

PREDICTING QUALITY OF LIFE FIVE YEARS FOLLOWING MEDICAL  
DISCHARGE FOR A TRAUMATICALLY-ACQUIRED SPINAL CORD INJURY

A Dissertation

by

NORMA ALICIA EROSA

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2012

Major Subject: Counseling Psychology

Predicting Quality of Life Five Years Following Medical Discharge for a Traumatically-  
Acquired Spinal Cord Injury

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Major Subject: Counseling Psychology

## ABSTRACT

Predicting Quality of Life Five Years Following Medical Discharge for a Traumatically-Acquired Spinal Cord Injury. (August 2012)

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This dissertation presents the prediction of quality of life (QoL), composed of by life satisfaction and self-perceived health status, across 5 years post a spinal cord injury (SCI) hospital discharge. Predictor variables of functional independence, pain, and family satisfaction, as mediated by environmental accessibility are examined. Environmental accessibility is conceptualized as being composed of mobility and social integration. Data are a subset from a longitudinal study of adjustment following disability. Two models were examined in order to predict QoL, Model 1 (Life Satisfaction) and Model 2 (Self-Perceived Health Status).

Results from this study were obtained by testing models using path modeling. Evaluation indices suggest good to adequate model fit, CFI, RMSEA, and SRMR for Model 1 and Model 2. In Model 1, results indicated that mobility and social integration, components of environmental accessibility, mediated the relationship between functional independence and life satisfaction ( $\beta = 0.243, p = 0.009$  and  $\beta = 0.120, p = 0.038$ , respectively). In Model 2, the component of mobility of environmental accessibility

mediated the relationship between functional independence and self-perceived health status ( $\beta = 0.288, p = 0.002$ ).

Results indicate that access to the environment is an important predictor of life satisfaction and perceived health status five years after medical discharge for a traumatically-acquired SCI. These factors of environmental access – mobility and social integration – appear to be more important determinants of quality of life post-SCI than functional impairment or the presence of pain. Programs that enhance mobility and social integration following return to the community following SCI may be indicated. Furthermore, given that the construct of environmental accessibility is relatively new, studies that examine this construct are needed in order to better understand how it is best conceptualized.

## DEDICATION

Dedico esta obra a mi madre Norma Erosa y a mi padre Reynaldo Erosa. Gracias por su apollo tras los años que me a traido fuerza para seguir adelante. Este logro lo comparto con ustedes.

I dedicate this work to my mother Norma Erosa and to my father Reynaldo Erosa. Thank you for the support across the years that has given me the strength to persevere. I share this accomplishment with you.

## ACKNOWLEDGEMENTS

I would like to thank my chair, Dr. Timothy R. Elliott, for his incredible support and guidance over the years. He may never truly understand the pivotal role he has played during my years in graduate school. Thank you for having faith and trust in me, I will forever be grateful. I also want to thank my dissertation committee: Dr. Daniel Brossart, Dr. William Rae, and Dr. James Burdine. I appreciate your support in this process. Your suggestions and advice have been invaluable in the completion of this work.

I would like to acknowledge the following people and groups who were tremendous influences on my development: Dr. Christopher Mack, Dr. Carolyn Tucker, Dr. Michael Duffy, Dr. Charles Ridley, Dr. Ron Lutz, 1SG Wayne Hockley and Project Upward Bound. In addition, I'd like to thank the staff at my pre-doctoral internship site, Edward Hines Jr. Veterans Hospital, for their incredible support and training.

I also want to thank my incredible fiancé Gerardo E. Gonzalez. Your mere presence has made life so much more rewarding. Thank you for believing in me and always encouraging me to be the best I can be. I only hope to reciprocate your immense love, understanding, and support. I love you.

Lastly, thank you to my family and friends who have provided the laughs along the way. Thank you for lifting my spirits day in and day out.

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## CHAPTER I

### INTRODUCTION

Spinal cord injury (SCI) is a relatively low-incidence injury, with approximately 40 cases per million in the United States, and the latest current rates estimated at 12,000 new cases per year (National Spinal Cord Injury Statistical Center (NSCISC), 2011). Currently, approximately 265,000 individuals live with a SCI in the United States (NSCISC, 2011). Lifetime costs for individuals with a SCI are well above the one million dollar mark, and costs increase dramatically as the severity of injury increases. In addition, the National Spinal Cord Injury Statistical Center (2011) reports that life expectancies for individuals with a SCI, although somewhat lower than the general population, are continually increasing as medical advancements are made. In fact, research shows that there has been a significant decrease in mortality rates in persons with SCI (Farhad, Hafiz, Nsar, & Souayah, 2010).

With increased incidence and longevity, there is a greater need to understand mechanisms and variables that influence quality of life (QoL) following a SCI. Individuals who have survived with a SCI report increased levels of QoL as they grow older (Charlifue, Lammertse, & Adkins, 2004; Westgren & Levi, 1998). Therefore, as individuals with a SCI survive and age decades longer with new medical care, a greater understanding in the adjustment processes is needed. The complexities of what affects QoL levels are ones that need to be addressed in the SCI literature, as we have little

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This dissertation follows the style of *Rehabilitation Psychology*.

understanding on how QoL changes over time (Dijkers, 1997).

Historically, the study of adjustment post-SCI was confined to matters of depression, anxiety, substance abuse, or personality characteristics, such as, impulsivity (Dijkers, 1997; Lammertse, Jackson, & Sipski, 2004). Research also focused on secondary medical complications (e.g. bladder problems, neurogenic pain, pressure ulcers, etc.) that often result from a SCI and in turn often result in lower QoL levels (Kennedy, et al., 2010; Westgren & Levi, 1998). Certain activities, such as employment, can also influence adjustment. Individuals with SCI who are unemployed report lower level of QoL than those who are employed full-time or part-time (Kennedy, Lude, Elfstrom, & Smithson, 2010; Westgren & Levi, 1998).

In 1978, Flanagan was the first to suggest a systematic approach to the study of QoL (Dijkers, 1997) after a 1971 meeting at the Board of Directors of the American Institutes for Research (AIR). AIR conducted a 25-year review on research and determined that improving the QoL of Americans should be a principle goal. Upon Flanagan's (1978) suggestion, the first study to examine QoL in the SCI population in this systemic approach was conducted by Crewe in 1980. Crewe defined QoL as life satisfaction and found that compared to Flanagan's (1978) national study, individuals with a SCI reported lower QoL levels than the non-disabled population.

However, it was the classic study by Schulz and Decker (1985) that stimulated considerable interest in this line of research. The study found that despite the presence of a SCI, participants reported levels of well-being only slightly lower than that of the nondisabled population. It is important to note that for the purposes of this study QoL

and subjective well-being will be synonymous terms, with QoL being used as the default term.

Studies such as Schulz and Decker (1985) increased consumer involvement and the infusion of perspectives from positive psychology (Elliott & Warren, 2007) to the current literature of important predictors of QoL following SCI. The infusion from positive psychology literature most likely stems from the field's emphasis on optimal adjustment as an inherent goal in rehabilitation (Boswell, Dawson, & Heininger, 1998; Dunn & Brody, 2009; Dunn, Uswatte, & Elliott, 2009; Elliott & Warren, 2007). Therefore, understanding predictors of and contributors to QoL following SCI is an important area of study. Consistent with Schulz and Decker's (1985) findings, the SCI literature shows that QoL does not necessarily differ greatly from the QoL reported by the nondisabled population. Albrecht and Devlieger (1999) addressed this somewhat surprising finding in their *disability paradox* concept. The disability paradox addresses the question: "Why do any people with serious and persistent disabilities report that they experience a good or excellent quality of life when to most external observers these people seem to live an undesirable daily existence?" (p. 977). To the population as a whole it seems the individuals with a severe disability, such as a SCI, would report significantly lower levels of QoL. Although lower than the nondisabled population, QoL levels among the SCI population are only little, if at all related to severity of injury; lower QoL is best predicted by psychological and social factors (Dijkers, 1997; Schulz & Decker, 1985).

Environmental factors are important in QoL research. The influence environmental factors have on the disability associated with SCI has only recently received substantial attention. With increased support of Federal funding agencies on this “person/disability/environment” concept, researchers are increasingly concerned with environmental factors and their influence on QoL (Richards et al., 1999). Findings thus far support the notion that environmental accessibility is associated with greater QoL (Richards et al., 1999). This work recommends the need for “further exploration and expansion” in this area (Richards et al., 1999, p. 1501).

As researchers aim to move away from measures that focus on negative aspects of the adjustment process, measures that focus on QoL domains, such as life satisfaction and health, are recommended (Elliott, Kurylo, & Rivera, 2002). As will be discussed in further detail in the literature review, QoL is an umbrella concept for domains, such as life satisfaction and self-perceived health status. These outcomes are of particular interest in the current study.

Despite the rich body of SCI research available, there are several key issues that merit closer scrutiny. Most SCI research studies have been cross-sectional in nature, thus making causal inferences among different variables complicated (Pollard & Kennedy, 2007). To better understand long-term outcomes in individuals with SCI, a thorough examination that employs appropriately sophisticated statistical procedures and repeated measures of the various psychological, social, *and* environmental factors that impact adjustment over time must be performed. Currently, there is a dearth of studies that take advantage of modeling procedures that study outcomes associated with SCI within a

broader conceptual context. With modeling techniques such as path modeling, contextual relationships between and among variables that occur over time can be better examined and understood (Jackson, 2010; Weston, Gore, Chan, & Catalano, 2008).

This is particularly true in the stream of longitudinal studies from the collaborative Model Systems project, in which many demographic and disability-specific variables are examined as predictors of life satisfaction, depression, and health status (Charlifue et al., 2004; Drainoni et al., 2004; Lammertse et al., 2004; Whiteneck et al., 2004). However, these studies do not routinely test *a priori* hypotheses informed by psychological theories. Theory-driven, longitudinal studies of psychological predictors of adjustment over time are lacking. When theory-driven studies are found, the focus has often been on coping strategies on adjustment (Pollard & Kennedy, 2007), making the need for predictive studies of meaningful QoL outcomes even more important. As those same authors point out, it is important to examine other social and psychological factors that likely contribute to the prediction of QoL. Therefore, research studies that examine environmental factors as predictors of QoL are particularly important.

#### Purpose of the Present Study

The purpose of the current study is to attempt to fill in several gaps in the current SCI literature. Though an abundance of quality research has been conducted in order to better understand various SCI issues, there is a lack of SCI studies that examine critical key concepts in contextual analyses informed by *a priori*, theory-driven hypotheses.

This study will examine the influence of personality, disability, social and environmental characteristics on the life satisfaction and self-perceived health status



reported by individuals across the first five years of hospital discharge following an acquired SCI. The study will analyze these constructs in a manner described in the Dynamic and Developmental Continuum Model (Elliott & Rivera, 2003). The Dynamic and Developmental Continuum Model will be explained in greater detail in the literature review. Specifically, the predictive ability of (1) diagnoses of pain, (2) functional independence, and (3) family satisfaction on environmental accessibility in the prediction of life satisfaction and self-perceived health status over time is of key interest in this study.

The study will examine how environmental accessibility, as measured by mobility and social integration, mediates the relationship of the predictor variables to psychological and physical health outcomes over time. Specifically, this study will examine if environmental accessibility (an appraisal process) mediates the relationship of the three predictor variables to two specific QoL domain outcomes, (1) life satisfaction and (2) self-perceived health status. Two separate statistical models will be run in order to treat each outcome measure independently.

The above aims of the study will be accomplished by conducting a secondary analysis of an existing, longitudinal data set. The data set is from a larger study of adjustment following disability conducted by the Injury Control Research Center (ICRC) at the University of Alabama at Birmingham. A subset of individuals with SCI in the data set will be used for the purposes of this current study. Specifically, this current study will address the following three hypotheses:

(a) The presence of pain, functional independence, and family satisfaction will predict environmental accessibility.

(b) Environmental accessibility will mediate the relation of predictor variables (pain, functional independence and family satisfaction) to life satisfaction across the first five years following hospital discharge from an acquired SCI.

(c) Environmental accessibility will mediate the relation of predictor variables (pain, functional independence and family satisfaction) to self-perceived health status across the first five years following hospital discharge from an acquired SCI.

To most effectively examine the hypothesized relationships between predictor, mediator, and outcome variables, path modeling will be employed by using the M-Plus statistical program, a structural equation modeling software. Authors have encouraged the use of structural equation modeling software programs to be used “as a model and theory testing procedure [that] allows continued progress on rehabilitation research efforts to identify effective and efficient standards of practice that serve to enhance the health, general well-being, and psychosocial functioning of individuals with disabilities” (Weston et al., 2008, p. 353).

## CHAPTER II

### LITERATURE REVIEW

To understand the importance of the proposed study, it is essential to understand the current status and issues in the study of psychological adjustment following a SCI. In this chapter basic information about SCI and secondary complications associated with it will be provided, and then a review of the current understanding of psychological adjustment post-SCI will be presented. The chapter will conclude with theoretical and methodological shortcomings in the existing literature that will be addressed by the proposed study, and how the proposed study will advance on this literature will be delineated.

#### Spinal Cord Injury

Two types of SCI are commonly described, paraplegia and tetraplegia. Paraplegia affects the lower trunk and legs, while tetraplegia affects the lower and upper body, including the arms and hands. The lesion to the spinal cord is classified as complete or incomplete. Complete injuries result in the total loss of all voluntary movement or sensation below the area of injury, while incomplete injuries result in some retention of voluntary movement or sensation below the area of injury. A basic understanding of the components of a SCI is necessary in order to begin to understand the potential challenges that accompany a SCI. With higher rates of survival and greater life expectancies, the emphasis in rehabilitation post and injury is needed more than ever because though rates of incidences are low, the consequences of the injury are long-lasting and profoundly impact individuals' overall functioning. In addition to the direct

physical outcomes that result from a SCI (e.g., bowel and bladder problems, loss of sensation, sexual functioning issues, and impaired mobility), individuals often encounter secondary impairments (e.g., pressure ulcers, depression, and pain) that pose significant challenges to their adjustment post-injury. These secondary impairments are typically associated with social, emotional, and psychological functioning (Elliott & Rivera, 2003).

### Psychological Adjustment and SCI

Traditionally, the SCI literature has studied depression as the focus of adjustment post an injury. A review of depression among SCI outlines that before empirical studies were conducted, depression was considered to be an anticipated result of a SCI and even thought of as necessary in order to adjust following a SCI (Frank, Elliott, Corcoran, & Wonderlich, 1987). The “stages and phases” model of depression following a SCI were not based on theory; consequently, critics of this school of thought emphasized the need for theory-based, empirical studies (Frank et al., 1987). Several influential empirical studies that employed diagnostic criteria to study depression found that, in fact, depression was not inevitable as previously assumed in the literature (Howell, Fullerton, Harvey, & Klein, 1981; Frank, Kashani, Wonderlich, Lising, & Visot, 1985; Fullerton, Harvey, Klein, & Howell, 1981). The use of operational definitions and standardized diagnostic criteria supported the need of empirical studies when studying adjustment post-SCI.

Despite the influx of SCI studies focusing on depression following the Frank et al. 1987 review, a re-visit to the same issues by Elliott and Frank (1996) discovered that

some of the same issues were still present in the literature. It seems that the mere presence of an SCI was still being used as the main predictor of adjustment post an injury (Elliott & Frank, 1996). Currently, even with the quality research being done in adjustment post an injury, personal and environmental factors are often fundamentally ignored, especially as related to the predictive quality they may have for adjustment post-SCI.

In addition to depression and SCI, literature on psychological components has also addressed issues such as personality characteristics. There is a substantial literature on sensation-seeking, risk-taking, and impulsivity traits that people with a SCI may tend to demonstrate, especially prior to their injury (Bockian, Lee, & Fidanque, 2003; Woodbury, 1978). In a study with the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985), a commonly used personality trait measure, individuals with SCI reported lower levels of Conscientiousness and higher Excitement-Seeking than normative samples (Rohe & Krause, 1999). This suggests that individuals with a SCI may be less strong-willed and less organized than people in general, but they may also crave excitement and stimulation. A similar line of research has examined the occurrence of personality disorders among individuals with a SCI: Results suggest that there seems to be no prevalent personality disorders among the SCI population (Bockian et al., 2003; Temple & Elliott, 2000).

Substance use, particularly alcohol, has also been a focus in SCI and adjustment research. Alcohol intoxication is often implicated in SCI incidence (Bombardier, 2000). Research suggests that alcohol increases risk-taking and sensation-seeking behaviors that

often result in an injury (Heinemann & Hawkins, 1995). In addition, alcohol abuse post-SCI often contributes to lower levels of self-care, which in turn contributes to secondary medical complications that affect the post-injury adjustment process (Heinemann & Hawkins, 1995).

As evident, there is a rich literature that indicates various psychological factors contribute to adjustment post-SCI. However, positive adjustment post-SCI has been largely overlooked in this work. Studies that focus on psychological factors that predict quality of life (QoL) outcomes in a positive, constructive manner are still needed. Within the last fifteen years the SCI literature started address QoL outcomes, with particular attention to life satisfaction, health status, and environmental accessibility, social integration, and mobility (Leduc & Lepage, 2002; LoBello et al., 2003; Whiteneck et al., 2004).

#### Quality of Life Following SCI

The QoL construct has been conceptualized in different ways across various disciplines. Although a consensus on a definition for QoL has yet to emerge, in the SCI literature QoL is frequently concerned with the individuals' experience and subjective well-being. This definition of QoL refers to "...the reaction to the (lack of) congruence between aspirations and accomplishments, *as perceived by the person involved*," with the reactions often being either cognitive or emotional in nature (Dijkers, 1999, p. 867). This definition corresponds to The World Health Organization's definition for QoL, which is: "...individuals' perception 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” (World Health Organization, 1997). Among the SCI population, the emphasis on subjective, individual experiences is of great importance (Frank et al., 1987). The controversy over the use of objective measures to determine QoL following SCI is a valid concern as each individual is unique and the severity of injury (objective in nature) does not greatly affect QoL (Hampton, 2004; Kennedy et al., 2000; Krahn, Suzuki, & Horner-Johnson, 2009; Trieschmann, 1988).

The QoL construct is an umbrella concept that houses many different domains. For the purposes of this study we are interested in two concepts of the QoL construct that involve the *subjective experience* of individuals with a SCI: life satisfaction and self-perceived health status. Due to the complexity of the QoL construct, it is important to note that the term well-being will often appear among the review of past research studies and should be recognized as part of this study’s focus on QoL in terms of life satisfaction and self-perceived health status.

### *Life Satisfaction*

Due to the emphasis on the individual’s perception of their position in life, life satisfaction is a vital component in measuring the QoL construct. Diener and colleagues’ (1985) research has been influential in providing an operational definition for *life satisfaction* in a way that is useful in empirical research. In Diener’s work, life satisfaction is conceptualized as a personal, cognitive-judgmental process an individual makes on the overall evaluation of his/her life (Diener, Emmons, Larsen, & Griffin, 1985). Many studies focusing on the SCI population that assess for QoL levels also use this same conceptualization (Richards et al., 1999). The “judgmental” aspect of the

evaluation is subjective in nature, as such, each individual is thought of as unique and therefore expected and likely to conceptualize their satisfaction with life in unique ways; this subjective evaluation falls into the interest of this study's conceptualization of QoL.

There are a number of different measures that attempt to capture the essence of life satisfaction in empirical research. For the purposes of this study the Life Satisfaction Index (LSI) (Neugarten, Havighurt, & Tobin, 1961) will be used as a measure of life satisfaction. The LSI is a frequently used measure in the QoL literature. Although the LSI was originally developed as a measure of general feelings of well-being among the elderly population, the LSI as a QoL measure "...has been [the] most widely used with the SCI population" (Wood-Dauphinee, Exner, & the SCI Consensus Group, 2002, p. 144).

In general, research suggests that people with a SCI tend to report lower QoL than non-disabled persons and lower physical, mental, and social health; all components in the cognitive-judgmental process in self-assessing life satisfaction (Diener et al., 1985; Dijkers, 2005) However, research within the SCI population has also shown that individuals can lead fulfilling and satisfying lives after a SCI (Pollard & Kennedy, 2007). In fact, it is important to note that studies have reported that up to 75% of individuals with a SCI report their QoL as good or excellent (Whiteneck, Charlifue, Gerhart, Overholser, & Richardson, 1992). Not only are research results showing that individuals' with a SCI can report high levels of QoL, but longitudinal studies have demonstrated that life satisfaction can also be maintained (Kennedy et al., 2000).



Enhanced understanding on variables that contribute to the improvement and maintenance of the adjustment process that leads to fulfilling and satisfying lives is crucial in optimal adjustment research. How the role of social support, particularly family support, influences life satisfaction is of interest in this current study, as individuals with a SCI who report greater levels of social support also tend to report greater life satisfaction (as measured by the LSI; Schulz & Decker, 1985). Following the onset of a disability, families can develop stronger relationships (i.e., social support) and even reorganize their views of marriage and family (Elliott et al., 2002). In addition, studies have also shown that the SCI population tends to use social support as a coping strategy (Reidy, Caplan, & Shawaryn, 1991), and family members are typically the first line of support persons with SCI (Meade, Taylor, Kreutzer, Marwitz, & Thomas, 2004).

Furthermore, family satisfaction has been shown to significantly improve during the first year post-discharge of a SCI (Richards, Elliott, Shewchuk, & Fine, 1997). This is interesting because longitudinal studies have shown that family satisfaction has a significant effect on life satisfaction levels among other disability groups (e.g., traumatic brain injury; Johnson et al., 2010). Consequently, it is reasonable to assume that family satisfaction would have similar beneficial effects on life satisfaction following SCI.

### *Self-Perceived Health Status*

The concept of *health* is comprised of many different variables. Following SCI, health can include depression, pain, pressure sores, and self-reported health status (Elliott, Bush, & Chen, 2006; Putzke, Richards, Hicken, & DeVivo, 2002). Literature on perceived health status is well documented with the general population and is often

examined in outcome research (Krahn et al., 2009). Self-reported health status has been a better predictor of mortality than objective indicators of health status (Kaplan, Ries, Prewitt, & Eakin, 1994). It has been studied frequently among specific populations, such as the elderly (Krahn et al., 2009). However, the significance of self-perceived health among individuals with disabilities is not well understood (Krahn et al., 2009).

Moreover, many studies that focus on health status rely on objective measures of health status (Hill, Noonan, Sakakibara, Miller, & the SCIRE Research Team, 2010). Because these objective measures do not consider individuals' values and preferences, they are not subjective. For the purposes of this study, the interest is in the health domain of QoL that is subjective and relies on a cognitive-judgmental process, much like that involved in assessing life satisfaction. This is an important distinction, as the concept of health has sometimes been conceptualized under the QoL construct as an *achievement* variable rather than a *subjective well-being* variable (Dijkers, 2005).

Similar to life satisfaction levels, the self-perceived health of persons with SCI are often lower than those of the general non-disabled population (Leduc & Lepage, 2002). The behavioral, psychological, and social mechanisms that influence life satisfaction also influence health status (Post, Ros, & Schrijvers, 1999). Keeping in mind the goal of optimal adjustment post an injury, not only is the domain of life satisfaction important in assessing QoL, but the health status domain is a vital component as well that contributes to well-being (Elliott & Warren, 2007; Hampton, 2004).

## Pain

Prevalence studies indicated that anywhere from 18 to 96% of persons with a SCI experience persistent pain (Anson & Shepherd, 1996; Demirel Yilmaz, Gencosmanolu, & Kesikta, 1998; Siddall, Taylor, McClelland, Rutkowski, & Cousins, 1999). This common secondary medical complication has received considerable attention in the research literature (Putzke et al., 2002; Rintala, Loubser, Castro, Hart, & Fuhrer, 1998).

In a study of 77 community-residing men with a SCI, chronic pain (as assessed by anesthesiologist) was reported by 75% of the sample. Chronic pain was associated with depressive symptoms, stress, and poorer self-assessed health (Rintala et al., 1998). Additionally, in two studies that examined predictors of pain and its impact on QoL there was a decrease in life satisfaction, physical health, and mental health among participants with pain (Putzke et al., 2002).

Despite the recent research on pain, there is little understanding on the causal impact pain has on adjustment over time (Putzke et al., 2002). Research has shown that secondary conditions, such as pain, affect general ratings of health after SCI (Krahn et al., 2009). Therefore, better understanding the role pain has on SCI outcomes is necessary. Additionally, Putzke et al. (2002) state the importance of assessing for pain at different time periods in order to better understand the possible causal relationship between pain and QoL. Those studies that have assessed for different time periods and that have looked at pain as a predictor on a longitudinal basis have been limited to 1 or 2 years post a SCI (Kennedy, Frankel, Gardner, & Nuseibeh, 1997; New, Lim, Hill, & Brown, 1997; Putzke, Elliott, & Richards, 2001; Putzke et al., 2002). Examining a

longer time period is necessary and would be informative in the understanding the role pain plays in SCI outcomes.

However, the study of pain among SCI has been complicated by various factors: chief of which is little consistency or even agreement on how to qualify the types and qualities of pain. As a result of these complications, a classification scheme or standard assessment for pain is not uniformly employed in the SCI literature (Putzke et al., 2002; Richards, 1992; Yeziarski & Burchiel, 2002). To further complicate this issue, the multitude of different SCI types and severity of injury make the measurement of pain an even more difficult task (Rintala et al., 1998). Despite these methodological complications, it is clear that the mere presence of pain is a prevalent complication in SCI. In fact, studies that use pain the presence of pain as a dichotomous variable are still employed in the literature with meaningful results (Budh & Osteraker, 2007).

#### Environmental Accessibility: Mobility and Social Integration

As previously stated in the introduction, research findings support the notion environmental accessibility is associated with greater QoL (Richards et al., 1999). With these findings and the National Institute on Disability and Rehabilitation Research's (NIDRR) challenge to integrate the person, disability, and environment as determinants of outcomes, environmental accessibility is vital in QoL research (NIDRR, 1998). The International Classification of Functioning (ICF) of disability by the World Health Organization (WHO) (2001) also clearly states that environmental factors greatly affect individuals with a disability. Therefore, the importance of the role of environmental access in SCI adjustment is clearly needed. To further support the examination of

environmental factors in research, a recent conceptualization emphasizes the importance of examining appraisal processes among individuals with a SCI (Pollard & Kennedy, 2007). As will be further described in detail in the following section, environmental accessibility, as composed by mobility and social integration, is conceptualized in this study as an appraisal process.

As with many constructs in disability research, environmental accessibility is not clearly defined in the field and it is one that is difficult to measure (Ullrich et al., 2012). However, the ICF definition conceptualizes environment as factors that “make up the physical, social, and attitudinal environment in which people live and conduct their lives” (World Health Organization, 2001, p.10). Persons’ mobility and social integration are the prominent components in this definition. For the purposes of this current study, environmental accessibility is comprised of mobility and social integration, both scales from the Craig Handicap Assessment and Reporting Technique (CHART; Whiteneck et al., 1988). Mobility is the persons’ ability to be mobile in their surroundings, both inside and outside their home and Social integration is the persons’ ability to socially interact with others (Whiteneck et al., 1988).

Studies that have implemented environmental factors have found promising results in understanding the impact of environmental factors in the adjustment process over time. In studies that use environmental factors in their disability model, it has been found that mobility and social integration (as measured by the CHART) are strongly related to life satisfaction levels (Whiteneck et al., 2004). Individuals with a SCI who have greater accessibility to their community report less physical secondary conditions

(Suzuki, Krahn, McCarthy, & Adams, 2007). In addition, studies have shown that greater environmental accessibility leads to greater life satisfaction at both 1 and 2 years post-injury (Putzke et al., 2002; Richards et al., 1999). Mobility and social integration have also been related to lower levels of pain (Putzke et al., 2002). In contrast, individuals with a SCI have reported significant lower QoL levels and reported greater handicaps in mobility and social integration when they experienced extreme pain levels (Putzke, Richards, & Dowler, 2000).

Studies that focus on environmental accessibility by employing the mobility dimension of the CHART have found that it is positively and linearly associated with life satisfaction, and mobility was predictive of life satisfaction once other variables were controlled (Richards et al., 1999). In addition, studies of the social integration dimension of the CHART have found that it, too, is positively related to higher life satisfaction (LoBello et al., 2003). Interestingly enough, higher social integration is also related to higher family satisfaction levels (LoBello et al., 2003)

#### Dynamic and Developmental Continuum Model

Adjustment following SCI should be studied from a dynamic, longitudinal perspective (Elliott & Rivera, 2003). The Dynamic and Developmental Continuum Model (Elliott & Rivera, 2003) is useful for understanding the adjustment process that follows a SCI as it considers the contextual relations between various elements (i.e., functional independence, pain, family satisfaction, environmental accessibility) over time. This model underscores how adjustment post a SCI is a “dynamic and fluid process in which characteristics of the person and the injury, their social and interpersonal world,

the environment in general, and the historical and temporal context interact to influence physical and psychological health” (Elliott & Rivera, 2003, p. 423). This model emphasizes optimal adjustment post an injury as opposed to pathology (see Figure 1).

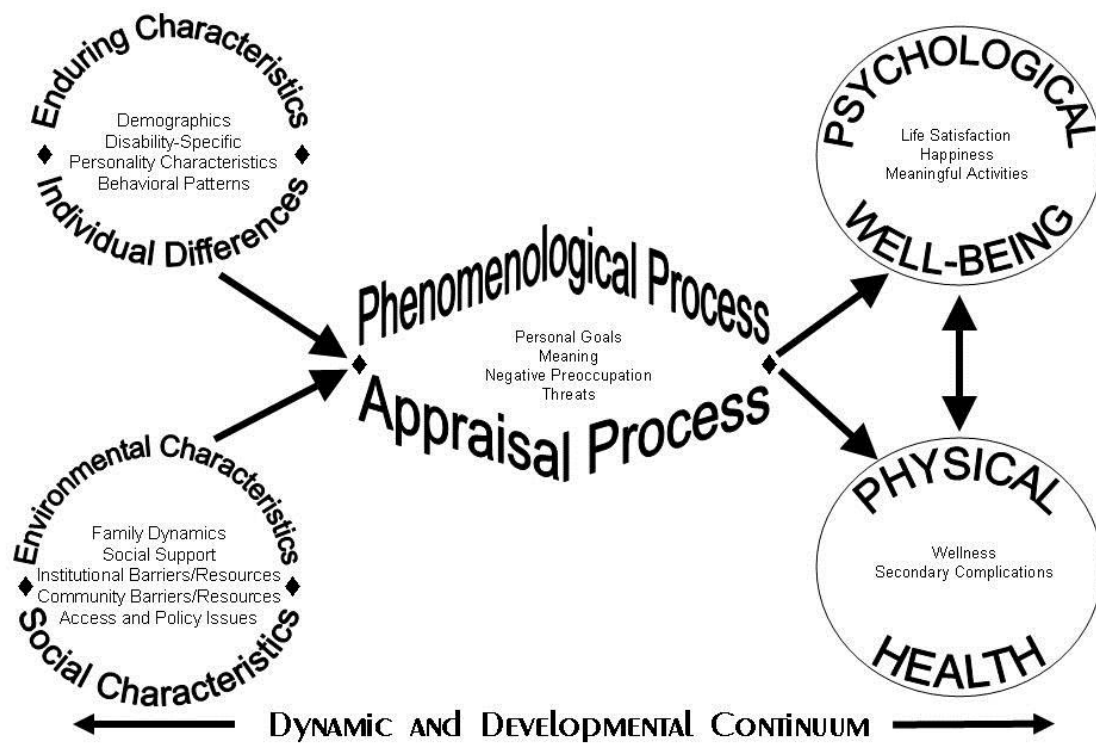


Figure 1: Dynamic and Developmental Continuum Model (Elliott & Rivera, 2003)

The model conceptualizes several domains that influence the psychological and physical areas of adjustment. Enduring Characteristics/Individual and Environmental Characteristics/Social Characteristics are the first two domains. The factors in these domains influence the social cognitive activity that occurs in the Phenomenological Process/Appraisal Process domain. The Phenomenological Process/Appraisal Process domain in turn influences the two major outcomes areas of Psychological Well-Being and Physical Health.

In the Enduring Characteristics/Individual Differences domain attention is given to demographics, disability-related characteristics, personality characteristics, and pre-disability behavioral patterns. In terms of this study, pain and functional impairments will be conceptualized within the Enduring Characteristics/Individual Differences domain. In the Environmental Characteristics/Social Characteristics domain attention is given to: family dynamics, social support, institutional barriers/resources, community barriers/resources, and access and policy issues. For the purposes of this study, family satisfaction will be conceptualized within the Environmental Characteristics/Social Characteristics domain.

In Phenomenological Process/Appraisal Process domain attention is given to: personal goals, meaning, negative preoccupation, and threats. In this study, we construe environmental accessibility as an appraisal variable because it is not solely objective, and it will likely be influenced by functional independence, pain, and possibly by family satisfaction. As such, environmental accessibility, as composed of by mobility and social integration, will be conceptualized within the Phenomenological Process/Appraisal



Process domain. In this conceptualization environmental accessibility may also mediate the relations of Enduring Characteristics/Individual (pain and functional independence) and Environmental Characteristics/Social Characteristics (family satisfaction) on adjustment across time. To further clarify, although the Dynamic and Developmental Continuum Model would likely construe environmental accessibility as better explained by Environmental Characteristics, this study believes that environmental accessibility is better explained as an Appraisal Process given the subjective nature of it. Furthermore, in this study, two QoL outcomes will be examined over time; life satisfaction will represent one aspect of QoL, and self-perceived health status will represent the other aspect of QoL.

### CHAPTER III

### METHODOLOGY

#### Participants

Participants of this study are a subset of a longitudinal study of adjustment following disability conducted by the Injury Control Research Center (ICRC) at the University of Alabama at Birmingham. The study of adjustment studied individuals who had incurred one or more of four disabling injuries (SCI, traumatic brain injury, severe burns, or intra-articular fractures of the lower extremity) and who were discharged from a sample of eight hospitals in north-central Alabama. Individuals were eligible to participate in the study if they: (a) had an acute-care length of stay in one of the eight hospitals of 3 or more days; (b) resided and were injured in the state of Alabama; (c) were discharged alive from one of the eight acute-care hospitals between October 1, 1989, and September 30, 1992; (d) were more than 17 years old at the time of the sustained injury; and (e) if they agreed to participate in regularly scheduled telephone follow-up interviews conducted by the ICRC personnel. Prospective participants were identified from acute-care medical records and were contacted at 12 months post-discharge. A trained interviewer for the study collected data from those individuals who consented to participate in the study.

The subset used for the current study was 144 individuals (108 men, 36 women) with a SCI. Racial breakdown among these participants was: White ( $n = 96$ ; 66.7%) and Black ( $n = 48$ ; 33.3%). Average age of individuals in the subset was 37 (men, mean age = 36; women, mean age = 39). At the time of injury, 35.4% of the subset was single,

45.1% was married, 11.1% was divorced, 4.2% was separated, and 4.2 % was listed as “Other/Unknown”. Range of days in in-patient rehabilitation was 0 to 365, with average days in in-patient rehabilitation at 36. Range of days in out-patient rehabilitation was 0 to 840, with average days in out-patient rehabilitation at 81. Average severity of disability for this subset at 12 months post injury was “Serious”, based on the Abbreviated Injury Scale (Civil & Schwab, 1988).

#### Procedure

A trained interviewer from the ICRC collected data in telephone interviews. These telephone interviews were usually conducted approximately 12 months after the patient was discharged from one of the acute care settings. Additional interviews were conducted at 24, 48, and 60 months post-acute care discharge. As a part of the larger project, several self-report measures were administered. However, the current study is concerned with only certain time periods by the variables measured by the instruments described in the following section.

#### Measures

##### *Predictor Variables*

In this current study, predictor variables described below are examined only for the 24 month time period of data collection.

**Functional Impairment.** Functional impairment was assessed to obtain a reliable indicator of disability at each measurement occasion. The project used the telephone version of the Functional Independence Measure (FIM; Keith, Granger, Hamilton, & Sherwin, 1987) to assess functional impairment. The FIM is a self-report

questionnaire used to assess the need (or lack thereof) for assistance across various functional domains. The FIM has 18 questions that are rated on a Likert-type rating scale. The FIM scale scores ranges from 1 to 7. A score ranging from 1 to 5 means there is a need for total assistance, an inability to complete the activity despite assistance, or the need for supervision of a second person. A score of 6 means that an activity requires an assistive device, takes an excessive amount of time to complete, or requires safety considerations. A score of 7 denotes complete independence (meaning the activity is performed safely, reasonably quickly, without aids and without modifications). The questionnaire was designed to be used in an assortment of settings and with any age group (Crewe & Dijkers, 1994).

Although studies involving the reliability of the FIM are limited, the FIM has been shown to have good interrater agreement among clinicians as supported by intraclass correlation coefficients; total FIM (0.96), self-care (0.93), sphincter control (0.90), mobility (0.91), locomotion (0.89), communication (0.90), and social cognition (0.88) (Granger & Hamilton, 1992). Among patient with SCI interrater reliability has been shown to be .83 at admission and .96 at discharge (Whiteneck, 1988). In another study with a spinal cord injury sample, the interrater reliability for the total FIM score was reported at .83 (Segal, Ditunno, & Staas, 1993). The internal reliability coefficient for this study is .95.

During the development of the FIM content validity was addressed; clinicians indicated in the pilot and trail phase that there were no unnecessary items (99% and 97%, respectively) and agreed that there were no items that needed to be added (59%

and 83%, respectively) (Hamilton, Granger, Sherwin, Zielezny, & Tashman, 1987).

Content validity within a spinal cord injury sample showed similar results (Whiteneck, 1988). The internal reliability coefficient for the FIM in the present study was .95.

Despite some indications of ceiling effects using the FIM, it is frequently used in research and has become “the de facto standard for describing medical rehabilitation outcomes in the United States; over 700 facilities use it worldwide” (Heinemann, 2000, p. 275).

**Pain.** The study includes an item that asks participants at the 24, 40, and 60 month follow-ups if they’ve been told by a doctor that the experience of pain is a health condition that resulted from their injury. Respondents report “yes” or “no” to the item. Responses to this item will be used in the present study to indicate the presence of pain secondary to SCI.

There is little consistency in research on the various types and qualities of pain; currently there is no classification scheme in SCI regarding the concept of pain (Richards, 1992). However, Richards (1992) suggests that reporting of pain independent of the participant’s self-report is helpful; this is accomplished in the measure of pain in this study by asking participants if their *doctor* reports that pain is a condition that resulted from their injury.

**Family Satisfaction Scale.** The original Family Satisfaction Scale was developed by Olsen and colleagues (Olson & Wilson, 1982). The FSS consists of 14 items designed to measure family cohesion and adaptability. The 14 items have a

Likert-type scale format (1 = dissatisfied, 2 = somewhat dissatisfied, 3 = generally satisfied, 4 = very satisfied, 5 = extremely satisfied). Total scores range from 14 to 70.

Original studies of reliability and validity by Olson and Wilson (1982) yielded an overall alpha coefficient of .92. The cohesion ( $\alpha = .85$ ) and adaptability ( $\alpha = .84$ ) coefficients were also high. The total score is recommended to be used for research purposes (Olson & Wilson, 1982; Lightsey & Sweeney, 2008). The total score of the FSS has been shown to be interplay with stress, coping, and meaning of life (Lightsey & Sweeney, 2008). The FSS has also been shown to have a strong association with life satisfaction and adjustment (Warren, Wrigley, Yoels, & Fine, 1996). The internal reliability coefficient for the FSS in the present study was .94.

#### *Mediating Variables*

In this current study, mediator variables described below are examined only for the 48 month time period of data collection.

**CHART Mobility Scale.** The CHART Mobility Scale is one of six dimensions that helps describe and identify the extent of a persons' handicap, as conceptualized by the World Health Organization (CHART; Whiteneck et al., 1988). It is the only measure of the concept of handicap validated to be used with individuals with a SCI (Whiteneck et al., 1992), and it is considered best available instrument for measuring access to the environment among persons with SCI (Ullrich et al., 2012). The mobility scale on the CHART assesses a persons' ability to be mobile in their surroundings, both inside and outside their home (Whiteneck et al., 1988).

On the Mobility scale scores range from 0 to 100, with a score of 100 indicating no handicap in the person's ability to be mobile in their surroundings (Whiteneck et al., 1988). Examples of items used in this scale: "Can you use your transportation independently?" and "Does your transportation let you get out whenever you want?" The CHART has shown good test-retest reliability; .93 for the total score and .80 to .95 for the subscales (Hall, Dijkers, Whiteneck, Brooks, & Krause, 1998).

**CHART Social Integration Scale.** The CHART Social Integration Scale is one of six dimensions that helps describe and identify the extent of a persons' handicap, as conceptualized by the World Health Organization (Whiteneck et al., 1988). It is the only measure of the concept of handicap validated to be used with individuals with a SCI (Whiteneck et al., 1992). The Social Integration dimension assesses a persons' ability to socially interact with others (Whiteneck et al., 1988).

Scores on the Social Integration scale range from 0 to 100, with a score of 100 indicating no handicap in the person's ability to socially interact with others (Whiteneck et al., 1988). Examples of items used in this scale: "Do you live alone?" and "How many friends (non-relatives contacted outside business or organizational settings) do you visit, phone, or write to at least once a month?" The CHART has shown good test-retest reliability; .93 for the total score and .80 to .95 for the subscales (Hall et al., 1998).

#### *Outcome Variables*

In this current study, outcome variables described below are examined only for the 60 month time period of data collection.

**Life Satisfaction Index (LSI).** The LSI – A (LSI; Neugarten et al., 1961) is a 20-item instrument designed to measure psychological well-being. The LSI assesses passion for life, mood, and congruence between desired and achieved goals. Respondents select either Agree or Disagree for each question. Each question differs in its categorization of an affirmative response, only affirmative responses are calculated towards the total score. Scores range from 0 to 20; higher scores indicate greater perceived life satisfaction while lower scores indicate dissatisfaction with life.

Several studies (e.g., Adams, 1969; Wallace & Wheeler, 2002) indicate the LSI is a reliable and valid instrument to measure life satisfaction. In the spinal cord injury population, the LSI has evidenced an internal reliability of .76 (Schulz & Decker, 1985). The LSI has also been positively correlated with measures of life satisfaction, adjustment, and morale (Wallace & Wheeler, 2002). The internal reliability coefficient for the LSI in the present study was .88.

**Self-Perceived Health Status.** In the current study, self-perceived health status was examined in terms of *self-rated health* assessed with a single item rating (Krahn et al., 2009). The study uses the following single item rating: “In general, how would you rate your health at the present time?” The item has a Likert-type scoring format: 1 = Excellent (no health problems), 2 = Good (no major health problems, but a few minor health problems), 3 = Fair (several minor health problems), 4 = Poor (major health problems affecting me daily). This item was reverse-scored for easier interpretation. This question has been used to assess health status in various studies, particularly in the nursing literature (Speake, Cowart, & Pellet, 1989). In addition, this question has also



been used in other self-perceived health studies (Godshall & Elliott, 1997). Of note, this item does not specify a time reference for respondents.

#### Proposed Statistical Analyses

Means and standard deviations for all self-report variables will be examined. Pearson correlations will be computed and subsequently used in path modeling. Data will be checked for outliers; if found, outliers will be dropped because the presence of outliers may significantly affect correlation coefficients. If left in the data, outliers may underestimate or overestimate the relationship between correlation coefficients (Pallant, 2007).

Path modeling will be used to examine the relationships between the predictors (FIM, pain, family satisfaction), mediator (environmental accessibility), and outcome variables (life satisfaction, self-perceived health status). Due to the statistical software's (MPLUS) ability to test for theory and theory development, it allows for confirmatory and exploratory modeling. Confirmatory modeling will be employed to test the hypothesized causal models. These models will be analyzed using Mplus 5.2 in order to test for model fit. Path modeling is able to examine relationships *across* time between all variables (predictors, mediator, outcomes), which is one of the main goals of this current study.

## CHAPTER IV

### RESULTS

#### Preliminary Analyses

Multivariate and univariate normality is assumed in structural equation modeling software; this assumption is important as non-normality may produce inaccurate results (Kline, 2005). Multivariate and univariate outliers must also be screened to prepare data for analysis. Therefore, data was screened and checked using SPSS 16.0 GP so as to not to violate these assumptions.

Skewness and kurtosis were checked to evaluate normality. Skewness and kurtosis values for all variables were within acceptable ranges to proceed with analysis. In regard to univariate outliers, scores that are three standard deviations above or below the mean were categorized as outliers (Kline, 2005). Upon inspecting the frequency distributions of  $z$  scores, one outlier was identified and removed for subsequent analyses. Mahalanobis distance, using a  $p = .001$  criterion, was employed to screen the data for multivariate outliers. No multivariate outliers were detected in the data.

#### Demographic Information

Means and standard deviations for model variables are as follows: Functional Independence ( $M = 99.87$ ,  $SD = 29.196$ ), Pain ( $M = 1.37$ ,  $SD = .485$ ), Family Satisfaction ( $M = 59.55$ ,  $SD = 12.539$ ), Mobility ( $M = 73.44$ ,  $SD = 30.435$ ), Social Integration ( $M = 80.87$ ,  $SD = 22.144$ ), Life Satisfaction ( $M = 11.45$ ,  $SD = 5.000$ ), and Self-perceived Health Status ( $M = 2.736$ ,  $SD = .929$ ). Out of 144 cases, 104 cases had

missing data on at least one variable, 24 cases had missing data on all variables. As such, path models were conducted with an  $N$  of 120.

Examination of the bivariate correlation matrix suggested that there were no statistically significant relationships between functional independence, family satisfaction, and pain; thus covariance paths between these variables were not included in the path models described below. A covariance between mobility and social integration was included in both models based on examination of the correlation matrix. Intercorrelations, means, and standard deviations for all variables can be viewed in Table 1.

#### Model Evaluation

Mplus V. 5.2, using Full Information Maximum Likelihood (FIML) estimation was used to examine the relationships between predictor, mediator, and outcome variables in both models. FIML is helpful in that it accounts for missing data (Kline, 2005). To test for model fit in the *a priori* models, the following fit indices were employed: (a) chi-square test of model fit ( $\chi^2$ ), (b) comparative fit index (CFI), (c) root mean square error of approximation (RMSEA), and (d) standardized root means square residual (SRMR). CFI is used to measure incremental fit and RMSEA and SRMR is used to measure absolute fit (Kline, 2005). CFI scores above .90 are typically categorized as having adequate fit, and categorized as having good fit if above a .95 (Kline, 2005). RMSEA and SRMR scores below .08 are typically categorized as having adequate fit, and categorized as having good fit if scores fall below .05 (Kline, 2005).

Table 1: Intercorrelations, Means, and Standard Deviation for All Variables (n = 144).

| Variable                        | 1      | 2     | 3      | 4      | 5      | 6      | 7      |
|---------------------------------|--------|-------|--------|--------|--------|--------|--------|
| 1. Functional Independence      | -      | -.051 | .054   | .721** | .384** | .300** | .401** |
| 2. Pain                         |        | -     | .157   | .043   | .123   | .110   | .199   |
| 3. Family Satisfaction          |        |       | -      | -.018  | .135   | .069   | -.175  |
| 4. Mobility                     |        |       |        | -      | .600** | .468** | .475** |
| 5. Social Integration           |        |       |        |        | -      | .450** | .394** |
| 6. Life Satisfaction            |        |       |        |        |        | -      | .247*  |
| 7. Self-Perceived Health Status |        |       |        |        |        |        | -      |
| <i>M</i>                        | 99.87  | 1.37  | 59.55  | 73.44  | 80.87  | 11.45  | 2.736  |
| <i>SD</i>                       | 29.196 | .485  | 12.539 | 30.435 | 22.144 | 5.000  | .929   |

Note: \* $p < .05$ . \*\* $p < .01$ .

Table 2

Model 1: Path Coefficient Estimates of Corrected, Best Fit Model

| Path   | Standardized Estimate | Standard Error | P-Value |
|--|-----------------------|----------------|---------|
| Functional Independence → Mobility           | 0.736                 | 0.047          | 0.000*  |
| Pain → Mobility                              | 0.144                 | 0.073          | 0.047*  |
| Family Satisfaction → Mobility               | 0.055                 | 0.086          | 0.519   |
| Functional Independence → Social Integration | 0.439                 | 0.083          | 0.000*  |
| Pain → Social Integration                    | 0.183                 | 0.094          | 0.053   |
| Family Satisfaction → Social Integration     | 0.165                 | 0.116          | 0.155   |
| Mobility → Life Satisfaction                 | 0.330                 | 0.124          | 0.008*  |
| Social Integration → Life Satisfaction       | 0.272                 | 0.120          | 0.023*  |
| Social Integration with Mobility             | 0.442                 | 0.088          | 0.000*  |

*Note.*  $N = 120$ . \* $p < .05$ .

*Model 1: Life Satisfaction*

In Model 1, chi-square test of model fit was found to be statistically non-significant, which indicates the model fits the data adequately,  $\chi^2(N = 120, df = 6) = 3.593, p < .001$ . The CFI (1.000), RMSEA (0.000) and SRMR (0.052) were all found to indicate good to adequate model fit. Based on these results it was acceptable to interpret the path coefficients.

All path coefficients and covariance statistics for Model 1 appear in Table 2. The following standardized path coefficients were found to be statistically significant in the full path analysis and can be viewed in Figure 2. The results of this analysis indicated that higher functional independence scores resulted in higher scores of social integration ( $\beta = 0.439, p = 0.000$ ) and higher scores of mobility ( $\beta = 0.736, p = 0.000$ ). In addition, individuals with no pain endorsement had higher mobility scores ( $\beta = 0.144, p = 0.047$ ). Furthermore, higher mobility scores resulted in higher life satisfaction scores ( $\beta = 0.330, p = 0.008$ ). Higher social integration scores also resulted in higher life satisfaction scores ( $\beta = 0.272, p = 0.023$ ). Additionally, mobility and social integration were statistically significantly positively related ( $\beta = 0.442, p = 0.000$ ). The model found that pain and family satisfaction were not statistically significantly related to social integration ( $\beta = 0.183, p = 0.053, \beta = 0.165, p = 0.155$ , respectively). Family satisfaction was not statistically significantly related to mobility ( $\beta = 0.055, p = 0.519$ ). The effects of the predictor variables in the model accounted for 25% of the variance in social integration ( $R^2 = 0.254$ ), 56% of mobility ( $R^2 = 0.566$ ), and 29% of life satisfaction ( $R^2 = 0.292$ ).

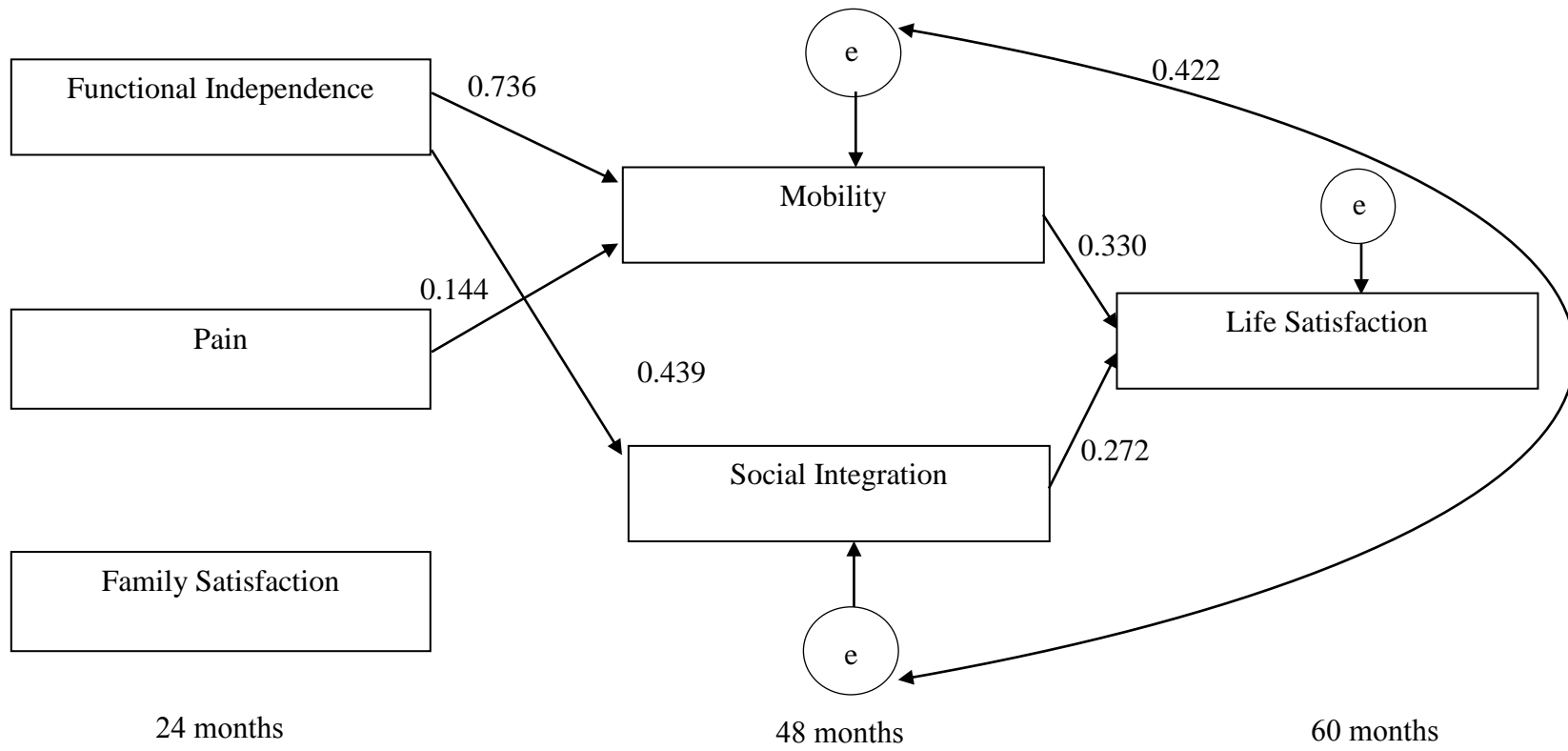


Figure 2: Model 1: Life Satisfaction

Note. Only standardized statistically significant relationships are presented. See Table 2 for all paths tested.

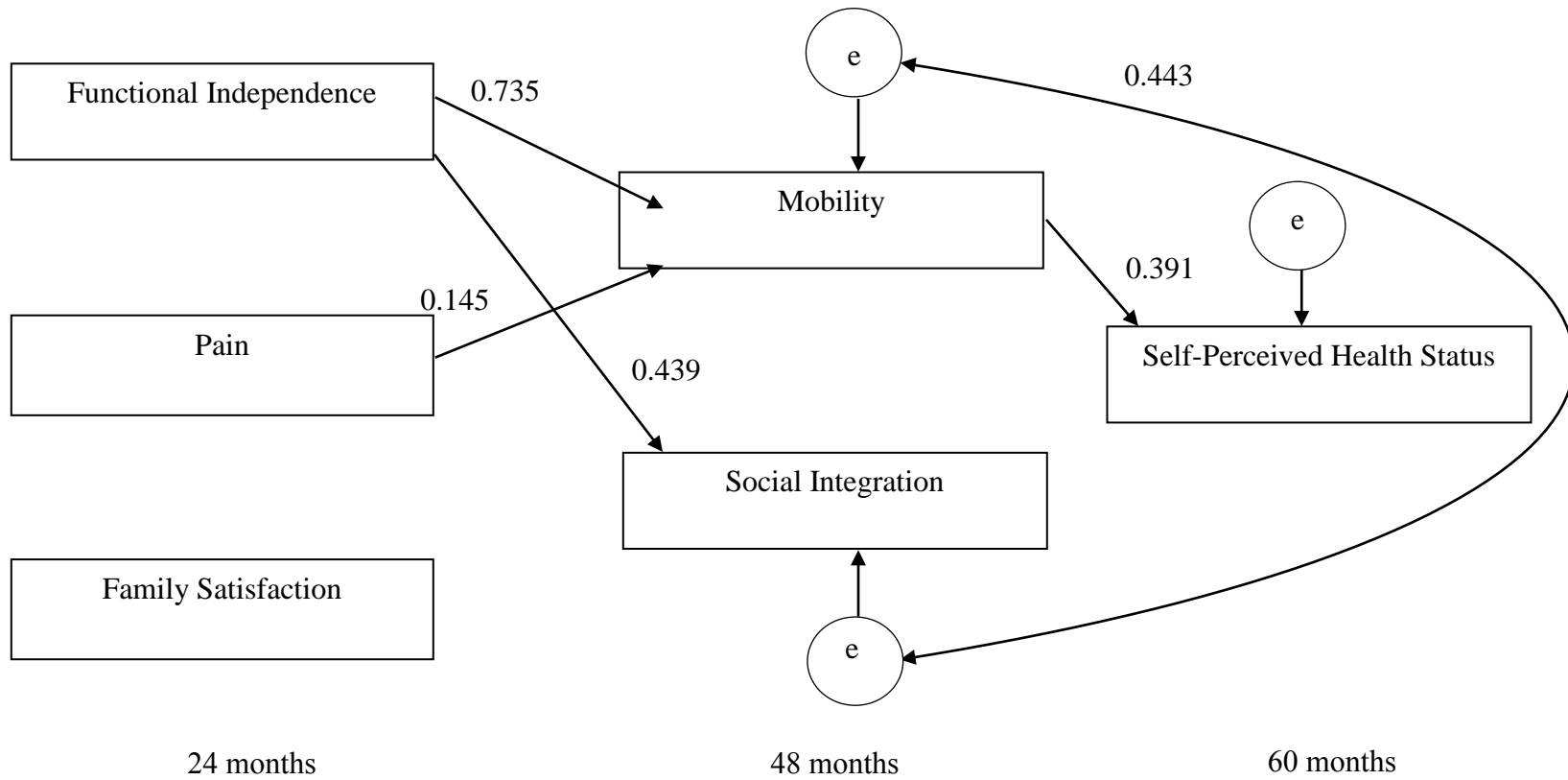


Figure 3: Model 2: Self-Perceived Health Status

Note. Only standardized statistically significant relationships are presented. See Table 3 for all paths tested.



*Model 2: Self-Perceived Health Status*

In Model 2, chi-square test of model fit was found to be statistically non-significant, which indicates the model fits the data adequately,  $\chi^2(N = 120, df = 6) = 8.644, p < .001$ . The CFI (0.978), RMSEA (0.061) and SRMR (0.055) were all found to indicate good to adequate model fit. Based on these results it was acceptable to begin interpretation of the path coefficients.

All path coefficients and covariance statistics for Model 2 appear in Table 3. The following standardized path coefficients were found to be statistically significant in the full path analysis and can be viewed in Figure 3. The results of this analysis indicated that higher functional independence scores resulted in higher scores of social integration ( $\beta = 0.439, p = 0.000$ ) and higher scores of mobility ( $\beta = 0.735, p = 0.000$ ). In addition, individuals with no pain endorsement had higher mobility scores ( $\beta = 0.145, p = 0.045$ ). Furthermore, higher mobility scores resulted in higher self-perceived health scores ( $\beta = 0.391, p = 0.002$ ). Additionally, mobility and social integration were statistically significantly positively related ( $\beta = 0.443, p = 0.000$ ). The model found that pain and family satisfaction were not statistically significantly related to social integration ( $\beta = 0.183, p = 0.052, \beta = 0.165, p = 0.155$ , respectively). Family satisfaction was not statistically significantly related to mobility ( $\beta = 0.056, p = 0.518$ ). The effects of the predictor variables in the model accounted for 25% of the variance in social integration ( $R^2 = 0.253$ ), 56% of mobility ( $R^2 = 0.565$ ), and 27% of self-perceived health status ( $R^2 = 0.274$ ).

Table 3

Model 2: Path Coefficient Estimates of Corrected, Best Fit Model

| Path  | Standardized Estimate | Standard Error | P-Value |
|---|-----------------------|----------------|---------|
| Functional Independence → Mobility                | 0.735                 | 0.047          | 0.000*  |
| Pain → Mobility                                   | 0.145                 | 0.073          | 0.045*  |
| Family Satisfaction → Mobility                    | 0.056                 | 0.086          | 0.518   |
| Functional Independence → Social Integration      | 0.439                 | 0.083          | 0.000*  |
| Pain → Social Integration                         | 0.183                 | 0.094          | 0.052   |
| Family Satisfaction → Social Integration          | 0.165                 | 0.116          | 0.155   |
| Mobility → Self-Perceived Health Status           | 0.391                 | 0.125          | 0.002*  |
| Social Integration → Self-Perceived Health Status | 0.183                 | 0.124          | 0.141   |
| Social Integration with Mobility                  | 0.443                 | 0.088          | 0.000*  |

*Note.*  $N = 120$ . \* $p < .05$ .

### Indirect Effects (Mediation)

Indirect effects were examined through Mplus V. 5.2 within Model 1 and Model 2 presented above. An indirect effect (i.e. mediation) involves intervening variables that “transmit casual effects of prior variables to subsequent variables” (Kline, 2005, p. 68). In the present study, the hypothesized intervening variables would be the mediator variables (social integration and mobility), prior variables would be the predictor variables (functional independence, pain, and family satisfaction) and subsequent variables would be the outcome variables (life satisfaction and self-perceived health status). To further clarify, the present study tested the indirect effects of functional independence, pain, and family satisfaction on life satisfaction (Model 1) and self-perceived health status (Model 2). In both models social integration and mobility were treated as potential intervening (mediating) variables.

In Model 1, there was an indirect effect between functional independence and life satisfaction through both mobility ( $\beta = 0.243, p = 0.009$ ) and social integration ( $\beta = 0.120, p = 0.038$ ), indicating that both social integration and mobility mediate the relationship between functional independence and life satisfaction. In Model 2, there was an indirect effect between functional independence and self-perceived health status through mobility ( $\beta = 0.288, p = 0.002$ ), suggesting that mobility mediates the relationship between functional independence and self-perceived health status. However, an indirect effect was not found between functional independence and self-perceived health status through social integration, as was found in Model 1.

### Post-Hoc Analyses

To further examine the mediation effects found in the models, two additional path models were conducted for the Life Satisfaction and Self-Perceived Health Status outcomes. The first model (A) only tested for direct effects between the predictor variables to the outcome variables for both models. The second model (B) tested direct *and* indirect effects between the predictor and mediator variables to the outcome variables in both models.

In the direct effects only model (A) to predict life satisfaction, the chi-square test of model fit was statistically non-significant, indicating the model fit the data adequately,  $\chi^2(N = 119, df = 3) = 2.882, p < .001$ . The CFI (1.000), RMSEA (0.000) and SRMR (0.059) indicated good to adequate model fit. Based on these results, it was acceptable to interpret the path coefficients. The model indicated that higher functional independence scores were predictive of higher scores of life satisfaction ( $\beta = 0.348, p = 0.001$ ). Presence of pain and family satisfaction were not statistically predictive of life satisfaction ( $\beta = 0.175, p = 0.100, \beta = 0.118, p = 0.406$ , respectively).

In the direct and indirect effects model (B) to predict life satisfaction, the chi-square test of model fit was statistically non-significant, again indicating the model fit the data adequately,  $\chi^2(N = 120, df = 3) = 2.959, p < .001$ . The CFI (1.000), RMSEA (0.000) and SRMR (0.049) indicated good model fit. Based on these results it was acceptable to interpret the path coefficients. In this second additional model, the relationship between functional independence and life satisfaction disappears ( $\beta = 0.015, p = 0.909$ ) as the mediators of mobility and social integration are introduced, indicating

that both mobility and social integration *fully* mediate the relationship between functional independence and life satisfaction.

In the direct effects only model (A) to predict self-perceived health status, the chi-square test of model fit was statistically non-significant, indicating the model fit the data adequately,  $\chi^2(N = 119, df = 3) = 2.366, p < .001$ . The CFI (1.000), RMSEA (0.000) and SRMR (0.057) indicated good to adequate model fit. Based on these results, it was acceptable to interpret the path coefficients. The model indicated that higher functional independence scores and absence of pain were predictive of higher scores of self-perceived health status ( $\beta = 0.444, p = 0.000, \beta = 0.271, p = 0.004$ , respectively). Family satisfaction was not statistically predictive of self-perceived health status ( $\beta = -0.079, p = 0.510$ ).

In the direct and indirect effects model (B) to predict self-perceived health status, the chi-square test of model fit was statistically non-significant, indicating the model fit the data adequately,  $\chi^2(N = 120, df = 3) = 2.391, p < .001$ . The CFI (1.000), RMSEA (0.000) and SRMR (0.045) indicated good model fit. Based on these results it was acceptable to interpret the path coefficients. In this model, the relationships between functional independence and absence of pain to self-perceived health status disappear ( $\beta = 0.090, p = 0.559, \beta = 0.186, p = 0.069$ , respectively) as the mediators are introduced. In this case, mobility *fully* mediates the relationship between functional independence and self-perceived health status.

## CHAPTER V

### SUMMARY

With increased longevity following SCI, a better understanding of the adjustment process and quality of life (QoL), is needed (Dijkers, 1997; Farhad et al., 2010). With increased support by funding agencies to examine QoL within a comprehensive “person/disability/environment” concept, research that is causal in nature and examines the various psychological, social, *and* environmental factors that impact adjustment over time must be performed (Richards et al., 1999). Examining these factors advances our understanding of the complex process of adjustment and the influence of environmental factors on QoL.

This study examined psychological adjustment five years post discharge from a SCI hospital admission. The study tested the direct causal effects of functional independence, pain, and family satisfaction on accessibility to environment and on the QoL measures of life satisfaction and self-perceived health status. Furthermore, to better understand the role environmental factors have on life satisfaction and self-perceived health status, the study also examined indirect causal effects. This was accomplished by examining environmental accessibility (composed of mobility and social integration) as a potential intervening (mediating) concept between functional independence, pain, and family satisfaction on the life satisfaction and self-perceived health status outcomes.

This chapter will summarize the main findings of the study, discuss findings in the context of the existing body of knowledge and address theoretical and clinical implications, discuss the study’s limitations, and outline future directions in research.

## Summary of Main Findings

### *Model 1: Life Satisfaction*

In the prediction of life satisfaction, higher functional independence scores were predictive of greater mobility and social integration. This hypothesized finding suggests that individuals who have fewer functional impairments (e.g., in self-care, locomotion, sphincter control) may be able to engage in more social interactions and be more mobile in their surroundings. In addition, this model also indicated that individuals who reported no pain had higher mobility scores, suggesting that these individuals are more mobile in their surroundings than those who report pain. Furthermore, greater mobility was predictive of greater life satisfaction. Greater social integration was also predictive of greater life satisfaction. Additionally, mobility and social integration were significantly and positively correlated. It is likely that individuals who are more mobile in their surroundings likely have more social interactions and these factors, in turn, facilitate greater life satisfaction.

However, the present study found that pain and family satisfaction were not directly predictive of social integration. Furthermore, greater family satisfaction was not predictive of mobility, indicating that family adjustment did not facilitate mobility in the environment in the years following SCI.

### *Model 2: Self-Perceived Health Status*

In the self-perceived health status model, greater functional independence was again predictive of greater mobility and social integration. Similarly, the absence of pain was again associated with increased mobility and social integration. More importantly,

this model found mobility was predictive of greater self-perceived health status. Greater mobility, then, has a significant influence on life satisfaction and self-reported health status five years following discharge for initial treatment for SCI.

The self-perceived health status model found that pain and family satisfaction were not predictive of social integration. Family satisfaction had no significant influence on mobility.

*Model 1 and Model 2: Indirect Effects (Mediation)*

In Model 1, an indirect effect between functional independence and life satisfaction through both mobility and social integration was found. This indicates that both mobility and social integration mediate the relationship between functional independence and life satisfaction. To further clarify, this suggests that the relationship between functional independence and life satisfaction is, at least in part, *explained* by mobility and social integration. Thus, individuals with higher functional independence experience greater life satisfaction *because* they have more social interactions and are more mobile in their surroundings. Taken another way, a person who is more functionally independent experiences greater mobility in their surroundings and has greater social contacts; which in turn contributes to greater life satisfaction.

A significant indirect effect between functional independence and self-perceived health status through mobility was found. This indicates that mobility mediates the relationship between functional independence and self-perceived health status. To further clarify, this suggests that the relationship between functional independence and self-perceived health status is, at least in part, *explained* by mobility. Thus, individuals



with higher functional independence report better self-perceived health status *because* they are more mobile in their surroundings. This, in turn, contributes to a more positive evaluation of personal health a year later. In contrast to the prediction of life satisfaction, there was no indirect effect of functional independence through social integration on health status.

#### Findings in Context of Current Literature

##### *Dynamic and Developmental Continuum*

The Dynamic and Developmental Continuum Model was used as a foundation for the organizational structure of this study. Although the Dynamic and Developmental Continuum Model recognizes the fluidity involved in adjustment over time, the environmental component in the model is construed as a fairly objective factor in the adjustment process (Elliott & Rivera, 2003). In addition, the developers of the CHART assert that the measure provides an objective assessment of access to the environment (Whiteneck et al., 1988). However, in this study environmental accessibility was examined as an appraisal process (due its susceptibility to individual difference factors and the self-report nature of the CHART) that could mediate the prospective effects of functional independence, pain, and family satisfaction on QoL outcomes. The subsequent results support this conceptualization.

##### *Environmental Accessibility and Subsequent QoL*

Mediation found in both models underscores the central role environmental accessibility can have in QoL outcomes. Prior research has demonstrated that higher mobility and social integration are predictive of greater life satisfaction following SCI

(Putzke et al., 2002; Richards et al., 1999, Whiteneck et al., 2004). In contrast, the evidence concerning the influence of functional independence on life satisfaction has been mixed (Fuhrer, Rintala, Hart, Clearman, & Young, 1992; Hicken, Putzke, Novack, Sherer, & Richards, 2002). The results of the present study indicate that the relationship between functional independence and life satisfaction may be *explained* by environmental accessibility. This distinction is important in that it provides rich knowledge to the process of adjustment post SCI and how environmental accessibility has been conceptualized in the literature. It supports the notion that environmental accessibility is perhaps best understood as an appraisal process that is subjective in nature. Although recent research has found that participation (i.e., environmental accessibility) -- composed of mobility range and social behavior -- accounts for higher life satisfaction among persons with SCI, this work did not examine the process across time by which this may occur (van Leeuwen et al., 2012). As such, the predictive quality of the current study contributes to a better understanding of how environmental accessibility may function *across* time, rather than examining relationships at later time points without accounting for the time in-between.

The model predicting self-perceived health status demonstrated that greater mobility at the fourth year following medical discharge was predictive of better self-perceived health status a year later. This finding advances our understanding of the role mobility may have in predicting to an important QoL indicator that is rarely examined in the SCI literature (Krahn et al., 2009). In addition, mobility in environmental accessibility mediated the prospective relation of functional independence to self-

perceived health status. This information provides some insight into the way in which functional independence may prospectively influence self-perceived health status. This pattern was not found between functional independence and social integration, the second component of accessibility to environment.

### *Family Satisfaction*

Contrary to initial predictions, family satisfaction was not prospectively predictive of either component of environmental accessibility. This is contrary to previous cross-sectional work that has shown that family satisfaction can be related to higher social integration, a component of environmental accessibility in this study (LoBello et al., 2003). In addition, research has also shown that family satisfaction is linked to life satisfaction following traumatic-onset disability (Johnson et al., 2010). More specifically, past research shows that closeness to family and higher level of family activities leads to higher life satisfaction among SCI populations (Warren et al., 1996).

### *Pain*

Pain has been shown to be a significant influence in optimal adjustment post-SCI (Yeziarski & Burchiel, 2002). The absence of pain predicted greater mobility, consistent with prior work that implies that individuals with no (or less) pain achieve greater mobility in their surroundings than those who report pain post-SCI (Putzke et al., 2000). The present study made no such distinction in varying levels of pain. The mere presence of pain was sufficient to predict self-reported mobility two years later, which in turn prospectively predicted life satisfaction and self-perceived health status. The prospective

relationship of pain to life satisfaction and self-perceived health status was best understood in pain's effect on mobility.

### Limitations

Though results of the study advance our understanding of factors that can influence access to the environment and the resulting association on important QoL indicators, it is important to also acknowledge limitations of the study. In addition, potential approaches to address these limitations in future research are also important. One limitation of the study is the lack of a formalized pain construct. Due to the difficulty in qualifying the types and qualities of pain, a formal system for conceptualizing pain is not currently employed in the SCI literature (Putzke et al., 2002; Richards, 1992; Yeziarski & Burchiel, 2002). As such, the implications of the present study may be limited to a basic appreciation of persons who report pain following SCI and those who do not. Given the uniqueness and complexity of pain following SCI it is unlikely a robust, formalized pain measure will ever be developed for use in this area; however, incorporating basic pain or no pain experiences can still provide important information about adjustment post-SCI.

Although the CHART scales of mobility and social integration do a nice job of capturing both physical and social/attitudinal factors promoted by the ICF (World Health Organization, 2001, p.10), the field still lacks a formal, operational definition of environmental accessibility (Ullrich et al., 2012). Given that environmental accessibility is quickly becoming vital in the understanding of adjustment post-SCI, a formalized measure would enable studies to better examine this construct and generalizability would

be increased. Efforts to develop better measures of environmental access are recommended for use in outcome research, although the CHART remains highly recommended for this purpose among persons with SCI (Ullrich et al., 2012). Furthermore, with passage of time social media is undoubtedly changing the nature of social interactions; as such, measures that also assess for this type of social interaction are needed.

Third, the present study examines QoL (life satisfaction and self-perceived health status) as synonymous with subjective well-being. Objective measures of QoL, particularly in terms of the health status component, are not examined or addressed. Attempting to incorporate health status assessed by objective medical measures may provide additional information about secondary health complications often associated with SCI over time (e.g., pressure sores, urinary tract infections).

Lastly, the generalizability of the study is limited by six key factors, 1) the *N* the study is small compared to the incidence of SCI, 2) the majority of the sample is male, 3) the sample is composed of solely Caucasian and African-American individuals, 4) the data used for analysis was collected from participants who were discharged from acute-care hospitals between the years 1989 to 1992, 5) participants in this study resided and were injured in the state of Alabama, and 6) information regarding lesion and level of injury, as well as, formal American Spinal Injury Association (ASIA) classification scores are unknown. The degree to which these factors influence the present results are unknown.

## Future Directions

The current study identified various factors that influence environmental accessibility and in turn QoL outcomes. Given that these factors (i.e. functional independence, pain, and family satisfaction) are easily identified soon after injury, special attention should be paid on the psycho-social assessments administered to individuals post-SCI. Furthermore, due to the study's results that indicate environmental accessibility functions as a mediator, *community-based* programs that are proactive in nature should be implemented in order to provide individuals with a SCI a more substantive setting that allows better environmental accessibility. In a case report that examined a community-based therapeutic recreation intervention aimed at health promotion, it was shown that the participant improved functional skills and more easily participated within his community (Sable, Craig, & Lee, 2000). There is a need to implement and evaluate these kinds of programs at an individual level or population based care level.

There is considerable research examining social support, views on marriage and family, and marital status among persons with SCI (Elliott et al., 2002; Putzke et al., 2001; Reidy et al., 1991; Schulz & Decker, 1985; see also Müller, Peter, Cieza, & Geyh, 2012). However, a review of the literature emphasized the lack of studies focusing on family *satisfaction* in particular and its impact of QoL following SCI. Further investigation is warranted in order to better understanding how family satisfaction functions within the adjustment process following SCI. Given the surprise finding in this study that family satisfaction was not predictive of environmental accessibility, studies

that examine family satisfaction as influencing environmental accessibility should also prove helpful.

Although there is a substantive amount of research on adjustment following SCI, the need for studies that examine causality with higher level statistical models persists. Advanced statistical modeling can provide the ability to examine complex relationships among various variables that affect adjustment. These offer “powerful procedures” for examining complex theoretical models that provide testable hypotheses about QoL in the rehabilitation literature, generally (Weston et al., 2008, p. 340).

With advances in medical care for persons with SCI, mortality rates have decreased and hospital/rehabilitation stays have been shortened (Farhad et al., 2010; National Spinal Cord Injury Statistical Center, 2011). As such, individuals often leave inpatient settings with basic skills that are expected to be maintained and enhanced in the community (Sable et al., 2000). In addition, research has also shown that the adjustment process begins early and appraisals made at the onset of SCI affect coping styles (Kennedy et al., 2010) and self-reported adjustment at discharge (Elliott, 1999). There is also evidence that an optimal level of adjustment following SCI may occur within three to six months following discharge from inpatient rehabilitation (de Roon-Cassini, Rusch, Mancini, & Bonanno, 2010). Consequently, systematic implementation and evaluation of psychosocial interventions during the inpatient program and following return to the community may be the best way to prepare individuals with a SCI to successfully reintegrate into their communities.

Studies that examine the environmental accessibility construct in general are also needed. Better understanding this construct can help provide information in how environmental accessibility is best conceptualized. A more formalized conceptualization of this construct can streamline research in the field, thus contributing to more generalizable information. As we wait for the “next generation of instruments” researchers should be mindful of the measures being used and what information they are truly providing (Ullrich et al., 2012, p.168).

The present study separated life satisfaction and self-perceived health status as two separate domains of QoL. This was done in order to have a more comprehensive understanding of subjective well-being. Though past research has examined perceived health as influencing subjective well-being, rather than an outcome in itself (Fuhrer, 1994), the statistically significant correlation between life satisfaction and self-perceived health status in this study suggests that they are similar concepts best understood as separate domains. Further research that examines these concepts as separate outcomes is needed in order to have a more wide-ranging understanding of QoL.

Finally, research focused on personality characteristics and traits, as they influence environmental accessibility may be useful. A recent study found that neuroticism, which reflects emotional stability, was related to participation (i.e. environmental accessibility), explaining 49% of its variance (van Leeuwen et al., 2012). Though there is substantial past research on personality variables in the SCI literature (Bockian et al., 2003; Costa & McCrae, 1985; Rohe & Krause, 1999; Temple & Elliott, 2000; Woodbury, 1978), re-visiting this line of research with environmental accessibility



in mind may help further identify what influences and predicts this construct, which in turn will advance our understanding of factors that predict QoL following SCI.

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