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The Role of Cognitive Distortions in Adaptation to Disability and Perceived Quality of Life in Spinal Cord Injury Survivors

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Philadelphia College of Osteopathic Medicine

Department of Psychology

THE ROLE OF COGNITIVE DISTORTIONS IN ADAPTATION TO DISABILITY
AND PERCEIVED QUALITY OF LIFE IN SPINAL CORD INJURY SURVIVORS

By Kerri M. Garruba

Submitted in Partial Fulfillment of the Requirements of the Degree of

Doctor of Psychology

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DEPARTMENT OF PSYCHOLOGY**

Dissertation Approval

This is to certify that the thesis presented to us by Kerri Gonzalez
on the 30 day of April, 2015, in partial fulfillment of the
requirements for the degree of Doctor of Psychology, has been examined and is
acceptable in both scholarship and literary quality.

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Dedication

To my sister, Holly.

Her resilience continues to inspire me every day.

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Abstract

Traumatic spinal cord injury (SCI) is a sudden, dramatic insult to the central nervous system that results in instant loss of sensory and/or motor function. In addition to physiological changes, survivors also endure both cognitive and emotional changes that increase susceptibility to depression, anxiety, and suicidality, all of which have been associated with cognitive distortions. This study sought to investigate the influence of cognitive distortions in relation to the ability to adapt to disability and establish a high quality of life among spinal cord injury survivors. Participants were 116 men and women living with spinal cord injury recruited via the Internet through various SCI websites and discussion forums and current patients at a respected rehabilitation facility in a northeastern state. Results indicate a negative relationship between the frequency of cognitive distortions and adjustment following SCI. Individuals who reported a higher frequency of cognitive distortions also endorsed depression or a loss of pleasure or interest. SCI survivors who scored higher on the quality of life measure tended to report being married or living with a significant other, reported better health, and reported a lower frequency of cognitive distortions. It is hoped that the results of this study will be useful in developing treatment protocols, improving rehabilitation effectiveness, and enhancing the lives of SCI survivors.

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Chapter 1

Introduction

Statement of the problem.

The onset of traumatic spinal cord injury (SCI) is usually precipitous and instantly impacts every aspect of an individual's life (Song & Nam, 2010). In the days, months, and years following onset, injured individuals face continuous challenges as they learn to maneuver the world with their new disability. Disability, for these individuals, entails a sudden loss of mobility, control, and sensation, including many aspects of pleasure. Such a sudden change understandably can shatter one's sense of identity and independence (Dickson, Ward, O'Brien, Allan, & O'Carroll, 2008).

Many victims also struggle with learning how to accept their newly disabled self (Dickson et al., 2008). Low self-esteem and feelings of loss are common among individuals with spinal cord injuries (Dickson et al., 2008), leading to depression in an estimated 30% to 40% of survivors (Galvin & Godfrey, 2001).

It is not surprising that perceived quality of life (QOL) also suffers. Factors contributing to low perceived QOL include both physical and psychological difficulties. Physically, one must adapt to life with new limitations in mobility and the ability to care for oneself. Additionally, potential medical complications commonly include pressure sores, autonomic dysreflexia, and gastrointestinal and respiratory problems (Kennedy, Lude, Elfstrom, & Smithson, 2010). Psychologically, the person must grieve the loss of their personal identity and cherished goals, which heightens vulnerability to depression, anxiety, substance abuse and suicidality (Bonanno, Kennedy, Galatzer-Levy, Lude, & Elfstrom, 2012; Fann, Bombardier, Richards, Tate, Wilson, & Temkin, 2011; Nicholls et al., 2012; Overholser, Schubert, Foliart, & Frost, 1993). Given the multifaceted impact

of SCI and limitations on almost every aspect of life, there has been great interest in understanding QOL issues in this population (Kennedy et al., 2010). Overall, investigators have consistently found that individuals with SCI report lower perceived QOL than individuals who have not lost physical abilities (Chang, Wang, Jang, & Wang, 2012; Kennedy et al., 2010; Tate, Kalpakjian, & Forcheimer, 2002).

On the other hand, as the individual finds meaning in the experience and begins to develop a new identity as a person with a disability, he or she can often begin to move towards acceptance of the disability. Acceptance of disability has been defined as “the process a patient must undergo in order to come to terms with altered abilities” (Nicholls et al., 2012, p. 1083) and reflects the ability to form a healthy self-concept.

Acceptance of disability was believed to be necessary in order to adjust to life after injury and subsequently became a common focal point during rehabilitation (Keany & Glueckauf, 1993; Li & Moore, 1998). Current belief posits that one does not have to accept disability in order to successfully adjust to life with a disability (Groomes & Linkowski, 2007). There is an established relationship between coping, adjustment, and self-esteem, which is believed to be integral to successful rehabilitation. Keany and Glueckauf (1993) suggest successful rehabilitation requires the ability to change one’s value system and the willingness to embrace the changes brought about by the disability. This change in value system is believed to foster adaptation to disability (Keany & Glueckauf).

Adaptation to disability permits survivors to adjust to life postinjury. In order to successfully adapt to the disability, the individual must reevaluate personal values and ensure congruence between values and the inevitable changes in life due to injury

(Nicholls et al., 2012). Four major adaptive value systems have been identified: (a) enlargement of the scope of values, (b) subordination of physique relative to other values, (c) containment of disability effects, and (d) transformation of comparative-status values to asset (intrinsic) values (Keany & Glueckauf, 1993). Those who view their disability as misfortune or value loss may overlook existing abilities and devalue themselves. Value loss, defined as the loss of something valuable, is encountered following disability as the person realizes that certain behaviors and goals can no longer be accomplished due to physical or cognitive limitations (Keany & Glueckauf, 1993). On the other hand, adaptive adjustment of one's value system to new realities reduces the propensity for one's perceived losses to negatively affect perception of existing abilities (Keany & Glueckauf, 1993). Nicholls et al. (2012) suggest that focusing on negative aspects of disability heightens the likelihood of lower levels of adaptation and increased depressive symptomatology.

Furthermore, depressive behaviors have been found to negatively impact adaptation to disability (Nicholls et al., 2010). For example, symptoms such as withdrawal, isolation, and anhedonia (loss of the capacity to experience pleasure) may limit the individual's ability to engage in rewarding activities and serve to maintain depression and prevent the opportunity to disconfirm distorted, negative injury-related cognitions (Mehta et al., 2011). Attawong and Kovindha (2005) suggest that irrational beliefs, such as "no one will accept or respect disabled persons..." fuel negative emotions and that depression often persists following discharge from rehabilitation (p. 69).

Cognitive theory posits that dysfunctional thinking, or the tendency to have thoughts that are either distorted in content or accurate in content but maladaptive, can

lead to psychological disturbances such as depression and anxiety (Beck, Rush, Shaw, & Emery, 1979; Wilson, Bushnell, Rickwood, Caputi, & Thomas, 2011). Beck (1967) was the first to use the term *cognitive distortion* in the literature to describe systematic and erroneous cognitive processing patterns that were frequently presented by his depressed patients. Such thoughts, he believed, led to maladaptive emotions and behaviors. The literature on cognitive distortions continues to grow as researchers are identifying the importance of cognition in many aspects of human emotion and behavior. Mental health research suggests that cognitive distortions predict both the severity of dysfunction and the number of clinical diagnoses on both clinical syndromes and personality disorders (Beck et al., 2001; Rosenfield, 2004; Wilson et al., 2011).

Cognition has been assessed in the SCI population in an effort to understand the adjustment to pain and the ability to cope with disability (Raichle, Hanley, Jensen, & Cardenas, 2007; Smedema, Catalano, & Ebner, 2010; van den Bout, van Son-Schoones, Schipper, & Groffen, 1988). Pain-related beliefs, as well as catastrophizing, or “unrealistic and negative self-evaluation in response to pain,” predicts mental health and coping in those with chronic pain (Hanley, Raichle, Jensen, & Cardenas, 2008; Raichle et al., 2007, p. 718). Turner, Jensen, Warms, and Cardenas (2002) found that catastrophizing is associated with psychological distress, pain related disability, and pain intensity among SCI survivors with chronic pain.

Researchers agree that coping skills are an important factor in attaining psychosocial adjustment and satisfactory quality of life (Groomes & Leahy, 2002; Smedema et al., 2010; Song & Nam, 2010). The type of coping strategy utilized, whether positive (results in a positive outcome) or negative (results in a negative outcome), is

dependent on the thinking pattern of the SCI survivor (Smedema et al., 2010). For instance, those who magnify losses incurred by the injury and minimize retained abilities demonstrated low levels of acceptance of physical disability (Wright, 1983).

It seems significant that dysfunctional thoughts have not been more extensively studied in individuals with disability. Dysfunctional thoughts can produce a variety of negative consequences. For example, the thought, “No one will ever want to marry someone who is confined to a wheelchair” illustrates a fortune-telling distortion and may result in hopelessness, withdrawing from social events and refraining from dating. Consequently, behavior resulting from these distortions might result in a self-fulfilling prophecy, thereby increasing the probability of the individual’s ultimate fear: not finding a mate.

Another variety of distorted thinking involves the possibility that the negative content of some thoughts may, in fact, be accurate but dysfunctional, in that they lead to maladaptive behavior and emotion (Beck, 2011). For instance, due to the traumatic nature of injuries and real-life obstacles confronting those with SCI, an SCI survivor may have the thought “I will never be able to run again.” If such thoughts are identified, the individual can learn how to cope and problem solve in an effort to decrease the distress and/or impairment caused by the thoughts. In this case, the individual could learn that although it is true he or she will never run again, the individual can still enjoy many other aspects of life, including functionally equivalent behavior, such as going outdoors with mobility allowed by the wheelchair, and learning different strategies to exercise through physical therapy and other activities.

Consequently, if dysfunctional thoughts are found to be prevalent in this population, correcting such maladaptive thinking might improve the ability to more quickly adapt to disability and attain a more positive quality of life. Although some researchers have measured cognitive distortions in this population in regards to depression, helplessness, and self-efficacy (Shnek, 1996; Shnek et al., 1997), no research has specifically investigated the relationship between frequency of cognitive distortion, adjustment, and QOL in an SCI population.

Purpose of the study.

The purpose of this study was to fill a void in the research on spinal cord injury, specifically by determining the frequency of cognitive distortions among individuals with SCI and whether a relationship exists between the frequency of such distortions, adaptation to permanent disability, and quality of life. Should a relationship exist, health care professionals in intensive care units, rehabilitation hospitals, and other settings could be trained to implement specific therapeutic interventions to modify this dysfunctional thinking in an effort to promote adaptation and improve the quality of life of those who sustain SCI. Data was also analyzed to reveal if individuals with SCI are more susceptible to certain types of cognitive distortions.

Literature Review

Traumatic spinal cord injury.

Traumatic SCI is a dramatic, sudden event that affects nearly every aspect of an individual's life, including physical abilities and emotional well-being, and ultimately alters self-image (DeSanto-Madeya, 2006). The dramatic changes resulting from this debilitating condition often impact an individual's ability to adjust to life postinjury and

can have a detrimental effect on perceived quality of life (Craig, Hancock, Dickson, & Chang, 1997). An estimated 11,000 people suffer traumatic spinal cord injury (SCI) each year in the United States (DeFrates & Cook, 2011; Lucke, Coccia, Goode, & Lucke, 2004). Currently, there are between 183,000 and 230,000 people in the United States who have sustained such injury. SCI most frequently occurs when the spinal cord becomes compressed or severed as a result of force or impact commonly resulting from a fall or motor vehicle accident (Lohne, 2008). Other causes of SCI include accidents of the domestic, sports, and industrial varieties, and gunshot wounds (Hatcher, Whitaker, & Karl, 2009).

The central nervous system.

In order to fully understand the impact of injury to the spinal cord, it is important to understand the structure and function of a normally operating spinal cord and overarching central nervous system. The complexity of this system is often overlooked because the ability to walk, contract muscles in a meaningful manner, and perceive tactile sensations are so automatic, or occur with such ease that they are taken for granted. The spinal cord is considered part of the central nervous system (CNS), a complex system that receives and interprets sensory information and controls both simple and complex behaviors (Waxman, 2003). This delicate and intricate system, which includes both the brain and spinal cord, is encased in bone and further protected by meninges and fluid-filled spaces (Waxman, 2003). With help from the peripheral nervous system (PNS), the CNS functions to coordinate efferent and afferent impulses. The CNS delivers sensory information from skin, mucous membranes, and deeper structures to the brain (afferent) via sensory neurons and sends motor information via motor neurons from the brain

(efferent) to the designated nerves to contract muscles. The CNS receives sensory information from the PNS, which is comprised of nerve bundles, including cranial nerves, spinal nerves, and their associated ganglia, enabling the CNS to communicate with other areas of the body (Waxman, 2003). The PNS is divided into the somatic and autonomic nervous systems.

The autonomic nervous system controls involuntary movements, or movements that occur outside of conscious control, such as respiration, circulation, and digestion, and regulates function of internal organs (Kalat, 2009; Westfall & Westfall, 2011). The autonomic nervous system is divided into the sympathetic, or thoracolumbar outflow, division and parasympathetic, or craniosacral outflow, division (Westfall & Westfall, 2011). The sympathetic nervous system helps prepare the body for emergency, using what is often referred to as fight-or-flight response (Kalat, 2009; Kolb & Wishaw, 2009). The neurons of the sympathetic nervous system extend into the CNS to allow synaptic neurotransmission through chemical synapses of the sympathetic ganglia (nerve masses) between the CNS and sympathetic nervous system. Within the sympathetic ganglia, when the sympathetic nervous system is activated, acetylcholine activates the nicotinic acetylcholine receptors, which subsequently release noradrenaline. After prolonged activation, the adrenal medulla, located on the kidneys, release adrenaline, which binds to the adrenergic receptors on the peripheral tissues, triggering the physiological stress responses associated with fight or flight, including increased respiration, increased heart rate, perspiration, muscle contraction, etc. The parasympathetic nervous system reverses the changes induced by the sympathetic nervous system and helps the body return back to a relaxed state by slowing the heart rate, lowering blood pressure, stimulating digestion,

and increasing blood flow to the skin (Kalat, 2009; Kolb & Wishaw, 2009). The main function of the parasympathetic system is conservation of energy and maintenance of organ function (Westfall & Westfall, 2011). In synthesis, somatic and autonomic nervous systems, which are overseen by the brain and spinal cord, work together to permit sensation, perception, movement, and internal processes vital to sustaining life (Kalat, 2009; Kolb & Whishaw, 2009). The CNS works with the peripheral nervous system to facilitate these abilities.

The nervous system is comprised of neurons, or cells, that store and transmit information throughout the nervous system (Kalat, 2009). A neuron has three main parts, the cell body or soma, dendrites, and axon. The dendrites are the receiving end of the neuron and allow for synaptic neurotransmission, or communication between neurons (Hauser & Beal, 2012). As the dendrite receives a chemical message via neurotransmitters from upstream, afferent neurons, it transmits the signal toward the soma in the form of an electrical impulse. The electrical impulse continues down the axon terminal, where it may inspire neurotransmitter release by the terminal buttons into the synaptic cleft, where it binds to receptors in the postsynaptic cell (Hauser & Beal, 2012).

The somatic nervous system controls voluntary movements, or movements that can be consciously controlled, such as standing or walking. This system allows neurotransmission between the sensory receptors and the CNS via afferent neurons and between the brain and skeletal muscles via efferent motor neurons. The somatic nervous system is comprised of nerves that branch out from the brain and spinal cord to the skin and muscles (Waxman, 2003). Twelve pairs of cranial nerves branch out from the brain

to the head, neck, and facial region. Thirty-one pairs of spinal nerves branch out laterally from the spine and correspond to a segment of the spinal cord (Waxman, 2003).

The spinal cord is composed of approximately 30 segments, or vertebrae, joined by ligaments and cartilage to allow movement and bending of the spine (Waxman, 2003). These vertebrae are grouped into the cervical, thoracic, lumbar, sacral, and coccygeal regions (Kolb & Whishaw, 2009; Waxman, 2003). The cervical region (C1 to C7) runs from the base of the head to the base of the neck. The thoracic region (T1 to T12) runs from the base of the neck to the waist. The lumbar region (L1 to L5) contains the end of the spinal cord and permits sensation over the legs. The sacral region (S1 to S5) connects the spinal cord to the tailbone and permits sensation in the genital area. Finally, the coccygeal region (Co1 to Co4) is comprised of the tailbone (Waxman, 2003). This region does not contain the spinal cord, as the cord tapers and ends at the L1 or L2 segment (Waxman, 2003). The vertebrae work closely with the peripheral sensory nerves and communicate by sending sensory information to the brain, where it is processed to facilitate perception (Kalat, 2009; Kolb & Whishaw, 2009). Overall, this is a very delicate and intricate system, and injury can have major consequence to proper function.

Physical impact of SCI.

The physical impact of SCI depends largely on the level of the injury (Baron, McSherry, Larson, & Scalea, 2011). An injury in the cervical region can result in tetraplegia, a condition characterized by limited or no use of the arms and hands and no use of the lower body and legs, with possible loss of physical sensation. An injury in the thoracic region may result in paraplegia and permits use of the arms and hands, but limited to no use of the legs, with possible loss of physical sensation. An injury at T10 to

T12 may permit use of some abdominal muscles because only areas below the injury are affected. An injury at the lumbar level may result in paralysis or weakness of the legs and possible loss of physical sensation and bowel, bladder, and sexual function. An injury at the sacral level may cause loss of bowel, bladder and sexual function and weakness or paralysis of the hips and legs (Baron et al., 2011).

Compression and spinal cord severance prevent blood from flowing to areas beneath the injury level, ultimately killing subordinate neurons by depriving them of oxygen and nutrients (Lohne, 2008). Additionally, because the spinal cord connects messages from the brain to the motor and sensory neurons and back again to the brain, injury to the spinal cord prevents this complex multidimensional communication. This disrupts incoming sensory information from reaching the brain and outgoing motor information from reaching the corresponding muscles and ligaments (Lohne, 2008).

Following injury, messages can no longer be sent or received between the brain and body parts below the level of injury (Baron et al., 2011). This may result in the inability to move or feel the arms and/or legs, loss of bladder and bowel control, and loss of sexual function (Lucke et al., 2004). Loss of these abilities occurs due to both primary and secondary injury (Becker, Sadowsky, & McDonald, 2003). Primary injury refers to the damage incurred to the spinal cord resulting from the initial force, compression, distraction (sudden stop in momentum leading to tearing), and/or laceration, while the damage resulting from the body's response to the trauma is referred to as secondary injury (Becker et al., 2003). Primary injury involves either an external object severing the spinal cord or to bone fragments, disc material, and ligamentous structures damaging the cord as a result of force or shattering of the vertebrae. The presence of foreign and

misplaced structures impacts the functioning of the blood vessels, axons, neurons, and oligodendrocytes. Oligodendrocytes are specialized cells responsible for forming myelin on nerve cells to speed the transmission of messages sent to and from the brain (Kolb & Wishaw, 2009). The body's response to initial trauma induces secondary injury as the cord quickly swells, and hemorrhaging results within the spine (Becker et al., 2003). Hemorrhaging negatively impacts blood circulation to the cells, resulting in cell death, and may expand the lesion due to the increasing pressure. The increasing pressure also affects the surrounding white matter, resulting in damage to nearby axons and neurons. After significant trauma, a dangerous process is triggered in which neurons are literally excited to death. Excitatory amino acids begin to concentrate outside the cell, inducing excitotoxicity triggering secondary loss of nerve fibers, neurons, and oligodendrocytes. Damage to the cells results in an increase of glutamate, which excites neighboring cells, causing them to release calcium. The overabundance of calcium induces further cellular changes, ultimately resulting in the death of even more neurons. Oligodendrocytes continue to die in the days and weeks following the initial injury. Loss of these cells affects the function of neighboring neurons, as single oligodendrocytes myelinate 10 to 40 different axons each, and demyelination resulting from the loss of oligodendrocytes impacts the ability for the cells to effectively transmit messages (Becker et al., 2003).

Prognosis.

The American Spinal Injury Association (ASIA) has developed a classification system, aimed at determining the extent of neurological impairment and predicting prognosis, called the International Standards for Neurological Classification of Spinal Cord Injury (ASIA, 2008; Middendorp, Hosman, Pouw, EM Study Group, & Van de

Meent, 2009). The ASIA neurological examination is comprised of two components, a sensory examination and a motor examination. The results of these combined examinations determine whether the injury is classified as complete or incomplete (Cuccurullo, 2004). The score ranges from A to E, with A being the most severe. This classification is based on a series of procedures used to determine if the individual is capable of feeling a light touch, any sensation below the level of injury, a pin prick, anal sensation, and the ability to contract the anus (Middendorp et al., 2009). If the individual is unable to voluntarily contract the anus and has no sensory sensations or anal sensations, signifying loss of motor function in the sacral regions, then the injury is labeled Grade A complete. If any level of sensation or the ability to contract the anus is present, indicating preserved function in the sacral region, the injury is said to be incomplete. Incomplete injuries can be rated Grade B, C, or D, depending on preserved function. Grade B incomplete SCI is characterized by preserved sensory function below the level of injury and throughout the sacral region in the absence of motor function (Becker et al., 2003). Grade C and D injuries both involve preserved motor function in the sacral region, but are differentiated depending on the amount of function preserved. Grade C permits active movement either without or against gravity, whereas Grade D injury permits active movement against moderate resistance and/or normal strength (Cuccurullo, 2004). Grade E injuries permit normal motor and sensory function (Becker et al., 2003). Typically, those with an incomplete injury, and more specifically, those able to contract the anus, have a higher probability of regaining sensory stimulation or mobility following injury (Middendorp et al., 2009). This classification system is not perfect, however, as only an estimated 67% of those able to feel anal sensation will

regain motor and/or sensory function (Middendorp et al., 2009). Although imperfect, this procedure is very important, as the physician will use this to estimate the likelihood of regaining the ability to ambulate independently. This rating may impact the individual's hope and attitude in the days and months following injury. Future research in this area could determine if such a relationship exists.

Economic impact.

SCI is very costly to both the individual, in terms of hospital fees, medical supplies, and renovations that may be needed in the home, and to society, in terms of insurance costs and ability to return to work (Priebe et al., 2007). Given the intensity of services needed to assist the individual in returning home as a newly disabled person, SCI rehabilitation is costly. The Model Spinal Cord Injury System reported that in 2012, the average cost of the initial hospitalization, rehabilitation, and other medical expenses during the first year of SCI onset ranged from \$508,904 to \$1,044,197, depending on the level of the injury (National Spinal Cord Injury Statistics Center, 2012). On average, survivors are hospitalized for 18 days until stabilized and the physicians determine the likely prognosis. Upon discharge from the hospital, SCI survivors are admitted to an intensive inpatient rehabilitation center for an average stay of approximately 45 days (Priebe et al., 2007). The goal of inpatient rehabilitation is to teach the person skills necessary for daily life following SCI (Riggins, Kankipati, Oyster, Cooper, & Boninger, 2011). Necessary skills vary depending on the level of the injury. For example, for many of those classified as paraplegic, skill training includes learning how to balance to sit upright without use of abdominal muscles, learning to transfer from the bed to wheelchair, and learning how to prevent and care for pressure sores. The individual

works with a multidisciplinary team composed of a physiatrist, nursing staff, and occupational and physical therapists (Priebe et al., 2007). As the individual gains strength and masters the learned skills, he or she is better able to reintegrate into society with some level of independence. Physical therapists work with the individuals to strengthen muscles that remain intact to ease the ability to maneuver through the world with altered abilities. Occupational therapists help patients to develop, recover, or improve skills needed to complete daily tasks of living, such as eating, cooking, dressing, bathroom hygiene, sexual activity, and cleaning from a wheelchair (Priebe et al., 2007). With the intensity of the needed care and the involvement of so many health professionals, it is easy to see how quickly costs can add up.

Aside from initial costs, there are many additional financial burdens. Necessary expenses include a wheelchair, medications, medical supplies, home and vehicle modifications, and personal assistance services (Priebe et al., 2007). Wheelchairs can range from under \$100 to a several thousand dollars in price, depending on an individual's needs (Spinlife, 2013). Home modifications typically include installing ramps for accessibility, widening doorways, and remodeling bathrooms, which, on average, totals approximately \$21,000. The cost of vehicle modifications varies greatly, depending on the type of modification needed. Installation of hand controls alone on a car costs approximately \$1,000. The cost of a wheelchair accessible van or transportation services can exceed \$65,000. Those who need personal assistance and nursing staff to visit the home spend an additional \$21,000 annually. Although some of these expenses may be covered partially by insurance, either private or public, there is a profound

financial burden placed on the individual, the family, and the insurance industry (Priebe et al., 2007). There are also indirect economic costs.

Indirect economic costs arise from absence from the workplace and decreased productivity (Priebe et al., 2007). According to the Americans with Disabilities Act (2008), some workplaces must make reasonable accommodations to ensure the environment is accessible for the individual. Whereas some SCI survivors are not able to return to full-time employment, others may not be able to return to their preinjury employment at all. Unemployment and underemployment are costly and average around \$57,000 annually per affected individual. This figure varies, depending on the survivor's education, severity of injury, and type of preinjury employment (Priebe et al., 2007). Overall, the estimated lifetime cost for a 25-year-old who sustains a traumatic SCI in the C1 to C4 region is \$4,543,182 (National SCI Statistic Center, 2012). Regardless of ability to return to work, reintegration into society and the financial impact of SCI can take an emotional toll on the individual.

Emotional impact.

Unlike the nature and course of many other chronic illnesses, the onset of SCI is sudden. Such abrupt, catastrophic injuries frequently leave the individual dependent on caregivers in order to complete the basic tasks of daily living. Many individuals with SCI describe the onset of the injury as “dramatic and unexpected shock” leaving them “immediately overwhelmed by emotional suffering” (Lohne, 2008 p. 67). A multitude of emotions surface at the time of the injury, which may include despair, panic, confusion, sorrow, guilt, and depression. Inability to move and/or feel all areas below the level of

injury leaves the victim reliant on medical equipment and caregivers, which in turn creates a sense of dependence, uncertainty, and helplessness (Lohne, 2008).

In an effort to simplify the literature regarding response to physiological and psychological threats associated with sudden chronic illness, Morse (1997) conducted a qualitative meta-analysis. To better understand the response to illness or injury, Morse selected eight studies; two studies, one medical and one psychiatric, dealt with the response to illness, two studies discussed response to accidental injury, and four studies focused on the response from relatives of a person recently diagnosed with illness or injury. Morse posited a 5-stage theory to describe the experience of illness that holds true regardless of the nature or onset and severity of the illness. These stages are (a) vigilance, characterized by the initial detection of the symptom or change; (b) disruption, enduring to survive, which involves self-talk as the person fights to survive and attempts to make sense of what is happening; (c) enduring to live, striving to regain self, characterized by a present-focused mindset and suppressed emotions as one begins to test retained abilities; (d) suffering, striving to restore self, characterized by a shift to a future focus as one begins to mourn losses and experiences overwhelming emotions; and (e) Learning to live with the altered self, where one becomes aware of the imposed limitations and retained abilities and begins to revalue life and reorder priorities. Morse (1997) found the most painful stages to be enduring to live and suffering, which involve unavoidable pain, suppressed emotions, suffering, and grief, mourning, and loss of the preillness self. Noticing a lack of literature of the immediate suffering in the acute phases of recovery, Lohne subsequently conducted research on this area with SCI survivors (2008).

Although the experience of sustaining a spinal cord injury is different among most individuals, Lohne identified common themes faced during the early phases of recovery (2008). Participants were recruited from inpatient rehabilitation, just 6 weeks to 4 months following injury. The participants were comprised of four women and six men and ranged in age from 22 to 76 years. Six had complete injuries, and four had incomplete injuries. Injury level ranged from C5 to L4. Lohne evaluated the SCI patients ability to comprehend the implications of the sudden and dramatic injury and the extent of the instant life changes resulting from the injury. Data for this qualitative study were collected through interviews conducted by the researcher to explore why the individual was in the rehabilitation facility. Asking this question allowed the researcher to discover each participant's experience of SCI, as well as the meaning each participant placed on the experience. Analyzing the patient narratives led to the identification of three common themes of the experience of sudden SCI: incomprehensible shock, brave survivors, and miracles, luck, or coincidences (Lohne).

Every participant in this study reported feeling overwhelmed with emotional suffering in the initial minutes following the injury (Lohne, 2008). Reported emotions included despair, panic, anxiety, and confusion. One woman in the study found it so hard to believe, she described the feeling as if being in a movie, an experience often labeled as a type of dissociation. Even though she did not want to believe it, the thought "I can't move my legs" made the paralysis real for her. This woman's experience of the onset of SCI illustrates the incomprehensible shock theme. The brave survivor theme was common in individuals who took the brunt of the damage in an effort to save others in the situation. Friends and family often looked at these survivors as heroes and saints. Lastly,

those who experienced the miracles, luck, or coincidences theme took a more existential approach, considering themselves lucky to be alive and viewing their recovery as a miracle. These individuals immediately believed SCI was meant to happen or part of their destiny (Lohne, 2008).

Other researchers have examined the meaning of living with spinal cord injury. DeSanto-Madeya (2011) interviewed 20 spinal cord injured individuals 5 to 10 years postinjury, along with a family member, using a semistructured format in an effort to explore meaning of life themes with traumatic SCI. Participants were asked to report on details of daily experiences to allow the researcher to gain insight into living with spinal cord injury from the perspective of both the injured and the caregiver. Qualitative analysis revealed seven themes: (a) looking for understanding of a life that is unknown, (b) stumbling along an unlit path, (c) viewing self through a stained glass window, (d) challenging the bonds of love, (e) being chained to the injury, (f) moving forward in a new way of life, and (g) reaching normalcy.

Each theme emerged from several subthemes evident among the interviews of SCI survivors and family members (DeSanto-Madeya, 2006). The first theme, looking for an understanding of life that is unknown, emerged from the participants view that families, society, and the healthcare system do not fully understand the ramifications of SCI. The second theme, stumbling along an unlit path, reflected the report of different daily struggles combined with constant worry about the future, with every day bringing a new challenge. The third theme, viewing oneself through a stained glass window, emerged from an altered self-perception. Many SCI survivors reported devaluing the self, categorizing themselves as disabled and being perceived as different by others. The

stained glass analogy represents this distorted perception of the self, as the various colors and fragments of the glass alter the overall perception of the image. The fourth theme, challenging the bonds of love, represents the interpersonal impact on family members. Some families become strained, while the bonds of others strengthen. The fifth theme, being chained to the injury, emerged from the loss of independence and freedom combined with increased reliance on others and inability to be spontaneous. The sixth theme, moving forward in a new way of life, depicts the process of developing a new perspective on life, as well as adjusting to a new lifestyle. Lastly, the seventh theme, reaching normalcy, represents a shift in perspective where one begins focusing on abilities rather than disabilities and begins maximally using resources that remain intact, such as cognitive abilities. Adjustment brings a new normal, achieved through engaging in a continuous learning experience as one navigates through the world with altered abilities (DeSanto-Madeya, 2006).

The information presented above provides a detailed overview of the impact of traumatic SCI. Physically, severance and/or compression of the spinal cord interrupt the communication from the brain to the sensory and motor muscles. The body's reaction to the initial trauma results in further damage to the neurons of the CNS. The ASIA neurological examination provides insight on the likely course and prognosis of the paralysis. Given the extensive hospitalization and rehabilitation involved, as well as modifications to the home and impaired ability to work, financial ramifications may cause additional stress. Emotional reactions have been reported immediately following the injury, and have also been identified 5 to 10 years postinjury. Increased rates of depression, suicidality, and irritability have been reported. However, many SCI survivors

have been able adjust emotionally by focusing on their abilities and shifting their values. This process, sometimes described as moving forward, has been found to impact health and quality of life (Chen, 2010).

We will now turn to examine these variables more closely, starting by reviewing the literature on QOL issues in SCI, then examining the acceptance/adaptation literature. Finally, we will examine cognitive distortions, which have been found to impact QOL and adjustment in medical patients. We will conclude with a discussion of cognition and SCI and the response to cognitive-behavioral interventions among SCI survivors.

Quality of life following SCI: Definitions and measurement.

Quality of life among SCI survivors is an area of great interest to patients, as well as to researchers and professionals in the rehabilitation setting (Tate, Kalpakjian, & Forcheimer, 2002). However, there is disagreement in the field as to how best to define QOL. For example, Tate et al. (2002) defined QOL as “the physical, social, psychologic, and existential aspects of well-being that might be affected by disease, disability, and its treatments (p. S18).” This broad definition encompassed a variety of ways in which QOL has been conceptualized throughout the existing literature with the SCI population. The World Health Organization (WHO) defines QOL as an “individual’s perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns” (WHOQOL Group, 1995, p. 14105). Using this definition, the WHOQOL Group created the World Health Organization Quality of Life Questionnaire (WHOQOL). Both definitions describe QOL as a complex construct containing multiple facets. The development of the World Health

Organization's definition and measure has guided much of the QOL research in medical settings (Miller, Chan, Ferrin, Lin, & Chan, 2008; Pershouse et al., 2012).

Several independent studies assessed QOL through subjective means, or by the survivor's perception of his or her well-being (Tate et al., 2008), while others included both a subjective and objective measure of QOL (Migliorini, New, & Tonge, 2011). Subjective means are generally comprised of coping skills, adjustment, presence of depression, perceived control, acceptance of disability, and life satisfaction (Tate et al., 2002). Objective means typically consist of socioeconomic status, health, employment status, relationship status, and emotional well-being, to name a few (Migliorini et al. 2011). These variables are useful in determining how well a rehabilitation program prepared the individual to reintegrate into society (Chang et al., 2012). QOL of SCI survivors is often examined following discharge in an effort to determine the success of the rehabilitation program. Assessing QOL through both subjective and objective means has been found to be important in the SCI population.

Studies that have included both subjective and objective measures of QOL have found that objective measures may indicate a low QOL, even when subjectively, the person reports a good QOL (Migliorini et al., 2011). Objective variables that indicate low QOL in the general population, such as difficulties in employment status and health, are not always correlated with subjective QOL in the SCI population. For example, an SCI survivor who is unable to return to work, has financial difficulties, and is single may report a good subjective quality of life, even though results of the objective measure might indicate a low quality of life. Using both subjective and objective measures to assess QOL has led to many important findings among SCI survivors. Many QOL

measures, such as the World Health Organization's WHOQOL – BREF, therefore include both a subjective and objective component (WHOQOL Group, 1998).

Using both subjective and objective measures, several studies have focused on identifying predictors and correlates of QOL in an effort to improve rehabilitation outcome (Hammell, 2004). Positive correlations have been found between quality of life and mobility (Dijkers, 1999; Pierce, Richards, Gordon, & Tate, 1999; Putzke, Richards, Hicken, & DeVivo, 2002), income (Clayton, & Chubon, 1994; Vogel, Klaas, Lubicky, & Anderson, 1998), and health (Anderson & Vogel, 2003; Crisp, 1992; Pierce et al., 1999; Putzke et al., 2002), while negative correlations have been found between quality of life and pain (Post, de Witte, van Asbek, van Dijk, & Schrijvers, 1998; Westgren & Levi, 1998; Vogel et al., 1998), poor health (Post et al., 1998; Putzke et al., 2002), and loneliness (Krause, 1997; Putzke et al., 2002). Lucke et al. (2004) found that SCI survivors tend to rate physical functioning as very low and suggest that emphasis be placed on helping individuals focus on abilities versus limitations. With rehabilitation occurring a few weeks from onset of injury, and the length of rehabilitation stay decreasing in the United States, emotional state during the initial phases of the trauma may prevent patients from focusing on preserved physical abilities while participating in a rehabilitation program (National SCI Statistical Center, 2012; Riggins et al., 2011). Many SCI survivors enter rehabilitation with the hope of walking out of the facility upon discharge (Riggins et al., 2011). With less than 1% of survivors gaining complete neurological recovery, however, the goal of walking again is almost always unattainable (National SCI Statistical Center, 2012). Consequently, rehabilitation staff help the individual shift focus to attainable goals, such as learning to use a manual wheelchair

(National SCI Statistical Center, 2012; Riggins et al., 2011). Altering the perception of ability can positively impact emotional well-being, facilitating emotional recovery, an element not often emphasized in medical rehabilitation facilities (Lucke et al., 2004). Interventions targeting emotional recovery might maximize gains during rehabilitation and therefore improve perceived QOL and rehabilitation outcome.

Physical aspects are important to consider when evaluating QOL (Pershouse et al., 2012). Time since injury and age of the survivor may impact the degree to which physical functioning affects perceived QOL. SCI survivors have been found to experience accelerated aging, which impacts the degree of independence and mobility attained. Time since injury might allow the individual time to shift goals, values, and expectations for life to better align with the disability, resulting in high perceived QOL, despite the effects of aging (Pershouse et al., 2012). As previously discussed, younger survivors and those recently beginning rehabilitation tend to place heavier emphasis on emotional well-being and remain optimistic about regaining physical functioning (Lucke et al., 2004; Riggins et al., 2011).

Quality of life has been found to remain fairly stable among SCI survivors over the course of the lifespan (Pershouse et al., 2012). SCI survivors report feeling satisfied with their family lives, unsatisfied with their sexual lives, and have differing levels of their satisfaction with their employment status (Kennedy, Lude, & Taylor, 2006). SCI survivors generally report a lower QOL than nondisabled populations (Tate et al., 2002). QOL within the SCI population is influenced by many factors, including access to the community, employment, marriage, social support, community reintegration, and acceptance of disability (Migliorini et al., 2011; Tate et al., 2002).

A shift in personal values to match postinjury abilities is cornerstone to adaptation to disability, a variable that has been found to correlate positively with the physical, psychological, and environmental domains of the WHOQOL – BREF (Miller et al., 2008). Although shifting values appears to be achieved over time after injury, because the duration of rehabilitation stays is steadily decreasing, an effort must be made to address emotional well-being, and gently speed the process of focusing on attainable goals, rather than on goals that are likely to be unattainable, such as walking. QOL and adaptation to disability are significantly and positively associated with one another (Elfstrom, Ryden, Kreuter, Taft, & Sullivan, 2005; Migliorini et al., 2011) because perception of abilities and limitations influence one's wellbeing and impact value change.

Acceptance of and adaptation to physical disability.

Acceptance of disability has been extensively researched as its relation to QOL has been established. Grounded in acceptance of loss theory, acceptance following physical disability is defined as a value change process in which an individual adjusts to life postinjury in a manner that losses incurred as a result of injury do not negatively impact the value placed on retained abilities (Dembo, Leviton, & Wright, 1956; Groomes & Linkowski, 2007; Keany & Gleuckauf, 1993). Wright (1983) built upon the acceptance of loss theory by outlining four value change processes that facilitate psychosocial adjustment to disability: (a) enlargement of the scope of values, (b) subordination of physique relative to other values, (c) containment of disability effects, and (d) transformation of comparative-status values to asset (intrinsic) values (Keany & Gleuckauf, 1993).

The first value change process, enlargement of the scope of values, occurs following the traumatic event, while the individual is in a period of crisis (Keany & Gleuckauf, 1993). During this crisis period, the individual actively mourns perceived losses resulting from the injury. Wright (1983) viewed mourning as a continuum ranging from all-inclusive or generalized suffering to focusing on specific losses. Mourning typically leads to the person becoming intensely preoccupied with loss. Enlargement of the scope of values occurs following the mourning process when the individual shifts his or her focus to retained abilities as successes with daily activities occur. Focusing on retained abilities allows the person to momentarily escape from intense grief as he or she learns that some of the perceived losses are not really losses after all. This process reflects enlargement of values. While this stage is proposed to be the first experienced by an individual following physical disability, the other three processes, subordination of physique, containment of scope of values, and transformation of comparative-status values to asset values, do not occur in a particular order and may be experienced concurrently (Keany & Gleuckauf, 1993).

The second process, subordination of physique relative to other values, consists of alteration of the amount of personal value placed on physique (Keany & Gleuckauf, 1993). Society generally places great emphasis on physical attractiveness and ability. This emphasis may intensify perceptions of loss while grieving a physical disability. Broadening the scope of other personal values, such as intelligence, work, creativity, and friendships, allows one to lessen the focus on physical appearance and lost physical abilities (Keany & Gleuckauf, 1993).

The third process, containment of disability effects, allows one to view oneself as separate from the debilitating condition (Keany & Gleuckauf, 1993). The perception of the functional impact of the disability can sometimes be magnified, because the individual may perceive it as also affecting retained abilities as well as emotional and intellectual characteristics. Shifting one's focus from the disability to other personal values places the functional impact of disability within real limits. During this process, the person shifts his or her thinking of the self as disabled to a person with a disability; the disability is not a defining feature of the person, but a characteristic the person possesses (Keany & Gleuckauf, 1993).

The fourth process, transformation of comparative-status values to asset values, is characterized by a shift from comparing oneself to a certain standard to comparing oneself relative to oneself (Keany & Gleuckauf, 1993), for example, comparing physical abilities with cognitive abilities instead of comparing physical abilities to that of an able-bodied person. The tendency to compare qualities or abilities to an arbitrary standard results in focusing on defects rather than retained positive qualities and abilities. This can impact self-worth, whereas comparing abilities within oneself allows the person to focus on retained abilities. Keany and Gleuckauf (1993) offer the example of shifting one's perception of using a wheelchair from being devalued as inferior, compared to walking or running, to the wheelchair being valued for its usefulness in permitting mobility, which is analogous to walking or running.

Together, these four processes allow reframing perceptions of oneself and the disability to facilitate acceptance of loss. Acceptance of loss is believed to enable the person to view the disability as "nondevaluating" (Keany & Gleuckauf, 1993, p. 201). In

this way, acceptance of loss allows one to adapt to life postinjury (Keany & Gleuckauf, 1993).

Studying acceptance of loss following physical disability has been made possible through development of the Acceptance of Disability Scale (ADS, Linkowski, 1971). Linkowski (1971) constructed the scale to reflect the four value changes proposed by Wright (1983). Since its construction, the ADS has been used widely, both nationally and internationally, to assess the process of adjustment. A revised scale was constructed after the validity and internal consistency of the ADS was questioned. The new scale was renamed the Adaptation to Disability Scale – Revised (ADS – R: Groomes & Linkowski, 2007) to reflect current belief that accepting is not necessary in order to adapt to disability. This measure has allowed researchers to learn more about adjusting to life following spinal cord injury.

Adaptation to disability in SCI survivors is a complex process influenced by many variables (Attawong & Kovindha, 2005). Researchers have identified several correlates to adaptation, including self-efficacy, emotional status (Attawong & Kovindha, 2005), depression, satisfaction with life, functional independence, spirituality (White, Driver, & Warren, 2010), social problem-solving abilities (Elliot, 1999), coping skills (Song & Nam, 2010), education (El Ghalit & Hanson, 1979), and marital status (Crewe & Krause, 1988). Much of the research conducted occurs during rehabilitation in the initial months following injury. Setbacks, however, may occur due to the challenge of reintegrating into society following discharge from rehabilitation.

Reintegration into society following standard rehabilitation programs is often challenging for the individual (Mask & Bosshart, 2008). Families may face difficulties

adjusting to shifting family roles, as the individual may be unable to complete his or her usual tasks and responsibilities. Disequilibrium in the household leads to other family members taking on those tasks, as well as assisting the injured individual. Outside the home, many survivors report challenges in meeting new people and attracting a potential significant other while in a wheelchair (Mask & Bosshart, 2008). These issues can be intensified if the person has not reached adaption to disability.

The ability to return to work depends on several factors, including the level and prognosis of the injury, the nature of the work, and available supports. While some are able to return to an office job, there may be many challenges in accessing the building and moving around freely within the office. Necessary accommodations such as ramps and handicap accessible doors may need to be installed, pursuant to the Americans with Disabilities Act of 1990 (2008). Such environmental modifications may be costly, but they are mandated and indispensable in helping SCI survivors to adjust and to reduce their new limitations. Even with such accommodations, physical limitations may prevent some SCI survivors from returning to preinjury jobs. For example, while an office job can be made accessible, physically intensive jobs, such as construction or retail, may be difficult if not impossible to return to. In such a case, insurmountable obstacles emphasize the importance of adjusting one's values to match postinjury abilities. Whether able to return to work or not, those with SCI face possible discrimination and stigma attached to physical disabilities (Mask & Bosshart, 2008).

The individual also may face drastic changes in their social lives. Many people with spinal injuries report having had an active life prior to the injury (Dickson, Allan, & O'Carroll, 2008). The injury leaves them unable to participate in physical and

recreational activities in ways they have in the past. This can reduce contact with friends and acquaintances, the individual's natural support system. The physical limitations may create feelings of frustration and beliefs of worthlessness, defectiveness, and helplessness (Dickson, Allan, et al., 2008).

Psychological distress negatively impacts adjustment. Contrary to previous beliefs, psychological distress often does not decrease significantly over time (Galvin & Godfrey, 2001). Coping strategies, rather than time itself, can lead to greater adjustment to life with SCI, as coping has been identified as a mediator of emotional adjustment to SCI (Galvin & Godfrey, 2001). Lazarus and Folkman (1984) define coping as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 178). Given the strong cognitive and behavioral aspects of coping, and therefore of adjustment, several studies have evaluated the efficacy of cognitive-behavioral interventions with SCI survivors. Value change may be achieved by cognitive and behavioral interventions, such as problem-solving interventions and acceptance and commitment therapy techniques.

Cognitive behavior therapy and SCI.

The first study to evaluate a CBT intervention on emotional adjustment in SCI survivors was conducted in 1997 by Craig, Hancock, Dickson, and Chang (Galvin & Godfrey, 2001). Craig et al. (1997) conducted a nonrandomized controlled trial to evaluate whether CBT interventions result in long-term changes. A total of 28 individuals (23 men and 5 women) received CBT in small groups for 1.5 to 2 hours per week during traditional hospital rehabilitation. The treatment protocol addressed anxiety,

depression, self-esteem, assertion, sexuality, and family relations. The intent of the treatment was to help the individuals adjust to reintegration into society. Results indicated no statistically significant differences between groups before or immediately following treatment. However, the CBT group was significantly less depressed 12 months after treatment than the control group (Craig et al.). This supports the need to study emotional adjustment to disability in individuals not only following discharge from rehabilitation, but well into their reintegration.

Research also indicates that CBT may benefit individuals with SCI who are struggling with negative reactions to disability (Smedema et al., 2010). In a study that included 224 SCI survivors, Smedema et al. (2010) found that individuals who engage in negative coping strategies, such as catastrophizing, dysfunctional attitudes (the Dysfunctional Attitudes Scale; Weissman & Beck, 1978; the Rosenberg Self-Esteem Scale; Rosenberg, 1965), and heightened perception of stressors (Perceived Stress Scale-4; Cohen, Kamarck, & Mermelstein, 1983), struggle with adapting to their new way of life and ultimately fail to adapt to their disability, as measured by the acceptance subscale of the Spinal Cord Lesion-related Coping Scale (Elfstrom, Kreuter, Ryden, Persson, & Sullivan, 2002). CBT interventions that specifically target such negative reactions to the disability were found to influence self-worth and subjective well-being. Smedema et al. (2010) recommend that effective treatments focus on helping the individual cope with stressful situations, decreasing magnification of elements of the disability, and restructuring and modifying dysfunctional attitudes. Interventions targeting cognitive distortions, such as magnification and reframing, can help change the individual's perception of disability (Smedema et al., 2010; Weber, 2002).

CBT, when applied to the SCI population, is designed to help individuals develop positive coping skills to allow them to adjust to the challenges that accompany living with a disability (Galvin & Godfrey, 2001) as well as to improve levels of depression and anxiety (Mehta et al., 2011). CBT, when offered in a group format, becomes even more cost-effective and practical and also allows SCI survivors the opportunity to benefit from group dynamics and to learn from each other in a supportive environment (Craig & Hancock, 1994; Galvin & Godfrey, 2001; Maki, Winograd, & Hinkle, 1976). Offering group CBT as a part of traditional rehabilitation also alleviates difficulties in transportation, mobility, and accessing psychological services encountered in the community (Craig & Hancock, 1994), although some survivors may be resistant to engage in group therapy during this phase of recovery. Mehta et al. (2011) systematically reviewed the literature to determine the effectiveness of CBT for psychosocial issues following SCI. In their research, they identified two studies, both supporting the use of CBT in treating and maintaining symptom reduction of depression among SCI survivors. Both studies found a significant decrease in depressive symptomatology. CBT appears to have a greater effect on SCI survivors who meet the criteria for major depressive disorder than those demonstrating mild symptomatology. CBT for treating anxiety in SCI survivors yielded mixed results, with some studies finding a small effect (Dorstyn, Mathias, & Denson, 2010; Duchnick, Letsch, & Curtis, 2009; King & Kennedy, 1999) and another study finding no effect (Craig et al., 1997). More research is needed to establish efficacy in this area (Mehta et al., 2011).

Some studies have utilized specific variants of CBT and applied them to the SCI population. Kennedy, Duff, Evans, and Beedie (2003) evaluated the impact of Coping

Effectiveness Training (CET; King & Kennedy, 1999) on depression in the SCI population. Participants were recruited from the inpatient unit of the National Spinal Injuries Center (NSIC). Treatment involved psychoeducation regarding stress and reactions to stress, appraisal skills, and problem-solving skills, followed by hands on practice working through several scenarios commonly experienced by the SCI population. Additionally, they introduced the cognitive model and employed activity scheduling and relaxation training. Participants learned how to identify and challenge negative assumptions as well as how to choose appropriate coping mechanisms and increase social supports. Results indicated that the treatment group showed a significant reduction in depression and anxiety following CET compared with 40 matched controls (Kennedy et al., 2003).

Given the empirical support for use of CBT interventions with SCI survivors as well as the importance of cognition in adjustment to disability and well-being, it is important to gain a better understanding of the presence of cognitive distortions among SCI survivors.

Cognitive distortions and dysfunctional thinking.

The cognitive model posits that thinking patterns influence behavioral, emotional, and even physiological response. Beck et al., (1979) described depression as a thinking disorder characterized by specific systematic cognitive errors. These systematic thinking errors are believed to result in erroneous thoughts, or cognitive distortions (Beck, 1967). Beck originally identified six cognitive distortions: arbitrary inference, selective abstraction, overgeneralization, magnification and minimization, personalization, and absolutistic, dichotomous thinking. Beck et al. (1979) defined arbitrary inference as a

process in which one draws a conclusion either in the absence of evidence or in the presence of contradictory evidence. Selective abstraction was described as homing in on a specific detail taken out of context and developing a general conceptualization based on only the detail. Beck et al. (1979) defined overgeneralization as the tendency to draw a general conclusion based on an isolated event, then applying the conclusion to all events. Magnification and minimization reflect the errors in perceived significance of an event. Personalization refers to the tendency to relate external events to the self, despite the absence of solid grounds for making such connection. Lastly, absolutistic, dichotomous thinking reflects the tendency to categorize experience by extremes (Beck et al., 1979).

Albert Ellis's theory of human irrationality and overarching rational emotive behavior therapy also has strong cognitive roots (1958; 1976). Ellis posited that thinking and emotion influence one another in a transactional manner and develop into a cause and effect relationship. Ellis believed that one's thinking and emoting process influences a type of self-talk that strongly determines thoughts and emotions. Ellis defined irrationality as "any thought, emotion, or behavior that leads to self-defeating or self-destructive consequences that significantly interferes with the survival and happiness of the organism" (Ellis, 1976, p. 145). Common thinking errors, according to Ellis, include overgeneralization, magnification or exaggeration, strong beliefs in absolutes, and strong beliefs in shoulds, oughts, and musts, among many others (1976). In his work, Ellis composed a list of 11 irrational beliefs that contribute to maladaptive emotions (1962).

Since the introduction of Beck's six original cognitive distortions, much attention has been given to thinking patterns in clinical populations. Burns went on to add to and simplify Beck's six original cognitive distortions as well as to borrowing from Ellis

(1962; 1976), ultimately identifying 10 cognitive distortions. Burns's greatest contribution in this realm may have been presenting these concepts in a way that a typical patient could readily understand and relate to (Burns, 1980; 1990). These 10 distortions are: all-or-nothing thinking, discounting the positives, emotional reasoning, jumping to conclusions, labeling, magnification, mental filter, overgeneralization, blaming and personalization, and should-statements (Burns, 1980, 1990, 1999). Others have identified even more thinking errors, such as comparison, externalization of self-worth, and perfectionism (Freeman & DeWolf, 1992; Freeman & Oster, 1999).

Several instruments have been designed to clinically assess the construct of cognitive distortions. These instruments include the Dysfunctional Attitude Scale (DAS; Weismann, 1979; Weismann & Beck, 1978), the Cognitive Bias Questionnaire (CBQ; Krantz & Hammen, 1979), the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), the Cognitive Error Questionnaire (CEQ; Lefebvre, 1981), the Cognitive Distortion Scale (CDS; Briere, 2000), and the Inventory of Cognitive Distortions (ICD; Yurica & DiTomasso, 2001). These instruments vary in both clinical usage and distortions assessed, with the ATQ, DAS, and CEQ designed specifically for use with individuals diagnosed with depression. Inconsistency in regards to the type and number of distortions assessed impacts clinical utility, as the DAS, CBQ, ATQ, CEQ, and CDS do not measure all distortions found in the literature.

In an effort to ease identification and assess frequency of cognitive distortions in clinical populations through the development of a self-report measure, Yurica (2002) designed the ICD to validate 16 theorized cognitive distortions found in the literature (Beck et al., 1979; Burns, 1980, 1999; Freeman & DeWolf, 1992; Freeman & Oster,

1999). Yurica (2002) performed a factor analysis on the distortions found in the literature, revealing 10 cognitive distortions: externalization of self-worth, fortune-telling, magnification, labeling, perfectionism, comparison to others, emotional reasoning, arbitrary inference/jumping to conclusions, minimization, and mind-reading. Yurica also identified a new distortion, emotional-reasoning and decision-making, yielding a total of 11 factor-analyzed distortions (2002). These distortions, as defined by Yurica (2002), are described below:

1. Externalization of Self-Worth refers to the development and maintenance of self-worth based almost exclusively on how the external world views oneself (Freeman & DeWolf, 1992; Freeman & Oster, 1999).
2. Fortune-telling is defined as the process of foretelling or predicting a future event or events and believing that this prediction is absolutely true for oneself (Burns, 1999; Burns & Seligman, 1989).
3. Magnification is the tendency to exaggerate or magnify either the positive or negative consequences of some personal trait, event, or circumstance (Burns, 1999; Burns & Seligman, 1989).
4. Labeling refers to the cognitive process of labeling oneself using derogatory names (Burns, 1999; Burns & Seligman, 1989).
5. Perfectionism refers to a constant striving to live up to some internal or external representation of perfection without examining the evidence or the reasonableness of these perfect standards, often to avoid the subjective experience of failure.

6. Comparison to others refers to the tendency to compare oneself to others, whereby the outcome typically results in concluding that one is inferior to or worse off than others.
7. Emotional reasoning refers to the predominant use of an emotional state to form conclusions about oneself, others, or situations (Beck et al., 1979; Burns, 1999; Burns & Seligman, 1989).
8. Arbitrary inference/jumping to conclusions refers to the process of drawing a negative conclusion in the absence of specific evidence to support that conclusion (Beck et al., 1979; Burns, 1999; Burns & Seligman, 1989).
9. Minimization refers to the process of minimizing or discounting the importance of some event, trait, or circumstance (Burns, 1999; Burns & Seligman, 1989).
10. Mind-reading refers to one's arbitrary conclusion that someone is reacting negatively, or thinking negatively towards him or her, without specific evidence to support that conclusion (Burns, 1999; Burns & Seligman, 1989).
11. Emotional reasoning and decision-making is defined as the tendency to rely on emotions to make decisions (Yurica, 2002).

Cognition and SCI.

Cognition has been assessed in the SCI population in an effort to understand the adjustment to pain as well as ability to cope with the disability (Raichle et al., 2007; Smedema et al., 2010; van den Bout et al., 1988). Pain-related beliefs, and catastrophizing, or “unrealistic and negative self-evaluation in response to pain,” predicts

mental health and coping in those with chronic pain (Hanley, Raichle, Jensen, & Cardenas, 2008; Raichle et al., 2007, p. 718). Researchers agree that coping skills are an important factor in attaining psychosocial adjustment and satisfactory quality of life (Groomes & Leahy, 2002; Smedema et al., 2010;; Song & Nam, 2010). The type of coping strategy utilized, whether positive (results in a positive outcome) or negative (results in a negative outcome), is dependent on the thinking pattern of the SCI survivor (Smedema et al., 2010). For instance, those who magnify losses incurred because of the injury and minimize retained abilities have been found to attain low levels of acceptance of SCI (Wright, 1983). Magnification and minimization are two of the 11 factor-analyzed cognitive distortions identified by Yurica (2002) above. This illustrates the relevance of identifying the role of cognitive distortions in the SCI population, as well as the influence of cognitive distortions on QOL and adaptation to disability. Identifying and correcting cognitive distortions may lead to selection of positive coping strategies.

Cognitive appraisals are another manner in which cognition has been studied in SCI survivors in relation to coping. Appraisals reflect how a person views a traumatic event in addition to their perceived resources for coping (Kaiser & Kennedy, 2011). The cognitive appraisal literature has identified links between types of appraisals and adjustment to injury (Lazarus & Folkman, 1984) and quality of life (Kennedy et al., 2010). Further, appraisals made immediately following the injury impact coping, psychological well-being, and adjustment to SCI (Kennedy et al., 2010), supporting the need for interventions targeting cognition during the initial hospitalization and rehabilitation.

A literature search using the phrase “spinal cord injury and cognitive distortions” performed in the EBSCO and Science Direct databases yielded five studies (Overholser, Schubert, Folliart, & Frost, 1993; Shnek, 1996; Shnek et al., 1997; Tirch, 2002; Weber 2002). These studies evaluated cognitive distortions in relation to depression and emotional distress among those with spinal cord injury. Only one study was identified in the literature that directly assessed cognitive distortions in SCI survivors. Shnek et al. (1997) evaluated whether learned helplessness, self-efficacy, and cognitive distortions, the latter as measured by the Cognitive Errors Questionnaire (CEQ; Lefebvre, 1981) predict depression in a sample of individuals with multiple sclerosis or SCI. Results indicated a significant positive correlation between cognitive distortions and depression in the SCI group, but no predictive relationship was established between cognitive distortions and depression. Shnek et al. also found that cognitive distortions were significantly associated with lower self-efficacy and increased helplessness. Independently, these three variables accounted for a significant amount of variance in depression (-.37, -.58, and .51, respectively). This is contrary to other studies that have found a relationship between cognitive distortions and major depressive disorder (e.g., Overholser et al., 1993; Rosenfield, 2004; Tirch, 2002; Yurica, 2002). Shnek et al. speculate that cognitive distortions may indirectly influence depression by leading to greater feelings of helplessness and low self-efficacy, which in turn predict depression. It is important to note that researchers in this study assessed cognitive distortions using the Cognitive Beliefs Questionnaire, a modified version of the CEQ, which may have limited the ability to adequately assess the presence of cognitive distortions. The CEQ is designed to measure general cognitive distortion. Modifications to the CEQ for the

purpose of this study that may have limited psychometric properties included altering eight of the 24 vignettes found on the original CEQ by replacing vignettes that describe physically active scenarios, such as sports, with less active scenarios, such as poker, in an effort to adapt the inventory for use with those with physical disabilities. Further, the CEQ is limited to only four cognitive errors (overgeneralization, arbitrary inference, selective abstraction, and magnification or minimization) and does not include all of the distortions identified in the literature (Shnek et al., 1997; Yurica, 2002). Moreover, Shnek et al. did not report whether SCI survivors were more susceptible to specific cognitive distortions within this measure. Further, this measure does not assess the frequency of cognitive distortions, which can provide a wealth of information for people with SCI.

Another study sought to evaluate the reliability and validity of the Medical-Based Emotional Distress Scale (MEDS; Overholser, Schubert, Foliart, & Frost, 1993), created to assess depression in individuals with physical disabilities by evaluating cognitive and affective symptoms of depression while controlling for physical symptoms to decrease the chance of false positives (Overholser et al., 1993). The MEDS includes a subscale that measures cognitive distortions. As a whole, the MEDS was found to be a valid and reliable measure of the cognitive and affective aspects of emotional distress. While this study emphasized the importance of cognition in emotional functioning, it did not focus on content or frequency of cognitive distortions.

The other three studies identified in the literature search were doctoral dissertations (Shnek, 1996; Tirch, 2002; Weber, 2002). Weber (2002) expanded research on the reliability and validity of the Perceived Disability Scale (PDS; Frey, Lofland,

O'Connor, & Semenchuk, 2000), determining that perception of the degree of disability experienced can vary greatly among individuals with the same condition and can alert clinicians to possible negative cognitions that exacerbate perceived disability. Weber administered the PDS to individuals with chronic pain, erectile dysfunction, or SCI. Results indicate that the SCI group scored higher on the PDS than the other groups assessed (SCI, 61.4; erectile dysfunction, 34.8; pain, 48.9) and that there were significant differences between all groups ($F(4, 344) = 18.0, p < .01$). However, a lack of normative data compromises the ability to interpret the scores both within and between groups (Weber, 2002).

Tirch (2002) examined predictions arising from the cognitive behavioral model of depression among SCI survivors. Results indicate that childhood experiences, certain cognitive distortions, dysfunctional attitudes, and negative automatic thoughts were significantly related. SCI was not predictive of depressogenic cognitions, although Tirch's results may have been limited by the measurements used to assess cognitive distortion, as these measures only assess for select distortions related to depression. Shnek (1996) evaluated the relationships between learned helplessness, cognitive distortions, and self-efficacy among SCI survivors and multiple sclerosis patients. Findings indicated that learned helplessness and self-efficacy predicted depression in both groups, even after controlling for demographic and disease-related variables. Cognitive distortions were not a significant predictor of depression when controlling for the effects of self-efficacy and learned helplessness (Shnek, 1996). As previously stated, researchers used the CBQ, a modified version of the CEQ, to assess cognitive distortions.

A second search using the phrase “disability and irrational thoughts” yielded an additional article pertaining to coping and catastrophic thinking (Ehde & Jensen, 2010), although not specific to SCI. The relationship between maladaptive thoughts and the severity of pain is discussed and the authors suggest that maladaptive thoughts influence pain severity and lead to greater psychosocial distress and disability (Ehde & Jensen, 2010).

In conclusion, traumatic SCI is sudden and dramatic and affects nearly every aspect of life. Further, many report a lower perceived quality of life stemming from both physical and psychological difficulties. These difficulties make it challenging to accept SCI and adjust to life postinjury. Only one study to date has evaluated cognitive distortions among SCI survivors, and the small number of cognitive errors addressed, as well as the fact that the frequency of these thought patterns was not addressed, limited the study. It is possible that thinking patterns that include frequency of cognitive distortions can influence both QOL and adaptation to disability because relationships have been identified between cognitive appraisals and QOL and adjustment (Kennedy et al., 2010; Lazarus & Folkman, 1984) and between pain perception and catastrophizing (Raichle et al., 2007). The present study is designed to determine if cognitive distortions are present in SCI survivors, as well as to determine if a relationship exists between frequency of cognitive distortions, QOL, and adaptation to disability.

This study tested three hypotheses. Based on the existing literature, it was hypothesized that frequency of cognitive distortions would be negatively correlated with adjustment to disability, while controlling for emotional distress, marital status, and education. Second, it was hypothesized that frequency of cognitive distortions would be

negatively correlated with quality of life, even after controlling for pain, secondary complications, and marital status. Third, it was hypothesized that there would be a significant interaction effect between QOL and level of adjustment. More specifically, it was hypothesized that SCI survivors who endorsed a higher frequency of cognitive distortions would also endorse a lower QOL and lower level of adjustment. Conversely, those who endorsed a lower frequency of cognitive distortions would endorse a higher QOL and a higher level of adjustment.

Chapter 2

Method

This study was conducted online in an effort to increase the ability to reach the specialized SCI population and recruit individuals who otherwise may not have been able to participate due to limitations in mobility and/or lack of transportation. We used a mixed correlational and between groups design. Institutional review board approval was obtained from the Philadelphia College of Osteopathic Medicine and Magee Rehabilitation prior to data collection.

Participants.

Participants were required to meet predetermined conditions in order to be included in this study. First, participants had to have sustained a chronic spinal cord injury, in which full neurological function has not been regained. Second, participants had to be a minimum of 18 years of age. Third, participants must have had at least an eighth grade education and be fluent in the English language to ensure they would be able to read and understand the measures. If participants were unable to physically fill out the electronic questionnaires, they were permitted to have a caregiver present to help complete the questionnaires. These participants were reminded in the cover letter that this would limit their privacy.

Participants were excluded from the study if they reported they did not have a chronic SCI, were not at least 18 years of age, were unable to understand English, or reported less than an eighth grade education. Participants were also excluded if they reported a documented moderate to severe traumatic brain injury, history of psychosis, or if they did not fill out the questionnaire in its entirety. Exclusion criteria resulted in one

participant under age 18 and 22 persons who reported a documented moderate to severe traumatic brain injury being disqualified from the statistical analysis.

Participants were a convenience sample recruited from a rehabilitation hospital located in Philadelphia and various SCI websites, including both discussion forums and Facebook pages. The total sample was comprised of 116 men and women (59 men; 57 women) ranging in age from 19 to 69 years (mean age = 45.05). Age at injury ranged from 9 months to 60 years. Time since injury ranged from less than 1 year to 58 years. The leading cause of SCI was vehicular/automobile accident (33.6%), followed by sports/recreation (19.8%), falls/hit by falling/flying object (18.1%), medical/surgical complications (15.5%), and violence and gunshot wounds (2.6%). Forty-seven percent had complete injuries. Level of injury ranged from cervical (36.2%) to lumbar (12.9%), with half of the sample reporting thoracic level injuries (50.0%). The majority of the sample identified as Caucasian (89.6%), followed by Asian or Pacific Islander (4.3%), African American or Black (3.4%), Native American, Eskimo, or Aleutian (.9%), and multiracial or other (.9%). Forty-eight were single (never married, divorced, separated, widowed and other/unclassified), while 51.7% were either married or identified as living with a significant other/partner.

Measures.

Study materials included a cover letter and four self-report questionnaires. The cover letter informed the potential participants about the general purpose of the study, potential risks, and the right to withdraw from the study at any time. The questionnaires were the Inventory of Cognitive Distortions (ICD; Yurica & DiTomasso, 2001), the World Health Organization's WHOQOL – BREF (WHOQOL Group, 1998), and the

Adaptation to Disability Scale – Revised (ADS – R; Groomes & Linkowski, 2007).

Demographic and diagnostic information was obtained using standardized questions from the National Spinal Cord Injury Database (2013) and the International Spinal Cord Society (International Spinal Cord Society, 2014) websites. The total administration time for the survey packet was approximately 30 to 45 minutes.

Inventory of Cognitive Distortions.

The ICD (Yurica & DiTomasso, 2001) is a 69-item self-report survey designed to measure the frequency of 11 factor-analyzed cognitive distortions. Items are scored on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*). Total possible scores range from 69 to 345. Lower scores reflect lower frequencies of cognitive distortions, whereas higher scores reflect more frequent distortions. The score is obtained through addition of the numerical ratings.

The ICD has good internal consistency and test-retest validity. The ICD was originally designed for and validated with an adult clinical population exhibiting symptoms of depression and anxiety. One study examining the frequency of cognitive distortions in medical patients found high internal consistency ($\alpha = .97$, Uhl, 2007). Yurica (2002) reported a test-retest reliability of .998 in a sample of 28 adults.

Content validity was established for the ICD during the construction of the instrument. A panel of three cognitive therapy experts reviewed and agreed unanimously on each of the 69 items (Yurica, 2002).

Convergent validity has been demonstrated, with the ICD correlating with measures of psychopathology and pervasive negative attitudes towards the self, world, and future. Yurica (2002) found that the ICD correlates with the Beck Depression

Inventory – II (BDI – II; Beck, Steer, & Brown, 1996) ($r = .70$), the Beck Anxiety Inventory (BAI; Beck & Steer, 1990) ($r = .59$), and Weisman and Beck's Dysfunctional Attitude Scale (DAS; Weisman & Beck, 1978 ($r = .70$)).

The ICD has been identified as a useful tool for measuring cognitive distortions and patterns of dysfunctional thinking. It can be used for a variety of reasons in CBT settings, including intake assessment, as well as a marker for treatment progress gleaned through baseline and outcome assessment. It has also been used for research in establishing relationships between cognitive distortions and psychological diagnoses for both clinical syndrome and personality disorders (Rosenfield, 2004), anxiety and depression in adults diagnosed with ADHD (Strohmeier, 2013), parental stress and child psychopathology (Kennedy, 2012), and psychological and behavioral outcome factors in medical patients (Uhl, 2007), family medicine outpatients (Goins, 2008), and overweight and obese individuals (Shook, 2010), among others.

World Health Organization's WHOQOL – BREF.

The WHOQOL – BREF is a 26-item self-report survey designed to measure quality of life (WHOQOL Group, 1998). The 26 items are divided into two global quality of life items and 24 specific quality of life items. The scale is comprised of four domains: physical health, psychological, social relationships, and environment. Items are scored on a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*extremely*).

Respondents are asked to answer how much each item pertains to them over the past 2-week period.

The score is obtained by calculating the mean score for each domain, then multiplying the mean score by 4. Scores for each domain range from 4 to 20, which is

comparable to the WHOQOL – 100. Each domain score can be transformed to a scale ranging from 0 to 100, if desired. A low score reflects a low QOL and a high score reflects a high quality of life. The first two items are examined separately, as these items assess the person's overall perception of quality of life and health.

The WHOQOL – BREF demonstrates satisfactory internal consistency and discriminant validity among SCI survivors (Jang, Hsieh, Wang & Wu, 2004), as well as item-domain validity ($r = 0.41$ to 0.77), and moderate to high reliability ($\alpha = 0.74$ to 0.87) (Hill, Noonan, Sakakibara, Miller & the SCIRE Research Team, 2010). Test developers reported the Cronbach's alpha coefficients as follows: .80 for physical, .76 for psychological, .66 for social, and .80 for environment (WHOQOL Group, 1998). When tested specifically for use with SCI survivors, the WHOQOL – BREF demonstrated internal consistency in three of four domains (Jang et al., 2004). The social relationships domain did not demonstrate high internal consistency ($\alpha = .55$), likely due to the small number of items within this domain (3 items). Subscale correlations confirm construct validity among the physical health (0.55 to 0.73), psychological health (0.59 to 0.73), social relationships (0.65 to 0.77), and environmental (0.52 to 0.75) subscales (Hill et al., 2010).

When the WHOQOL – BREF was compared to the Short Form – 36 (SF – 36; Ware, Snow, Kosinski, & Gandek, 1993), both measures demonstrated very good internal consistency (Cronbach's alpha coefficients of 0.72 to 0.98 and 0.75 to 0.84 , respectively), intrainterater reliability (intraclass correlation coefficients of 0.41 to 0.98 and 0.56 to 0.95), and convergent validity among the conceptually related domains (Lin, Hwang, Chen, & Chiu, 2007). The WHOQOL – BREF has lower ceiling and floor values than

the SF – 36. In all, the measure has been used extensively and found to be a valid measure of QOL among SCI survivors.

Adaptation to Disability Scale – Revised.

The ADS – R (Groomes & Linkowski, 2007) is a revised version of the Acceptance of Disability Scale (ADS, Linkowski), originally developed in 1971. The ADS – R is a 32-item self-report scale designed to measure the extent to which an individual with physical disability has made a satisfactory adjustment to disability. The original measure was comprised of 50 items and was designed to reflect the value change process inherent in acceptance of loss theory. Items on the revised scale are scored on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Total possible scores range from 32 to 128, with lower scores reflecting lower levels of adaptation and high scores reflecting higher levels of adaptation. The score is obtained through addition of numerical ratings. The scale is comprised of four subscales, one for each value change component indicative of acceptance of loss: transformation of comparative status to asset values, containment of disability, enlargement of scope of values, and subordination of physique. Subscales can be examined independently to reflect extent of adaptation in each domain.

The revised scale was created to retain the psychometric integrity of the original scale. Linkowski (1971) reported adequate construct validity as well as high internal consistency in the original and revised scales ($\alpha = .93$). The revised scale maintains a high to moderate internal consistency among each subscale (transformation = .88, enlargement = .82, containment = .88, subordination = .71). Overall reliability remained stable between the original and the revised scale ($\alpha = .93$). This scale is widely cited in

the acceptance/adjustment to physical disability literature (Groomes & Leahy, 2002; Heinemann, Bulka, & Smetak, 1988; Hopps, Pepin, & Boisvert, 2003; Woodrich & Patterson, 1983).

Procedure.

The principal investigator composed a demographic and diagnostic questionnaire, using standard questions that have been accepted for use with SCI survivors, to identify sample characteristics and ensure both inclusion and exclusion criteria were met. No identifying information was collected, and all participants remained anonymous. The measures used in the study (ICD, ADS – R, WHOQOL – BREF) were administered electronically via Google Forms, which allows users to create and share questionnaires on the Internet and allows respondents to remain anonymous. The researcher gained approval from Darlene Groomes, author of the ADS – R, Robert DiTomasso, author of the ICD, and the World Health Organization, authors of the WHOQOL – BREF, to both use the measures and administer the measures electronically for the purpose of this research.

The principal investigator created a research study announcement, flyer, and cover letter. The announcement informed prospective participants of the purpose of the study and expected duration of participation. The flyer informed potential participants of the purpose of the study, inclusion and exclusion criteria, anticipated duration, the URL to access the study, and contact information for the researcher, advisor, and research coordinator. The cover letter included a description of the study, an explanation of what participation would entail, and a description of the risks and benefits of participating. Participants were recruited both on the Internet and from a large urban rehabilitation

facility in the northeastern U.S. The study announcement was posted to several discussion forums and websites for SCI:

- Discussion board of the Neurorecovery Network website, found at <http://www.spinalcordinjuryparalysis.org/discussions>
- Discussion board of the Apparalyzed Spinal Cord Injury Peer Support website, found at <http://www.apparelyzed.com/forums/forum/26-spinal-cord-injury-research-cure-treatment-news/>
- The Surveys and Research Studies section of the CareCure Community website, found at <http://sci.rutgers.edu/forum/forumdisplay.php?f=104>
- Discussion board of the Christopher and Dana Reeve Foundation website, found at <http://www.spinalcordinjuryparalysis.org/forums/viewcategory /3352>
- Life After Spinal Cord Injury (LASCI) Facebook page, found at <https://www.facebook.com/LASCIonline>
- Reeve Foundation Spinal Cord Injury - Paralysis Resource Center Facebook page, found at <https://www.facebook.com/ReevePRC?ref =profile>

Clinicians at the rehabilitation hospital posted the research flyer in various areas of the hospital, including the outpatient physician clinic and outpatient therapy facility, and included a research announcement in their winter 2013 and spring 2014 newsletters. Clinicians also sent an announcement about the research study with an attached research flyer via e-mail to members of their peer mentor program.

Participants accessed the survey by using the link found on the announcement and flyer. This link led the potential participants to the cover letter, which provided detailed information about the study. After reading the letter participants were directed to the

questionnaire to begin the study. Participants filled out the form electronically at their convenience.

Completed surveys were retrieved electronically through the Google Forms spreadsheet. The researcher ensured inclusion/exclusion criteria were met and then prepared data for analyses.

Chapter 3

Results

Data analysis was completed using the Statistical Package for the Social Sciences (IBM SPSS Statistics; SPSS Inc., 2012). Missing values analyses were utilized to account for items omitted by respondents.

Based on the existing literature, it was hypothesized that frequency of cognitive distortions would be negatively correlated with adjustment to disability while controlling for emotional distress, marital status, and education. To test this hypothesis, multiple linear regression analysis was used to determine if the total score on the ICD would predict level of adjustment of disability. The assumptions of linearity, independence of errors, homoscedasticity, unusual points, and normality of residuals were met. Level of adjustment, operationalized as total score on the ADS – R (low = 32 to 64, medium = 65 to 96, high = 97 to 128) was the dependent variable and emotional status, marital status, and education were the independent variables and served as predictor variables because they have previously been found to be significantly correlated with adjustment to disability (Attawong & Kovindha, 2005; Crewe & Krause, 1988; Krause & Anson, 1997). Emotional status was operationalized as self-reporting a loss of interest or pleasure over the past 2 weeks, feeling down, depressed or hopeless over the past 2 weeks, being told by a health professional that you have depression in the past 12 months, or being told by a health professional that you met criteria for posttraumatic stress disorder, panic disorder, or generalized anxiety disorder in the past 12 months. Marital status was operationalized as married if currently married or living with a significant other/partner and single if the participant endorsed never married, divorced, separated, widowed, or other/unclassified. Educational status was operationalized as the

highest level of education completed and comprised of the following selections: eighth grade or less, ninth grade through 11th grade, a high school diploma or GED, associate degree, bachelor's degree, master's degree, doctorate, or other/unclassified. These items were included on the diagnostic and demographic questionnaire. Total ICD score was also entered into the regression equation as an independent variable to determine if the model was significant when controlling for the predictor variables. Emotional status, specifically presence of depression, $b = -12.11$ $[-21.46, -2.77]$, $p = .012$, or anhedonia, $b = -7.72$ $[-12.33, -3.11]$, $p = .001$, was a significant predictor of adjustment, while marital status $b = 3.18$ $[-2.23, 8.58]$, $p = .246$, and education, $b = -8.15$ $[-20.88, 4.59]$, $p = .207$, were not significant.

SCI survivors who endorsed depression on the demographic and diagnostic questionnaire, $b = -12.11$ $[-21.46, -2.77]$, $p = .012$, or a loss of pleasure or interest, $b = -7.72$ $[-12.33, -3.11]$, $p = .001$, were less adjusted to disability than those who did not endorse these items. Overall, the full model of emotional status, marital status, educational level, and frequency of cognitive distortions predicted level of adjustment, $R^2 = .452$, $F(7, 96) = 11.303$, $p < .0005$; adjusted $R^2 = .412$. Frequency of cognitive distortions alone was also a significant predictor of adjustment, $b = -0.18$ $[-0.28, -0.08]$, $p = .001$. Regression coefficients and standard errors can be found in Table 1.

Table 1

Predictors of Adaptation to Disability: Summary of Multiple Regression Analysis

Variable	<i>b</i>	<i>SE_B</i>	β	<i>p</i>
Marital status	3.176	2.721	.091	<i>p</i> = .246
Education	-8.146	6.415	-.100	<i>p</i> = .207
Anhedonia	-7.721	2.324	-.404	<i>p</i> = .001*
Depressed/down	3.440	2.848	.155	<i>p</i> = .230
Depression diagnosis	-12.111	4.708	-.269	<i>p</i> = .012*
Anxiety/PTSD	1.831	4.596	.036	<i>p</i> = .691
Cognitive distortions	-.179	.051	-.316	<i>p</i> = .001*

Note. Adaptation to disability was measured using the ADS – R (Linkowski and Groomes, 2007), and cognitive distortions was measured using the ICD (Yurica and DiTomasso, 2002). The remaining variables were self-reported by survivors on the diagnostic and demographic questionnaire. The table depicts the correlations between each predictor variable and adaptation to disability. Significant predictors of adjustment to disability are marked by an asterisk. **b* = unstandardized regression coefficient; *SE_B* = standard error of the coefficient; β = standardized coefficient.

In summary, regardless of educational level and marital status, those who endorsed depression and/or anhedonia tended to report more cognitive distortions and scored lower on a measure of adjustment to disability.

Second, it was hypothesized that frequency of cognitive distortions would be negatively correlated with quality of life, operationalized as total score on the WHOQOL – BREF (low score operationalized as 18.0 to 47.6; high score operationalized as 48.0 to 80.0) while controlling for pain, secondary complications, and marital status. Presence of pain was operationalized as a self-report rating of usual pain level over the past 4 weeks using a 0 to 10 scale (0 = no pain, 10 = pain so severe you could not stand it), and a rating of how much pain has interfered with normal work outside the home and housework over the past 4 weeks (0 = not at all, 4 = extremely). Secondary complications were operationalized as self-reported perception of general health, current health in comparison to health 1 year ago, endorsing having had a urinary tract infection that required treatment with antibiotics within the past year, a pressure sore with open or broken skin within the past year, and having been diagnosed with diabetes or high blood sugar following SCI. These variables were included as questions on the demographic and diagnostic questionnaire.

A principal component analysis (PCA) was conducted to determine if the domains of the WHOQOL – BREF loaded on a single construct versus the four identified domains. The PCA revealed one component that had an eigenvalue greater than one and explained 66.9% of the total variance. Visual inspection of the Cattell screen plot indicated that one component representing quality of life should be retained. A single

score for overall QOL was computed by adding the four domain scores together, resulting in a score that ranged from 16 to 80.

Multiple linear regression analysis was used to determine if frequency of cognitive distortions predicted level of QOL. The assumptions of linearity, independence of errors, homoscedasticity, unusual points, and normality of residuals were met. Quality of life was the dependent variable and marital status (Dijkers, 1999; $F = 12.4$, $df = 4$, $p < .0001$), presence of pain (Vogel et al., 1998; $b = -1.90$ [-3.49, -.32] $p = .02$), and presence of secondary medical complications (Putzke et al., 2002; $F = 15.8$, $df = 2,907$, $p < .01$) were the independent, predictor variables that significantly correlated with quality of life. Total ICD score was also entered into the regression equation as an independent variable to determine if the model was significant when controlling for the predictor variables. The full model of presence of pain, secondary complications, marital status, and frequency of cognitive distortions to predict level of QOL was statistically significant, $R^2 = .529$, $F(9, 90) = 11.231$, $p < .0005$; adjusted $R^2 = .482$. Frequency of cognitive distortions ($b = -0.07$ [-1.21, -0.02], $p = .008$), subjective perception of general health ($b = -3.87$ [-5.52, -2.22] $p = .000$), and marital status ($b = 2.74$ [0.06, 5.41], $p = .045$) added significantly to the prediction, $p < .05$. In summary, SCI survivors who reported a lower frequency of cognitive distortions scored higher on the QOL measure. Additionally, they tended to report being married or living with a significant other and reported better health. Regression coefficients and standard errors can be found in Table 2.

Table 2

Predictors of Quality of Life: Summary of Multiple Regression Analysis

Variable	<i>b</i>	<i>SE_B</i>	β	<i>p</i>
Pain scale 0 to 10	-.140	.436	-.036	<i>p</i> = .748
Pain interference	-1.346	.933	-.168	<i>p</i> = .153
Marital status	2.736	1.345	.149	<i>p</i> = .045*
General health	-3.865	.826	-.419	<i>p</i> = .000*
Health over past year	.574	.804	.058	<i>p</i> = .477
UTI	1.083	1.425	.057	<i>p</i> = .449
Pressure sore	-2.590	1.577	-.124	<i>p</i> = .104
Diabetes or high blood sugar	-3.007	1.973	-.114	<i>p</i> = .131
Cognitive distortions	-.070	.026	-.235	<i>p</i> = .008*

Note. QOL was measured using the WHOQOL – BREF (WHOQOL Group, 1998) and cognitive distortions, using the ICD (Yurica and DiTomasso, 2002). All other variables were self-report items included on the diagnostic and demographic questionnaire. Significant predictors of QOL are marked by an asterisk. **b* = unstandardized regression coefficient; *SE_B* = standard error of the coefficient; β = standardized coefficient.

Third, it was hypothesized that there would be a significant interaction effect between QOL and level of adjustment. More specifically, it was hypothesized that SCI survivors with a low QOL and low level of adjustment would endorse a higher frequency of cognitive distortions, while those with a high QOL and high level of adjustment would endorse a lower frequency of cognitive distortions. A low QOL was operationally defined as a score between 18.0 to 47.6 on the WHOQOL – BREF, while a high QOL was defined as a score between 48.0 to 80.0. Low, medium, and high levels of adjustment were operationally defined as a score between 32 and 64; 65 and 96; and 97 and 128, respectively, on the ADS – R. A two-way ANOVA was used to determine if there was an interaction between those with a high or low quality of life and those with a high, medium, or low level of adjustment to disability on frequency of cognitive distortions. There were two independent variables, QOL and adjustment to disability. QOL had two levels, high and low. Adjustment to disability had three levels, high, medium, and low. The dependent variable was the total score on the ICD. There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p = .384$). There was no statistically significant interaction between level of quality of life and level of adjustment in frequency of cognitive distortions, $F(2, 107) = .344, p = .710$, partial $\eta^2 = .006$.

Because no interaction was identified, we performed a main effect analysis. There was a statistically significant difference between groups, as determined by the two-way ANOVA. A Tukey post hoc test revealed there was no statistically significant difference between the low quality of life and high quality of life groups for frequency of cognitive distortions, $F(1, 107) = 2.534, p = .114$, partial $\eta^2 = .0232$. However, there was

a statistically significant difference in frequency of cognitive distortions in those with a low, medium, or high level of adjustment, $F(2, 107) = 4.982$, $p = .009$, partial $\eta^2 = 0.85$. Frequency of cognitive distortions was significantly greater in those with a medium level of adjustment to disability than those with a high level of adjustment, $M = 25.1$, $SE = 53.5$, $p < .0005$. Additionally, frequency of cognitive distortions was significantly greater in those with a low level of adjustment, $M = 38.6$, $SE = 12.6$, $p = .008$. There was no significant difference between those with a low level of adjustment and those with a medium level of adjustment. These results suggest that the more distorted thinking one endorses, the less adjusted one is following SCI.

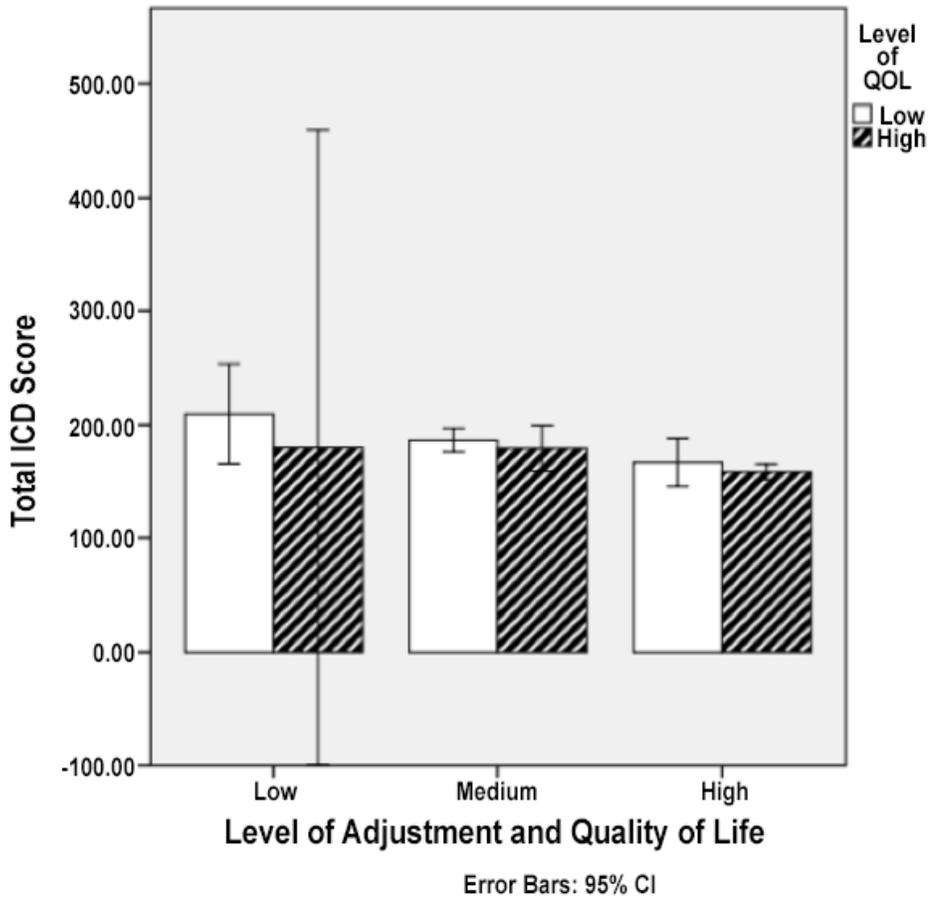


Figure 1. Quality of life, level of adjustment, and frequency of cognitive distortions: summary of two-way ANOVA. Those who endorsed a low QOL endorsed higher ICD scores than those who endorsed high QOL. Those who endorsed a low level of adjustment also tended to endorse higher ICD scores than those who endorsed either a medium or high level of adjustment.

The most frequent cognitive distortions endorsed by SCI survivors, in order of frequency, were emotional reasoning, perfectionism, emotional reasoning and decision making, externalization of self-worth, comparison to others, fortune-telling, magnification, labeling, mindreading, minimization, and arbitrary inference, as shown in Table 3. Each subscale of the ICD had a varying range of scores, given the unique number of items that comprised each scale. To allow for comparison of cognitive distortions, the mean of each subscale was transformed into a percentage (0 to 100).

Table 3

Frequency of Cognitive Distortions in SCI Survivors

Distortion	%	<i>M</i>	<i>SD</i>	<i>SE</i>
Emotional reasoning	50.75	10.15	1.70	.157
Perfectionism	48.75	9.75	2.46	.228
Emotional reasoning and decision-making	47.90	4.79	.940	.087
Externalization of self-worth	44.59	33.44	8.72	.810
Comparison to others	43.00	8.62	2.25	.209
Fortune-telling	40.35	22.19	6.53	.606
Magnification	40.45	14.16	3.61	.335
Labeling	39.12	9.78	2.93	.272
Mindreading	35.50	3.55	1.18	.109
Minimization	35.00	3.50	1.04	.096
Arbitrary inference	34.40	5.16	1.39	.129

Notes. Mean, standard deviation, and standard error of the mean for each distortion subscale of the ICD. To allow for comparison among subscales, the mean for each subscale was transformed into a percentage falling on a 0 to 100 continuum.

Chapter 4

Discussion

As hypothesized, results indicated that a higher frequency of cognitive distortions in SCI survivors predicts lower level of adjustment to disability. This relationship persisted even after controlling for emotional status, marital status, and education. Emotional status, specifically a diagnosis of depression or report of anhedonia, was a significant predictor of lower level of adjustment to disability, while marital status and level of education were not. This is in contrast to previous studies identifying marital status (Crewe & Krause, 1988) and level of education (El Ghalit & Hanson, 1979; Krause & Anson, 1997) as significant predictors of adjustment. Krause and Anson (1997) compared employment status among survivors and found that both employed participants and those who identified as students reported a greater number of years of education than did unemployed participants, and employed survivors scored significantly higher on an adjustment scale. In the present study, the presence of depression or anhedonia and high frequency of cognitive distortions predicted a low level of adjustment. This is consistent with the literature, given the established relationship between depressive behaviors and adaptation to disability (Craig et al., 1997; Galvin & Godfrey, 2001; Nicholls et al., 2010) and between cognitive distortions and depression (Beck et al., 1979; Ellis, 1976; Rosenfield, 2004; Yurica, 2002).

Other studies have also established a relationship between emotional status, depression, and adjustment (Attawong & Kovindha, 2005; White et al., 2010) and between dysfunctional thinking and adjustment (Smedema et al., 2010). These results are in contrast to Shnek et al. (1997), who failed to find a relationship between cognitive distortions and depression, although this may be explained by the fact that they used a

measure that may have been less sensitive to transdiagnostic distortions and that their study controlled for self-efficacy and learned helplessness. The fact that the measure of cognitive distortions used in the current study, the ICD, is sensitive to transdiagnostic distortions (e.g., Rosenfield, 2004) may have contributed to our ability to identify a relationship between frequency of cognitive distortions and adjustment to disability because a variety of diagnoses and even personality features can inhibit coping and affect the ability to adjust to disability.

Frequency of cognitive distortions in SCI survivors also predicted perceived QOL even after controlling for pain, secondary complications, and marital status. Survivors' perception of their general health and marital status were significant predictors of QOL. Clinicians working with unmarried survivors should assess QOL and intervene to address underlying issues that may account for a lower perceived QOL in this population. SCI survivors who were single, perceived they had poor overall health, and endorsed a high frequency of cognitive distortions endorsed a low overall QOL. This is consistent with studies that have found a positive relationship between QOL and health (Anderson & Vogel, 2003; Crisp, 1992; Pierce et al., 1999; Post et al., 1998; Putzke et al., 2002) and a relationship between marital status and QOL (Dijkers, 1999). Assessing the survivors' perception of their health status can allow the clinician to correct distorted or dysfunctional thoughts or adjust illness perceptions related to disability. While this may be one of the first studies to find a relationship between QOL and cognitive distortions, it certainly makes sense, given the established relationship between cognitive distortions and emotional and psychological well-being. This is consistent with studies that have found a relationship between cognitive appraisals and QOL (Kennedy et al., 2010).

Consistent with cognitive theory emphasizing a connection between cognitive distortions and psychological difficulties (Beck et al., 1979; Ellis, 1976), such distortions seem to account, at least in part, for low QOL in SCI survivors. It is likely that the survivor's interpretation of disability (e.g., "Disability means that I'm defective and/or unlovable" versus "Disability does not define a person or his/her value to society") influences perceived QOL and it is the interpretation that may be distorted or dysfunctional. A distorted or dysfunctional view of disability can contribute to low QOL by impeding emotional and behavioral coping. Consequently, in treatment, identifying and challenging distorted or dysfunctional thoughts can contribute to raising perceived QOL, despite a debilitating injury.

While frequency of cognitive distortions predicts QOL, as discussed above, once artificial levels were created for high and low QOL groups, this relationship was no longer significant. There was no statistically significant difference between the low QOL and high QOL groups for frequency of cognitive distortions; however, there was a statistically significant difference in frequency of cognitive distortions in those with a low, medium, or high level of adjustment. The more distorted thinking one endorses following SCI, the less adjusted one is. This supports the notion that adjustment following SCI has strong behavioral and cognitive components, which supports the use of CBT in this population, as well as the need for rehabilitation psychologists to address cognitive distortions, for instance by helping survivors shift focus from lost abilities to retained abilities. Psychological interventions used in the rehabilitation setting should aim to change the survivors' perception of their disability, which emphasizes changing cognitions about the disability to facilitate adjustment (Krause & Edles, 2014). In other

words, treatment outcome should be improved by reducing selective abstraction (focusing on lost abilities) and shifting attention to, or cognitively maximizing, retained abilities or even exploring novel interests and learning new skills, such as those found in various areas of academia, hobbies, social pursuits, adaptive sports, volunteering, or other interests.

Use of the ICD as a measure for cognitive distortions also permits researchers to identify the most frequent distortions within the population being studied. Strohmeier, Rosenfield, DiTomasso, & Ramsay (2014), for example, found perfectionism as the most frequent distortion among a sample of persons with ADHD. The most frequent cognitive distortions endorsed by SCI survivors were, in descending order, emotional reasoning, perfectionism, emotional reasoning and decision making, externalization of self-worth, and comparison to others. It is possible that emotional reasoning is prevalent because survivors are overwhelmed with the initial flood of emotions following sudden and dramatic onset of disability. The intensity of the emotional experience may lead some to base their decisions and beliefs on their feelings instead of rational thought. A strong desire to perform at one's preinjury level may induce perfectionistic qualities as a compensatory strategy for both real and perceived limitations. New limitations can also increase the survivors' tendency to compare themselves to others, either able-bodied people or those with a less debilitating SCI (lumbar level or incomplete injury versus cervical level or complete injury). Appearance and body image, which are highly valued in most societies, may lead those with SCI to base their personal value on their interactions with others and how others treat them.

Given the multitude of changes in life following SCI and after such a legitimate loss, it is important to reiterate that many reported cognitive distortions may not be distorted at all. To the contrary, these beliefs and automatic thoughts may indeed be accurate, but dysfunctional. For example, having the thought “My life as I know it, is over” reflects the cognitive distortions of fortune-telling and magnification for most people. For SCI survivors, although this thought is arguably accurate it is dysfunctional if it narrowly focuses attention on losses instead of retained abilities. Moreover, this statement implies a belief that life will never improve. This sort of thinking can result in hopelessness and thus interfere with motivation to adjust to disability.

Conversely, having the thought “Life will be different now, but my injury will not hold me back from doing things I enjoy” instills a sense of hope and determination to return as closely as possible to preinjury activities. This mindset can be facilitated during rehabilitation through CBT and occupational and physical therapy as the SCI survivor learns to function independently following disability, as well as in the years following the injury as the survivor begins to test his or her abilities. These experiences of success create a sense of mastery over the environment despite physical limitation and can serve as behavioral experiments to falsify more maladaptive, dichotomous beliefs about helplessness and unlovability (Beck, 2011).

Implications.

This research illuminates the interaction between external and internal events, specifically, the role of the interpretation of events and the multidirectional influence on emotional process and perceived well-being. These results support the role of CBT in

helping survivors alter dysfunctional and distorted cognition to improve QOL and facilitate adjustment to disability.

Whereas past studies have assessed cognition among SCI survivors (Overholser et al., 1993; Raichle, et al., 2007; Shnek, 1996; Shnek et al., 1997; Smedema et al., 2010; Tirch, 2002; Turner et al., 2002; van den Bout et al., 1988; Weber 2002), these studies were limited by the use of measures that assess for only select distortions. The present research is the first study to assess frequency of the 11 factor-analyzed cognitive distortions (Yurica, 2002) within this population.

CBT interventions are well suited to reducing the specific cognitive distortions in this population. For example, consider the five most frequent cognitive distortions: emotional reasoning, perfectionism, emotional reasoning and decision making, externalization of self-worth, and comparison to others. Specifically, using cognitive restructuring for both emotional reasoning and emotional reasoning and decision making, clinicians can teach survivors the cognitive model, that thoughts influence emotional states, helping them identify and challenge distorted and dysfunctional thoughts. Survivors can learn to replace distorted or dysfunctional thoughts with more accurate or adaptive thoughts and problem-solving skills to help them learn to rely less on emotions for reasoning and decision making. Survivors can be taught to distinguish between fact and an emotional state. Techniques such as a cost benefit analysis, vertical descent, or the double-standard exercise can be useful tools to illustrate this concept (e.g., Leahy, 2003). Problem-solving therapy, which facilitates adoption of a more adaptive problem orientation, such as being optimistic in believing that one can cope with and resolve feelings of hopelessness and doubt rather than believing one's situation will never

improve, is another avenue by which one can learn to challenge emotional reasoning and decision making and improve one's life (Nezu, Nezu, & D'Zurilla, 2013).

For perfectionism, clinicians can help survivors by teaching them how to examine fairness and find evidence for the reasonableness of the perfectionistic standards set for themselves and others. The therapist can help individuals determine whether the use of extreme standards is adaptive for them, fair, or even realistic (Leahy, 2003). Asking about the "average person" and shifting focus to use of average as a baseline rather than the extreme standard may help the survivor to set more realistic expectations. Survivors can then collaboratively set more realistic standards to help reduce the frequency of perfectionistic cognitive distortions. It is also helpful to scale expectations of performance, for example on a scale of 1 to 10, rather than in extreme dichotomous terms of pure perfection or abject failure. Furthermore, individuals quickly learn that behavioral experiments, with the goal of improvement of recent performance and testing cognition, brings more steady progress in actual achievement than some illusory standard. These behavioral experiments can further modify cognition and mood.

For externalization of self-worth, clinicians can help survivors learn to reestablish their self-worth and to base their judgments on internal processes (e.g., positive and more accurate self-talk) instead of external sources (approval/recognition from others). Monitoring and identifying negative self-talk and examining the evidence supporting such thoughts can help survivors learn to think more rationally and respond to negative thoughts in an effective way. The therapist can help the survivor explore the need for approval and/or fear of negative evaluation from others to identify and modify

maladaptive core beliefs (Leahy, 2003) through the use of cognitive restructuring techniques (e.g. Beck, 2011; Burns, 2000).

For the cognitive distortion of comparison to others, clinicians can help survivors to refrain from comparing themselves to others and shift their focus to personal strengths and retained abilities, which may permit them to think more adaptively. Leahy (2003) suggests the use of positive tracking, or keeping a journal of positive experiences or actions to help shift focus to positive qualities rather than perceived shortcomings. Survivors can then praise themselves for their positives, which may serve to increase the positive behavior. Identifying and correcting these frequent distortions can enhance QOL and facilitate adjustment to disability. In positive psychology, interventions aim to help people shift their focus from misfortune and what has gone wrong in life to blessings and what has gone right (Seligman, Rashid, & Parks, 2006). One such positive psychology technique that seems particularly well suited to this population is the three blessings exercise, in which SCI survivors can be encouraged to identify three things that they are most happy with at the end of the day and how they contributed to the three blessings going well, in order to add gratitude and optimism to life, in addition to increasing self-efficacy by recognizing their own contributions.

Limitations.

This study had several limitations. First, participation was limited to those with Internet access and who visited SCI-related websites and discussion forums and/or were patients at a large rehabilitation facility in a major northeastern city. This may have, therefore, led to selection bias, as it is unknown if SCI survivors who frequent these sites and patients at this urban rehabilitation facility are representative of the greater SCI

population. For example, those with the most severe disabilities may not be physically able to access the Internet. Also, survivors who live in rural areas that do not have large rehabilitation centers that specialize in SCI may differ in significant ways from patients at this urban rehabilitation facility. While using a convenience sample can improve the ability to reach out to this specialized population, generalizability is threatened (Alessi & Martin, 2010).

The second limitation involves the use of self-report measures, as these are reactive measures, and respondents may not have answered truthfully (Kazdin, 2003). Ideally, it would have been advisable to use a multimethod approach with behavioral, physiological, and/or collateral data. Also, while the ADS – R and WHOQOL – BREF have been validated for use with SCI survivors, the ICD is a generalized measure of cognitive distortion that has not been validated for use with SCI survivors. This population may require the use of a measure designed specifically for SCI survivors to target distortions related to the challenges resulting from the disability. Unfortunately, no such measure exists.

Recommendations for future research.

Research in the area of cognitive distortions among SCI survivors could guide improvements in the treatment and rehabilitation of this population. Repeating this study using a multimodal approach with behavioral, physiological, and/or collateral data in addition to self-report measures would improve internal validity. Because there is a positive relationship between cognitive distortions, QOL, and adaptation to physical disability, future research should determine if it would be helpful to administer the ICD early in SCI recovery as a means to identify individuals at risk for prolonged

psychological distress, failure to adjust to disability and low QOL. This information can guide preventative care and treatment by directing these individuals to therapy services that address these maladaptive cognitions. Results can also be used to help future researchers to develop treatment protocols that identify and replace maladaptive cognitions. Thus, it is further hoped that this study aids in the development of an empirically validated CBT treatment manual for health care workers to implement when working with SCI survivors at any phase of recovery (i.e., from initial emergency room admission to those living in the community several years after injury). It is also hoped that future research may help to determine the best time to intervene, for instance, to determine if early phases of recovery may be necessary for the grieving process, as it is essential to permit SCI survivors the ability to mourn the loss of physical abilities. Intervening too early might negatively impact the grieving process. It would be also be interesting to study the effect of integrating positive psychology into CBT therapy for survivors, aimed at facilitating a shift in focus from misfortune to blessings despite such devastating injury.

SCI survivors resistant to psychological services and traditional talk therapy may benefit from other interventions and/or experiences that challenge dysfunctional beliefs and thoughts about the self. For example, Disabled Sports USA is a program that reaches out to persons with disabilities and rebuilds confidence and independence by training survivors to master adaptive sports at a competitive level. Consequently, it would be interesting to determine if frequency of cognitive distortions decreases following mastering a new sport for SCI survivors partaking in the Disabled Sports USA program. In cognitive terms, such well-considered athletic activity may serve as behavioral

activation and as a series of behavioral experiments to challenge maladaptive cognitions and improve mood.

Finally, future researchers could also refine the ICD to measure cognitive distortion specifically for use with the SCI population. A revised ICD for SCI survivors targeting distortions related to the challenges caused by the disability may allow for a more valid assessment of distortions and further improve treatment and the existing literature in this area.

In conclusion, despite the sensory and physical limitations associated with SCI, many survivors have been able to adjust to disability and attain a high QOL. For those struggling with adjusting to disability and reporting a low QOL, this study demonstrates that it may be essential for therapists to identify and challenge distorted or dysfunctional thoughts to facilitate healthy adjustment and improve perceived QOL. CBT seems to be a viable option to address these issues. The resilience of the SCI population should not be overlooked, but used to empower those who face new disability in their journey to reestablishing independence and an active lifestyle following SCI.

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