasik, 2002).

It is also important to look at the differences between long-term memory, short-term memory, and immediate memory. Immediate memory only lasts minutes and is used to remember a phone number for a short period of time. Short-term memory is remembering something for approximately thirty minutes to a couple of hours. Most clients with a head injury have difficulty with short-term memory and this is a significant problem. For example, the client may not remember from one minute to the next what day it is or what they just did. Long-term memories are things that you can recall after a day, weeks, or years. Not all memories make it into long-term storage, but the memories that do are entered into permanent storage through a process called memory consolidation (Bear, Connors, & Paradiso, 2001). Depending on the client and the severity of the injury, long-term, short-term, or both will be affected. After trauma to the brain, memory loss manifests itself in two ways: retrograde amnesia and anterograde amnesia. Retrograde amnesia is noted by memory loss prior to the trauma and with anterograde amnesia, events that occurred after the trauma have been erased.

Attention

There are several forms of attention which are related to the senses. For example, an individual can be paying attention to an object (i.e., visual attention) or a
conversation (i.e., auditory attention). The ability to listen to one conversation over another or focus on one object over another is referred to as selective attention. “The act of differentially processing simultaneous sources of information is called selective attention” (Bear, Connors, & Paradiso, 2001, p. 659). Areas of the brain associated with attention include the posterior parietal cortex, prefrontal cortex, and the cingulate cortex. It is hypothesized that the pulvinar nucleus of the thalamus is the structure that may guide attention. More research is needed to fully understand attention.

Common TBI Interventions/Evaluations

*Levels of rehabilitation intervention*

Usually treatment begins with emergency personnel before the individual is admitted to the Intensive Care Unit (ICU). Individuals with severe to moderate brain injuries are admitted to the ICU where medical stabilization and management occur. Medical measures also take place to prevent further injury such as range of motion, positioning, and splinting. Medical equipment used in the ICU include ventilators, intravenous lines, arterial lines, the foley catheter, nasogastric tube, intracranial pressure monitor, pulse oximeter, and electrocadiogram machine. The next level of care is acute rehabilitation and includes team members such as a physiatrist, physical therapist, occupational therapist, speech/language pathologist, rehabilitation nurses, case managers/social workers, recreational therapist, neuropsychologist, and/or aquatic therapist. These team members provide services to increase functional abilities which is done on an inpatient status. The next level of treatment is subacute rehabilitation. It is for
those that are still progressing but at a slower rate; or for those that have been discharged from acute rehabilitation.  In sub-acute rehabilitation, the individual post-TBI may be receiving rehabilitation services from some of the same types of professionals, but on a less intensive level.  Day treatment is designed so that an individual post-TBI can still receive therapy services in a structured setting, but may return home at night.  Outpatient therapy follows acute rehabilitation or subacute rehabilitation.  With this type of therapy, an individual can still receive professional services to meet goals which are not intensive enough to require inpatient care.  Additional services for TBI clients are home health, community re-entry, and independent living programs (Brain Injury Association of America, 2003).

Medical and rehabilitative evaluations

The range of severity of a TBI extends from full consciousness to a permanent vegetative state.  Generally, TBIs are classified as mild, moderate, or severe.  There are many scales used to measure the progress a client makes after TBI.  One scale used is the Ranchos Los Amigos Scale which is an ten-point scale depicting how the client interacts with the environment (Brain Injury Association of America, 2003).  For example, at level one the client is basically in a deep sleep or coma and does not respond to the environment.  At level four the client is confused and agitated but may be able to enter into coherent conversation.  At the highest level ten, the client has the ability to interact with the environment purposefully and appropriately.

Another scale used mainly to describe and communicate level of independence is the Functional Independence Measure (FIM).  The FIM measures independence in the
areas of self-care, sphincter control, mobility, locomotion, communication, and social cognition. (Brain Injury Association of America, 2003). It is a seven-point scale is used, with seven being completely independent, and one needing total assistance with the individual performing less than 25 percent of the task.

The Glasgow Coma Scale is scored by the physician from 3-15, which is based on the individual’s ability to open their eyes, perform movements, and verbalize. Usually the best indicator of prognosis is the amount of time an individual is in an alerted conscious state for survival. Post-traumatic amnesia (PTA) is the amount of time that passes before the client is able to remember daily events that occurred after the injury. This is used to estimate the cognitive and functional deficits that are likely after a TBI. A person with a mild TBI rating has an initial Glasgow Coma Scale rating of 12-15 and duration of PTA is less than 24 hours. A person with a moderate TBI rating has an initial Glasgow Coma Scale rating of 9-11 and a PTA of 1-7 days. A person with a severe TBI rating has an initial Glasgow Coma Scale rating of 3-8 and a PTA of 1-4 weeks (Khan, Baguley, & Cameron, 2003).

Inquiry Results

Needs Post-TBI

In order to provide effective and necessary intervention for the client with a TBI, it is important to first examine the current needs of this population. Studies have been conducted to determine what services are needed for the TBI population.

A state-wide survey was sent out to persons with traumatic brain injury in the Illinois area (Heinemann, Solkol, Gervin, & Bode, 2002). The objectives of this study
were to develop a list of needs and services for TBI clients, to determine if there is a hierarchy of needs not being met, to illustrate a relationship between services received and unmet needs, and finally to estimate a relationship between personal characteristics and predicted unmet needs.

Heinemann, Solkol, Gervin, and Bode (2002) determined that unmet needs were defined as, “expressed needs not satisfied by current service provisions” (p. 1052). Of the respondents, the median age was 37 and the median time post-TBI was 7 years. The results of the study indicated that memory or problem-solving skills was the greatest unmet need. Increasing income and improving job skills were the next greatest unmet needs respectively. Finding places to socialize, increasing educational qualifications, managing stress and emotional upset were also prevalent unmet needs. Services such as transportation assistance, money management, legal services, instrumental activities of daily living, health services, religious or spiritual services, daily living assistance and personal care assistance were among the most common services provided. The results showed that there is a relationship between unmet needs and service utilization. In general, those with the greatest need received the least amount of services. This study indicated that the TBI clients were not receiving the services that they needed to succeed.

Another indication as to whether needs of the client with a TBI are being met is to examine quality of life. Huebner, Johnson, Bennet, and Schneck (2003) set out to examine outcomes of occupational therapy services after a traumatic brain injury. This was accomplished by phone interview of 25 adults, on average 21 months post injury. A retrospective chart review gathered information on patient characteristics. Several
measures where used in this study, including the Glasgow Coma Scale, Functional Independence Measure (FIM), Activity Limitation Survey, Community Integration Questionnaire, and Quality of Life Rating. Results indicated that cognitive limitations were the most reported reason for activity limitation followed by social behavior, sensory and communication, emotional and medical complications respectively. Community integration issues, as determined by the community integration questionnaire, found shopping for groceries and finances were done by someone else in more than 50% of the sample. It was also found that for a large number of participants planning social events, caring for children, and preparing meals were done by someone else. Also, 20% of the sample reported never going out to visit friends and family, 20% never get out for leisure activities, and 24% never go shopping. This information indicates that community involvement for traumatic brain injury clients is significantly impaired. From the quality of life rating, some of the lowest rated activities indicating dissatisfaction included: volunteer activities, work/career activities, learning and educational activities. This study found that community involvement and fewer areas of limitation were associated with improved quality of life. It was found that satisfaction with occupational therapy was high but this did not correlate to increased function.

In conclusion, community involvement and limited dysfunction are associated with increased quality of life following a traumatic brain injury. Occupational therapy practitioners often set treatment goals with the client to reach community involvement and decrease dysfunction. Many of the skills needed to participate in the community directly involve aspects of cognition, such as executive functions. Cognitive
rehabilitation is an intervention approach designed to promote restoration of cognitive functioning in order to increase quality of life and allow participation in the community such as employment.

*Cognitive Rehabilitation*

Cognitive rehabilitation focuses on remediation of deficits by restoring function through both compensatory strategies and restoration of skills or abilities. It is defined as, “a systemic, functionally oriented service of therapeutic activities that is based on assessment and understanding of the patient’s brain-behavioral deficits” (Cicerone et al, 2000, p. 1596). Reinforcing, establishing new patterns of cognitive activity through both internal and external means, and enabling a person to adapt to their deficits to improve overall functioning are all examples of approaches used in cognitive rehabilitation.

Cognitive rehabilitation is differentiated from other forms of rehabilitation by its focus on relieving acquired neurological cognitive impairment and disability.

Cognitive rehabilitation started during World War I when soldiers were in need of cognitive rehabilitation due to head injuries from war. In the 1970's and 1980's when medical advances allowed more people to survive after head trauma, the need for cognitive rehabilitation again increased. Ylvisaker, Hanks, and Johnson-Green (2002) examined the history of cognitive rehabilitation and two theoretical paradigms for cognitive rehabilitation of persons that have experienced a brain injury. The two main theoretical paradigms reviewed in this article were the traditional paradigm and the contextualized paradigm.
In the traditional paradigm, cognitive rehabilitation focuses on restoring performance by alleviating underlying component cognitive deficits. When restoration of cognitive function is no longer indicated for a particular component, compensatory behaviors such as self-cueing are used. Assessment usually evaluates components of cognitive function using a battery of tests assuming that individual cognitive processes can be measured separately. Interventions focus on specific components of cognitive function to eliminate or reduce cognitive impairment. Two interventions used are computer activities and exercises that isolate cognitive components. Organization of treatment is placed on a hierarchy ranging from attention to reasoning or higher cognitive processes.

The contextualized paradigm of cognitive rehabilitation focuses more on functional deficits rather than specific components of cognition. The overall goal of the contextualized paradigm is to restore function in occupations that are currently impaired. Interventions may include focusing on a component of cognition to restore function in occupations, focusing on the occupation itself, and/or the environment in which the individual participates during occupations. Toglia’s model (1998), A Dynamic Interactional Model to Cognitive Rehabilitation, is an example of the contextualized paradigm. Assessment involves standardized tests to determine specific components of cognitive dysfunction, but a strong emphasis is placed on direct observation in situations. The organization of treatment relies on three hierarchies: intracognitive, generalization, and impairment-activity-to-participation. This system is flexible and discourages concrete examination of an individual’s cognitive functions. As an occupational
therapy model it includes theorized components of cognition, task, environment, as well as, occupations. This paradigm provides practitioners with two way of conceptualizing cognitive rehabilitation which has the potential to increase knowledge, research, and investigation into this growing area of rehabilitation.

Many studies have been done on cognitive rehabilitation interventions. A study conducted by Cicerone et al. (2002) reviewed studies to develop evidence-based practice guidelines for the treatment of persons with traumatic brain injuries and strokes. The methodology used involved gathering data and sorting the articles into a meta-analysis for the following categories: attention, visual perception, constructional abilities, language, communication, memory, problem solving, executive functions, multi-modal interventions, and comprehensive-holistic cognitive rehabilitation. The results of this study were organized into practice standards, practice guidelines, and practice options. While significant findings were found for both stroke and traumatic brain injury diagnoses, the following results focus on the recommendations for clients with a TBI. Interventions for functional communication deficits are recommended for clients with a TBI. Compensatory memory strategy training is recommended for clients with a mild memory impairment after a TBI. Practice guidelines indicated that cognitive interventions for specific language impairments, training in formal problem-solving strategies and their application to everyday situations, and functional activities are recommended for clients with a TBI. It was also found that comprehensive-holistic neuropsychologic rehabilitation is not recommended for the remediation of functional disability after a TBI. Verbal self-instruction, self-questioning, and self-monitoring to
promote self-regulation as well as use of memory notebooks are recommended practice options for the client post-TBI.

Further studies have investigated additional strategies or interventions used in cognitive rehabilitation for adult clients with a TBI. A study conducted by Dirette (2002) utilized a survey to investigate the use of cognitive compensatory strategies: chunking, pacing, and verbalization. Dirette defined chunking as “grouping visual information,” pacing as, “reducing proactive interference by pausing to clear the previously processed visual information,” and verbalization as, “verbally repeating visual information” (2002, p. 7). The survey was sent out to thirty clients that acquired brain injury to determine if carryover occurred. Carryover refers to the ability to take information learned in one situation and apply it to another situation. It was found that 93.3% of the participants recalled learning the strategies, 30% generated their own strategies during treatment, and 64% have generated strategies since the study. Chunking was reported as being used the most often; followed by pacing, and then verbalization.

Employment status was also surveyed by Dirette (2002) and it was found that 67% of the participants were employed full-time, 7% part-time, and 26% were retired or unemployed. It should be noted that 73% of the employed persons used the cognitive compensatory strategies to complete their job duties. Overall, this study provides justification for the use of compensatory strategies in cognitive rehabilitation and provides evidence that compensatory strategies can be used to sustain employment.
A survey developed by Ashley and Persel (2003) examined the current views of clinicians that work with clients with a traumatic brain injury and who use cognitive rehabilitation. The focus of the survey was to determine who provides cognitive rehabilitation, degree to which clinicians support cognitive rehabilitation, and how cognitive rehabilitation is provided. The disciplines that provided cognitive rehabilitation included: speech language pathology (88.1%), occupational therapy (70.8 %), neuropsychology (65.5%), psychology (33.9%), education (25.6%), and physical therapy (19.0%). According to this survey, those who benefitted from cognitive rehabilitation were those who had dysfunction in: memory, problem solving, attention, reasoning, concentration, planning, self-monitoring, sequencing, flexible thinking, goal setting, information processing, categorization, self-directing, perception, comprehension, discrimination, communication, and recognition. Interventions used in cognitive rehabilitation fell into three categories in this survey: computer, commercial workbooks, and internally developed exercise. Most facilities (97.4%) relied on internally developed exercises for cognitive rehabilitation. Most importantly, respondents where asked to rate how effective cognitive rehabilitation was in several areas of client functional outcomes. A six point scale was used with six being highly effective. Overall functioning was rated at 5, as well as, activities of daily living. Cognitive functioning was rated as 4.94, return to school was rated at 4.90, social functioning was rated as 4.69, returning to work was rated as 4.53 and returning to drive was rated as 3.81. As demonstrated by this survey, cognitive rehabilitation is viewed as an important component of rehabilitation after a traumatic brain injury.
A study by Chesnut et al. (1999) set out to answer several questions about the overall effectiveness of rehabilitation for persons with traumatic brain injury; for example, whether interdisciplinary rehabilitation should begin during the acute phase or not. It was determined through literature review that there was no direct evidence that interdisciplinary rehabilitation in the acute phase effects health outcomes. However, there was some indirect evidence associated with shorter hospital stay with the introduction of interdisciplinary rehabilitation in the acute phase. Another issue that this study addressed was the intensity of interdisciplinary rehabilitation. The research showed that the intensity or minutes of therapy cannot predict the outcome of traumatic brain injury clients. Next, the researchers sought to find out if the use of cognitive rehabilitation improved health outcomes for the TBI client. The research lead to the conclusion that the use of notebooks and alarm wrist watches helped to reduce memory problems. This study also indicated that there were benefits of supported employment for TBI clients. Supported employment improved vocational outcomes for the client with a TBI. Finally this study sought to describe the functional gains of long-term care coordination. The results were mixed as to whether coordinated services increased client functional abilities.

Supported Employment

The participants in a study conducted by Wehman et al. (2003) consisted of 59 individuals who were involved with a minimum of one competitive supported employment position from 1985-1999. To be included in the study each individual had to be of working age, have a moderate to severe TBI, and a need for vocational intervention.
Data was collected and analyzed to reflect the costs of supported employment, employment characteristics, and the benefit to cost ratios of supported employment. The sample included: an average age 32.6 (+/- 8.4 yrs), 81.4% men, 76.4% white, 91.7% received a severe TBI, and 71.4% were employed full time prior to injury. A major finding was that the longer an individual was employed, the more cost effective the supported employment program was due to decreased monthly costs for employment services.

The financial burden of a traumatic brain injury is substantial and reaches far beyond one’s hospitalization. A study done by Johnstone, Mount, and Schopp estimated that in addition to the estimated $9 to $10 billion spent on traumatic brain injury (TBI) acute and rehabilitation services on an annual basis...TBI may cost an additional $1 billion per year in lost wages, lost income taxes, and increased public assistance” (2003, p. 238). The sample consisted of 35 individuals that had sustained a TBI and received inpatient rehabilitation and were contacted one year later. At the time of injury 11% of the participants were unemployed compared to 49% at one year follow up. Thus unemployment for these individuals increased by 425%. Average earned income at the time of injury was $1,491 per month which dropped to $726 per month one year later. At the time of injury, participants on average received $153 per month in public assistance; one year later that amount increased to $421 per month on average. These results indicated that persons with TBI have a difficult time finding and maintaining employment.
Next, examining the aspects of the individual limitations leading to economic difficulties is warranted in order for a thorough understanding of supported employment. Awareness of one’s abilities and deficits after a traumatic brain injury allows one to make competent decisions regarding functioning in daily life. Coetzer and du Toit (2002) set out to test several hypotheses regarding awareness and employment. The researchers hypothesized that greater impairment of awareness resulted in poorer financial outcomes and job placement; initial severity of injury determines degree to which awareness is impaired; and that impaired awareness decreases over time. The participants in the study included 40 patients, 31 male and 9 female. The average age was 36.2 years and the average time since injury was 56.03 months. In this sample the percentage of mild TBI was 7.5%, moderate 10%, and severe 82.5%. The measures used in this study include the European Brain Injury Questioner (EBIQ), Glasgow Coma Scores (GCS), period of loss of consciousness (LOC), Grafton Manor Study Hierarchy of Placement, and employment outcomes such as a change in position or going from employed to unemployed. Descriptive statistical analyses were computed for the various variables. It was found that severity of injury was related to awareness in that mild TBI participants more often noted decreased self-awareness. It is possible that those with severe TBI overestimate their capabilities and those with mild TBI underestimate their capabilities. It was also found that higher caregiver ratings of executive problems and depression on the EBIQ was associated with poorer employment outcomes.

Limitations
The studies represented in this literature review are diverse in the type and quality of the research. Most of the studies had large sample sizes but a few had small sample sizes or were conducted in only one area of the country. However, the majority of the participant characteristics (i.e. age, onset of injury, employment status) of a particular study are congruent with national data characteristics of the TBI population. Also, when working with clients that have sustained a TBI many therapists tailor interventions to meet the needs of a specific client. Thus it is difficult to quantify particular interventions which makes more rigorous research design difficult to carry out. Many of the studies used to assess TBI dysfunction and needs are of the subjective nature because the method of collecting data was self-report through survey by the TBI client and/or their caregivers. This information is still valuable because these individuals are best suited to indicate problems that arise in their daily lives.

**Summary of the literature review results.**

The research has shown that the client with a TBI has unmet needs which decrease quality of life. It has been found that cognitive limitations are the most prevalent limitation compromising long-term functioning with activities of daily living, returning to work, and education. The financial burden of a TBI is substantial; thus incorporating employment strategies as one of the main interventions used in the treatment of TBI clients is essential. The monetary benefit is not only helpful to the client and their family but also the community as a whole. Research indicates that the longer an individual is employed through supported employment after sustaining a TBI, the more cost effective the program is due to decreased monthly cost for employment.
services. Additional benefits to the client from supported employment include improved quality of life, increased self-esteem, and community involvement, all of which are areas of need that are not currently being met in the majority of clients post-TBI.

Research indicates that the following content belongs in cognitive rehabilitation programs: memory, problem solving, attention, reasoning, concentration, planning, self-monitoring, sequencing, flexible thinking, goal setting, information processing, categorization, self-directing, perception, comprehension, discrimination, communication, and recognition. Occupational therapists need to use clinical observational skills to identify limitations in these areas. The client with a TBI has cognitive deficits in which cognitive rehabilitation strategies have been proven to be effective. Interventions include but are not limited to compensatory strategies such as chunking, verbalization, notebooks, and alarm wrist watches. The research also shows that one compensatory strategy is not necessarily better than another, thus including a variety of compensatory strategies in this protocol allows for client centeredness and enhances employability. Currently most facilities rely on internally developed exercises for cognitive rehabilitation.

Clinical observation of a client’s strengths and limitations is preferred by the contextualized paradigm (Ylvisaker, Hanks, & Johnson-Green, 2002) and the dynamic interactional model of cognitive rehabilitation (Toglia, 1998) over concrete examination of a cognitive component. The contextualized paradigm focus on restoring functions in occupations that are currently impaired. The Dynamic Interactional Model of Cognitive Therapy stresses cognition as an interactive process that is dynamic and places little
importance on performance tests; it highlights a dynamic relationship between the person, environment, and task. Tasks are made up by parameters that can be changed for assessment and intervention for example, body position, lighting, and number of stimuli. When dysfunction occurs it is due to deficits in processing strategies and metacognition, not a specific cognitive skill.

In conclusion, persons with TBI have difficulty finding and maintaining employment due to cognitive deficits leading to decreased community involvement, lowered self-esteem, and quality of life. Cognitive limitations are the number one reported limitation by TBI clients and caregivers; particularly executive functions such as memory and problem-solving. Cognitive rehabilitation (i.e. interventions that use remediation of skills and interventions that use compensatory techniques) have been proven to increase quality of life, employability, and community integration.

The occupational therapist’s expertise lies in the knowledge of cognitive rehabilitation, of occupations and the use of occupations to improve dysfunction. The occupational therapist has the educational background that allows for the evaluation of the individual, environment, and the occupation to create a meaningful fit. This occupational therapy skill combined with current research will allow for cognitive rehabilitation to be used to effectively create the right results for the individual.

In the following chapter a case study is presented to demonstrate the occupational therapist’s ability to create a meaningful fit between the person, occupation, and environment. The case study also illustrates the use of current research combined with
occupational therapy skills and cognitive rehabilitation. Chapter III provides for an overview of the product and its relationship to the literature presented in Chapter II.

CHAPTER III

METHODOLOGY AND CASE STUDY

Overview of Protocol

One of the main issues facing health care workers is justification of services. Thus relying on protocols that have been developed by examining current research allows for justification of services and quality care for client. Further development of treatment
protocols for cognitive rehabilitation are needed and the occupational therapists have the educational background to develop cognitive rehabilitation specifically occupation-based interventions. Overall, the literature indicates that there is support for cognitive rehabilitation and supported employment to address the needs of adults post-TBI. This is important to the field of occupational therapy because therapists evaluate clients, provide cognitive rehabilitation, and often make recommendations, or coordinate supported employment services. This information is pertinent to the development of an occupation-based cognitive rehabilitation protocol for adults with TBI, which includes appropriate timing and inclusion of supported employment. In this scholarly project, such an occupational therapy protocol has been developed in order to provide positive health outcomes for adults after TBI.

It is the intent of this protocol to provide resources for occupational therapists treating TBI clients as they transition back into the work force. Physical dysfunction is not directly addressed in this protocol. Thus, this protocol is best suited for those TBI clients with primarily cognitive dysfunction; however, it may be used in conjunction with other protocols for those clients with multiple impairments.

Methodology

The development of this protocol began with my interest in the TBI population. I then asked a member of the occupational therapy faculty, (Jan Stube), with similar interests to help guide this process. After exploring the literature, I began to see patterns that indicated a need for the development of this protocol. I began by critically analyzing research studies on the topics of evidence-based interventions, cognitive
rehabilitation, unmet needs of the TBI population, neuroscience and other relevant resources. After conducting an extensive literature review, my advisor and I discussed the best way to present the information. A case study methodology was chosen because it would provide an example of practical application of information, would allow for application of a conceptualized paradigm, and best support the use of evidence-based intervention. The following case study is used to interpret the results of this inquiry.

Case study

Dave is a twenty-three year old male that was involved in a jet ski accident. His jet ski collided with an oncoming speed boat. He hit his head and was believed to be unconscious and under water for approximately three minutes. A friend of his and the driver of the speed boat began cardiopulmonary resuscitation (CPR) until Emergency Medical Services (EMS) arrived twenty minutes later. He was taken to the hospital emergency room by EMS. Dave had a weak heart beat but remained unconscious. Dave was in a coma for roughly a month before he started to open his eyes. At this time Dave was in the intensive care unit of the hospital and began receiving rehabilitation services including occupational therapy.

To stimulate cognitive functioning, the occupational therapist began to arouse Dave’s senses by providing visual stimuli such as a photograph of loved ones, colored cards, and gently touching Dave’s hand. This was done for short periods of time as not to over stimulate Dave. The occupational therapist also instructed family members to talk to their loved one and show affection. At this time the occupational therapist also gathered information from Dave’s family about his occupations before the accident. Dave
enjoyed restoring old cars, playing cards with friends and family, helping out at the
family farm, and hunting. Dave worked as a carpenter for the last five years and enjoyed
talking care of his two hunting dogs. Dave took pride in owning his own home and
taking care of himself. He also rented out a room of his house to a friend for the last six
months. The occupational therapist used this information to provide meaningful
interventions during each stage of recovery.

The main cognitive rehabilitation goal in the acute stage of intervention was to
help Dave maintain a conscious state. At first Dave responded inconsistently to sensory
input. As time passed, Dave began to respond to sensory simulation by turning his head
towards a noise. At times he would even follow simple commands however the
response was delayed. The occupational therapist provided cognitive interventions that
focused on Dave’s ability to follow simple commands. This demonstrated Dave’s ability
to begin to respond to the environment. The occupational therapist engaged Dave in
simple self-care tasks with assistance, activities to orient Dave to reality, and asked Dave
to follow simple commands. Goals at this stage of cognitive intervention focused on
orientation, purposeful response, and memory.

As Dave continued to recover he demonstrated strange behavior such as swearing,
hitting, sexual aggression, biting, and screaming. At times, restraints were used to
protect Dave from hurting himself or others. Dave had gaps in his memory and
unintentionally fabricated stories to fill gaps in his memory. At this stage the
occupational therapist continued to assist Dave with cognitive rehabilitation. Goals
focused on sustaining attention to a task such as dressing, eating, grooming, and activities
that incorporated Dave’s interests and/or past employment. Memory was a treatment focus so introduction of a memory notebook began at this time. In the notebook Dave recorded his daily activities. At first he needed maximum assistance with this; but as his memory improved, Dave took on more responsibility for completing his notebook activities.

As therapy continued, Dave was able to follow simple commands fairly consistently but still struggled with complex commands and activities. Dave was able to concentrate for a short period of time but frequently needed redirection. Memory impairment was still substantial but Dave was able to complete basic activities of daily living such as grooming and getting dressed on a more consistent basis with less redirection. Dave still had difficulty with orientation and not knowing what happened to him. The occupational therapist worked with Dave to improve cognition through both remedial interventions and compensatory interventions. Dave continued to use his memory notebook; but he also used a checklist of activities he had completed during the day. These strategies were implemented to improve memory and increase independence. As improvement occurred Dave was able to use the checklist as a memory aid at home (and later at work). The occupational therapist also had Dave do simple writing tasks to assist him with being able to use a checkbook, fill out paper work, and a job applications.

As Dave continued to improve by demonstrating appropriate behavior and increased orientation, he was discharged to his parent’s home with the supervision of his parents and attended a day treatment program. Dave was able to complete most simple self-care tasks with minimal assistance, less confusion, and redirection. Orientation had improved but his memory was still limited. Dave knew he was in an accident, hit his head, and was unconscious but lacked insight about his current functioning level. His judgement and problem-solving abilities were still impaired. At this point Dave was
unable to plan for the future, drive a care, operate machinery, or care for others. Dave was now able to complete self-care activities independently but still needed supervision at home and in the community for safety. Interventions at this time focused on pre-vocational training, memory, and executive functions (problem-solving, plan actions, and initiation of a task). New learning or carry over takes time and was done with supervision. Cognitive interventions such as self-questioning, self-instruction, self-monitoring, self-instruction, visual imagery, and categorization were used to improve his performance with job tasks, cooking, community mobility, and care-giving.

As Dave made improvements, he was able to go back to work as a carpenter on a limited basis with direct supervision by his employer in collaboration with his occupational therapist. Dave was paired with a colleague and was responsible for simple tasks such as cutting flooring. Before Dave returned to work he practiced skills in occupational therapy at a day treatment program and in out-patient occupational therapy. Dave learned to use the bus system and to call a taxi for transportation. His parents also assisted Dave with transportation to appointments and work. Dave was also in a driver’s retraining program.

Case Study Summary

This case study follows Dave from injury, through hospital rehabilitation, day-treatment programs, out-patient and return to work. It illustrates occupational therapy cognitive rehabilitation goals and interventions throughout the intervention process. This method allows for the research to be presented in a useable format in order to assist occupational therapists in choosing interventions that best fit the clients they are serving. In Chapter IV, the case study will be used as the basis for a practical application of occupational therapy cognitive rehabilitation interventions in clinical settings.

CHAPTER IV

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Dave’s occupational therapy treatment plan is the result of information gathered in the literature review process combined with the case study and the occupational therapy process (AOTA, 2002). The goals in this section have been condensed to emphasize research which indicates that treatment is reactive and individualized; thus the goals are functional but not measurable, or defined by time lines. The occupational therapy goals and interventions are based on the case study of Dave. Occupational therapists in the clinical setting may use these as guidelines; but goals for each client will need to be individualized and written according to facility policy.

Also included is a list of global occupational therapy interventions that have been found effective with the TBI population for inclusion in the clinical setting. These occupational therapy interventions are presented in an occupational therapy process format (AOTA, 2002) and are grounded in the literature review evidence. They emphasize cognitive rehabilitation and supported employment.

The goals and interventions are presented in a sequential order by setting, thus some overlap may occur. They may not be inclusive of all occupational therapy interventions possible, but serve as an examples. Goals and interventions begin in an acute hospital setting, followed by inpatient rehabilitation, day treatment, and outpatient phases of service delivery.

**Dave’s Treatment Plan**
**Acute Hospital Stay:** The interventions and goals used are mainly preparatory and focus on client factors, performance skills, and purposeful activities to prepare Dave for participation in occupations later in occupational therapy intervention and life such as employment.

**Limitation:** little ability to attend

**Goal:** Dave will demonstrate increased attention by responding to sensory stimulation thus maintaining and increasing conscious state. These interventions are done for short periods of time so as not to overstimulate.

*Intervention:* pictures of loved ones
*Intervention:* smells such as coffee
*Intervention:* colored cards
*Intervention:* gentle touch to the hand

**Limitation:** unable to complete grooming tasks

**Goal:** Dave will begin to participate in self-care activities to address procedural memory as well as the occupation of self-care itself.

*Intervention:* washing face with assistance as needed
*Intervention:* brushing teeth with assistance as needed

**Limitation:** lack of consistent orientation to person, place, or time

**Goal:** Dave will demonstrate orientation to person by identifying himself, and beginning to demonstrate orientation to the environment.

*Intervention:* self recognition using a mirror
*Intervention:* identification of familiar and personal objects

**Limitation:** poor environmental interactions

**Goal:** Dave will demonstrate ability to minimally interact with his environment, (responses may be delayed) by demonstrating purposeful responses. Dave must be able to interact with the environment for future learning.

*Intervention:* simple commands, example: giving a thumbs up after this command
*Intervention:* loved ones and therapist talking to Dave, example: Dave turns his head towards the voice of the person speaking
**Rehabilitation Hospital Stay** : Intervention and goals in the rehabilitation phase often use purposeful activity and occupations with goals that focus on client factors, performance skills, as well as participation in occupations such as employment. Intervention approaches include establish/restore, maintain, and modify.

**Limitation**: decreased memory ability

**Goal**: Dave will demonstrate improved memory ability by increasing recall ability during activities of daily living. This foundation will assist Dave with instrumental activities of daily living and employability.

*Intervention*: memory book, to review schedule and daily events

*Intervention*: checklists, of daily routine

**Limitation**: decreased attention

**Goal**: Dave will demonstrate sustained attention when completing simple tasks. As Dave’s attention improves he will be able to learn and re-learn more information and skills. The ability to attend to a task is also a needed skill for returning to work.

*Intervention*: grooming and dressing, assistance provided as needed

*Intervention*: eating a meal, decreasing cues as Dave’s attention improves

*Intervention*: card games

**Limitation**: poor use or lack of executive function abilities

**Goal**: Dave will demonstrate the ability to begin to do simple planning, and problem-solving. The use of executive functions in simple tasks will assist Dave with more complex task such as those he would use on the job.

*Intervention*: simple meal preparation, such as canned soup and toast

*Intervention*: picking out clothing for dressing for work, whether, and every day.

*Intervention*: planning out daily activities in a work situation and for at home.

**Limitation**: limited safety awareness and orientation

**Goal**: Dave will demonstrate safety awareness by increased orientation to self, environment, and time. This ability is foundational for returning to work.

*Intervention*: knowing how and when to dial for emergency assistance

*Intervention*: ability to tell time, day, month, year using a clock and calendar

*Intervention*: demonstration of knowledge of work place hazards.
**Day Treatment Program:** Interventions and goals in this phase focus heavily on occupations however, client factors and performance skills are still addressed. Intervention approaches include establish/restore, maintain, and modify. At this point Dave has been discharged from the hospital and is independent for basic activities of daily living. He still needs supervision, particularly for learning or more complex tasks. At this point Dave is unable to Drive and will need to learn how to use the transportation systems in his area.

**Limitation:** limited executive function ability

**Goal:** Dave will demonstrate ability to complete simple tasks for job performance such as using a hammer, tape measure, and successful completion of simple problem-solving activities. At this point it is ideal to work with Dave’s employer to prepare Dave for eventual return to work.

*Intervention:* self-questioning, particularly when solving a problem

*Intervention:* self-monitoring, using metacognition to increase awareness

*Intervention:* self-instruction, verbally talking self through the process

*Intervention:* visual imagery, picturing self doing and successfully completing the task

*Intervention:* Checklist may be used for areas of difficulty or more complex job tasks as needed

**Limitation:** limited executive function ability

**Goal:** Dave will demonstrate use of public transportation by use of the bus and/or cab system for community mobility. Dave’s ability to get around in the community will allow him to return to work sooner and increase quality of life.

*Intervention:* bus training, participation in this occupation

*Intervention:* visual imagery: example road signs

*Intervention:* Dave and his occupational therapist will take the bus to his place of work to meet with his employer

**Limitation:** inappropriate or lack of nonverbal and verbal communication

**Goal:** Dave will demonstrate appropriate job place communication/interaction

*Intervention:* self-monitoring for eye-contact, appropriate gestures, and body orientation

*Intervention:* role playing & role reversal for appropriate expression, articulation, assertiveness and engaging in interactions

**Limitation:** limited executive function ability
Goal: Dave will demonstrate financial management abilities by correctly using a checkbook. This will assist Dave with managing his finances once he returns to work.

Intervention: balancing checkbook
Intervention: practicing bank transactions
Intervention: Self-instructing: talking self through each step

Limitation: decreased self-awareness
Goal: Dave will further develop self-awareness skills for metacognition to improve occupational performance with instrumental activities of daily living. Improvements in these areas can be seen as foundational to employment.

Intervention: identifying compensatory strategies such as self-questioning and visual-imagery that Dave finds useful to complete complex tasks. So Dave is then able to generalize these compensatory strategies to other situations or tasks.

Intervention: assisting Dave develop his own compensatory techniques to evaluate his performance during complex tasks.

Outpatient Treatment & Supported Employment: Interventions and goals in this phase focus heavily on occupations however, client factors and performance skills are still addressed. Intervention approaches include establish/restore, maintain, and modify. At this point Dave has been discharged from the hospital and is independent for basic activities of daily living and some instrumental activities of daily living. Interventions in this phase focus heavily on employment.

Limitation: poor awareness of time
Goal: Dave will demonstrate improved temporal organization with an emphasis on employment.

Intervention: alarm wrist watch
Intervention: Increased structure/supervision when first returning to work, part-time/light duty progressing to full-time regular duties.

Intervention: self-instruction though work tasks (this was practiced in day treatment and know applied to the actual environment)

Intervention: daily work task check list

Limitation: poor ability to generalize
Goal: Dave will demonstrate carry-over of skills from one job site to another.  
*Intervention:* employer/co-worker education by the occupational therapist  
*Intervention:* self-monitoring of performance to increase successful completion of tasks from one job site to another  
*Intervention:* job-coach trained and organized by an occupational therapist, the job-coach provides assistance as needed, with more assistance provided when Dave first returns to work

**Limitation:** limited use of executive functions  
**Goal:** Dave will be able to monitor his abilities at work and know when to ask for assistance. This will allow for increased independence and improved quality of life.  
*Intervention:* role reversal for assisting Dave in recognizing a situation in which he needs assistance  
*Intervention:* self-monitoring for correct and timely completion of work tasks; and problem-solving  
*Intervention:* education in problem-solving strategies for increased ability to solve problems independently.

In the preceding occupational therapy treatment plan, goals and interventions are highlighted in each phase of services delivery, with a focus on cognitive rehabilitation and employment. Dave’s treatment plan will assist in guiding cognitive occupational therapy rehabilitation services by demonstrating the use of current cognitive interventions in a functional and descriptive format. In the following section, a list of occupational therapy interventions are provided based on the occupational therapy practice framework structure (AOTA, 2002) and based on literature review findings of effective intervention strategies. These interventions are global in nature; only some are used in the previous case study application. They are intended to be useful as a planning guide for occupational therapists providing intervention for the wider adult brain-injury population. See also Appendices E through H for supplemental intervention materials.
The following details interventions that focus on cognitive rehabilitation with an emphasis on supported employment. Some but not all of these interventions were used in Dave’s treatment plan. The use of these interventions should be determined on an individual basis by an occupational therapist. Dave treatment plan is an example of how this can be accomplished (see Appendices E-H).

References: Cicerone et al., 2002; Dirette, 2002; and Toglia, 1998

**Establish/Restore Interventions**

- Problem Solving Strategies
- Role Playing Job Task, Role Reversal
- Job Applications
- Banking Activities
- Communication Strategies for Work
- Skills Training for a New Job
- Verbalization: Verbally Repeating Visual Information
- Chunking: Grouping Visual Information
- Pacing: Pausing to Clear Previously Perceived Visual Information

**Preventative Interventions**

- Education to at risk individuals (males under 35yrs of age)
  - Automobile Safety
  - Risk Taking
  - Common Consequences of a TBI
- Substance Abuse Education Post-TBI (family/client)

**Modify (compensation, adaptation) Interventions**

- Alarm Wrist Watch
- Check List; Task for Job are Listed out and Checked off After Completion
- Increase Structure/Supervision
- One Direction at a Time
- Employer Education
- Limit Unnecessary Detail
- Visual Cues, Labels of Job Task
Verbal Self-Instruction, Questioning, Monitoring, and Regulation
Categorization
Written Schedules, Lists
Use of Tape Recorder
Memory Notebook
Family/Care Giver Education

**Maintenance Interventions**
Continued Support for Employment- Job Coach
Structured Tasks
Support Groups
Consistent Care Givers
Relaxation Techniques
CHAPTER V: SUMMARY

The preceding protocol was developed for the adult client post-TBI and the occupational therapist(s) providing cognitive rehabilitation services through the continuum of care emphasizing supported employment as the final outcome of intervention. It started with my interest in the TBI population and cognitive rehabilitation. I then asked Jan Stube, a member of the occupational therapy faculty, for her assistance with this scholarly project. An extensive literature review was then conducted in which several patterns were seen. It was found that there was a lack of developed protocols of care developed for occupational therapy cognitive rehabilitation with the adult TBI population. There were unmet needs of the TBI population related to executive function impairments and unemployment. Further, research has been conducted on overall recommendations for clinical practice with this population but this information and not been integrated into a protocol that could be used by occupational therapists.

This information was combined with additional literature in the areas of neuroscience, common TBI interventions and assessments, specific needs of the TBI client, cognitive rehabilitation, and supported employment. A study conducted by Cicerone et al., (2002) developed evidence based practice guidelines for the treatment of persons with traumatic brain injuries and strokes which were than incorporated into the care protocol. The result was an occupational therapy protocol using a case study format that focused on cognitive rehabilitation and supported employment interventions. It was
designed to be reactive and flexible to meet the needs of each individual client. The occupational therapy care plan was developed to demonstrate the use of cognitive rehabilitative strategies at each phase of treatment from acute care to outpatient services.

It was found in a study by Heinemann, Solkol, Gervin, and Bode (2002) that memory, problem-solving skills, increasing income and improving job skills were the greatest unmet needs of the client post-TBI. For this reason these skills are addressed directly throughout the intervention plan as well as foundational skills needed for memory, problem solving, and employment. A study by Huebner, Johnson, Bennet, and Schneck (2003) found that cognitive limitations were the most reported reason for activity limitations following a traumatic brain injury. For these reasons this protocol focuses on occupational therapy cognitive rehabilitation interventions to address these unmet needs.

Further research indicated that there were two main paradigms as the basis for cognitive rehabilitation. The contextualized paradigm was used due to its applicability to current researched cognitive rehabilitation interventions. Togila’s model (1998), a Dynamic Interactional Model to Cognitive Rehabilitation, is an example of a contextualized paradigm in which emphasis is placed on direct observation of abilities and encourages a flexible approach to intervention of cognitive dysfunction. Thus this model was used in the development of the occupational therapy intervention plan.

Finally research in the areas of cognitive rehabilitation and supported employment were combined to develop this protocol. For example, Dirette (2002) investigated compensatory strategies such as “chunking” that were also used in this protocol. It was
also found that supported employment not only met the needs of the TBI population but it also could be cost effective and improve quality of life, (Wehman et al., 2003; Coetzer & du Toit, 2002).

The studies represented in this scholarly project are diverse in the type and quality of the research. Most of studies have a large sample size but a few had small sample sizes. The results may not be representative of all clients post-TBI. Also many therapists tailor interventions to meet the needs of each client which can make more rigorous research design more difficult to implement.

Clinical implications of this scholarly project include the need for educating occupational therapist about current cognitive rehabilitation interventions, improving employment outcomes for clients post-TBI, improving quality of life for clients post-TBI, and assisting occupational therapists with their method of evaluation and choice of interventions. It is also anticipated that the development of this intervention plan will also improve functional outcomes and the development of further occupational therapy evidence-based protocols. Further research is also needed to provide additional evidence of occupational therapy interventions with the TBI population, especially related to supported employment.
APPENDIX A

Neuroanatomy and Functions

Cerebrum: is made up of the frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

**Frontal Lobe;** consciousness, initiation of activity, judgments, emotional response, expressive language, word associations, and memory for habits and motor activities and is located at the anterior portion of the cerebrum.

**Parietal Lobe;** is located at the anterior and posterior portion of the cerebrum. Functions that occur at the parietal lobe include; visual attention, touch perception, goal directed voluntary movements, manipulation of objects, and integration of senses to a single concept. Parietal lobe is located at the anterior and posterior portion of the cerebrum.

**Temporal Lobe;** hearing ability, memory acquisition, some visual perception, and categorization of objects are all functions of the temporal lobe which is located on the lateral sides of the cerebrum.

**Occipital Lobe;** located at the most posterior aspect of the cerebrum is mainly responsible for vision.

Cerebellum: is located at the base of the skull functions to coordinate voluntary movement, balance, and contains some memory for reflex motor acts.

Brain Stem: breathing, heart rate, swallowing, startle response, autonomic nervous system, level of alertness, ability to sleep and vestibular functions are all controlled by the brain stem which is located in the spinal cord.

(References: Bear, Connors, & Paradiso, 2001; Lehr, 2004).
APPENDIX B

Types of Brain Injury

Localized Injury: causes damage to one area of the brain and as known as focal damage.

Diffuse Axonal Injury: movement of the brain within the skull cause stretching and tearing of the axonal white matter. Forces that causes this are acceleration, deceleration, and rotation of the brain within the cavity of the skull. This type of injury is only visible on a computed tomography (CT) scan in the worst cases.

Polar Injuries: occur when brain shifts within the skull and meninges. This usually is the case in a motor vehicle accident and general damages the frontal and temporal lobes.


TBI Severity

Mild TBI - has an initial Glasgow Coma Scale rating of 12-15 and duration of post-traumatic amnesia (PTA) is less than 24 hours.

Moderate TBI - has an initial Glasgow Coma Scale rating of 9-11 and a PTA of 1-7 days.

Severe TBI - has an initial Glasgow Coma Scale rating of 3-8 and a PTA of 1-4 weeks.

(Reference: Khan, Baguley, & Cameron, 2003).
APPENDIX C

Dynamic Interactional Model of Cognition by Toglia

<table>
<thead>
<tr>
<th>Individual</th>
<th>Environment</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing Strategies and Behaviors</td>
<td>Social interaction</td>
<td>Number of items</td>
</tr>
<tr>
<td>Metacognition</td>
<td>Physical</td>
<td>Complexity</td>
</tr>
<tr>
<td>Individual Characteristics</td>
<td>Cultural</td>
<td>Familiarity</td>
</tr>
<tr>
<td>External/Internal</td>
<td>Multiple Contexts</td>
<td>Arrangement</td>
</tr>
<tr>
<td></td>
<td>Familiarity/Predictability</td>
<td>Movement</td>
</tr>
</tbody>
</table>

Key Concepts:
1. Individual’s response determines how and what interventions will be used.
2. Test scores on performance skills and client factors are not as important as functional ability.
3. No predetermined order of interventions.
4. Processing strategies and behaviors is one’s approach to learning information and range form surface levels to deep processing strategies. For example, memorizing words to being able to generalize information to another experience.
5. “Metacognition refers to knowledge and regulation of one’s own cognitive processes and capacities” (Toglia, 1998, p.11).
6. Environment (social, physical, cultural) can influence one’s ability to learn.
7. Tasks are made up by parameters that can be changed for assessment and intervention for example, body position, lighting, and number of stimuli.
8. There is a dynamic interaction between the individual, environment, and task with influences learning.

Reference:
APPENDIX D

Terminology

The National Institutes of Health (1998, p. 4) defines a TBI, “as a brain injury from externally inflicted trauma which may result in significant impairments of the individual’s physical, cognitive, and psychosocial functioning.”

As noted by Radomski, (2001), the practice of occupational therapy means the therapeutic use of purposeful and meaningful occupation to evaluate and treat persons who have disease or disorder, impairment, activity limitation, or participation restriction that interferes with their ability to function independently in daily life roles and to promote health and wellness.

Occupational therapy intervention includes remediation, adaptation, disability prevention, and health promotion strategies. Services provided by occupational therapy include but are not limited to; evaluation, development, improvement, and restoration of occupations, performance components or performance skills, client factors, performance patterns or roles, adaptation of the environment or context, family and/or client education, consolations (AOTA, 2002).

Cognitive rehabilitation uses specific techniques to modify and prevent cognitive dysfunction, as well as promote, establish, and maintain cognitive function (Cicerone et al., 2000; Ashley & Persel, 2003).

Supported employment is an intervention used to assist the TBI client with community reintegration through the environmental context and other support services (Wehman et al., 2003).

Quality of life refers to one’s satisfaction with various areas such as employment, education, and relationships (Huebner, Johnson, Bennet, & Schneck, 2003).
Joe Smith
PH. 705-854-9823
Date________________
9845- 56th ST. S. APT 405
Sunny City, MN 34567

Pay to the
Order of__________________________________________________________
$________
______________________________________________________________ Dollars

Federal Savings Bank
PO. Box 30198 Sunny City
PH 1-800-478-4400

Memo________________________________
________________________________
:219853790: 13249851132: 01453
APPENDIX H
PROBLEM SOLVING

Define the Problem________________________________________________________
________________________________________________________________________
________________________________________________________________________
                                                                                   facts:
                                                                                   ______________________________________
                                                                                   ______________________________________

Causes:______________________________________________________________
________________________________________________________________________

Solutions________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Desired Result___________________________________________________________
________________________________________________________________________

Steps to Implement_______________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

How can I monitor_______________________________________________________
________________________________________________________________________
APPENDIX G

Application for Employment

Last Name___________________   First Name_____________________
Address______________________________________________
Phone___________________       Position_____________________

<table>
<thead>
<tr>
<th>Education</th>
<th>Institution</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
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</tbody>
</table>

Experience: (Name/Address of last 3 jobs/volunteer experiences, responsibilities, start/end date)
1.______________________________________________________________________
2.______________________________________________________________________
3.______________________________________________________________________

Applicant Information
Hobbies_________________________________________________________________

Personal
Qualities________________________________________________________________

References
1.______________________________________________________________________
2.______________________________________________________________________

I declare that all of the above information provided is true and complete.

Date_________________________    Signature______________________

_____
APPENDIX H

Sample Page for Memory Notebook (Inpatient Rehabilitation)

Today’s Date__________________________

For Breakfast I Had______________________________________________________
_______________________________________________________________________

In Occupational Therapy I ________________________________________________
________________________________________________________________________

In Physical Therapy I ____________________________________________________
_______________________________________________________________________

In Speech Therapy I ___________________________________________________
_______________________________________________________________________

For Lunch I Had_________________________________________________________
_______________________________________________________________________

In Occupational Therapy I ________________________________________________
________________________________________________________________________

In Physical Therapy I ____________________________________________________
_______________________________________________________________________

In Speech Therapy I ___________________________________________________
_______________________________________________________________________
REFERENCES


56


Bethesda, MD: The American Occupational Therapy Association, Inc.