Implications of Undiagnosed Cognitive Impairments in People with a History of Substance Abuse Seeking Vocational Rehabilitation

by

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ABSTRACT

Recent neurological research has demonstrated that a strong correlation exists between substance use disorders (SUD) and minor brain trauma injury (MBTI). This research paper reviews the array of complications that present themselves when these two disabilities coexist. Vocational Rehabilitation Professionals (VRP) who are aware of the various dysfunctions and limitations associated with substance abuse and minor brain trauma injury are likely to positively impact their client's employment outcome and support the client's substance abuse rehabilitation.

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Chapter I: Introduction

The role of the Vocational Rehabilitation Professional (VRP) is to assess the client's abilities, limitations and preferences. Using this knowledge, the VRP implements counseling skills to educate clients toward an informed choice of employment options (Commission on Rehabilitation Counselor Certification, 2006). When a disability is obvious, the VRP's course of action is fairly straight forward: assessment, evaluation, planning, treatment, job placement, follow up and follow through. During the rehabilitation process, the VRP assesses the client's interests, aptitudes, work history, skills and limitations in both the physical and cognitive realms. The VRP may enlist assistance from other sources (e.g., neuropsychologist) to evaluate the client's psychological strengths and limitations. The client and counselor collaborate to develop an Individualized Plan for Employment (IPE). The IPE may include treatment options (e.g. cognitive rehabilitation), training, assistive technology or employee supported services to overcome client limitations and foster a successful employment outcome (Rubin & Roessler, 2008).

Not all disabilities are easily assessed. The individual with minor brain trauma injury (MBTI) may appear physically fit, ambulatory and possess apparent communication skills. These visible characteristics may be coupled with invisible complicated neurological difficulties in areas of concentration, organization, multi-tasking, and memory deficits (Kay, 1986; Champion 2006). Kay described this condition as the "unseen injury " (p. 1). Undiagnosed brain trauma injury can severely limit an individual's gainful employment (Malec, Buffington, Moessner & Thompson, 1995). Additionally, misunderstanding the client's behaviors and attitudes can create conflictual stress in the counselor-client relationship (Zuger, 1993).

Since the early 1970's, the media has cooperated with health officials to educate the general public on the threat of brain damage caused by illegal drug use (Inaba & Cohen, 2007). As the presence of drug induced brain damage became increasingly obvious, researchers began to investigate the extent of neurological damage caused by substance abuse. Researchers using quantitative electroencephalogram technology (QEEG) were able to generate maps demonstrating brain damage from drug use or abuse (Braverman & Brown, 1996). The neuroscience community has made advancements in this area of knowledge in recent decades. Advanced neuroimagery technology allows researchers to view three dimensional images of the brain, showing both static and functioning images. This research contributes greatly to the understanding of substance abuse recovery and rehabilitation. Incorporating sophisticated neuroimaging technology like single photon emission computerized tomography (SPECT), allows researchers to better analyze and define neurological damage caused by substance abuse (Amen, 2001; Lingford-Hughes, et al., 2003; Iverson, Lange & Franzen, 2005). Researchers at the Brookhaven National Laboratory used positron emission tomography (PET) scans to document adverse affects of drug abuse (Volkow, 2001; Gately et al., 2005). Using functional magnetic resonance imaging (*f*MRI), researchers at the University of California – San Diego found evidence of prefrontal dysfunction (Paulus et al., 2002).

Additionally, advanced understanding of brain chemistry has aided research. Analysis of proteins in cerebral fluid is a useful indicator of damaged brain cells. Damaged and defective cells are reclaimed by breaking down their molecular structure into proteins that can be utilized elsewhere in the body. Higher levels of certain enzymes and proteins indicate the extensiveness of neurological atrophy occurring within a brain. Using protein analysis, University of Florida

researchers found evidence that drug induced neurological damage is similar to traumatic brain injury (Gold & Wang, 2007).

Researchers at the University of British Columbia attempted to differentiate neurological dysfunctions associated with brain trauma and those associated with substance abuse. Using traditional neuropsychological testing methods, Iverson, Lange and Franzen (2005) were unable to distinguish any differences in cognitive dysfunctions between people recovering from substance abuse and people recovering from MBTI.

Substance abuse rehabilitation is "a multi-phase, multi-faceted, long term process. Detoxification is only the first step on the road of addiction treatment. Physical detoxification alone is not sufficient to change the patterns of drug addiction" ("Drug-Statistics," n.d., p.1). People in recovery face many real and perceived challenges. The general public's bias toward substance abuse can contribute to these challenges. To protect the individual recovering from substance abuse from barriers to employment, the United States Congress included substance abuse in the Americans with Disabilities Act (ADA) of 1990.

Substance abuse is a disability protected by law under the ADA. Employers may not discriminate against an employee because of a known history of substance abuse. The individual is required to have successfully completed, or be currently participating in, a supervised rehabilitation program, and the individual must not engage in illegal use of drugs in order to receive protection under the ADA (Muir, 2003). Abstinence becomes crucial to the individual with a Substance Use Disorder (SUD). The law affirms employers' rights to maintain zero tolerance for current substance use. Therefore, it is vital that an individual with a history of substance abuse maintains abstinence.

Recent research addressing relapse prevention has determined a number of contributing factors that encourage long term sobriety. McIntosh and McKegany (2000) surveyed recovering substance abusers with continuous abstinence ranging from four years and three months to seven years. Three conditions were determined to be common essential contributors to long term abstinence: 1) Avoidance of previous environments that condoned substance use (i.e. wet environments) where they either bought or used alcohol or drugs; 2) Severance of ties with former drug using social networks, replaced with new and healthy non-using relationships, and; 3) Development of healthy activities to occupy free time. Survey participants reported that paid employment was preferred over volunteering. Therefore, the VRP is in a key position to support clients in relapse prevention (Christensen, Boisse, Sanhez & Fiedmann, 2004; Graham, 2006).

Vocational rehabilitation (VR) is recognized as an important course of action in substance abuse rehabilitation (Platt, 1995). Successful job placement benefits the recovery process by providing a substance free social network and a task orientated, structured environment that fosters feelings of satisfaction and accomplishment (DeLambo, Chandras, Homa & Chandras, 2008). VR focuses on helping the client to accept their disability, increase their self esteem and affirm their self efficacy regarding employment.

Information about VR and substance abuse is gradually becoming more available (Glenn & Moore, 2008). The popular traditional sources such as the "*Physical Aspects of Disability Handbook*" (Zaretsky, Richter & Myron, 2005) may not provide the most current information about SUD. For example: in the chapter titled "*Substance Use Disorders*" the editors briefly describe alcohol, cocaine and nicotine addictions. Other aspects of addiction described in the handbook include: social costs, intervention, denial, treatment, relapse prevention, and cravings. Absent from the list of disabling implications are the neurological or cognitive dysfunctions

caused by substance abuse. Similar to Kay's (1986) description of MBTI as the "unseen injury," cognitive limitations and dysfunctions resulting from substance abuse may continue to go unnoticed, undiagnosed and unaddressed throughout the VR process. The Job Accommodation Network (JAN) is a contemporary internet resource gaining in popularity with VRP's (Rubin & Roesslor, 2008). JAN describes accommodations for SUD that parallel conditions similar to MBTI.

Familiarization of minor brain trauma symptomolgy can aid the VRP in assessing limitations that may prove detrimental to effective rehabilitation assessment, strategies and outcomes (Yüral & Lubman, 2007). Knowledge of all conditions that contribute to the challenges of substance abuse recovery is likely to improve the effectiveness of the vocational rehabilitation process of clients with a SUD. This research will investigate the impact of minor brain injury incurred from substance abuse and explore the implications of undiagnosed brain injury on the vocational rehabilitation process.

Prevalence of Substance Abuse in the Vocational Rehabilitation Process

The Substance Abuse and Mental Health Services Administration (SAMHSA) estimates that in 2007, 22.3 million adults over the age of 12 were classified as substance dependent or substance abusing. Only 3.9 million of those people received treatment (SAMHSA, 2007). It is estimated that people with disabilities are two to four times more likely than the general public to experience substance abuse. Prevalence rates of substance abuse are 50% or greater, compared to the general public, than people with minor brain trauma injuries, spinal cord injuries, and mental illness (Benshoff & Janikowski, 2000).

Rehabilitation Services Administration (RSA) 911 data reported that in 2005, an average of 12.59% of individuals seeking VR services in the United States had a primary or secondary

diagnosis of substance abuse. The lowest percent was reported by Arizona with .90%. The highest reporting state was South Carolina with 28.32%. The mean percentage of all 50 states was 10.25% (Moore, 2007).

Statement of the Problem

As substance abuse continues to impact society, the VRP can expect contact with an increasing number of clients either actively using or recovering from a SUD. People who abuse illicit drugs or alcohol run a risk of experiencing residual cognitive affects from the toxic nature of these substances. In order to successfully interact with these clients, it is imperative that the VRP become aware of the limitations and dysfunctions attributable to the brain injury caused by substance abuse.

This research will investigate three areas of concern and address the following questions:

1) To what extent does substance abuse cause injury to the brain?
2) How does substance abuse induced MBTI affect the client/VRP relationship?
3) How do cognitive dysfunctions and limitations associated with substance abuse affect successful employment outcomes?

Definitions of Terms

Abstinence: To live without the use of any mind or mood altering chemicals with the exception of those medications that are prescribed by a physician as part of a medically sanctioned and monitored treatment.

Amotivation Disorder: A neurological deficiency that affects the initiation of thoughts and the initiation of action.

Cognitive: A person's conscious intellectual activity such as thinking, reasoning or remembering.

Consciousness: The mind's incorporation of sensations, perceptions, ideas, attitudes and feelings of which an individual is attentive to at any given moment.

Executive Function: The complex processes of the brain that utilize multiple brain structures and neuropathways simultaneously.

Minor Brain Trauma Injury: A traumatically induced physiological disruption of brain function before or after the event; alteration in mental status at time of accident, or; focal neurological deficits that may or may not be transient as manifested by any period of lost consciousness; loss of memory for events.

Recovery: The state in which an individual abstains from mood or mind altering substances, thereby improving the quality of cognition and emotional control.

Spontaneous recovery: The reappearance of an extinguished cognitive process or behavior(s) without the use of re-training or rehabilitation.

Substance Abuse: A maladaptive pattern of substance use leading to significant impairment or distress, as manifested by one or more distinct criteria.

Substance Use Disorder: Any of a category of disorders in which pathological behavioral changes are associated with the regular use of substances that affect the central nervous system

Assumptions and Limitations

A purpose of this study was to research the negative neurological impact of neurotoxins that enter the brain through substance abuse. Not all substance use results in permanent brain injury; in some cases, spontaneous recovery is possible. This study assumes that residual dysfunction occurs more frequently than complete spontaneous recovery. As a result, residual effects of substance abuse are likely to be experienced by an individual in recovery long after they have completed the withdrawal process.

Chapter II: Literature Review

Introduction

Brain imaging technology has made substantial advancements in recent years (Lingford-Hughes et al., 2003). PET, SPECT and single photon emission tomography (SPET) technology allow physicians and researchers to view images of the brain's activity as never before observed (Amen, 2008). Strong correlations have been established between the neurological affects of substance abuse and MBTI (Amen, 2001; Volkow, 2001; Gold & Wang, 2007).

VRPs play an important role in recovery and relapse prevention (Graham, 2006; Delambo, Chandras, Homa & Chandras, 2008). While traditional vocational rehabilitation strategies focus on the work place environment and schedule flexibility (Zaretsky et al., 2005), the neuroscience community is providing data indicates individuals with a history of drug or alcohol abuse are likely to experience limitations similar to individuals with MBTI.

Using advanced nuclear imaging technology, researchers are able to gather important information about how the brain functions (Amen, 2001; Pliszka, 2003). This information can aid in the rehabilitation process. For example, neurosurgeons now use advanced nuclear imaging to assess neurological damage resulting from strokes. The information gained from the brain images can determine a baseline prior to the initiation of rehabilitation. As patients undergo cognitive rehabilitation, scans are repeated to track the patient's improvements. As the brain reorganizes, the patient's rehabilitation is re-designed to maximize use of brain areas that are developing new activity (Mountz, 2007; Amen, 2008).

This literature review includes data published in three areas: 1) Brain injuries caused by drug and/or alcohol abuse; 2) MBTI and SUD impact on the client/VRP relationship; and, 3) Complications of MBTI on vocational outcomes.

Findings of Neurological Damage

Neurological damage resulting from substance abuse has residual effects. Nora Volkow (2001), and colleagues at the Brookhaven National Laboratories studied metabolism rates of methamphetamine users. They found abnormalities in the parietal cortex. The parietal cortex is the area of the brain that regulates intentional movement, manipulation of objects and the integration of different senses required for concept formation. In further research, studies indicated a 20% reduction of dopamine transporters in methamphetamine addicts as compared to the control group of non using subjects. Dopamine is a neurotransmitter present in regions of the brain that regulate movement, emotion, cognition, motivation and feelings of pleasure (Gatley et al., 2005).

Daniel Amen and fellow physicians at Amen Clinics, perform SPECT and PET scans to study the cerebral activity of people who have neurological disorders, brain injuries and SUDs (Amen, 2008). They have documented damage caused to all areas of the brain. Specific for this research paper is the damage identified in the prefrontal cortex. This area of the brain regulates consciousness and initiates activities of complex processing. Individuals that incur brain injuries causing damage to the prefrontal cortex and the frontal lobes are known to experience difficulties in executive functioning (Kay, 1986; Champion, 2006). Often, there are no apparent physical abnormalities. Sometimes the individual simply senses something is different about the way they think.

Evidence in a study reported by Mcevory, Kitchen and Thomas (2000) concluded that neurovascular accidents can occur in individuals who abuse cocaine, methamphetamine, or ecstasy. Intracerebral hemorrhaging was discovered in 6 out of the 10 participants in the study. Three other participants had indications of intravenous malformations (i.e., potential aneurysm

sites). An additional participant, who died, was found to have a middle cerebral arterial aneurysm discovered at autopsy. Only one of the ten participants was found to have normal intracerebral blood vessel structure. Researchers in London found that chronic methamphetamine users lost 11% of the brain tissue in their limbic region and 8% of the brain tissue in their hippocampus region (Thompson et al., 2004). The limbic and hippocampus regions of the brain regulate mood, emotion, the sense of pleasure and reward, new memory and storage of old memories (Pliszka, 2003). In Thompson's research, the magnetic resonance imaging (MRI) scans show consistent results with neuropsychological testing. The study participants with diminished brain mass tested significantly lower on memory and ability to concentrate. In addition, they reported feeling anxious and depressed more often than the control group.

Researchers in the United Kingdom studied chronic amphetamine and opiate drug users. Neuropsychological test results from the active users group were compared with tests results from a group of former amphetamine and opiate drug users. The results indicated significant impairment of executive and memory functions in both groups (Ersche, Clark, Robbins & Sahakian, 2006). Abstinence did not improve brain function.

Wilbrecht (2007) reported on the 2005 conference of the Oligonucleotide Therapeutic Society where Ali &Fornai (2006) presented a section of their book outlining the deteriorative effects of several drugs of abuse. These studies indicate neurological damage from substance abuse causes neurodegeneration similar to Huntington's and Parkinson's diseases. As with neurodegenerative diseases, damaged or ineffective neurons are subject to atrophy, causing a reduction in brain mass and a loss of neuro-circuitry. Once lost to atrophy, a neuron cannot regenerate. More recent studies by researchers at the University of Florida using protein analysis, found evidence that the drug ecstasy inflicts neurological damage similar to traumatic brain

injury (TBI) (Gold & Wang, 2007). The presence and quantity of certain enzymes and proteins in cranial fluid are indicators of cerebral atrophy.

In studies conducted at the University of Cambridge, Department of Experimental Psychology, researchers found a correlation between long term substance abuse and abnormal decision making (Clark & Robbins, 2002). Study subjects focused more on the associated reward (i.e., pleasure) than with the risks and consequences of the decision involved. Concurrently, studies conducted on cocaine dependent individuals report poor inhibitory response control (Lane , Moeller, Steinberg, Buzby & Kosten, 2007).

Correlations of Substance Abuse to Minor Brain Trauma Injury Complications

The Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine (Sbordone, Liter & Pettler-Jennings, 1995) defined Mild Traumatic Brain Injury as predicated by any event in which:

> an individual has had a traumatically induced physiological disruption of brain function, as manifested by at least one of the following:
>
> 1. Any period of loss consciousness;
> 2. Any loss of memory for events immediately before or after the accident;
> 3. Any alteration in mental state at the time of the accident (e.g., feeling dazed, disorientated, or confused); and
> 4. Focal neurological deficit(s) that may not be transient; but where the severity of the injury does not exceed the following:
>
> 4a. Posttraumatic amnesia (PTA) not greater than 24 hours.

4b. After 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and,

4c. Loss of consciousness of approximately 30 minutes or less (p.86).

They further comment that individuals with MBTI may not recognize cognitive deficits due to the disability's impact on cognitive functions. Most importantly, of the four criteria listed above, only one is required to meet the definition of having a MBTI.

Many elements of the MBTI definition mirror the description of the "tripping" phenomenon described by individuals who have SUD. Consciousness is defined as "the totality of psychology of sensations, perceptions, ideas, attitudes and feelings of which an individual is aware at any given time or within a time span" (Merriam-Webster, 2009). The user "spaces-out" or "passes-out" and in some instances "blacks-out." Some experiences can result in seizures.

Many people who use drugs or alcohol describe loss of memory. First time users and chronic abusers describe episodes known as blackouts: "I don't know how I got home, but I was in my house and my car was in the driveway." The user often has no memory of events for varying lengths of time, even up to several hours or longer in duration. The "high" that people experience when using psychoactive drugs or plants can include undesired effects including hallucinations and racing thoughts. Alteration of the mental state is precisely the goal for the vast majority of people who abuse substances.

Extrapolating from the committee's definition of MBTI, each of the four conditions can commonly be found in people with a SUD. Compelling research shows evidence of MBTI caused by substance abuse in many individuals. Concomitant with the probability that MBTI can occur in people with SUD, is the likelihood that these individuals will also experience residual cognitive defects.

This literature review includes recently published studies of cognitive limitations associated with MBTI. New imaging technology assists scientists to more effectively map functional properties related to specific areas of the brain (Amen, 2001; Pliszka, 2006). Understanding the correlations of damaged areas of the brain to cognitive functions associated with those areas, may provide VRP's a better understanding of their client's behaviors and attitudes (Champion, 2006). This information could enable VRP's to more efficiently assess areas of concern, evaluate (or refer for evaluation), and counsel clients concerning limitations they may experience while performing tasks associated with certain jobs (Malec et al., 1995; Rubin & Roessler, 2008).

How Minor Brain Trauma Injury Impacts the Therapeutic Relationship

Another research area includes studies pertinent to neurological complications associated with MBTI rehabilitation. Knowledge of symptoms expressed by the client with MBTI can help the vocational counselor understand behaviors, attitudes and dysfunctions that could otherwise contribute to the deterioration of the client and counselor relationship (Zuger, 1993). By incorporating knowledge of SUD and MBTI, VRPs can educate and counsel clients toward recognition and acceptance of both cognitive disability and related limitations.

Champion (2006) indentified attention, memory, executive functioning, feelings and thoughts, communication and perception as areas of potential complication with people who have sustained a brain injury. The need for understanding and patience from supportive relationships is important to the rehabilitation process. The work place is often where subtle problems begin to identify themselves. Employers, family and the VRP can play key roles in the identification, accommodation and continual improvement of the individual.

How Minor Brain Trauma Injury Impacts Vocational Outcomes

Mayo Clinic published a study reporting results of a multidisciplinary rehabilitation team working with patients that incurred brain injury. The study indicated positive employment results were achieved when medical and vocational case management systems worked together with individuals who have brain injury. The program describes barriers to employment that brain injury survivors encounter. An important barrier defined was the need for the VRP to educate the employer about the ramifications of brain injury. The employer's awareness and understanding of the limitations exhibited by brain injury was an important factor necessary to enlist the cooperation of the employer in the patient's recovery (Malec et al., 1995).

The neurological assessment must begin immediately (Champion, 2006). VRPs must be aware of cognitive deficits and address these within the intake process. For example, if an individual is unable to understand written material, think in abstract terms, or is unable to process auditory language, the therapeutic or vocational counseling is likely to have little impact. Speaking to this same issue, the Ohio Valley Center for Brain Injury and Rehabilitation offers 22 suggestions for substance abuse treatment providers working with clients who may have cognitive limitations (Suggestions for Substance Treatment, 2007). These 22 ideas are divided into four categories: communication and learning; accommodations for unique communication and learning styles; direct feedback for inappropriate behaviors; and, cautions regarding inferences of motivation and behaviors.

Apathy and motivation are impacted by brain injury, neuro degenerative diseases, mental illness and substance abuse (Shulman, 2007). Amotivation is a neurological disorder resulting from neurological abnormalities found in the hippocampal region of the brain. An individual impacted by this disorder may appear to be lazy or aphetic. Research into Parkinson's disease

and schizophrenia suggests that not all symptoms of depression are indicative of the mental illness. Amotivation may emulate the same symptomolgy, but the disorder has subtle differences and treatment modalities.

It is imperative that the VRP is aware of the possible implications MBTI can have on the therapeutic relationship. According to Rubin and Roessler (2008), a thorough understanding of the client's assets, limitations and preferences is the catalyst of a successful rehabilitation plan.

Chapter III: Methodology

Introduction

VRPs play an important role in substance abuse recovery (Malec et al., 1995; Delambo et al., 2008). Knowledge of residual effects caused by substance abuse and MBTI increases the likelihood of the professional's effectiveness, thereby facilitating client success. Current literature relating to the detection and diagnosis of cognitive dysfunctions in individuals with SUD was reviewed for this paper. Peer-reviewed literature, published in both printed and electronic format, was utilized.

Data Collection

This research investigated three topics: 1) To what extent does substance abuse cause injury to the brain? 2) How does substance abuse induced MBTI affect the client/VRP relationship? 3) How do cognitive dysfunctions and limitations associated with substance abuse affect successful employment outcomes?

Research was conducted through the UW-Stout library utilizing the EbscoHost, Google and Googlescholar search engines. Key words associated with the topics were entered into the internet search engine. The key words used were: vocational rehabilitation and substance abuse; substance abuse; substance abuse recovery; substance abuse and brain damage; substance abuse and cognitive damage; neuroscience and substance abuse; neuropsychiatry and substance abuse; neuroimaging and drug abuse; neuroscience and brain injury; neuro-imaging and brain damage; vocational rehabilitation and minor brain trauma; and, brain trauma and cognitive disability. Selection criterion for articles and publications included relativity to the topic and the credibility of the author or website. Website credibility was established based on the integrity of the author, agency or organization sponsoring each site.

Data Analysis

Substance abuse research was limited to toxic neurological insult causing MBTI in people abusing drugs and alcohol. This literature did not include brain trauma injury caused by external injury or blunt force traumas that occurred prior to substance use. Dual diagnosis of mental illness and substance abuse occurring simultaneously was also excluded from this study. Though dual diagnosis and comorbidity is recognized as prevalent in the population of people with disabilities, this literature was considered outside the scope of this review.

Vocational rehabilitation research was limited to literature that addressed the VRP's pro-active influence on substance abuse recovery. These findings included articles relevant to MBTI complications that can occur in both vocational rehabilitation and substance abuse treatment. Also included was literature related to cognitive dysfunctions and limitations of MBTI and how they impact employment outcomes. This research included literature concerning successful assessment techniques, strategies and accommodations for MBTI.

This literature review also investigated information originating from substance abuse treatment professionals. Literature discussing rehabilitation strategies and concerns from professionals with direct experience working with SUD was considered valuable to this research. Their knowledge and experience offers insight to the VRP and positively impacts the vocational rehabilitation process.

Chapter IV: Results

Introduction

Research was conducted to investigate associations between neurological damage and cognitive dysfunctions resulting from substance abuse. Strong correlations link substance abuse to MBTI (Volkow, 2001; Lingford-Hughes, et al., 2003; Iverson et al., 2005). The hypothesis was that this research would indicate neuropsychological damage resulting from substance abuse. Comparative research on MBTI cognitive deficits show that similar complications are experienced by individuals with SUD. MBTI research offers insight to rehabilitation strategies that benefit the client or patient (e.g., memory and executive function deficits). Furthermore, this research supported the premise that dysfunctions associated with areas of damage do impact an individual's ability to adequately perform certain tasks within the vocational rehabilitation process.

Substance Abuse and Toxic Insult on the Brain

The most convincing data collected in this research came from images produced by neuroimaging technologies such as PET, SPECT and *f*MRI. These technologies use sophisticated nuclear imaging to analyze the health, activity and metabolism of brain cells. The SPECT scan images shown below reveal irrefutable evidence that neurological damage and abnormality occurs as a result of substance abuse.

Figure 1 shows SPECT images of a healthy brain. Areas of the palest colors ranging toward white indicate high or overactive neuro-activity. The areas indicated by the lighter colors of yellow, green, pink and red indicate healthy metabolism and efficient neuro-activity. Colors darkening toward the blue and purple color variations indicate decreasing neuro-activity, while areas of no activity appear as colorless voids.

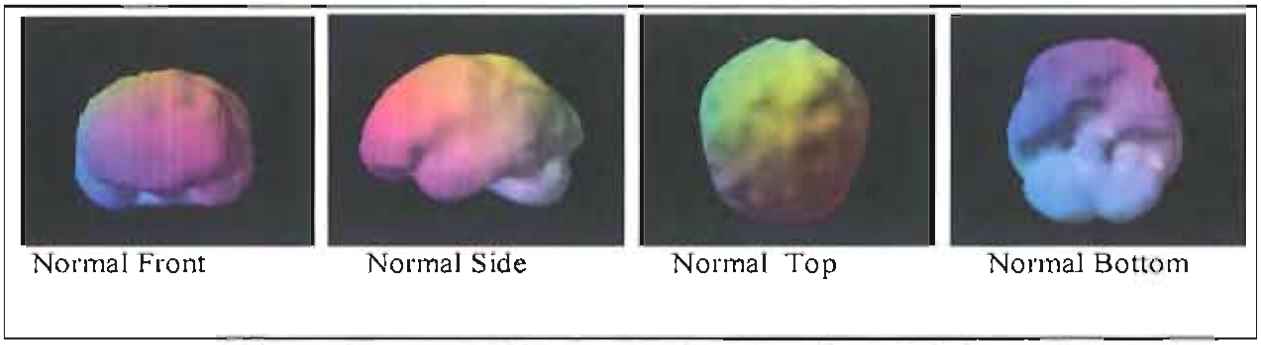

Figure 1. SPECT brain scan images of healthy normal brain activity. Copyright by Amen Clinics Inc. Printed with permission from MindWorks Press and Amen Clinics Inc.

Figure 2 shows images of brains affected by chronic heroin abuse. Figure 1 and Figure 2 show evidence that heroin use has decreased neuro-activity throughout the brain. The upper area of the front view indicates diminished activity across the cortex of the heroin abused brain, and the lower regions of the temporal lobes have become inactive. In the normal brain these regions in the front view are active and the lower portion of the front view is more filled out. In the top view of Figure 2, the surface area is pocked with multiple areas of non-activity. A front view of this brain would indicate the depth at which the damage has occurred, similar to the front view shown on the left. Comparatively, the normal brain is full and solid.

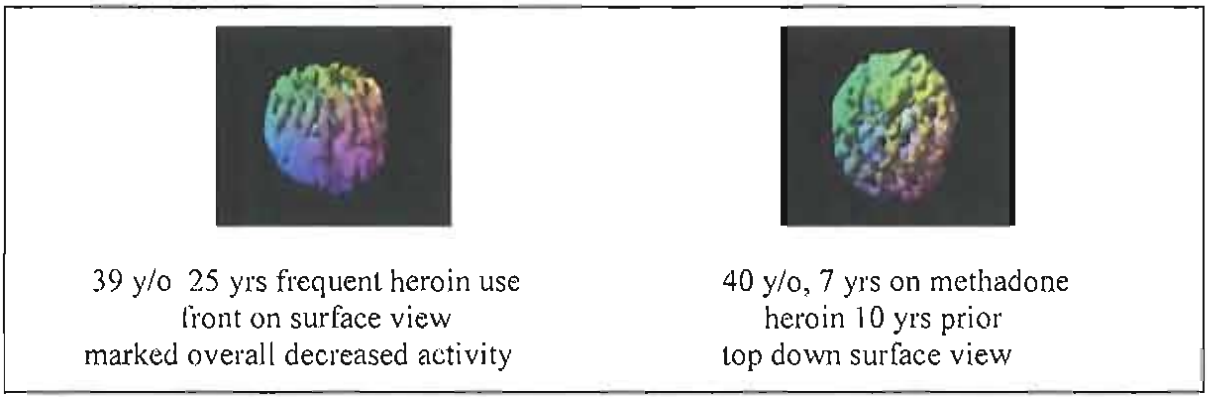

Figure 2. SPECT brain scan images of substance abuse. Copyright by Amen Clinics Inc. Printed with permission from MindWorks Press and Amen Clinics Inc.

Marijuana use is often argued to be safe and non-pervasive (Olhms, 1992). In Figure 3, brain scans of chronic marijuana users indicate that the lower regions of the brain have reduced neurological activity. Figure 3 represents brain scans of the underside viewed from the neck region looking up into the brain. The brain scans indicate that overall activity has decreased in the prefrontal cortex and the temporal lobes. The darker areas also indicate that the efficiency of the neuro activity has been diminished.

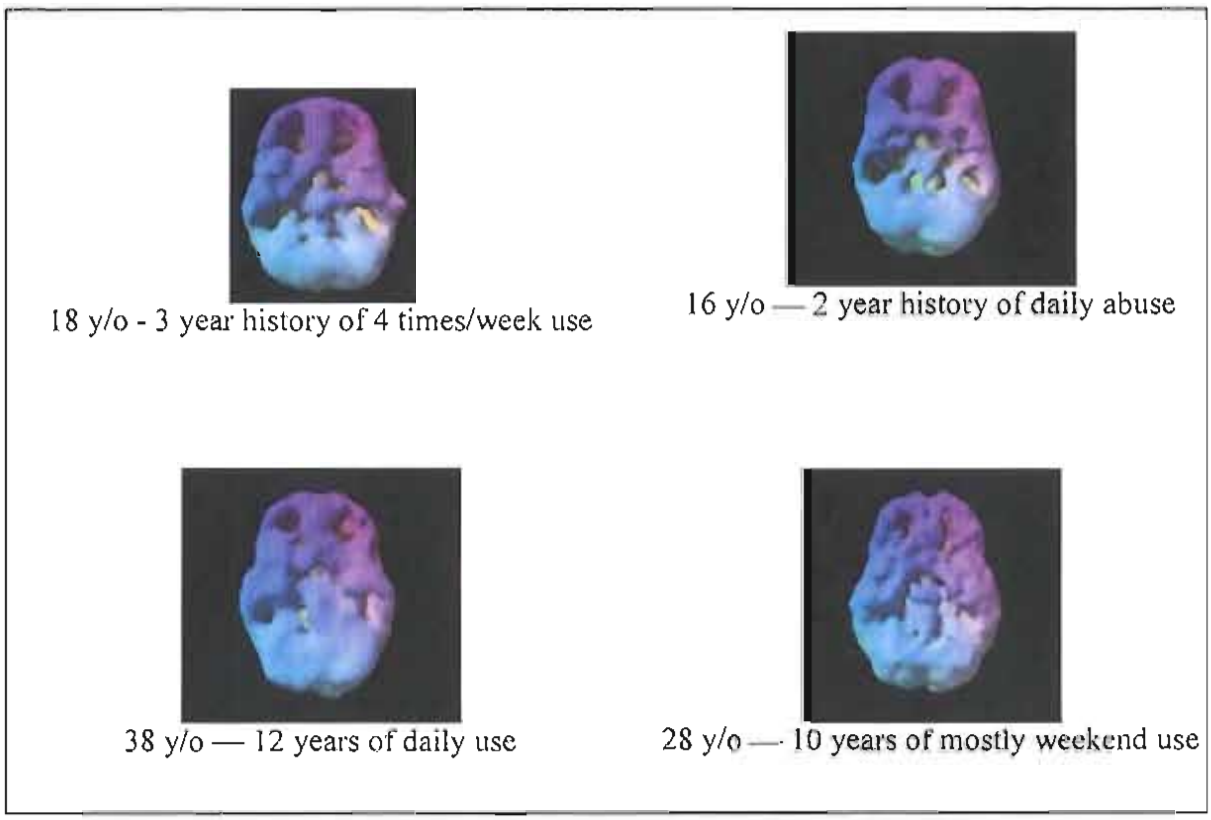

Figure 3. SPECT brain scan images of marijuana use. Copyright by Amen Clinics Inc. Printed with permission from MindWorks Press and Amen Clinics Inc.

Alcohol is seldom perceived by the general population as a neuro-toxin (Inaba & Cohen, 2007). Neuroimaging in Figure 4 shows evidence of neuro degeneration throughout the brain. The major damage from alcohol abuse occurs in the parietal lobes, occipital lobes and the underside of the temporal lobes.

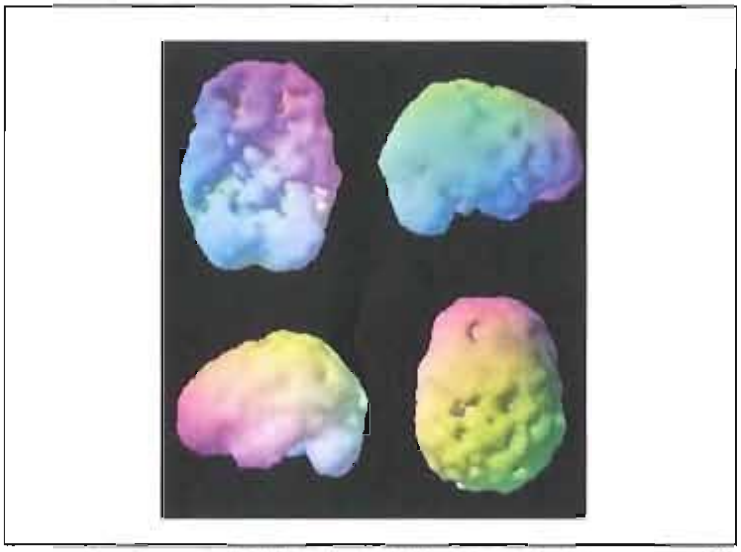

Figure 4. SPECT brain scan images of daily Alcohol Use. Copyright by Amen Clinics Inc. Printed with permission from MindWorks Press and Amen Clinics Inc.

Using similar technology, Volkow (2001) found evidence of reduced brain matter volume in the hippocampus. The hippocampal region of the brain is crucial in shifting short-term memory into long-term memory. Pliszka (2003) reports that critical memory of past experience is stored in this region and plays a part in stimulating the hypothalamus to prepare for response (e.g., fight or flight, anxiety, biophysical responses, etc.). Furthermore, reduced hippocampal volume has been associated with executive dysfunction in individuals with major depression (Frodl et al., 2006) .

Volkow (2001) and colleagues also found evidence of abnormal neurochemistry in the cranial fluid at the molecular level. Studies show that neurotransmitters such as dopamine are continually mimicked by stimulant drugs including methamphetamine. As the brain reacts to this foreign substance, it reduces its natural production of dopamine. Since dopamine is responsible for the sensation of pleasure, the absence of dopamine generates a flat or depressed feeling. Without the ability to feel the sense of pleasure naturally, the substance user often feels

depressed during withdrawal and may resort to substances to relieve the depression (Devine, n.d.).

Dopamine is an active neurotransmitter in the limbic region of the brain. Its reduced presence in this area inhibits the neuropathways relating to emotion, pleasure and memory, gradually depleting the overall activity in this region. Studies by Thompson and colleagues report an 8% to 11% reduction in the brain matter of the limbic region (Thompson et al., 2006). This reduction in volume correlates to depression and memory loss resulting from problems utilizing the circuits of the thalamus and hypothalamus (Pliszka, 2003). This reduction of brain matter found by Thompson and colleagues is an indicator of cerebral atrophy, similar to Huntington's and Parkinson's diseases (Volkow, 2001).

Data from studies using traditional neuropsychological testing methods such as the Wisconsin Cart Sorting Test, the Trail Test, and Tower of London Test, verify that substance abuse adversely affects cognitive functioning. These results correlate with the abnormalities found in neuroimages, and are related to the functions and performance associated with specific areas of the brain (Grant et al., 2000; Paulus et al, 2002; Iverson et al., 2005; Ersche et al., 2006). In many cases, the deficits caused by closed brain injury (i.e., MBTI) are similar to the dysfunctions experienced by people recovering from substance abuse (Iverson et al., 2005).

Analyzing protein in the cranial fluid of methamphetamine users, researchers at the University of Florida found levels of protein similar to individuals with brain injury (Gold & Wang, 2007). Higher than normal levels of certain protein indicate that brain cells have been damaged beyond repair, and atrophy is occurring. Atrophy is the body's natural process of dismantling unutilized cellular material into proteins that can be put to use elsewhere in the body.

In a study conducted by University of British Columbia and Riverview Hospital researchers attempted to distinguish between MBTI caused by head trauma and cognitive dysfunction associated with substance abuse (Iverson et al., 2005). Head trauma survivors are often involved in litigation to award compensatory damages for the sustained injury. Since the rehabilitation process for MBTI can be a lengthy venture, litigators often seek to determine if the individual with MBTI has true symptomolgy or is pretending to have symptoms (i.e., malingering). Additionally confounding the rehabilitation process is self-medicating by patients to quell their emotions and frustrations associated with the MBTI.

Researchers reported that it is impossible to differentiate between cognitive dysfunction resulting from trauma and cognitive dysfunction caused by substance abuse (Iverson et al., 2005). Even though the study was not directly related to substance abuse causing brain damage, this study demonstrated that the damage is as extensive as the damage found in MBTI.

Other research focused on the long term affects of methamphetamine abuse (Ali & Formai, 2006) and support evidence that methamphetamine use reduces dopamine. The brain produces less dopamine as an individual ages. The drug induced loss of dopamine production, especially in addition to the natural decline, could lead to debilitating consequences. Regarding dopamine deficiency, researchers warn that these individuals are at an increased risk for developing various neurodegenerative symptoms or diseases earlier than has been typical (Volkow, 2001).

Brain Injury Impact on Vocational Outcomes

Four possible vocational outcomes are commonly realized by individuals with brain trauma: 1) A person is able to return to work at a level comparable to pre-injury; 2) A person returns to pre-injury work status but reports complications executing the same job duties; 3) A

person returns to a position requiring less cognitive functioning, or; 4) A person does not return to work at all (Thomas, Menz & McAlees, 1993). Evaluation is necessary in order to determine which outcome is most feasible. Failure to use evaluation of physical and cognitive abilities forces the VRP to utilize trial and error methodology to determine the individual's return to work capacity. Unfortunately, the results of trial and error strategies often lead to job dissatisfaction, injury, or termination of employment. For an individual recovering from substance abuse, such consequences can have grave effects. Diminished self esteem and emotional stress can precipitate a return to substance abuse (Inaba & Cohen, 2007).

Champion (2006) reports that difficulty with memory is the most common problem following a brain injury. The processes of memory utilize several regions of the brain that drugs and alcohol adversely impact. Prospective memory (working memory) is the type of memory that is utilized to remember transient things. Another type of memory is called procedural memory. It is used to perform a job or task. Playing the piano or riding a bike are learned after several repetitions. Procedural memory is more durable than prospective memory.

Semantic memory is utilized to recall specific facts. People who excel at trivia type games have a high functioning semantic memory. Semantic memory is used to remember: personal information, important phone numbers, company address, or a physician's name. Simple math utilizes a form of semantic memory. Some individuals experience a loss in the fourth type of memory process called meta memory. This type of memory prompts an individual to remember . Dysfunctional meta memory is apparent when an individual utilizes a planner or list in order to organize their day, but forgets to look at the planner.

Episodic memory involves the recall of specific events or incidents that has already occurred. For example, a person may remember how to get to work (procedural memory) but

fails to remember how long they have worked at their job (episodic memory dysfunction), or the names of the people they work with (semantic memory dysfunction). Often a person will not remember having performed a task previously, yet given the opportunity, they are able to perform the task.

Training someone to execute a new or lost skill is an important process in brain trauma rehabilitation. Client safety should always be a primary concern in the training phase. Response inhibition is the ability to alter a learned task (procedural memory) when something interferes with the expected outcome. Studies conducted on cocaine dependent individuals report poor inhibitory response control (Lane, Moeller, Steinberg, Buzby &Kosten, 2007). Inhibitory response is processed through the brain's executive functioning process.

Studies indicate executive functions are frequently impacted by substance abuse (Grant et al., 2000; Paulus et al., 2002; Mackin et al., 2005; Ersche et al., 2006). Executive function is the complex process utilizing multiple area of the brain simultaneously, that regulate such functions as planning, memory, organization, judgments, task shifting, self monitoring and time management. Job skills that require extensive use of executive functioning can limit an individual's efficiency, accuracy and overall performance (Kay, 1989; Champion, 2006).

The Ohio Valley Center for Traumatic Brain Injury works with clients who have sustained a brain injury and later develop a substance abuse disorder. Suggestions made on their website offer insight for counselors working with clients that have brain injury. This facility works mainly with postmortem substance abuse (i.e., substance abuse that occurs after an acquired brain injury). The Ohio Valley Center's suggestions provide insight to the VPR concerning how cognitive issues impact the client. It is suggested that before any effective work commences, the counselor must first ascertain that the client is capable of understanding spoken

and written communication (Suggestions to the Treatment provider, n.d.). Assessment of communication abilities like listening, reading, and writing is paramount to initiation of any rehabilitation or therapeutic process.

The neurological process of communication including reading and comprehension, utilizes the temporal, occipital, and frontal regions of the brain (Pugh et al., 1996). Neuroimaging and psycho-neurological testing indicate damage occurs to these areas as result substance abuse. A person is unlikely to benefit from written or spoken instruction if they are unable to cognitively process language. Consider the client who may hear what the VRP is saying, but in reality, the client is experiencing difficulty linking words together to form an understanding. The VRP sees no indication of difficulty from the client. In response, the client may nod to indicate they understand. Their response is only done to mask their difficulty in comprehension and not appear "stupid." The VRP in turn, accepts the nod as affirmation of comprehension, proceeding onto the next explanation, instruction or concept. VRPs should consider the complexity of the instructions and written information they provide to their clients. A verbal confirmation is necessary to ensure the client understands. A client's lack of comprehension may appear as noncompliance or inattentive behavior. The VRP could logically interpret these behaviors as insincerity to the vocational rehabilitation process. Caution should be used so the VRP does not assume the client is unwilling to fully participate.

Verbal instructions can be a challenge for individuals with MBTI. They may forget instructions shortly after hearing them (Champion, 2006). Dysfunctional memory encoding combined with dysfunctional working memory can result in omission of portions, or entire instructions. Clients are often blamed for inattentiveness when the reality may be the client has memory function impairments in encoding and retrieving information. Additionally, executive

function plays a key role in sorting, storing and retrieving information to complete the process of understanding. Thus, verbal instructions should be reinforced with written communication.

The process of reading involves multiple cognitive activities of symbol recognition, memory recall, memory encoding and conceptualization (Perfetti & Bolger, 2004). The process of reading includes the understanding and interpretation of phonetics. Therefore, auditory interpretation and reading have similarities in the cognitive processes and neurological structures they employ. Utilizing *f*MRI, Pugh et al., (1996) found that reading activates the temporal, parietal, occipital and frontal lobes of the brain, all areas impacted by substance abuse.

The inability to communicate efficiently through speaking, reading or writing may produce frustration and anxiety. As emotions exasperate, the ability to speak or recall coded information declines. Language difficulties combined with the emotional quagmire within the client can complicate the individual's rehabilitation process and employment outcomes.

Chapter V: Discussion

Introduction

This discussion will address the three research questions posed in Chapter One. First it will explore the potential residual cognitive dysfunctions an individual recovering from substance abuse may have experienced. Secondly, this discussion will highlight the importance of awareness on the part of VPRs to identify possible undiagnosed neurological conditions that may affect their client's abilities. These undiagnosed cognitive conditions can be misperceived by the counselor. Misunderstandings between the counselor and the client, and in some case within the client, can strain the therapeutic relationship. Finally, this discussion will focus on how cognitive dysfunctions adversely affect employment goals, potentially endangering the client's recovery and abstinence. A VRP who is unaware of cognitive dysfunctions in their client can inadvertently support unrealistic employment goals, leading the client to unexpected job performance difficulties, resulting in job stress or termination. Frustration, shame and failure may potentiate incentives within the client to revert back to substance abuse behaviors as a quick fix for insecurity and negative emotions.

Cognitive Dysfunctions Associated with Substance Abuse

Utilizing advancements in neuroimaging technology, researchers are discovering the impact of substance abuse on the brain (Volkow et al., 2001; Lingford-Hughes et al., 2002; Paulus et al., 2002; Gately et al., 2005). The research indicates that these psychoactive substances affect nearly every area of the brain. The damage inflicted by substance abuse impacts a user's ability to fully function in several ways. In some cases the affects are noticeable (e.g. tremors, slowed gait, or difficulty with speech). In other instances, the damage occurs in areas that facilitate higher cognitive processes and the dysfunctions are less apparent (e.g. memory, organization, problem solving and concentration).

Research on brain neuro-circuitry is also compiling evidence that assists physicians, counselors and researchers in understanding how the brain, as an organ, operates. The identification of functions associated with specific structures of the brain aid in the understanding of the cognitive processes affected by substance abuse. Knowledge of the neuropathways that link the brain's structures together is useful to analyze the interrelations between structures and the cognitive dysfunctions that occur when these pathways or structures are compromised (Allen, 2002; Pliszka, 2003; Champion, 2006). Then, as the brain heals itself through maintaining abstinence, the IPE can be modified to meet the client's improvements, in both cognitive and physical functioning levels (Lingford-Hughes et al., 2005).

Additionally, studies at the molecular level provide insight into the multiplicity of neurotransmitter functions. Scientists now better understand the diversity of functions that neurotransmitters perform. In addition to their electro-chemical communication abilities, neurotransmitters also work with peptides and neurotrophins contained in the cranial fluid to maintain the health status and growth of brain cells. The toxic destruction of healthy neurotransmitters can lead to inefficient neuronal communication, decreased cognitive processing and eventual neuron death resulting in cerebral atrophy (Pliszka, 2003).

Current research is re-forming perceptions toward substance abuse. Nora Volkow (2001), director of the National Institute on Drug Addiction (NIDA), describes substance abuse as a disease of the brain. Abuse of drugs or alcohol creates a chemical imbalance within the brain. The withdrawal and cravings experienced by people attempting to abstain from substance use present real physical symptoms. Autonomic responses to withdrawal can be beyond the individual's ability to control. Abnormalities within the brain's structures and chemistry can produce serious consequences (e.g., seizure). The inclination for an individual to return to

substance abuse for immediate relief can overpower the user's ability to control their decision toward abstinence. Willpower alone may not be enough to ensure prolonged abstinence (Devine, n.d.). Relapse becomes an attempt to relieve withdrawal symptoms. For example, with opioid addiction, withdrawal symptoms may include pronounced muscle and joint pain, insomnia, and flu-like symptoms including diarrhea (Inaba &Cohen, 2007).

Researchers also found neurological effects of substance abuse can parallel known degenerative diseases of the brain such as Huntington's and Parkinson's Disease (Volkow, 2001; Ali &Fornai, 2006). Similar to these diseases, an individual with SUD is unable to control the catalyst of the nerve destruction (i.e., neuro-toxic elements associated with drugs or alcohol). The progressive neurological deterioration exceeds the body's natural ability to defend or heal. The VRP should be aware that these symptoms (Parkinson's Disease) may be due to substance abuse. A referral for a brain scan may be necessary.

Based on these parameters, it can be understood why substance abuse recovery has been defined as a complex task. "Withdrawal from the toxins of substance abuse is just the beginning of the road to recovery. Substance abuse rehabilitation professionals believe that behavioral and cognitive strategies are required to facilitate a change within the lives of people seeking recovery" (brain statistics, n.d.). In addition, the disabling neurological effects of substance abuse can include many possible cognitive dysfunctions which present additional challenges (Fals-Stewart et al., 2003).

McIntosh and McKeganey (2000) found that healthy activity was one of three contributing factors that facilitated long term abstinence. Traditional support groups like AA and NA suggest volunteer work as important activities for newly recovering alcoholics and addicts. Participants agreed that, while they found service work beneficial, they preferred paid

employment. Employment offers a structured and healthy environment for substance abuse recovery (Graham, 2006, Delambo, et al., 2007). At the same time, employers need the assurance that employees' perceptions and abilities are not obscured by the impact of substance abuse (Muir, 2003). As defined in the ADA, employers may reinforce a substance free work environment and are not required to tolerate employee substance use. The ADA protects only the individual who has gone through treatment at an accredited substance abuse rehabilitation facility and remains abstinent. Therefore, the long term abstinence for an individual in recovery is crucial to their employment. Employment can facilitate successful recovery, but alone does not guarantee success. Continuous involvement with aftercare recommendations and participation with peer support groups is also necessary (McIntosh & McKeganey, 2000). The VRP using the techniques of motivational interviewing can lead the client to define their personal benefits of employment. When the client discovers increased self-esteem, confidence and increased socio-economic status as personal motivators, they become empowered to take personal responsibility for their abstinence (Graham, 2006). Motivational interviewing is a counseling technique that has successful outcomes by locating unique motivators for each client (Hoster & Miller, 2003).

Researchers found that employment can foster long term abstinence from substance abuse (McIntosh & McKegany, 2000; Delambo et al., 2008) and cultivate reintegration of the former addict into society (Graham, 2006). Employment serves as a healing agent and an educational process for the individual recovering from substance abuse. The former isolated lifestyle can be replaced with normal societal relationships. Employment offers the benefit of structured time: the employee is expected to follow the employer's regimen of start time, break time and quitting time each day. Employers expect employment tasks to be completed in a logical and sequential order (Delambo et al., 2008). Additionally, the employee becomes part of

a micro-society, all attempting to succeed with similar employment demands. Communication, cooperation and social behaviors are often necessary for the satisfactory completion of work projects (Graham, 2006). Therefore, client social skills become an important area to address within the VR process.

Given their professional responsibility to assess, counsel and coordinate aid(s) toward successful employment outcomes (CORE, 2006), the VRP can assist people in recovery to develop IPE's that incorporate physical, cognitive and psychosocial considerations. Sensitivity and awareness of the unique disabilities and limitations of people in recovery can foster long term employment and community reintegration (Delambo, et al., 2008).

Researchers found that substance abuse affects the brain in three ways. First, toxins found in illegal drugs and alcohol enter the brain's chemistry and force an imbalance in normal brain activity. This neuro-chemical imbalance is perceived by the individual to bring a desired affect: dizziness, lightheadedness, pleasure, disruption of thought, relaxation, hallucination, heightened awareness, increased energy, etc. Meanwhile, the toxins are also affecting the communications between brain cells. Neurotransmitters are either increased or decreased beyond their normal functioning levels. Either condition can create inefficiency in the communication between vital neuronal connections. Volkow (2001) found that dopamine levels were greatly reduced in the brain chemistry of people who used methamphetamines. The toxins within methamphetamine mimic neurotransmitters such as dopamine. As the toxin replaces natural dopamine, the brain perceives less need for dopamine and reduces production. Eventually, natural dopamine levels decrease until the person can experience pleasure only by reintroducing the chemical toxin. When an individual detoxifies from methamphetamine use, the lack of natural dopamine

generates a depressed feeling. This depression lasts until the balance of natural dopamine is restored.

Degeneration of neurons is the second affect substance abuse has upon the brain (Volkow, 2001; Thompson, et al., 2004). Chemical toxins such as those found in methamphetamine, act as direct solvents on the myelin layer, resulting in electrochemical short circuits and brain cell death similar to the disease of multiple sclerosis. Research reported that chronic methamphetamine users demonstrate an 11% tissue reduction in the limbic region and an 8% reduction in the hippocampus. Furthermore, Ali andFornai (2006), report neurological degeneration similar to Huntington's and Parkinson's Disease. Such tissue loss can have a profound affect on an individual. The limbic system is associated with coordinating emotions and bodily responses. How a body responds to a given stimuli and how fast it organizes and implements appropriate responses to that stimuli can become delayed. Included in the Limbic region are the thalamus and the hypothalamus. The thalamus serves as a central switching station for sensory pathways to the cerebral cortex, playing a critical role in language and memory. True aphasia is often linked to abnormalities in the thalamus. Researchers report slowed speech or determined word choice while speaking as residual effects from thalamic damage (Pliszka, 2003).

Damage to the thalamus is also associated with difficulties in learning and the recall of previous information and learning experiences. The thalamus acts as a routing terminal for the brain: information from the temporal lobes, the hypothalamus and the limbic region are directed to specific areas of the brain for processing. Coordination of muscle movements that correspond with learned behaviors or reactions to stimuli are routed to and from their respective sources. The hypothalamus is located just below the thalamus in the limbic system. The hypothalamus

processes basic regulatory functions of the body: The sensations of thirst, appetite and sexual arousal. Damage to the hypothalamus has been associated with mood disorder, diminished drive, appetite control and body temperature regulation (Pliszka, 2003).

Neuroimaging scans done by Amen (2008) show visual evidence of decreased neuro-activity in all surface areas of the substance abused brain. The evidence of neurological malfunction in the frontal lobes corresponds to studies of MBTI in individuals surviving frontal head injuries. Head injury assessment and MBTI rehabilitation research provides useful knowledge in the complex functioning of the brain's structures. The frontal lobes and prefrontal cortex for example, are responsible for memory and complex brain processing. Paulus et al., (2002) found evidence of prefrontal dysfunction in methamphetamine users. Fals-Stewart and Bates (2003) found that chronic alcohol users and drug abusers scored significantly lower

The third affect that substance abuse may exhibit is interference within the structure of brain cells. Marijuana use, for example, causes trihydocannibinol (THC) to be stored in the fatty deposits of the nerve's protective coating known as myelin (Ohlms, 1992). This protective layer of cells also serves as the substrate through which the electro-chemical charge is delivered through the length of the neuron. THC is a resilient chemical that takes longer to metabolize from the body than any other substance of abuse. THC has a half-life of 48 hours. When additional THC is introduced before the existing THC has been metabolized, the result is an abundance of this chemical. The additional THC now saturates a larger area. As THC deposits increase within the myelin and cranial fluid surrounding the neuron, the efficiency of neurotransmitters is compromised. The ability of the neurons' dendrites to interact with the axon terminals of other neurons becomes inefficient. Nerve endings and synapses become clouded with THC residue forcing the neurotransmitters to find alternate routes across or around the

synapse. As the neurons' efficiency slows down, so do the processes they affect: decisions take longer to make, body movement slow and memory storage and recall become limited (Ohlms, 1998).

To correct injured or ineffective neuropathways, the brain will seek an alternative neuro-circuit, discarding the previous brain cells to atrophy. Atrophy is the body's process of utilizing damaged or inactive cellular components to support healthy molecular activity elsewhere. Inactive cells are broken down and their proteins are reutilized elsewhere (Starr & McMillan, 2001). Gold and Wang (2007) found that protein levels in the brain of ecstasy users were similar to people who experienced brain trauma.

Substance Abuse and Cognitive Dysfunction Impact on the VRP and Client Relationship

Christensen, Boisse, Sanchez and Friedman (2004) report that barriers exist within the VR process. Their survey of substance abuse screening and intervention practices used by VRCs revealed twelve barriers limiting successful outcomes with this population. Many agency's policies were found to inadvertently interfere with successful SUD recovery. Only two of the twelve barriers identified were client generated. VRPs surveyed reported non-compliance with referral appointments and lack of effectiveness of formal drug/alcohol treatment programs as difficulties experienced when working with clients having SUD. The remaining ten barriers were related to administrative policies or VRPs perceptions.

Additionally, relapse and non-compliance issues discourage many VRPs from working effectively with clients in recovery. The study reported the most frequently listed barrier imposed on the VRP was time constraints limiting provision of adequate substance use screening, intervention and counseling. In addition, the survey indicated that VRPs often lack information and training on effective treatment options (Christensen et al., 2004).

Given the importance of employment to the recovery process (McIntosh & McKenney, 2000), it is possible that inappropriate agency policies, attitudes and limitations inadvertently discourage long term abstinence. Treatment facilities are often blamed for poor treatment outcomes (Dodes, 2003; Christensen, et al., 2004). However, the success of any treatment facility is contingent upon the patient's decisions and actions following program completion. Early contact with adequately trained VRPs who are able to circumnavigate barriers and provide adequate vocational services is more likely to facilitate successful outcomes in both employment and long term abstinence.

Before a VRP can effectively assist the client in recovery from substance abuse, it is important for the VRP to scrutinize their personal attitudes toward addiction (Graham, 2006). Lack of awareness concerning the complexity of addiction and substance abuse rehabilitation has the potential to negatively impact the client and counselor relationship. An understanding of the cognitive and behavioral conditions of addiction can illuminate many psychological and psychosocial challenges the individual with a SUD must manage. A VRP who believes that addiction connotes insufficient willpower or social incompetence only adds to the client's low self esteem, shame and lack of confidence.

The experiences of patients with MBTI provide tremendous insight into the limitations and dysfunctions encountered by individuals recovering from substance abuse. A high probability that undiagnosed MBTI resulting from substance abuse is overlooked just as with head injury MBTI (Report to Congress, 2003). The progression of MBTI in an individual who abuses substances usually occurs subtly, hence the individual seldom notices the changes in their cognitive functioning. Unlike a MBTI that can often be traced back to an event that indicates when the brain injury occurred, individuals recovering from substance abuse generally have no

precise event or recollection of brain damage occurring. Similar to MBTI, the individual may be completely unaware that limitations or dysfunctions prevent them from fully functioning or understanding the conditions affecting them (Christensen et al., 2004).

Unidentified cognitive dysfunctions can adversely impact the relationship between the client and counselor. Unaware of cognitive dysfunctions and limitations, clients may be directed toward a vocational goal that is prone to fail. Ignoring or overlooking cognitive limitations may place the client in employment situations in which they cannot adequately perform. Frequent mistakes or poor performance is likely to corrode the client's sense of worth and self esteem. In people with undiagnosed MBTI, these scenarios often lead to depression (Kay, 1986).

Zuger (1993) reports that client behaviors and attitudes may also interfere with the therapeutic relationship. Client behaviors and attitudes can easily be misconstrued by the VRP as uncooperative or non-compliant. The VRP may perceive undiagnosed motivational dysfunction as laziness or disinterest instead of recognizing the client's inability to rapidly process a solution toward task completion. Awareness of MBTI complications would mandate an investigation of when the client most often experiences motivation problems, and what type of tasks instigate motivational difficulties. Another behavior open to misinterpretation is consistently missed appointments. The perception of the client's action might be that they disrespect the VRP and has low interest in the VR process. The reality may be the client's dysfunctional meta memory process. The client may remember the appointment all morning, then forgetting to reference a clock, becomes distracted and misses the appointment. A simple solution might be to schedule ongoing appointments on the same day of the week and at the same time.

Studies indicate that patients with MBTI often lose their sense of self monitoring (Newman, et al., 2000). A client may become angry with the VRP who suggests jobs that the

client perceives are beneath their capabilities. The VRP may interpret that the client is grandiose or possesses an inflated ego. In fact the client remembers what was achievable in the past but is unaware of their cognitive dysfunctions: hence successful employment is improbable at this time (Zuger, 1993). Evidence of these dysfunctions, when presented to the client, do not correlate with their memory of past experience. For example: A client desires to pursue an engineering job that requires above average competencies in mathematics. The client bases the vocational goal on pre-substance abuse accomplishments (e.g., college math grades). Preliminary assessments indicate the client now has below average competencies in mathematics. A VRP who is unaware that the client has self monitoring deficiencies, may argue with the client. The debate may escalate until the relationship becomes irreconcilable. Eventually, the client or the counselor chooses to remove themselves from the therapeutic relationship (Zuger, 1993). In this situation, it is in the best interest of the client for the counselor to negotiate a compromise before the relationship deteriorates. According to Rubin and Roessler (2008), an agreement to use trial and error experiences can, in some cases, empower the client through the dignity of failure. If the client is made aware of the challenge, and has agreed to perform the task to the best of their ability without reservation of outcome, the results can be viewed as a learning opportunity. Dignity is found in the self-determined attempt made by the client as opposed to following orders mandated by the VRP.

Utilizing work samples or temporary work trials, the VRP can provide clients with experiences of job tasks (Rubin & Roessler, 2008). Consideration should be given to a controlled environment with minimal audience. Allow the client to perform the task and experience the frustrations and difficulties that may arise. The dignity of failure is often cited as beneficial to the rehabilitation process. From a failed experience, the VRP can work with the client to accept the

failure as part of the educational process. Similarly, a work trial held on a day when no one else is present can reduce undue humiliation to the client otherwise experienced performing in front of others.

Neurological studies have shown that the brain's limbic system is often compromised by substance abuse (Volkow, 2001; Thompson et al., 2004). Anxiety and anger are often related somatic responses. A client whose flight or fight responses are deregulated may become agitated when their sense of anxiety heightens. This anxiety may not represent be a physically perceptible danger. The danger may be that the client perceives eminent failure and embarrassment. In addition, Amen (2008), using SPECT imaging of substance abused brains, found heightened neuro activity in regions of the brain associated with anger. Therefore, an angry reaction expressed by the client may have no sound logical basis, thus should not be perceived by the VRP as a personal assault. It would be best to help the client process their anxiety and seek solutions that empower the client to move beyond their perceived danger (Champion, 2006).

Understanding the potential actions of clients with MBTI related substance abuse issues is no different than any other disability (Rubin & Roessler, 2008). Similar to understanding the collateral effects of multiple sclerosis or Huntington's disease, the more knowledgeable the VRP is with the traits related to a particular disability, the more capable the VRP is to facilitate education, counseling and empathetic concern to the client. When the client is understood, the process of rehabilitation can continue on to the next phase: client supports and education of employers (Falvo, 1999).

Substance Abuse and Cognitive Dysfunction Impact on Vocational Outcome

Empathy, patience, support and encouragement are important qualities for a VRP to possess. The incorporation of good counseling skills and techniques does not preclude a VRP

from potentially making serious mistakes. Consideration must also be given to the impact that cognitive dysfunctions may have on critical tasks of employment. Research indicates several cognitive processes may be impacted by substance abuse MBTI (Lingford-Hughes, et al., 2002; Iverson et al., 2005; Lane, et al., 2007).

Executive function is the complex process utilizing multiple areas of the brain simultaneously. It regulates such things as planning, memory, organization, judgments, task shifting, self monitoring and time management. Job skills that require extensive use of executive functioning can limit an individual with cognitive dysfunction's efficiency, accuracy and overall performance (Kay, 1986; Champion, 2006). Executive functioning is utilized when an individual attempts to organize, problem solve, or sequentially manage tasks, (i.e., multi-tasking). The brain is expected to hold certain information in memory while another thought or task is performed. When necessary to return to the previous memory or task, an individual must be able to pick up where they were interrupted (Plizska, 2003; Champion, 2006).

Executive functioning can impact employment is several ways. Some job descriptions require an employee to stay focused on their work and monitor their environment and anticipate action(s) to follow tasks at hand. Switching from one task to another and back again, without losing one's place, is often difficult to perform when executive functioning is compromised. Additionally, time management is a crucial component of most jobs. Executive function disorders can be perceived by the employer as "wasting time." Productivity, efficiency and flexibility are criteria for employers focusing on the bottom line.

Champion (2006) claimed that difficulty with memory is the most common problem following a brain injury. The processes of memory utilize several regions of the brain that drugs and alcohol adversely impact. Prospective memory (i.e., working memory) is the type of

memory used to remember transient things. This is frequently considered the most frustrating type of memory loss. Prospective memory deficiencies can easily be mistaken by the VPR as non-compliant behaviors. For example, missing appointments, forgetting assignments or paperwork and frequently forgetting where something was placed are often indicators of compromised prospective memory. The VRP may find it helpful to advise the client on the use of functional aids: A daily planner, making lists or referring to a pocket notebook can easily assist them with their day to day tasks and schedule.

Another type of memory is procedural memory, used to perform a job or task. Playing the piano or riding a bike are learned after several repetitions. Procedural memory is more durable than prospective memory. A person experiencing memory complications with prospective memory may recall how to perform a task, but have no recollection of when or how they learned it. Procedural memory is often left intact after a brain injury and can be utilized in rehabilitation to teach new skills and behaviors (Champion, 2006).

Semantic memory is utilized to recall specific facts. People who excel at trivia type games have a high functioning semantic memory. Semantic memory is used to remember: personal information, important phone numbers, company address, a physician's name or basic math concepts. When semantic memory is impacted by injury, facts and important details are often lost. For example: an individual may remember they went to work the previous day and met with their employer. Unfortunately, they have no recollection of how long the meeting lasted or what was said at the meeting. Their only memory is walking into the office, talking and then leaving the office (procedural memory is intact). Even when questioned, they have no memory of the information discussed (dysfunctional semantic memory). Semantic memory is necessary in the completion of high functioning job tasks. A list or task analysis could be posted in close

proximity to a work station (e.g., steps necessary to operate a machine) to accommodate their memory dysfunction.

Some individuals experience a loss in the fourth type of memory process called meta memory which prompts an individual to remember. Dysfunctional meta memory is apparent when an individual utilizes a planner or list in order to organize their day, but forgets to look at the planner (Champion, 2006). Meta memory dysfunction can be very frustrating to both the employer and the client. The client may have every intention of meeting the employer's needs but inadvertently fails designated task at the employer's predetermined time. Utilizing assistive technology can empower the client to compensate for these memory deficits. A cell phone alarm, palm held computer or programmable wrist watch can be set to sound an alarm prompting the individual to look at their task list. In this way, the client is accommodated by the employer without incurring undue hardship.

Organization is complex cognitive task (Plizska, 2003; Champion, 2006). An individual must reference each item to be organized; make a decision to its relative value; hold it in memory while other tasks are assessed for value; recall the value scale that determines priority; and then insert the item into the ranking of the organization. In this process, two cognitive tasks are intertwined: decision making and memory. Weakness in either task is likely to slow down or interrupt the process. The frustration from dysfunctional organization can often lead to a psychological state of disassociation. The client reaches a point where they find no solution or direction with which to proceed. The client "zones out" or disassociates from the task. Often this will appear as staring into space or day-dreaming (Pliszka, 2003; JAN, 2009). The ability to organize has varying stages of complexity. An individual will attempt to organize their day into a prioritized list. At the same time, the individual must determine the most efficient order in which

to complete the list. The influence of efficiency may change the order of the list but contradict the priority. An example of this might be the conflict between the amount of fuel in a person's gas tank, and the efficiency of how they plan to accomplish a list of errands. If efficiency overrides the urgency for fuel, the person may not think to fill the gas tank and consequently run out of gas. If the fuel condition overrides the priority for efficiency, the individual may find themselves traveling out of their way to fill their tank at their customary gas station, discounting any sense of efficiency and arriving at the post office after it has closed. In some instances, individuals who struggle with organization may perceive all tasks having an equal priority. With no way to discern the difference, they struggle with the decision of what to do next.

Inhibition is a cognitive process used to stop an action or behavior. Inhibitory response control allows an individual to stop the execution of a task when something interferes with the preferred outcome (Champion, 2006). Dysfunctional inhibitory response can endanger a worker and individuals in close proximity. In the example used in Chapter Four, the client is unable to stop the programmed behavior of pulling the lever of a drill press when he notices his hand is under the drill bit. Somewhat related to inhibitory response is persistent recall. This is the ability to change strategies when a new objective is introduced. For example, an employee has worked in one area of a shop for many years. The manager promotes the employee and transfers the individual to a new department at the other end of the building. The next day when the employee returns to work, they arrive at the location of the previous job. People with MBTI may present with similar difficulty even though a habit has not yet been established. In the Wisconsin Card Sorting Test, "perseverance" is defined when the test taker repeatedly returns to previously unsuccessful strategies to satisfy parameters set forth by the test giver (Grant & Berg, 2003).

Amotivation disorder looks very similar to laziness. An individual's determination to move forward with a task is compromised. THC found in marijuana smoke forms deposits in neuropathways and causes this disorder (Ohlms, 1992). Inefficient neuro connections and tainted cerebral fluid cause neuro chemical messages to move slowly through the brain. When presented with a task, a healthy brain makes decisions in milliseconds. When the brain processing is slowed due to neurological insult or containments such as THC, an individual requires more time to elicit a response. The person may also experience psychological implications resulting from criticisms or accusations of laziness. External criticism and self criticism can produce potent emotions (Champion, 2006). Exasperating this condition is the impact that stress has on neurological and psychological disorders. Increased stress exacerbates original symptomology, further compromising cognitive performance (Esch, et al., 2002).

Patients with neurodegenerative diseases such as Parkinson's Disease were found to have this same disorder (Shulman, 2007). Researchers report that neurological damage in the areas of the amygdala and basal ganglia are the source of this disorder. Thompson et al., (2004) evaluated the tissue volume of the hippocampus and reported an 8% to 10% reduction in volume of individuals abusing methamphetamine.

The inability to recognize cognitive limitations impacts employment objectives. Memories of past abilities or unrealistic expectations of present abilities can generate situations where the employee over-extends themselves or fails. Additionally, employers expect workers to improve in performance of tasks and duties. In order to do this, individuals must be able to assess their experience, knowledge, abilities and performance to evaluate mistakes and implement changes or compensations to improve. People with brain trauma injury often experience a lack of self awareness (Newman, et al., 2000).

Conclusion

Research on the effects of substance abuse is producing insight into limitations and challenges that face individuals recovering from addiction. Substance abuse rehabilitation may offer the person with SUD methods and strategies to manage and maintain abstinence, but residual cognitive effects of substance abuse can present additional challenges. Employment presents former addicts with environments and structures that foster long term abstinence, while also providing socio-economic stimuli that encourage reintegration into society. The person with SUD can gain successful vocational rehabilitation if accommodations are inaugurated to assist the individual to effectively perform the tasks of their employment. The VRP who is cognizant of the limitations caused by neurological damage is better prepared to champion the abilities of their clients. For example, they are more likely to implement compensation strategies in the IPE that will take into account the unique obstacles that individuals with SUD experience.

More research is needed to investigate subtle barriers that people with SUD's encounter. Dealing with an undiagnosed MBTI can be frustrating and exasperating. Frustration is often associated as one trigger of relapse. Stressful conditions found in some places of employment can amplify cognitive dysfunctions, causing a decline in job performance and efficiency. Research regarding employment and relapse prevention may offer insight to better understand the long term effects of SUD. Educating the client and the employer can bring about a more conducive relationship that benefits both parties: Employee performance and self efficacy are enhanced while meeting the employer's production needs.

Additional research is necessary to define the role of the VRP in the holistic rehabilitation of people with SUD. Education of VRPs regarding the implications, limitations and unique conditions of SUD and MBTI is necessary. New directions are needed to develop efficient

modalities and strategies that facilitate successful rehabilitation of individuals with SUD's. Furthermore, policy changes that remove present barriers to employment must be addressed by governing authorities. Doing so could produce more successful vocational outcomes and assist in returning marginalized addicts to active participating members of society.

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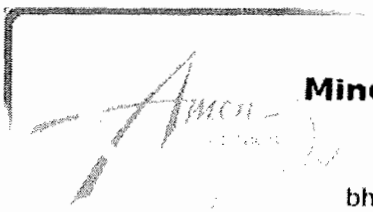

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