Abstract

Recreational Therapy Services and the Functional Independence of Inpatient Pediatric Population

By

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Recreational Therapy (RT) is a relatively new and growing profession with an expanding body of literature. The benefits of RT services have been demonstrated through research studies for several decades. However; there is a lack of significant studies examining the efficacy of RT services in clinical settings; specifically in pediatric rehabilitation settings. In an effort to promote efficacy based research studies in the RT field, the American Therapeutic Recreation Association (ATRA) published a research agenda in 2003. This agenda highlighted the need for specific research areas in the field, including: (a) effects of leisure functioning on various aspects of health, (b) effect of leisure education on quality of life, (c) the effect of RT on overall independent functioning, and (d) effect of frequency and duration of contact with clients on RT outcomes. The current study aims to explore each of those impacts on the pediatric population. The purpose of the study is to determine if amount of recreational therapy services received during treatment significantly predicts changes in functional independence of pediatric patients in an in-patient rehabilitation setting.

The study will be an examination of existing evaluation data from patients of an in-patient rehabilitation hospital who received RT services over a eight year period (2000-2008). The data analyzed in this study will utilize formerly collected electronic medical records data from an existing research study titled *Effects of Recreational Therapy on Functional Independence Measure (FIM Scores and Patient Satisfaction* (RW 06-01-05). The data includes demographic information (e.g., age, gender), amount of total rehabilitative services received (recorded in 15 minute units), information related to diagnosis and functional independence measure impairment group codes and pre- and post-treatment total pediatric Functional Independence Measure (Wee-FIM) scores. Independent variables for this study include: (a) number of treatment units of PT, (b) number of treatment units of OT, (c) number of treatment units of SLP, (d) number of treatment units of RT, (e) number of treatment units of Psychology, (f) gender, (g) age at admission, (h) frequency of utilization of each treatment service (i) diagnosis, and (j) pre-test Wee-FIM Scores. The dependent variables for this study include (a) change in total Wee-FIM, (b) change in cognition Wee-FIM, (c) change in mobility Wee-FIM, and (d) change in psychosocial Wee-FIM (from admission to discharge). In cooperation with a data manager from PCMH, the anonymity of participants of the study will be protected by assigning a identification number unique to this study to each participant. No patient names or other identifiers will be included in the dataset.

Research questions include:

1. Does the amount of recreational therapy services received during treatment significantly predict changes in total Wee-FIM scores from admission to discharge?
2. Does the amount of recreational therapy services received during treatment significantly predict changes in mobility Wee-FIM scores from admission to discharge?
3. Does the amount of recreational therapy services received during treatment significantly predict changes in cognition Wee-FIM scores from admission to discharge?
4. Does the amount of recreational therapy services receive during treatment significantly predict changes in self-care Wee-FIM scores from admission to discharge?
5. Does the amount of recreational therapy services received during treatment significantly predict changes in psychological Wee-FIM scores from admission to discharge?

Recreational Therapy Services and the Functional Independence of Inpatient Pediatric Population

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CHAPTER I

INTRODUCTION

There is a critical need to conduct recreational therapy (RT) efficacy research (Compton, 1984; Coyle, Kinney, Riley, & Shank, 1991; Richards, 1985; Shank, Coyle, Boyd, & Kinney, 1996). The American Therapeutic Recreation Association's research agenda of 2003 identified specific efficacy research priorities for RT researchers and practitioners (Wilhite et al., 2003) including: (a) effects of recreational therapy on independent functioning and successful community integration, (b) effects of leisure functioning on various aspects of health, (c) effect of leisure education on quality of life, and (d) effect of frequency and duration of contact with clients on RT outcomes (Wilhite, et al.). Similarly, a previous efficacy research agenda in 1998 identified nearly identical priorities, suggesting consistent research needs (Carruthers, 1998).

RT has little evidenced-based research supporting the outcomes of services (Williams et al., 2007), thus limiting the ability of RT practitioners to adhere to the tenets of evidenced-based practice. Research is needed to justify the use and effectiveness of RT services and to guide clinical decisions so that practitioners can: (a) provide high-quality, efficient, and effective services; (b) comply with accrediting body standards; and (c) contribute to cost containment and continuously improving quality of care provided (Driver, 2002). Most importantly, RT services have the potential to enhance the quality of life of their clients. Among the many client populations receiving RT services are children who have a variety of illnesses and disabilities.

Pediatric Rehabilitation

As a consequence of advanced medical knowledge leading to higher survival rates of children with serious physical illnesses or disabilities, attention has shifted from dealing with mortality toward coping with morbidity with an emphasis on the medical, psychological, and social consequences of chronic conditions (Helders et al., 2003). Interdisciplinary modalities in pediatric rehabilitation commonly use play and recreational activities when working with patients to improve strength, endurance, development and overall functioning. RT specialists use a wide array of interventions to address individualized goals specific to each pediatric patient in inpatient rehabilitation. Such interventions include: (a) social skill training (Thomas et al., 1988), (b) community re-entry training, (c) community reintegration activities/outings, (d) aquatics, (e) animal assisted therapy, (f) arts and crafts, (g) leisure education, and (h) preparation to enter or return to school (Kinney, Kinney, & Witman, 2004). Additionally, play therapy is a common treatment among RT specialists working with children (Dattilo, 2000; Kinney & Whitman, 1997; Kinney et al., 2004).

Play is a universal behavior in children (Pellegrini & Bjorkland, 2004) that supports cognitive development, socialization, physical abilities and many aspects of growth and development (Brown, 2007). Additionally, play is essential to the development of the ability to cope with stress and is a primary means of managing emotionally challenging experiences (Axline, 1969; Erikson, 1963; Freud, 1952). The use of play as a therapeutic modality allows children to express thoughts and feelings, assimilate reality, resolve internal conflicts, achieve mastery, and cope effectively (DelPo

& Frick, 1988). McMahon (1992) noted that play becomes therapeutic when it is used to bring about a positive change in children who have limitations and disabilities.

The goals of therapeutic play and other RT interventions coincide with the primary goals of inpatient rehabilitation: the improvement of basic physical, emotional and social function that facilitates a return to home and engagement in the community (Dumas, Bedell, & Hull, 2001). Among other interventions, RT specialists work with pediatric patients to facilitate age-appropriate play with others, participation in school, and understanding of medical procedures.

Pediatric Efficacy-Based Research

There is little research generally supporting the effectiveness of RT services in rehabilitation for adults (Carruthers, 1998; Wilhite et al., 2003), and there is even less evidence demonstrating effects of RT on children in rehabilitation. Specific research that could be used by RT specialists who work with children is entirely absent from the literature. For instance, there is no reported evidence of dose response for pediatric patients receiving RT services. Additionally, there is a lack of research into the effects of RT services and pediatrics with brain dysfunction diagnoses (e.g., traumatic brain injury).

All health care professions have embraced evidenced-based practice, which demands the utilization of the best available evidence in clinical decisions in addition to the use of clinical skills and expertise (Huppert, Fabbro, & Barlow, 2006) and a consideration for patient values (Institute of Medicine, 2001). Practitioners often perceive that their services are effective and have documented effects through non-rigorous evaluations and progress notes yet lack research evidence to support choices of

interventions (Wilhite et al., 2003). The few relatively large-scale studies into the effects of RT (e.g. Williams et al., 2007) generally support therapeutic benefits of RT. Although the scope of evidence for the effects of RT services is narrow, several studies have demonstrated the effectiveness of RT and other services on the functional independence of individuals in an in-patient rehabilitation setting.

Recently, Williams et al. (2007) used extant data from medical records to study the influence of RT on changes in functional independence of participants receiving rehabilitation following stroke. Results indicated that number of treatment units of RT was a significant predictor of change in functional independence. Limited in its scope by the nature of regression analysis, the authors concluded that approximately five treatment units of RT predicted a one-point change in functional independent scores.

Dumas, Haley, Bedell, and Hull (2001) examined changes in social function capabilities between and within groups of children with six subtypes of traumatic brain injury (TBI; N=139 children) during inpatient rehabilitation. Scales used to measure the changes in social functioning included the Pediatric Evaluation of Disability Inventory (PEDI) and the Social Function Skills Scale. The speech language pathologist on the team administered the Social Function domain of the PEDI. Participants were residents at a specialized children's rehabilitation hospital who received interdisciplinary treatment including RT services. The researchers focused on social function skills including communication, peer social interaction, play and home and community activities on each individual's treatment plan. Results indicated that 45% of all children made clinically

meaningful changes. However, children with TBI demonstrated the greatest amount of change during rehabilitation, but only significantly greater than children with seizures.

While not a study specifically into the effects of RT, Philip, Ayyanger, Banderbilt, and Gaeblet-Spira (1994) used the Wee-FIM instrument to examine effects of rehabilitation on functional improvement of 30 children treated for brain tumors. Results indicated statistically significant ($p < .01$) improvements from admission to discharge in total Wee-FIM changes, total Wee-FIM changes from discharge to follow up and in subgroups self-care, mobility and locomotion. Borderline (yet non-significant) improvements were noted at discharge for communication and social/cognition; however, social/cognition gains became significant at follow up periods, which ranged from three to 84 months.

While research evidence remains scarce, results of recent studies suggest positive outcomes of RT and similar rehabilitation treatments. Additional efficacy studies are needed to determine general effects of pediatric rehabilitation and the effects of specific interventions on targeted outcomes.

Statement of Need

There is a lack of efficacy-based research addressing the effectiveness of pediatric recreational therapy programs and modalities. Keith (1991) noted the widespread use of comprehensive treatment modalities in general rehabilitation as an act of faith rather than empirical evidence. Additionally, there is an ever-increasing demand from health care administrators, third party payers and the public to justify the cost of health care and the choice of treatments. RT researchers and scholars (e.g. Riley & Connolly, 2007; Stumbo

& Hess, 2001; Lee & McCormick, 2002) have long stressed the importance of documenting client outcomes. “There is a continuing need to assess and predict outcomes more accurately. Payer, provider and patient interests, injury recovery and new reimbursement mechanisms require such detailed outcome studies to ensure that service delivery is cost-effective and efficient” (Heinemann et al., 1995, p. 316). Additionally, the relationship between the number of treatment units of rehabilitation services provided and functional outcomes have not been well studied (Chen, Heinemann, Granger, & Linn, 2002; Dudgeon, 1996). Furthermore, the use of evidenced-based practice can “bridge the practice-research gap and provide a basis for researchers and clinicians to work together to translate research into meaningful practice” (Driver, 2002, p. 596). Helders (2003) noted that members of the pediatric rehabilitation team must demonstrate, like all other health care professionals, that they make a difference in the lives of children with disabilities and their families. The most frequent diagnoses in the pediatric in-patient population are brain dysfunctions (IDSMR, 2009). The need for efficacy research examining the effects of RT on pediatric patients with brain dysfunction diagnoses in rehabilitation is evident. Thus, the purpose of the study is to determine if amount of recreational therapy (RT) and other services received during treatment significantly predict changes in functional independence of pediatric patients with brain dysfunctions in an in-patient rehabilitation setting.

Research Questions

1. Does the amount of recreational therapy services received during treatment significantly predict changes in total Wee-FIM scores from admission to discharge?
2. Does the amount of recreational therapy services received during treatment significantly predict changes in mobility Wee-FIM scores from admission to discharge?
3. Does the amount of recreational therapy services received during treatment significantly predict changes in cognition Wee-FIM scores from admission to discharge?
4. Does the amount of recreational therapy services receive during treatment significantly predict changes in self-care Wee-FIM scores from admission to discharge?
5. Does the amount of recreational therapy services received during treatment significantly predict changes in psychological Wee-FIM scores from admission to discharge?

Hypotheses

To answer these five research questions multiple hypotheses were developed including:

1. It is hypothesized that amount of recreational therapy services will significantly predict changes in total Wee-FIM scores.

2. It is hypothesized that amount of recreational therapy services will significantly predict changes in mobility Wee-FIM scores.
3. It is hypothesized that amount of recreational therapy services will significantly predict changes in cognition Wee-FIM scores.
4. It is hypothesized that amount of recreational therapy services will significantly predict changes in self-care Wee-FIM scores.
5. It is hypothesized that amount of recreational therapy services will significantly predict changes in gains in psychosocial Wee-FIM scores.

Limitations

The study utilized extant data obtained from medical records at a regional rehabilitation unit of a large hospital. Due to the nature of the data, analysis was limited to descriptive statistics, correlation, and regression. By using the Wee-FIM data as the primary means to measure gains in functioning, goal outcomes not measured by the Wee-FIM were not captured. Additionally, the sample for this study has a variety of brain dysfunction diagnoses, limiting the homogeneity of the sample and thus the generalizability of findings. Moreover, the study was not an analysis of a specific RT intervention; rather, it was an examination of the general effects of pediatric rehabilitation RT services. This leads to the possibility that some interventions used with patients having different and more profound effect than others.

The data gathered may well reflect site specific outcomes and may not be generalized to other RT programs or settings due to the lack of universal treatment protocols in RT. Having one therapist providing the majority of RT services to pediatric

patients also presents a limitation to this study. That one primary therapist provided most of the RT services may suggest that the variable being analyzed is not RT in general but a particular therapist's ability to change functional independence levels. Finally, because of the nature of correlation and regression, no causal relationships between variables can be implied (Shank, Coyle, Kinney, & Lay, 1995).

Definitions

Evidenced based practice - Evidenced-based practice refers to the integration of clinical expertise and patient values with the best available empirical research. (Institute of Medicine, 2001).

Family Centered Care – the expansion of total patient care to include the patient's family in the planning and implementation of the patient's plan of care (Medina, 2005).

Functional Independence Measure – The Functional Independence Measure is an 18 item ordinal scale measurement instrument focused on functional abilities of individual patients, primarily in the rehabilitation setting, designed to determine the highest burden of care patients require to achieve the higher functional status *(*Deutsch, B raun & Granger, 1996).

Therapeutic Recreation – Therapeutic Recreation is often referred to as Recreational Therapy.

"Therapeutic Recreation is the provision of Treatment Services and the provision of Recreation Services to persons with illness or disabling conditions. The primary purposes of Treatment Services which are often referred to as Recreational Therapy, are to restore, remediate or rehabilitate in order to

improve functioning and independence as well as reduce or eliminate the effects of illness or disability. The primary purposes of Recreational Services are to provide recreational resources and opportunities in order to improve health and well-being. Therapeutic Recreation is provided by professionals who are trained and certified, registered and/or licensed to provide Therapeutic Recreation" (ATRA, 1987).

Therapeutic Recreation Specialist – Therapeutic Recreation Specialists, also referred to as Recreational Therapists, work with individuals who have mental, physical or emotional disabilities. These individuals utilize activity modalities to treat or maintain the physical, mental and emotional well-being of consumers they serve in order to help remediate the effects of illness or disability and achieve an optimal level of personal independence (ATRA, 1987).

Traumatic Brain Injury – TBI is an occurrence of injury to the head (arising from blunt or penetrating trauma or from acceleration-deceleration forces) that is associated with any of the following symptoms or signs attributable to the injury: decreased level of consciousness, amnesia, other neurologic or neuropsychologic abnormalities, skull fracture, diagnosed intracranial lesions, or death (Thurman, Sniezek, Johnson, Greenspan, & Smith, 1994).

Wee-Functional Independence Measure – The pediatric functional assessment instrument included in the Uniform Data Set for Medical Rehabilitation is composed of 18 items rated on a seven-level scale that represents gradations in function from

complete independence (7) to total assistance (1) (Uniform Data System for Medical Rehabilitation, 2005).

CHAPTER II

LITERATURE REVIEW

Recreational therapy (RT) is a profession committed to helping people with illnesses and disabilities achieve functional independence, well-being and quality of life (Nichols & Brasile, 1998). RT specialists are employed in a variety of health care and community settings that serve people with illnesses and disabilities. The American Therapeutic Recreation Association (ATRA, 1987) defines therapeutic recreation as:

> The provision of Treatment Services and the provision of Recreation Services to persons with illness or disabling conditions. The primary purposes of Treatment Services which are often referred to as Recreational Therapy, are to restore, remediate or rehabilitate in order to improve functioning and independence as well as reduce or eliminate the effects of illness or disability. The primary purposes of Recreational Services are to provide recreational resources and opportunities in order to improve health and well-being. Therapeutic Recreation is provided by professionals who are trained and certified, registered and/or licensed to provide Therapeutic Recreation.

A primary goal of inpatient rehabilitation (including RT services) for children and adolescents is to improve social functioning that facilitates successful return to their homes and to community participation (Dumas, Haley, Bedell, & Hull, 2001). Additionally, pediatric rehabilitation addresses the health, growth and development of infants, children and adolescents and provides opportunities to achieve full potential (Behrman, 2000).

When working with children in an effort to improve their overall functioning and independence, one must take into consideration the developmental stages in which children progress. A child at age six months will be expected to have dependence in a larger array of tasks than a child age six years. Interdisciplinary modalities in pediatric

rehabilitation commonly use play and recreational activities when working with patients to improve strength, endurance, development, and overall functioning. RT specialists use a wide array of interventions to address individualized goals determined for each pediatric patient in inpatient rehabilitation.

Health care providers face mounting pressures to reduce costs and to demonstrate effects of their services. These pressures have been felt particularly acutely by RT specialists who have access to a relatively small research base and who often struggle to establish credibility in an increasingly competitive health care environment (Kinney, Kinney, & Witman, 2004).

Thus, there is a critical need to develop and conduct RT efficacy research (Compton, 1984; Coyle et al., 1991; Richards, 1985; Shank, Coyle, Boyd & Kinney, 1996). The need for efficacy research in RT is long-standing, and the requests for efficacy-based research typically include a focus on functional independence. In 1991, Shank and Kinney suggested that RT researchers focus on outcomes that could be appreciated by health care professionals both in and outside of RT. The purposeful use and appropriate selection of modalities and facilitation techniques is essential to successful outcomes for RT interventions (Kinney et al., 2004).

Recreational Therapy

What is Recreational Therapy?

RT includes the provision of treatment and recreation services to people with illnesses and disabilities. The primary purposes of RT services are to restore, remediate or rehabilitate in order to improve functioning and independence as well as reduce or

eliminate the effects of illness or disability (ATRA, 1987). Additionally, RT specialists provide recreational resources and opportunities to improve health and well-being. Professionals who provide RT services are required to be trained to provide such services and must be certified, registered and or licensed (ATRA, 1987).

Certification and Licensure in Recreational Therapy

Certified Therapeutic Recreation Specialists (CTRS) are individuals who have successfully met all requirements of the National Council for Therapeutic Recreation Certification (NCTRC) to become eligible to practice RT services. The Council offers the CTRS credential to candidates who have a bachelor's or graduate degree from an accredited educational institution, pass a written certification examination, and complete a supervised internship of at least 480 hours (NCTRC, n.d.). An RT specialist must possess certification (and licensure in some states) in order to legally practice. Although certification is usually voluntary, most employers prefer to hire candidates who hold the CTRS credential. In 2006, about three out of four recreational therapists worked in a clinical setting, which often requires certification by the NCTRC (Bureau of Labor Statistics, 2009). Several states (e.g., North Carolina, Utah, New Hampshire) have the additional requirement of licensure in order to practice RT (Bureau of Labor Statistics, 2009).

Employment Settings for Recreational Therapy Specialists

RT specialists are employed in a wide array of settings and facilities throughout the United States and internationally. In the most comprehensive study examining the employment characteristics of currently practicing RT specialists, Riley and Connolly

(2007) noted that hospitals employ the largest number of CTRS with 38.6% of the workforce employed in this setting. Other settings in which RT specialists are employed include: (a) rehabilitation hospitals, (b) rehabilitation units in general hospitals, (c) long term care facilities, (d) sub-acute care, (e) substance abuse rehabilitation facilities, (f) home health care services, (g) residential facilities for individuals with disabilities, (h) skilled nursing facilities, (i) residential and transitional settings, (j) community settings, (k) out-patient facilities, (l) day treatment centers, (m) schools, and (n) mental health facilities and correctional centers (Riley & Connolly). General populations served by RT specialists include mental health, physical medicine, developmental disabilities, geriatrics, adults and adolescent/pediatric populations (Nichols & Brasile, 1998; Riley & Connolly, 2007). Riley and Connolly reported that nearly 20% of RT specialists work with pediatric clients.

Recreational Therapy Interventions

RT specialists utilize various recreational activities as interventions in promoting optimal functional independence in physical, cognitive, emotional, and social functioning of individuals with disabilities. RT specialists enhance an individual's current skills and teach new skills for daily living and community functioning (Nichols & Brasile, 1998). The wide array of interventions RT specialists use when working with patients can address: depression, change in physical functioning, change in mobility, loss of independence, limited access to social opportunities and community resources, limited awareness of leisure alternatives and adaptive strategies as well as the relationship of leisure to quality of life (Nichols & Brasile).

Much of the responsibility for community adjustment and integration while in the rehabilitation setting falls upon the RT specialists, who are instrumental in aiding the individual with a disability in a smooth and successful transition from the clinical treatment setting to community-based transition (Nichols & Brasile). Thus, there is a significant need for RT to demonstrate efficacy of interventions designed to address functional deficits affecting transition to home and community (Compton, 1984; Coyle et al., 1991; Richards, 1985; Shank et al., 1996).

Efficacy-Based Research in Recreational Therapy

In the early 1990s evidenced-based medicine was introduced as a framework for research and practice and as a methodological approach to enable physicians to more effectively access clinically relevant research (Kronenfield et al., 2007). Evidenced-based medicine has evolved into evidenced-based practice in recognition of the movement toward inclusion of related domains such as nursing, physical therapy and other allied health professions (Kronenfield et al., 2007). Terms such as *best evidence*, *best practice*, and *benchmarking* are commonly used interchangeably with evidenced-based practice (Driver, 2002).

Evidenced-based practice should not be defined narrowly by the strength of the current empirical evidence used to guide clinical decisions. It is commonly accepted that one cannot directly apply evidence derived from randomized controlled trials and other studies on the effects of treatment to the management of individual cases (Barry, 2006; Fisher & Wood, 2007; Woolf & George, 2000). Evidenced-based practice should be defined broadly by what is the best information to use to make decisions for a given

patient in a particular setting (Higgs, Burn, & Jones, 2001). Although empirically supported treatments are one component of evidenced-based practice, it is important to note that evidenced-based practice also requires the utilization of clinical skills and expertise and the patient's choice in order to provide successful treatments appropriately (Huppert, Fabbro, & Barlow, 2006; Institute of Medicine, 2001; Sackett, 1996; Triano, 2008). Without current best external evidence, practice risks becoming rapidly out of date, to the detriment of clients served (Sackett, 1996).

Kronenfield et al. (2007) conducted a meta-analysis of literature related to the current state of evidenced-based practice in the nursing and other allied health professions including: (a) athletic training, (b) audiology, (c) heath education and promotion, (d) nursing, (e) occupational therapy, (f) physical therapy, (g) physician assisting, (h) respiratory care, and (i) speech-language pathology. The authors reported that evidenced-based practice was in various stages of growth in those fields. The integration of research evidence in practice has advanced via developments in pre-service training, growth of the literature and resources and increased research funding resources. Common obstacles found to applying evidenced-based practice is ability to complete other job tasks, need for additional training, and commonly held attitudes and behaviors toward research among practitioners (Kronenfield et al., 2007).

In 1991, Shank and Kinney suggested that RT researchers focus on outcomes that could be appreciated by health care professionals both in and outside of RT. In 1993 Shank, Kinney and Coyle suggested a research agenda for the profession that included a focus on functional abilities. In a subsequent article, Shank et al, (1996) further

recommended that RT researchers place their research within the larger context of rehabilitation and focus at least part of their efforts of RT on functional limitations.

Carruthers (1998) conducted a national study examining the research focus preferences of RT practitioners and educators and reported that these professionals recognized the need for research into effects of RT services on functional independence. Most recently, the American Therapeutic Recreation Association's efficacy research agenda of 2003 identified efficacy research topics that were the highest priority in RT including those of researchers and practitioners including: (a) effects of RT on independent functioning and successful community integration, (b) effects of leisure functioning on various aspects of health, (c) effect of leisure education on quality of life, and (d) effect of frequency and duration of contact with clients on RT outcomes (Wilhite et al., 2003). The purposeful use and appropriate selection of modalities and facilitation techniques is essential to successful outcomes for RT interventions (Kinney et al,, 2004). Yet without literature documenting specific outcomes and appropriate intensity and duration of interventions, clinicians lack the ability to make informed decisions.

Repeated calls for efficacy research illustrate the inadequacy of research literature documenting the relationship between medical rehabilitation therapy and functional outcomes (Heinemann, Hamilton, Linacre, Wright & Granger, 1995). Few experimental studies have been published on the relationship between rehabilitation treatment intensity and outcomes of rehabilitation. Clinicians and financial parties assume there is a parallel relationship between treatment and functional outcomes, however, there is a lack of objective evidence to support this assumption (Heinemann et al., 1995). Largely

unsupported by empirical evidence, there is widespread use of comprehensive treatment modalities that are based on beliefs and faith that the treatment will have the desired effect (Keith, 1991).

Cost-effective rehabilitation services require an understanding of what resources and strategies result in efficient achievement of therapeutic outcomes. Rehabilitation theory assumes that patients reacquire old skills or compensate for impairments in a logical and coherent manner (Heinemann et al., 1995). To re-learn skills and to learn to compensate for reduced functioning; patients in rehabilitation require guided practice of skills over time (Heinemann et al.). Unfortunately, the extent to which this practice generalizes to post-rehabilitation settings is unclear. There is a continuing need to assess and predict outcomes of therapeutic services more accurately. Payer, provider, public, and patient interests require such detailed outcome studies to ensure that service delivery is cost-effective and efficient (Heinemann et al.).

Pediatrics

Demographics

The dramatic advances in pediatric medicine in the past three decades have led to increased survival rates of children with serious physical illnesses or disabilities (Helders et al., 2003). Historically, pediatric rehabilitation has primarily treated patients with neurological disabilities (e.g., cerebral palsy, spina bifida and myopathies or congenital limb deficiencies). With advances in medicine, many children survive conditions such as leukemia, trauma, childhood rheumatic arthropathies, severe pulmonary conditions, and chronic pain and fatigue conditions (Helders et al.). However, these advances may

require extended stays in hospitals that can have a significant impact on the quality of life of pediatric patients and their families. Children are at a greater risk than adults to develop severe and long-term emotional, behavioral and social problems due to the fact that hospitalization interrupts typical development (Thompson & Stanford, 1981).

Prevalence

The number of children living with chronic illness or disabling conditions nearly tripled from 1960 to 1988, accounting for an estimated 15% of all citizens under the age of 21 years in the United States (Hostler, 1999). Each year, more than 92,000 children acquire disabilities as a result of traumatic accidents or severe illnesses (Schreier, Lalakakos, Morabito, Chapman, & Knudson, 2005). There are an estimated 4.7 million children; 2.8 million boys and 1.9 million girls; under the age of 18 who report activity limitations (Access to Disability Data, 1998). Additionally, there are an estimated 6.3% of persons aged 5 to 15 years old and an estimated 6.8% of persons aged 15 to 20 years of age with disabilities. Of the 6.3% of children aged 5 to 15, 1.1% had sensory impairments, 1.1% had physical impairments, 5.1% had medical impairments and 0.9% had self-care impairments (Erickson & Lee, 2008).

The Uniform Data System for Medical Rehabilitation classifies pediatric diagnoses into several categories including: (a) stroke, (b) brain dysfunction, (c) neurological disorders, (d) spinal cord dysfunction, (e) amputation, (f) arthritis, (g) pain syndromes, (h) orthopedic conditions, (i) cardiac disorders, (j) pulmonary disorders, (k) burns, (l) congenital disorders, (m) other disabling impairments, (n) major multiple trauma, (o) developmental disabilities, (p) debility, and (q) failure to thrive/malnutrition

(Uniform Data System for Medical Rehabilitation, 2008). The most common diagnosis seen in pediatric rehabilitation is traumatic brain injury (TBI; UDSMR, 2009).

Brain Dysfunction in Pediatrics

The Uniform Data System for Medical Rehabilitation classifies brain dysfunction into two board categories of diagnoses: non-traumatic brain dysfunction and traumatic brain dysfunction (including closed and open traumatic brain injuries and unspecified non-traumatic brain dysfunction). The Centers for Disease Control and Prevention (CDC) define traumatic brain injury (TBI) as an occurrence of injury to the head (arising from blunt or penetrating trauma or from acceleration-deceleration forces) that is associated with any of the following symptoms or signs attributable to the injury: decreased level of consciousness, amnesia, other neurologic or neuropsychologic abnormalities, skull fracture, diagnosed intracranial lesions, or death (Thurman, Sniezek, Johnson, Greenspan & Smith, 1994). Additional functional limitations associated with sustaining a brain insult include: decreased cognition (e.g. difficulty in memory, concentration, decision making, slower thinking/processing, confusion, difficulty reading and following directions), decreased energy level/lethargy, changes in mood, dizziness, decreased balance, vision changes, and decreased tolerance for environmental stimuli (e.g. lights, sounds, smells, etc.; CDC, 2009).

The estimated medical cost for Americans with TBI in the year 2000 was $60 billion (Finkelstein, Corso, & Miller, 2006). The CDC (2009) report an estimated 1.4 million individuals sustain a traumatic brain injury each year in the United States. It is estimated at least 5.3 million Americans currently have a long-term or lifelong need for

assistance in daily living as a result of a TBI. Additionally, of these individuals aged 0 – 14 years of age, 2,685 result in death, 37,000 hospitalizations and 435,000 emergency department visits annually (CDC, 2009). In 2005, it was estimated 15,000 Americans aged 0- 4 and 19,000 Americans aged 5 - 14 sustained a TBI (Johnson, Thomas, Thomas, & Samiento, 2009). It was estimated over 5,500 individuals sustained hospitalization due to a TBI in North Carolina alone; with 257 individuals aged 0–4 and 289 individuals aged 5 – 14 (Johnson et al., 2009). The leading causes of TBI are falls (28%), motor vehicle accidents (20%), striking (e.g. struck by or struck against) events (19%) and assaults (11%; CDC, 2009).

Childhood Developmental Stages

When working with pediatrics in a medical rehabilitation setting one must take into consideration the developmental milestones children pass through to reach full development and maturity. In a rehabilitation setting Braun and Granger (1991) note children develop independence in less complex tasks at a younger age and develop independence in more complex tasks at an older age (Braun & Granger, 1991). Children's developmental stages are extremely important to consider when measuring outcomes in order to accurately determine level of functioning.

The Center for Disease Control and Prevention published childhood developmental milestones for children from birth to five years of age (Centers for Disease Control and Prevention, n. d.). From birth to three months, a child should begin to develop a social smile and imitate some movements and facial expressions. Physically a child should be able: to raise their head and chest and support upper body with arms

when lying on stomach; stretch legs out and kick when lying on stomach or back; open and shut hands; swat at objects and grasp and shake toys with hands; move hands to mouth and push down on legs when feet are placed on a firm surface. They should follow moving objects and start to use hands and eyes in coordination. Finally, they should smile at sound of familiar voices, begin to initiate some sounds, and turn head toward source of sound.

Typically, by seven months children should enjoy social play and respond to other people's expressions of emotion. Cognitively they can find a partially hidden object, explore environment with hands and mouth and attempt to get objects out of reach. They begin to respond to their own name and "no" and can tell emotions by tone of voice. They will respond to sound by making sounds and use voice to express joy or displeasure. Physically they will: roll front to back and back to front; progress from sitting with and then without support on hands; supports whole weight on legs; and use hand to rake objects.

By 12 months, children should: behave shy or anxious with strangers, cry when parent leaves, imitate people in play, show preference for certain people and t test parental responses to their behavior, and repeat sounds or gestures for attention. Cognitively they should: easily find hidden objects, when named look at correct picture, imitate gestures, and begin to use objects correctly. They should respond to simple verbal requests, use simple gestures, and attempt to imitate words. Physically they should: independently sit, crawl on stomach, creep on hands and knees, pull self up to stand, and walk while using objects for support, and may walk few steps without support. Fine

motor skills begin to develop via use of pincer grasp, banging objects together, voluntarily lets go of objects go and tries to imitate scribbling.

By two years of age children should become more aware of themselves as separate from others and become more excited about the company of others. They will begin to show defiant behavior, and demonstrate varying levels of separation anxiety. Cognitively children should be able to follow simple commands, find objects complexly hidden, sort objects by shapes and colors, and begin make-believe play. Expressive communication should advance where children: recognize names of familiar people, objects, and body parts; verbalize several single words (15 – 18 months); use simple phrases (18 – 24 months); and repeat words overhead in conversation. Physically children should: (a) independently walk, (b) carry objects when walking, (c) begin to run, (d) stand on tiptoe, (e) negotiate on and off furniture independently, and (f) walk up and down stairs with support.

By three years of age children should imitate adults and peers, spontaneously show affection for familiar peers, take turns and understand ownership. By this age children should be able to easily separate from parents and make objection to major changes in routine. Cognitively they can: identify objects in pictures, complete simple three or four piece puzzles, follow two or three step commands, understand most sentences, use four to five word sentences, and have clear speech for most of vocabulary. Physically children this age can: climb, alternate steps when negotiating stairs, easily run, and bend over easily without falling.

By age four children should: be interested in new experiences, cooperate with peers, imitate parental roles, and negotiate solutions to conflicts. They begin to view self as a whole person involving body, mind and feelings. Cognitively they: correctly name some colors, understand the concept of counting, take single point of view when solving problems, has a clear sense of time, can follow three step commands, and understands concepts of *same* and *different*, mastered some basic rules of grammar, and speak in sentences of five to six words. Physically they should: independently negotiate stairs, throw a ball overhand, and moves forward and backward with agility.

Finally, by age five children should: have a desire to please and be similar to friends, are more likely to agree to rules and enjoy singing, dancing and acting. They are aware of gender, can distinguish fantasy from reality, can count ten or more objects, have a better understanding of time and have knowledge of common everyday items. They are able to speak sentences of five words and more, use future tense when conversing and can give address when asked. Physically they should: be able to stand on one foot for 10 seconds or longer, perform hop, somersaults and possibly skip. Fine motor skills should advance to include: copying triangles and other shapes, print some letters, independently dress, use utensils when eating, and independently care for toileting needs (Centers for Disease Control and Prevention, n. d.).

Pediatric Rehabilitation

Evolution of Pediatric Rehabilitation

Pediatric rehabilitation as a field has been rapidly changing over the past few decades. In the past, pediatric rehabilitation was characterized by adult intervention

strategies in a miniaturized form, delivered by professionals with an orientation to the treatment of adults (Helders et al., 2003). Significant changes began to occur in pediatric rehabilitation with changes in theories on childhood development and a shift in focus of interventions: from impairment to function, from the child to family, community and peers. Finally, the push for outcome-oriented and evidenced-based practice changed the structure of pediatric rehabilitation into a mature pediatric profession with its own scientific framework conditions (Helders et. al.). As a consequence of advanced medical knowledge leading to higher survival rates of children with serious physical illnesses or disabilities, attention has shifted from dealing with mortality towards coping with morbidity with an emphasis on the medical, psychological and social consequences of chronic conditions (Helders et. al.).

Most intervention strategies used with pediatric patients stem from the mid-20th century and focus primarily on children with cerebral palsy (CP) and children with developmental disabilities (Helders et al,, 2003). In a comprehensive review of effectiveness of pediatric intervention strategies, Bleck (1987) reported that over the past half century of research attempting to justify the efficacy of certain interventions, no studies significantly proving efficacy have been forthcoming. Most studies examining the effects of rehabilitation are inconsistent with the results of the effectiveness of the interventions under study (Helders et al.). Additionally, Helders et al. concluded that intervention strategies should not be directed towards restoring the motor patterns to as close as *normal* as possible, but rather towards restoring or improving functional ability

while respecting the typical characteristics of the disease and the disease-related natural course.

Characteristics of Pediatric Rehabilitation

Primary goals of pediatric rehabilitation include the health of infants, children and adolescents, their growth and development and their opportunities to achieve full potential (Behrman, 2000). Rehabilitation professionals working with children need to have an understanding of growth and development, and to understand the emergence of motor, cognitive and social-emotional competence (Helders et al., 2003). Interdisciplinary modalities in pediatric rehabilitation commonly use play and recreational based activities when working with patients to improve their overall strength, endurance, development and overall functioning.

As with many other programs, the pediatric rehabilitation program follows a family-centered model of care, which has become an integral part of total patient care (Nelson & Polst, 2008). Medina (2005) defined family centered care as the expansion of total patient care to include the patient's family in the planning and implementation of the patient's plan of care. Applied to pediatrics, family centered represents "a philosophy of care to which the pivotal role of the family is recognized and respected in the lives of children with special needs" (Brewer, McPherson, Magrab, & Hutchins, 1989, p. 1055).

Family-centered care allows empowerment of families and caregivers by offering them opportunities to become actively engaged in patient care. In the family-focused model of care, questions from family and significant others are encouraged. This approach affords staff an opportunity to provide answers to important questions and to

provide education to family using a shared decision-making approach (Dumbar et al., 2007).

Stanton (1999) concluded that the family environment is a significant predictor of rehabilitation outcomes, even when controlling for severity of disability. Additionally, it appears that the lack of family and social support can lead to developmental loss among children (Stanton, 1996). Thus, families are important components in the treatment of children with illnesses and disabilities, and to be effective partners, families may need counseling about medical diagnoses and their consequences in regards for the functional status of the child. Such understanding could help family members decide which daily activities are safe and healthy choices (Helders et al., 2003).

Each patient treated in the in-patient rehabilitation program participates in an interdisciplinary program. Pediatric rehabilitation treatment teams often consist of an attending pediatric physician, rotating medical residents, rehabilitation nurses, pediatric physical therapists, pediatric occupational therapists, pediatric speech language pathologists, a pediatric recreational therapist/child life specialist, a pediatric psychologist, a school teacher, a dietician, a chaplain and a case manger. RT specialists use a wide array of interventions to address individualized goals determined for each pediatric patient in inpatient rehabilitation. Such interventions include: (a) social skill training (Thomas, et al., 1988), (b) community re-entry training, (c) community reintegration activities/outings, (d) aquatics, (e) animal assisted therapy, (f) arts and crafts, (g) leisure education, and (h) preparation to enter or return to school (Kinney, Kinney, & Witman, 2004). Additionally, play therapy is a common treatment among RT

specialists working with children (Dattilo, 2000; Kinney & Whitman, 1997; Kinney et al., 2004).

To further elaborate on interventions used with pediatric patients these interventions will be defined. Social skill training is an intervention in which individuals receive training on social skills such as ability to listen, awareness of personal space of others, demonstration of appropriate body language congruent with situation and discussion, initiating/maintaining conversation, friendship skills, sharing personal information and feelings with others (Blaschko, 2001; Thomas et al., 1988). Community re-entry training and outing interventions include the education of community skills and clinically supervised community outing where an individual may demonstrate their independence in community skills (Blaschko, 2001). Aquatic therapy services include passive or active exercise and swimming as a means of rehabilitation and returning functional independence. Aquatic therapy services can provide psychological and physiological effects as well as promote independence in leisure pursuits and improvements in quality of life (Dattilo, 2000). Animal assisted therapy, or therapeutic use of animals, refers to the use of animals to improve the lives of individuals with disabilities through interactions and engagement with animals through the RT specialist using various facilitation techniques to achieve specific outcomes (Dattilo, 2000). Leisure education is generally a process of teaching various recreation and leisure related skills, attitudes and values. Leisure education promotes human choice, freedom and self-determination by creating options for people that allows for the choice of a wide array of activities (Dattilo, 2000).

Play

In a 1995 American Therapeutic Recreation Association Curriculum Conference, attendees came to a consensus and identified 23 modalities and 21 facilitation techniques commonly utilized by RT specialists. One of these facilitation techniques includes the use of play therapy (Kinney & Witman, 1997), commonly used by RT specialists who work with children in clinical settings (Dattilo, 2000 and Kinney et al., 2004). While many different activities have been labeled *play therapy*, they all share play as a common element.

Play is a universal behavior in children and supports a child's cognitive development, socialization, physical abilities and many aspects of growth and development of a child is supported via involvement in play (Brown, 2007). Play is essential in the development of children's abilities to cope with stress and manage emotionally challenging experiences (Freud, 1952; Erikson, 1963; Axline, 1969). Play helps improve basic social functioning; thus facilitating a return to home and community participation, thus addressing what Dumas et al. (2001) identified as a primary goal of inpatient rehabilitation for children. Specific play-related goals addressed in RT include age appropriate play with others, return to participation in school and medical understanding of relevant procedures (Committee on Hospital Care, 2006; Shira & Diamond, 1994).

Play Therapy

Play therapy is not a new concept within the healthcare field. This treatment modality was first used in the treatment of children as far back as 1919 (Schaefer &

O'Conner, 1983). Play therapy has evolved over the last 100 years to employ numerous treatment methodologies and theoretical schools of thought. However, each stage of development of play therapy embraced the therapeutic and developmental properties of play to ultimately help children prevent or resolve limitations and promote optimal growth and development (Bratton, Ray, Rhine, & Jones, 2005). Datillo (2000) notes play becomes therapeutic when its intent is to bring a positive change in children who have a disabling or limiting condition. Play therapy is defined as using the therapeutic powers of play to help clients prevent of resolve psychosocial difficulties and achieve optimal growth and development (Association for Play Therapy, n. d.). Additionally, the use of play as a therapeutic modality allows children to express thoughts and feelings, assimilate reality, resolve internal conflicts, achieve mastery and copy effectively (DelPo & Frick, 1988).

Pediatric Studies

Social Studies

Dumas, Haley, Bedell, and Hull (2001) examined changes in social function capabilities between and within groups of children with six subtypes of TBI (n = 139) during inpatient rehabilitation. Scales used to measure the changes in social functioning included the Pediatric Evaluation of Disability Inventory (PEDI) and the Social Function Skills Scale. A speech language pathologist administered the Social Function domain of the PEDI. Participants were residents at a specialized children's rehabilitation hospital who participated in an interdisciplinary treatment program that included RT services with a significant focus on social function skills including communication, peer social

interaction, play and home and community activities on each individual's treatment plan. Results indicated that 45% of the participants made clinically meaningful improvements with play therapy. Additionally, children with TBI demonstrated the greatest amount of change during rehabilitation, but only significantly greater than children with seizures (Dumas, Haley, Bedell, and Hull, 2001).

Physical Studies

Philip, Ayyanger, Banderbilt, and Gaeblet-Spira (1994) examined the effects of rehabilitation on functional improvement after treatment of brain tumors in 30 children. Outcomes were measured via the Wee-FIM. Results indicated statistically significant improvements from admission to discharge in total Wee-FIM changes ($p = .001$), total Wee-FIM changes from discharge to follow up ($p = .001$) and in subgroups' self-care, mobility and locomotion. Borderline improvements were noted at discharge for communication ($p = 0.054$) and social/cognition ($p = .051$); however, social/cognition became significant ($p = .004$) at follow up periods, which ranged from three to eighty-four months (Philip et al., 1994).

Exercise interventions are an important factor in rehabilitation of pediatric patients (Helders, 2003). Maintaining and improving physical fitness can assure that children and adolescents with a chronic disease will enter adulthood with a sound basis for their future health and an optimal physical function. This is important because aerobic physical fitness improves during childhood and fitness continues to improve until approximately age 20 (Helders).

Predictors of Outcomes

When measuring outcomes of children, there are several factors that may have a direct impact on those outcomes even before an intervention is introduced. Age at admission, diagnosis and length of stay have been identified as significant predictors of functional outcomes for patients within in-patient rehabilitation settings (Chen, Heinermann, Bode, Granger & Mallinson, 2004; Heinemann, Hamilton, Linacre, Wright & Granger, 1995). Additionally, level of functioning prior to rehabilitation or injury itself predicts level of gain made during treatment (DeNise-Annunziata & Scharf, 1998; Johnson, Wood, & Fiedler, 2003; Sansone, Alba, & Frengley, 2002; Timbeck & Spaulding, 2003).

Inpatient Rehabilitation Studies (similar methodologies)

Williams et al. (2007) conducted a study using existing medical record data to examine the effects of RT services on the functional gains made by individuals who had suffered a stroke within an in-patient rehabilitation setting. Participants (n = 960) were individuals who had experienced a stroke, ranged in age from 13 to 97, and who received in-patient treatment over the course of five years from a regional acute care hospital in the southeast United States. The study conducted separate multiple stepwise regression analyses for each dependent variable. Dependent variables included change scores (from admission to discharge) on the motor subscale, cognitive subscale and total change in Functional Independence Measure (FIM) scores. RT proved to be a significant predictor of change scores in all three dependent variables. For both motor FIM scores and total FIM scores, number of RT units predicted a statistically significant amount of the

improved functional independence from pre to post-test. This study also demonstrated that data have predictive value finding that a patient receiving five treatment units of RT would have an average corresponding increase of one point change in total FIM score.

Heinemann, Hamilton, Linacre, Wright, and Granger (1995) followed a similar methodology as Williams and examined the relationship between functional status at discharge and intensity of therapies received during inpatient medical rehabilitation. The sample consisted of individuals with traumatic brain injuries (n = 140) and individuals with spinal cord injuries (n = 106) at eight hospitals that subscribe to the Uniform Data System for Medical Rehabilitation. Data analysis included linear measures of motor and cognitive FIM scores at admission and discharge. Also, multiple regression analysis was performed to predict intensity of therapies, discharge motor and cognitive function, and the extent to which potential functional gains were achieved. Results indicated PT, OT, and SLP were not significant predictors of therapeutic outcomes while controlling for admission functioning, psychology intensity, length of stay, onset to admission time, age and interrupted stays. The only therapy that was a significant predictor was psychology. The intensity of psychology services related to functional cognitive gains for patients with traumatic brain injury (Heineman et al., 1995).

Similarly, a study conducted by Vincent, Vincent and Alfano (2007) analyzed obesity effects on outcomes following inpatient rehabilitation in patients after primary total knee arthroplasty (TKA) or revision total knee arthroplasty. The study utilized existing data from an inpatient rehabilitation facility from 2002 – 2005 for obese and non-obese patients (n = 285) who underwent either a primary or a revision of TKA.

Variables included range of motion, length of stay, FIM scores, FIM efficiency scores, total and daily hospital charges and discharge disposition location. Dependent variables were outcome measures. Results indicated range of motion and FIM scores improved from admission to discharge in both obese and non-obese patients regardless of TKA type. There was no significant interaction between arthroplasty type and obesity status on range of motion or FIM scores at admission or discharge ($p > 0.05$). Only discharge FIM scores were lower in the revision compared to primary TKA groups ($p < 0.01$). Among all patients FIM efficiency scores were higher in the primary than in the revision TKA patients ($P < 0.01$).

A recent study by Rice and colleagues (2005) conducted a descriptive analysis of change in admission and discharge Wee-FIM scores and related outcomes for children ($n = 3815$) discharged from inpatient rehabilitation after TBI during 1999 through 2001 from 56 inpatient pediatric rehabilitation facilities. Results indicated admission and discharge Wee-FIM scores correlated positively with age at admission, time from injury to rehabilitation admission and length of stay. Higher admission Wee-FIM scores correlated with shorter lengths of stay. Finally, discharge function and length of stay correlated with admission severity.

Conclusion

There is a significant need to demonstrate the effectiveness of RT services in the inpatient rehabilitation setting, especially with the pediatric population. The lack of efficacy research in this area is a strong indicator to this need. Examining the functional independence of children with brain dysfunction using the Wee-FIM will provide a

glimpse into the effectiveness of RT services with the pediatric population in an inpatient rehabilitation setting.

CHAPTER III

METHODS AND PROCEDURES

The purpose of the study was to determine if amount of recreational therapy (RT) and other services received during treatment significantly predict changes in functional independence of pediatric patients with brain dysfunctions in an in-patient rehabilitation setting. This study addressed five questions related to the effect of RT services on the functional independence of pediatrics:

Research Questions

1. Does the amount of recreational therapy services received during treatment significantly predict changes in total Wee-FIM scores from admission to discharge?
2. Does the amount of recreational therapy services received during treatment significantly predict changes in mobility Wee-FIM scores from admission to discharge?
3. Does the amount of recreational therapy services received during treatment significantly predict changes in cognition Wee-FIM scores from admission to discharge?
4. Does the amount of recreational therapy services receive during treatment significantly predict changes in self-care Wee-FIM scores from admission to discharge?

5. Does the amount of recreational therapy services received during treatment significantly predict changes in psychological Wee-FIM scores from admission to discharge?

Hypotheses

To answer these five research questions multiple hypotheses were developed including:

1. It is hypothesized that amount of recreational therapy services will significantly predict changes in total Wee-FIM scores.
2. It is hypothesized that amount of recreational therapy services will significantly predict changes in mobility Wee-FIM scores.
3. It is hypothesized that amount of recreational therapy services will significantly predict changes in cognition Wee-FIM scores.
4. It is hypothesized that amount of recreational therapy services will significantly predict changes in self-care Wee-FIM scores.
5. It is hypothesized that amount of recreational therapy services will significantly predict changes in gains in psychosocial Wee-FIM scores.

Research Design

The design was a retrospective exploratory study utilizing data from the medical records of pediatric patients admitted to a university-affiliated regional inpatient rehabilitation center between 2001 and 2008. Shank, Cole, Kinney and Lay (1995) suggested that the use of existing data resources to examine the effects RT services is an appropriate approach to conducting research. This design is appropriate for the field of

RT especially considering the challenges of conducting experimental research due to relatively small number of participants and ethical issues related to the denial of treatment to a control group. This design is ideal when the manipulation of the independent variable (e.g. RT services) is not feasible due to existing treatment protocols and standards of practice. The use of extant data may help researchers pinpoint specific interventions and anticipate outcomes that can later be investigated in clinical trials using more sophisticated designs (Shank et al., 1995).

This study was modeled on a study by Williams et al. (2007) that used data from existing medical records of patients from a five-year period to examine the influence of in-patient RT services on the functional gains made by individuals with stroke. Independent variables used in the Williams et al. study consisted of various demographic variables, amount of treatment units received from several disciplines (including RT) and admission FIM scores. Regression analysis was used to determine the influence of the independent variables on total functional improvement, motor functional improvement, and cognition functional improvement. Results indicated RT was a significant predictor of change scores in all three dependent variables. The authors concluded that approximately five treatment units of RT predicted an approximate one-point change in total FIM score (Williams et al., 2007). The current study used a similar protocol and similar variables, but utilized pediatric patients as participants.

Participants

The study used a convenience sample consisting of all pediatric patients with brain dysfunction diagnoses between the age of six months to 13 years of age who

received RT and other rehabilitation services between 2001 and 2008. Data was gathered from existing medical records of pediatric patients admitted at a university-affiliated regional inpatient rehabilitation center. Participant descriptive variables included age at admission, gender, diagnosis, and length of stay within in-patient rehabilitation setting. These demographic variables were included as they have been identified in previous literature as significant predictors of change in functioning of patients while in in-patient rehabilitation (Chen, Heinermann, Bode, Granger & Mallinson, 2004; Heinemann, Hamilton, Linacre, Wright & Granger, 1995). Participants had various brain dysfunction diagnoses including: non-traumatic brain dysfunction and traumatic brain dysfunction (including closed and open traumatic brain injuries and unspecified non-traumatic brain dysfunction).

Pediatric Rehabilitation at the Study Site

The pediatric rehabilitation treatment team consists of an attending pediatric physician, rotating medical residents, rehabilitation nurses, pediatric physical therapists, pediatric occupational therapists, pediatric speech language pathologists, a pediatric recreational therapist/child life specialist, a pediatric psychologist, a school teacher, a dietician, a chaplain, and a case manger. Each patient treated in the in-patient rehabilitation program participated in an interdisciplinary program. As with any rehabilitation setting, pediatric patients at this hospital received a minimum of three hours of combined physical therapy, occupational therapy and speech language pathology therapy services each day. Additionally, patients received a minimum of 30 minutes of recreational therapy/child life services daily. All patients participated in activities to

improve independence in performing activities of daily living; to increase overall strength and endurance; and to improve gait, balance, and proprioception. If necessary, specific patients received instructions regarding the use of assistive devices for ambulation and additional therapeutic interventions (e.g., speech pathology). Most participants with a brain dysfunction diagnosis received speech language pathology treatment services.

The in-patient rehabilitation program followed a model of family-centered care. Family-centered care has become an integral part of total patient care in today's healthcare setting (Nelson & Polst, 2008) and can be defined as the expansion of total patient care to include the patient's family in the planning and implementation of the patient's plan of care (Medina, 2005). Additionally, family-centered care been defined from a more pediatric viewpoint as "a philosophy of care to which the pivotal role of the family is recognized and respected in the lives of children with special needs" (Brewer, McPherson, Magrab, & Hutchins, 1989, p. 1055). A pediatric treatment team places both the family members and patients at the center of the decision making process for treatment.

Recreational Therapy Pediatric Services

Within the in-patient rehabilitation center where data was collected, RT services were one of the many treatment services available to patients. Of the 26 CTRS on staff at the hospital, eight full-time and five part-time RT specialists worked in the rehabilitation center. Specifically, pediatric in-patient rehabilitation had one RT on staff. This staff member worked at the hospital for eight years in pediatric rehabilitation and held duel certifications in both Therapeutic Recreation (CTRS) and Child Life Services (CCLS). It

is important to note that this therapist consistently provided the majority of RT treatment services to pediatric patients; however, other qualified RT therapists within the rehabilitation center provide treatment to pediatric patients as needed. Having a primary RT staff member on the pediatric rehabilitation team, allows for consistency in documentation, maintaining patient rapport, ease of communication between staff, and family on patient's progress, and consistency in providing treatment interventions. Having one therapist providing the majority of RT services to pediatric patients also presents a limitation to this study. That one primary therapist provided most of the RT services may suggest that the variable being analyzed is not RT in general, but a particular therapist's ability to change functional independence levels.

The primary RT interventions often used in rehabilitation include: (a) fine and gross motor skill development using crafts, games and other activities, (b) aquatic therapy services, which is often a co-treatment with physical therapy (c) community re-entry outings and skills education, (d) transfer skills, (e) social skills development, (f) facilitation of age appropriate play, (g) facilitate school participation, and (h) promote medical understanding of relevant procedures. RT specialists utilize various recreational activities as interventions in promoting an optimal level of functional independence in physical, cognitive, emotional and social functioning in individuals with disabilities. RT specialists in rehabilitation settings work to enhance an individual's current skills and teach new skills for daily living and community functioning (Nichols & Brasile, 1998)

Data Collection Procedures

Data was collected from existing electronic medical records at the study site. To protect anonymity of participants, a medical records manager at the study site gathered data from the hospital's medical records database and assigned an identification number unique to this study to each participant's record. Data included: (a) descriptive items (e.g., age at admission, length of stay, gender, diagnosis), (b) number of units of treatment (each lasting 15 minutes) received from RT, occupational therapy (OT), physical therapy (PT), speech therapy (SP), and psychology; and (c) admission and discharge Wee-FIM scores.

Measurement and Instrumentation

Independent Variables

The primary independent variables for this study included: (a) number of treatment units of RT services received, (b) number of treatment units of PT received, (c) number of treatment units of OT received, (d) number of treatment units of SP received, (e) number of treatment units of psychology services received, (f) gender, (g) age at admission, (h) diagnosis, (i) length of stay, and (j) admission Wee-FIM scores. Treatment units of RT, PT, OT, SP, and psychology were included as independent variables to address the research questions. The amount of treatment received has been shown to be a predictor of functional independence in an in-patient rehabilitation setting (Williams et al., 2007). Age at admission, diagnosis (Rice et al., 2005) and length of stay (Rice et al.) were included as independent variables due to their potential impact on functional

improvements for patients within in-patient rehabilitation settings (Chen et al., 2004; Heinemann et al., 1995).

Admission Wee-FIM scores were included as independent variables in this study because level of functioning prior to rehabilitation or injury itself can predict gain in functional improvement during treatment (DeNise-Annunziata & Scharf, 1998; Johnson, Wood & Fiedler, 2003; Sansone, Alba & Frengley, 2002; Timbeck, R. & Spaulding, 2003). Additionally, admission Wee-FIM scores can serve as an indicator of treatment assignment bias. For instance, a particular therapy might treat patients with more functional independence. Admission Wee-FIM scores included in each regression model could correspond to the dependent variable. For instance, for the regression model examining change in motor FIM scores, the motor FIM admission score was included as an independent variable.

Dependent Variables

Dependent variables included: (a) change in total Wee-FIM scores from admission to discharge, (b) change in cognitive Wee-FIM scores from admission to discharge, (c) change in motor Wee-FIM scores from admission to discharge, and (d) change in psychosocial Wee-FIM scores from admission to discharge scores.

Wee-FIM: The Functional Independence Measure for Pediatrics

The Wee-FIM instrument was first developed in 1987 in an effort to create a standardized instrument to track progress of children toward independence in personal care, mobility and psychosocial competence. The Wee-FIM was designed to measure changes in functional performance over time, to evaluate the effectiveness of therapeutic

interventions and to assess the cost and quality of rehabilitation services (Braun & Granger, 1991).

Two concepts form the basis for the development of the Wee-FIM. First, the Wee-FIM is based on the model of pathology, impairment, disability, and handicap described by the World Health Organization (WHO, 1980). Medical approaches are used to evaluate pathology and impairment; whereas disability and handicap are measured by functional assessment. Second, the Wee-FIM is concerned with the burden of care as well as type and amount of assistance required for an individual with a disability to perform basic life activities effectively. The ultimate goal of the Wee-FIM is to measure changes in function over time to weigh the burden of care in terms of physical, technologic and financial resources (Braun & Granger, 1991). The instrument can be administered in several ways: in person, a telephone interview or mailed questionnaire. By far, the most popular method of administration is the in person interview; especially in the in-patient rehabilitation setting. Information may be gathered from the staff, parent/caregiver or the child (Uniform Data System for Medical Rehabilitation, 2005). At the study site, information for Wee-FIM scores were gathered by direct in-person interview and observation.

The Wee-FIM is a basic indicator of severity of disability. The instrument measures functional abilities and the *need for assistance* within the developmental context that is associated with levels of disability in children ages six months to seven years (Uniform Data System for Medical Rehabilitation, 2005). The instrument can be used with youth over the age of seven provided their functional abilities, as measured by

the Wee-FIM instrument, are below those expected abilities of children at the age of seven who do not have disabilities (Uniform Data System for Medical Rehabilitation, 2008). The Wee-FIM is applicable in several settings including: inpatient, outpatient and acute care hospital and rehabilitation settings, in community agencies, and in school-based programs (Braun & Granger, 1991). The Wee-FIM is modeled after the original Functional Independence Measure (FIM) and was purposefully kept as comparable as possible to the FIM by using the same items and rating system language to allow for ease in communication and measurement. Adult FIM term definitions were modified to accommodate the developmental aspect of child habilitation, taking into account that varying degrees of dependence are normal until the approximate age of seven years old (Braun & Granger, 1991; Uniform Data System for Medical Rehabilitation, 2005).

The Wee-FIM is composed of 18 items rated on a seven-level scale that represents gradations in function from complete dependence (1) to complete independence (7), much like the original FIM (Uniform Data System for Medical Rehabilitation, 2005). The Wee-FIM scale consists of six categories with eighteen subscales (Philip, Ayyanger, Banderbilt, & Gaeblet-Spira, 1994) and consists of three domains: self-care, mobility and cognition. The self-care domain consists of eight items: eating, grooming, bathing, dressing (upper body), dressing (lower body), toileting, and bladder and bowel management. The mobility domain consists of five items: transfer from chair or wheelchair, transfer to toilet, transfer to tub or shower, walking/wheelchair/crawling distance, and moving up and down stairs. The cognition domain assesses comprehension, expression, social interaction, problem solving and

memory. Total Wee-FIM scores range from 18 to 126 (Uniform Data System for Medical Rehabilitation, 2005). To examine the validity of the instrument, Braun and Granger (1991), conducted a study over a nine month period which confirmed a strong correlation ($r^2 = 0.83$) between Wee-FIM ratings and chronological age from six months to 7 years of age. The study found typically developing children over seven years old tend to achieve scores indicating functional independence on all Wee-FIM items. However, the Wee-FIM has wide applicability for use with children beyond age seven with delays in functional development (Braun & Granger). The Wee-FIM has been shown to have acceptable content validity (CVI = 0.08) (McCabe & Granger, 1990). Additionally, Chen et al. (2004) found that diagnosis and age were significantly related to functional gains noted in pediatric patients.

The validity of the Wee-FIM was tested through pilot studies including: (a) children with significant prematurity (Ciesielski, 1995), (b) cerebral palsy (Buran, Sawin, Brei & Fastenau, 2004; DeNise-Annunziata & Scharf, 1998; McCabe, 1996), (c) Down syndrome, (d) congenital limb disorders (Deutsch, Braun & Granger, 1996), (e) spina bifida (DeNise-Annunziata & Scharf, 1998), (f) traumatic brain injury (Chen et al., 2004), and (g) spinal cord injury (Garcia, Gaebler-Spira, Sisung & Heinemann, 2002). These studies support the use of the Wee-FIM with a wide variety of populations and diagnoses.

Speele and colleagues (1997) examined the equivalence reliability of two administrative methods with the Wee-FIM: (a) direct observations of children's behavior and (b) parental interview for children with developmental disabilities. Results indicated

strong reliability for both administrative methods (r = 0.93; Speele, Ottenbacher, Braun, Land & Nochajski, 1997). The Wee-FIM has demonstrated acceptable test re-test reliability (interclass correlation coefficient = 0.98, $p \leq 0.05$), and interrater reliability (Kappa statistics = 0.61 for 13 out of 18 subscales, $p \leq 0.05$; McCabe & Granger 1991; Ottenbacher, Msall, Lyon, 1997). Additionally, DeNise-Annunziata and Scharf (1998) reported that the Wee-FIM demonstrated appropriate internal consistency (Cronbach alpha = 0.94). Finally, the Wee-FIM demonstrated appropriate reliability with children ages one to seven with motor, communicative and neurodevelopmental disabilities (Braun, Sawin & BreiFastenau, 2004), children with developmental disabilities (r ranged from 0.78 to 0.98 for subscales; Ottenbacher, Msall, Lyon, et al., 1997), children beyond age seven with cerebral palsy, traumatic brain injury (Chen et al., 2004), and spina bifida (McCabe, 1996), and with a wide range of diagnoses in the community setting (Ciesielski, 1995; Granger & Braun, 1996; Granger, Kelly-Gayes, Johnson, Deutsch, Braun & Fiedler, 1996; Hsu, 1995; Leonard, Msall, Bower, Tremony & Leonard, 2002; Ottenbacher, Msall, Lyon, et al., 1997).

Data Analysis

Separate multiple regression analyses (using the enter method) were used to examine the relationships proposed in the hypotheses. The regressions were used to determine which independent variables predicted changes within each of the total and three subscale of the Wee-FIM. Descriptive statistics were used to examine demographic variables.

To clarify, the independent variables associated with each hypothesis included:

(a) number of treatment units of RT services received, (b) number of treatment units of PT received, (c) number of treatment units of OT received, (d) number of treatment units of SP received, (e) number of treatment units of psychology services received, (f) gender, (g) age at admission, (h) primary diagnosis, (i) length of stay, and (j) admission Wee-FIM scores corresponding to the dependent variable. The dependent variable for hypothesis one was change in *total* Wee-FIM scores from admission to discharge. The dependent variable for hypothesis two was change in *mobility* Wee-FIM scores from admission to discharge. The dependent variable for hypothesis three was change in *cognition* Wee-FIM scores from admission to discharge. The dependent variable for hypothesis four was change in *self-care* Wee-FIM scores from admission to discharge. Finally, the dependent variable for hypothesis five was change in *psychosocial* Wee-FIM scores from admission to discharge.

Pearson correlation analysis was used to determine if there were significant relationships between functional independence at admission and amount of various treatments received (i.e, PT, OT, RT, etc units received). A significant relationship between admission functional independence and the amount of particular treatment received could indicate a bias in the assignment of treatment.

Handling Missing Data and Outliers

The study utilized data from medical records of inpatients that received treatment from an acute care hospital; therefore, the concern for significant amounts of missing data was minimal. In the researcher's experience with similar data with previous research studies with extant data from the study site, it would be unusual for there to be missing

data. The potential for missing data was still a concern, however. Once missing data was identified, the researcher ran a descriptive statistics analysis to identify inaccurate data entry points followed by a frequency count to determine the number of missing data points within the dataset. Finally, box and whisker plot analysis were used to determine statistical outliers related to number of RT services received, age and length of stay. Outliers were eliminated from the final analysis. Additionally, participants who received no treatment from any service (i.e. no treatment units throughout their rehabilitation stay) were eliminated from the dataset.

CHAPTER IV: RESULTS

The purpose of the study was to determine if amount of recreational therapy (RT) and other services received during treatment significantly predicted changes in functional independence of pediatric patients with brain dysfunctions in an in-patient rehabilitation setting. Five hypotheses were tested to examine relationships between frequency of treatment units received and level of patient functioning.

Sample Description

The sample in this study included 408 pediatric participants with brain dysfunctions (e.g., traumatic brain injury) who received treatment in an inpatient rehabilitation center in the southeastern United States between 2001 and 2008. If patients received no treatment from any discipline (e.g., PT, OT, SLP, RT) during their inpatient rehabilitation stay, they were removed from the original dataset. This resulted in the removal of 60 cases. In the interest of homogeneity, the sample was also delimited by age where the oldest 25% of the sample (all 142 participants over the age of 13) was eliminated from the dataset. Box and whisker plot analysis were used to identify outliers in terms of length of stay (125 or more days) and outliers for amount of RT received (102 or more units), resulting in the removal of 15 cases from the original sample. The resulting sample of 408 pediatric patients had the following characteristics: (a) 67.9% male and 32.1% female, (b) mean age at admission of 5.66 years (SD = 4.39) with an age range of 6 months to 13.97 years, and (c) mean length of stay (LOS) = 31.51 days (SD = 16.58). Additionally, diagnoses of brain dysfunction included: (a) traumatic brain

dysfunction (241; 59.1%), (b) non-traumatic brain dysfunction (140; 34.3%) and (c) unspecified non-traumatic brain dysfunction (27; 6.6%) cases.

Functional Independence

Table 1 represents the mean admission functional independence measure for pediatrics (Wee-FIM) scores and change in Wee-FIM scores among participants. Mean total Wee-FIM score at admission was 28.71 with a mean change of 25.06. Mean mobility Wee-FIM score at admission was 7.40 with a mean change of 7.93. Mean cognitive Wee-FIM score at admission was 8.34 with a mean change of 5.76. Mean self-care Wee-FIM score at admission was 12.96 with a mean change of 11.37. Finally, mean social Wee-FIM score at admission was 1.59 with a mean change of 1.29. Mobility and cognitive Wee-FIM scores were similar to one another at admission, yet most change in total Wee-FIM score from the two variables was due to changes in mobility Wee-FIM scores.

Table 1

Mean Admission and Change Scores

Wee-FIM Category	Admission Wee-FIM score	Change in Wee-FIM score
Total Wee-FIM	28.71 (SD = 16.78)	25.06 (SD = 24.15)
Mobility Wee-FIM	7.40 (SD = 4.42)	7.93 (SD = 8.04)
Cognitive Wee-FIM	8.34 (SD = 5.28)	5.76 (SD = 5.51)
Self Care Wee-FIM	12.96 (SD = 8.38)	11.37 (SD = 11.77)
Social Wee-FIM	1.59 (SD = 1.20)	1.29 (SD = 1.46)

Note. Higher Wee-FIM score indicates higher functioning. Maximum possible total FIM score is 126. Mobility Wee-FIM consists of five items with a maximum possible score of 35. Cognitive Wee-FIM consists of five items with a maximum possible score of 35. Self-care Wee-FIM consists of eight items with a maximum possible score of 56. Psychosocial Wee-FIM consists of one item with a maximum possible score of 7.

Treatment Received

Participants received a variety of therapy units during treatment (as represented in Table 2) including a mean of 69.91 units of SLP, 63.89 units of PT, 57.94 units of OT, 32.2 units of RT, and 4.23 units of psychology, with a total average of 228.17 units during their stay in rehabilitation. One unit equals 15 minutes of treatment.

Table 2

Mean Number of Treatment Units Provided

Type of Therapy	Number of Units
Speech and Language Pathology	69.91 (SD = 49.61)
Physical Therapy	63.89 (SD = 44.07)
Occupational Therapy	57.94 (SD = 37.00)
Recreational Therapy	32.20 (SD = 24.32)
Psychology	4.23 (SD = 10.82)

Note. One unit equals 15 minutes of treatment.

Hypothesis Testing

Results of Tests of Hypothesis 1

Hypothesis 1: It is hypothesized that amount of recreational therapy services will significantly predict changes in total Wee-FIM scores.

Multiple regression analysis using the enter method was used to determine significant predictors of change in total Wee-FIM scores among participants. Independent variables included units of therapy received (e.g., RT, PT, OT, SLP), admission Wee-FIM scores, length of stay and age at admission. Additional independent variables included diagnosis and gender, which were both categorical variables that were recoded to be included in the regression analysis. The psychology treatment unit variable was removed from the regression models due to the relatively low mean number of treatment units received (mean = 4.23 units and range from 0 – 82 units).

Significant predictors of change in total Wee-FIM score for the model were PT units (β = -.246, *p* = .018), OT units (β = .289, *p* = .009), admission Wee-FIM scores (β = -.199, *p* = .000), length of stay (β = -.131, *p* = .002), age at admission (β = .726, *p* = .000), diagnosis (β = -.218, *p* = .000), as shown in Table 3. Amount of RT units was *not* a significant predictor of change in total Wee-FIM score; thus, Hypothesis 1 was not supported by the findings.

Table 3

Regression Analyses for Variables Predicting Change in Total Wee-FIM

Variable	B	SE B	β	*p*
RT Units	.080	.055	.081	.142
PT Units	-.135	.057	-.246	.018**
OT Units	.189	.072	.289	.009**
SLP Units	-.040	.035	-.082	.249
Admission Wee-FIM score	-.286	.064	-.199	.000**
Length of stay	-.191	.060	-.131	.002**
Age at admission	3.989	.222	.726	.000**
Diagnosis	-8.519	1.332	-.218	.000**
Gender	2.532	1.766	.049	.153

**$p < .01$. *$p < .05$.

Results of Tests of Hypothesis 2

Hypothesis 2: It is hypothesized that amount of recreational therapy services will significantly predict changes in mobility Wee-FIM scores.

A similar multiple regression model, using the enter method, was tested using mobility Wee-FIM scores as the dependent variable. The same independent variables were tested as in the previous hypotheses.

Significant predictors of change in mobility Wee-FIM score for the model were OT units ($\beta = .316$, $p = .009$), admission Wee-FIM scores ($\beta = -.142$, $p = .003$), length of stay ($\beta = -.187$, $p = .000$), age at admission ($\beta = .651$, $p = .000$) and diagnosis ($\beta = -.203$ and $p = .000$) as shown in Table 4. Thus, hypothesis was not supported since amount of RT units was not a significant predictor of change in mobility Wee-FIM scores.

Table 4

Regression Analyses for Variables Predicting Change in Mobility Wee-FIM

Variable	B	*SE B*	β	*p*
RT Units	-.001	.020	-.003	.954
PT Units	-.037	.020	-.204	.069
OT Units	.069	.026	.316	.009**
SLP Units	-.016	.012	-.096	.214
Admission Wee-FIM score	-.068	.023	-.142	.003**
Length of stay	-.091	.022	-.187	.000**
Age at admission	1.190	.080	.651	.000**
Diagnosis	-2.639	.480	-.203	.000**
Gender	.526	.636	.031	.409

**$p < .01$. *$p < .05$.

Results of Tests of Hypothesis 3

Hypothesis 3: It is hypothesized that amount of recreational therapy services will significantly predict changes in cognition Wee-FIM scores.

A similar multiple regression model, using the enter method, was tested using cognition Wee-FIM scores as the dependent variable. The same independent variables were tested as in the previous hypotheses.

Significant predictors of change in cognition Wee-FIM score for the model were RT treatment units (β =.187, $p = .002$), admission Wee-FIM scores (β = -.171, $p = .001$),

length of stay (β = -.091, *p* = .045), age at admission (β = .631, *p* = .000) and diagnosis (β = -.230, *p* = .000) as shown in Table 5. In this model, amount of RT units was a significant predictor of change in cognition Wee-FIM scores; thus, Hypothesis 3 was supported.

Table 5

Regression Analyses for Variables Predicting Change in Cognition Wee-FIM

Variable	B	*SE B*	β	*p*
RT Units	.042	.014	.187	.002**
PT Units	-.024	.014	-.193	.091
OT Units	.022	.018	.148	.227
SLP Units	-.007	.009	-.065	.405
Admission Wee-FIM score	-.056	.016	-.171	.001**
Length of stay	-.030	.015	-.091	.045*
Age at admission	.791	.056	.631	.000**
Diagnosis	-2.053	.335	-.230	.000**
Gender	-.131	.444	-.011	.768

**$p < .01$. *$p < .05$.

Results of Tests of Hypothesis 4

Hypothesis 4: It is hypothesized that amount of recreational therapy services will significantly predict changes in self-care Wee-FIM scores.

A similar multiple regression model, using the enter method, was tested using self-care Wee-FIM scores as the dependent variable. The same independent variables were tested as in the previous hypotheses.

Significant predictors of change in self-care Wee-FIM score for the model were PT units (β = -.276, p = .007), OT treatment units (β = .309, p = .005), admission Wee-FIM scores (β = -.231, p = .000), length of stay (β = -.098, p = .017), age at admission (β = .750, p = .000), diagnosis (β = -.201, p = .000), and gender (β = .085, p = .012) as shown in Table 6. Thus, Hypothesis 4 was not supported since RT units was not a significant predictor of change in self-care Wee-FIM scores.

Table 6

Regression Analyses for Variables Predicting Change in Self-Care Wee-FIM

Variable	B	SE B	β	*p*
RT Units	.039	.026	.081	.137
PT Units	-.074	.027	-.276	.007**
OT Units	.098	.035	.309	.005**
SLP Units	-.017	.017	-.073	.301
Admission Wee-FIM score	-.162	.031	-.231	.000**
Length of stay	-.070	.029	-.098	.017**
Age at admission	2.008	.107	.750	.000**
Diagnosis	-3.827	.641	-.201	.000**
Gender	2.137	.849	.085	.012**

**$p < .01$. *$p < .05$.

Results of Tests of Hypothesis 5

Hypothesis 5: It is hypothesized that amount of recreational therapy services will significantly predict changes in gains in psychosocial Wee-FIM scores.

A similar multiple regression model, using the enter method, was tested using psychosocial Wee-FIM scores as the dependent variable. The same independent variables were tested as in the previous hypotheses.

Significant predictors of change in psychosocial Wee-FIM score for the model were RT units ($\beta = .155$, $p = .019$), admission Wee-FIM score ($\beta = -.145$, $p = .007$),

length of stay (β = -.104, *p* = .036), age at admission (β = .570, *p* = .000), and diagnosis (β = -.145 *p* = .000) as shown in Table 7. In this model, amount of RT units was a significant predictor of change in psychosocial Wee-FIM scores; thus, Hypothesis 5 was supported.

Table 7

Regression Analyses for Variables Predicting Change in Psychosocial Wee-FIM

Variable	B	SE B	β	*p*
RT Units	.009	.004	.155	.019**
PT Units	-.007	.004	-.223	.072
OT Units	.008	.005	.202	.129
SLP Units	-.002	.003	-.074	.387
Admission Wee-FIM score	-.013	.005	-.145	.007**
Length of stay	-.009	.004	-.104	.036*
Age at admission	.190	.016	.570	.000**
Diagnosis	-.343	.097	-.145	.000**
Gender	.015	.128	.005	.908

***p* < .01. **p* < .05.

Considering the support of only two out of five hypotheses, further analysis was conducted to explore the possible reasons for results.

Secondary Analyses

All treatments were significantly correlated ($p = .000$) with each other. The strongest association existed between OT and PT ($r = .938$). RT units were significantly correlated with OT units ($r = .774$), PT units ($r = .748$), SLP units ($r = .676$), and psychology units ($r = .209$). Each of these relationships was smaller than the relationship between PT units and OT units. Psychology and SLP had lower, yet significant, correlations with other disciplines. Please refer to Table 8 and Table 9.

Table 8

Correlations among Treatment Variables

		RT	OT	PT	SLP	Psychology
RT	*r*		.774**	.748**	.676**	.209**
	p		.000	.000	.000	.000
OT	*r*			.938**	.871**	.251**
	p			.000	.000	.000
PT	*r*				.857**	.272**
	p				.000	.000
SLP	*r*					.206**
	p					.000
LOS[a]	*r*	.289**	.408**	.430**	.384**	.222**
	p	*.000*	.000	.000	.000	.000
Admit Total Wee-FIM	*r*	-.071	-.182**	-.222**	-.210**	-.035
	p	.152	.000	.000	.000	.478

Note. All *n* values = 408.

[a]LOS = length of stay.

***p* < .01 (2-tailed). * *p* < .05 (2-tailed).

Admission total Wee-FIM scores were negatively correlated with all therapies. All therapies were significantly positively correlated with LOS, suggesting that the longer a person stayed in rehabilitation, the more units of treatment they received from each discipline.

Table 9

Correlations among Change in Wee-FIM Variables

		Δ Total	Δ Mob	Δ Cog	Δ S-C	Δ Social
Age[a]	*r*	.673**	.620**	.598**	.678**	.545**
	p	.000	.000	.000	.000	.000
LOS[b]	*r*	-.124*	-.197**	-.083	-.081	-.101*
	p	.012	.000	.095	.104	.042
Diagnosis	*r*	-.261**	-.244**	-.266**	-.244**	-.179**
	p	.000	.000	.000	.000	.000
Admit Total Wee-FIM	*r*	.247**	.286**	.212**	.213**	.212**
	p	.000	.000	.000	.000	.000
RT	*r*	.164*	.090	.204**	.180**	.169*
	p	.001	.069	.000	.000	.001

Note. All *n* values = 408.

[a]Age at admission. [b]LOS = length of stay. Diagnosis: : 0 = *traumatic brain dysfunction*, 1 = *non-traumatic brain dysfunction, 2 = unspecified non-traumatic brain dysfunction.*

*$p < .05$. **$p < .01$ (2-tailed).

All therapies (i.e., units provided) included in the study were significantly correlated with one another, with the strongest correlations between PT, OT, and RT units. Additionally, all changes in Wee-FIM scores (i.e. total and each sub-scale) were significantly ($p = .000$) and positively correlated with each other ($r = .975$ - $.746$).

The only significant positive correlation between therapy type and age at admission was RT ($r = .157$, $p = .001$) suggesting that the older pediatric patients received more RT treatment. Age at admission was also significantly negatively

correlated with LOS (r = -.099, p = .046) suggesting the younger pediatric patients had longer lengths of stay. Age at admission was significantly positively correlated with total Wee-FIM scores at admission (r = .5-1, p = .000) suggesting the younger children had the lowest admission Wee-FIM scores. Finally, age at admission was significantly positively correlated with change in total and all sub-scales of the Wee-FIM. The older the participants at admission, the more likely they were to make larger gains in total Wee-FIM score (r = .673, p = .000), mobility Wee-FIM score (r = .620, p = .000), cognition scores (r = .598, p = .000), gains in self-care Wee-FM score (r = .678, p = *.000)*, and make larger gains in psychosocial Wee-FIM scores (r = .545, p = .000).

Length of stay was significantly positively related to each therapy type suggesting that the longer a person stayed in rehabilitation, the more units of treatment they received from each discipline. PT and OT had the strongest relationships with longer lengths of stay followed by SLP and RT. LOS was significantly negatively correlated with change in total Wee-FIM (r = -.124, p < .05), change in mobility Wee-FIM (r = -.197, p = .000), and change in social Wee-FIM score (r = -.101, p < .05). LOS and admission Wee-FIM scores had a negative correlation (r = -.450, p = .000).

Admission Wee-FIM scores were negatively correlated with all therapies. RT was not significantly correlated with admission Wee-FIM scores. PT recorded the strongest negative correlation (r = -.222). Admission Wee-FIM scores was significantly positively correlated with changes in total Wee-FIM score as well as each sub-scale of the Wee-FIM (r = .212 - .286, p = .000).

The amount of OT treatment units received was significantly positively correlated with change in self-care Wee-FIM scores ($r = .101$, $p < .05$). Interestingly, the number of RT treatment units was significantly positively correlated with change in total Wee-FIM score, change in cognitive, self-care, and psychosocial Wee-FIM score. Number of RT units was not significantly correlated with change in mobility Wee-FIM scores.

CHAPTER V: DISCUSSION

Summary

There are critical developmental milestones in childhood (Centers for Disease Control and Prevention, n.d.), and interruptions in development can have effects lasting into adulthood. Pediatric rehabilitation addresses the health, growth and development of infants, children and adolescents and provides opportunities for patients to achieve full potential (Behrman, 2000). Pediatric patients receive various therapeutic services designed to increase functional independence. Therapies such as physical therapy (PT), occupational therapy (OT), speech and language pathology (SLP), recreational therapy (RT), and psychology address therapeutic goals and facilitate functional gains (Heinemann, 2000) of children and adults with a variety of disabilities. However, these therapies are not always predictive of functional improvements of patients with brain injuries (Heinemann et al., 1995).

Given the nature of pediatric development, younger children are expected to have greater dependence in a larger array of tasks than older children, and the rate of functional improvement and its maintenance varies from case to case depending on "the appropriate timing of rehabilitation therapies" (Heinemann et al., 1995, p. 315). Thus, it is likely that there will be differences in functional gains made by pediatric patients of similar diagnoses yet of different ages.

A growing body of literature supports the efficacy of rehabilitation in general, but it remains unclear to which therapy or intervention these improvements in functioning can be attributed. Both health care administrators and third party payers have begun

holding practitioners accountable for cost containment and efficiency of services (Heinemann et al., 1995).

RT researchers have provided little empirical evidence of effects of RT services on functional outcomes of pediatric patients in inpatient rehabilitation. Without such evidence, the ability to provide effective and efficient services is left to chance and clinician intuition (Keith, 1991), and the RT profession finds itself at a competitive disadvantage in an increasingly competitive health care arena. Therefore, the purpose of this study was to determine if amount of recreational therapy (RT) and other services received during treatment significantly predicted changes in functional independence (as measured by the pediatric Functional Independence Measure: Wee-FIM) of pediatric patients with brain dysfunctions in an in-patient rehabilitation setting. Five hypotheses were tested in this study:

H_1: The amount of recreational therapy services will significantly predict changes in total Wee-FIM scores.

H_2: The amount of recreational therapy services will significantly predict changes in mobility Wee-FIM scores.

H_3: The amount of recreational therapy services will significantly predict changes in cognition Wee-FIM scores.

H_4: The amount of recreational therapy services will significantly predict changes in self-care Wee-FIM scores; and

H_5: The amount of recreational therapy services will significantly predict changes in psychosocial Wee-FIM scores.

Multiple regression analyses were used to determine significant predictors of change in Wee-FIM according to type of treatment, admission Wee-FIM scores, length of stay, diagnosis, gender and age at admission. Secondary analysis included examination of descriptive statistics and significant correlations between variables.

Summary of Findings

The sample consisted of 408 pediatric patients with brain dysfunction diagnoses including: (a) traumatic brain dysfunction (n = 241), (b) non-traumatic brain dysfunction (n = 140), and (c) unspecified non-traumatic brain dysfunction cases (n = 27). The sample was 67.9% male and 32.1% female. The mean age at admission was 5.66 years (SD = 4.39) with an age range of 6 months to 13.97 years. The length of stay varied from two to 72 days with a mean length of stay of 31.51 days (SD = 16.58).

Participants received a variety of therapy units during treatment including a mean of 69.91 units of SLP, 63.89 units of PT, 57.94 units of OT, 32.2 units of RT, and 4.23 units of psychology with an average total of 228.17 units during their stay in rehabilitation. The finding that SLP delivered the highest average number of treatment units is not surprising considering that the sample consisted of patients with brain dysfunctions.

The sample made relatively large gains in total and self-care Wee-FIM scores. The majority of change in total Wee-FIM scores was due to changes in self-care Wee-FIM scores. Mean total Wee-FIM score at admission was 28.71 with a mean change of 25.06 with a total Wee-FIM scores ranging from 18 to 126. The self-care subscale of the Wee-FIM has eight items, ranging in a score of 8 to 56 with a possible score change of 46

points. The mobility and cognition subscales have only five items each, with scores ranging from 8 to 35 and a possible score change of 27 for each subscale. Considering this, the mobility subscale scores had the greatest change (22%) within the possible allotment of gains in functioning, compared to the self-care change in Wee-FIM scores of 20%. Although it might be expected that cognition scores would change more than other scores for this population due to the cognitive deficits present with this population, the cognition Wee-FIM scores did not have the greatest change among the dependent variables.

The results of the multiple regression analyses were difficult to interpret in part because the amounts of all treatments received were significantly correlated with each other. The strongest association existed between amounts of OT and PT units. Additionally, RT units were strongly correlated with PT units and amount of OT units as well.

Hypothesis Findings and Predictors of Change

Treatment Units as Predictors of Change

No therapy was a consistent predictor of change in all of the regression models. The most consistent therapy that predicted change in Wee-FIM scores was amount of OT units, which was a positive predictor of change in total, mobility and self-care Wee-FIM scores. Amount of PT units was a negative predictor of change in total and self-care Wee-FIM score changes. Finally, amount of RT units was not a significant predictor of change in total Wee-FIM scores, but it was a positive predictor of change in cognition and

psychosocial Wee-FIM scores. Speech therapy services were not a significant predictor of change in any of the regression models.

Both amounts of PT and OT were significant predictors of change in total Wee-FIM scores, perhaps due to the relatively large amount of treatment provided by PT and OT. Although participants received substantially more PT and OT treatment than other treatments, PT was not a significant predictor of changes in mobility, cognition or psychosocial Wee-FIM. Given that participants received nearly equal amounts of PT and OT treatment units, OT appears to have had a more significant influence on Wee-FIM score changes (i.e. total, mobility and self-care) in general than PT. These findings may be explained by the particular focus of OT services on improvement of patients' daily care needs.

Curiously, PT was a negative predictor of change in total Wee-FIM scores. While possible, it seems unlikely that PT treatment impaired gains in functional independence. Although it might be suspected that amount of PT correlated with age at admission or admission FIM scores, the findings from the current study do not support this suspicion. As such, it remains unclear why amount of PT had an unexpected negative relationship with change in functional independence. Heinemann et al., (1995) found a lack of significant relationships between the amount of PT, OT or SLP services provided and functional gains made by adults with SCI and TBI as measured by the FIM. Heinemann offered several explanations for this finding: (a) therapy alone did not did not produce the observed results, (b) therapies worked on different goals and thus provided different service strategies, and (c) therapies have delayed benefits that may only be seen at home

and in the community. Heinemann also suggested therapies are focused inefficiently; for example therapy may attempt to alleviate impairments in functioning when there is little likelihood of significant effect. Additional research is needed to clarify this relationship.

As noted, amount of SLP was not a significant predictor of change in total Wee-FIM sores. Secondary analysis supports this finding, as SLP was not significantly correlated with total or any subscales of Wee-FIM scores. This could be due to the goals SLP addresses with pediatric patients. The cognition subscale of the Wee-FIM consists of only 5 out of 18 items, thus, not contributing a significant amount to the overall gains in Wee-FIM scores. However, SLP failed to be a significant predictor of change in cognition Wee-FIM scores as well. The data do not indicate how long post-injury participants were, which could have had an effect on gains in cognitive functioning (Chen et al., 2004).

Essentially, time since injury may have served as a confounding and unmeasured variable that affected the dependent variables. Additionally, it is possible that medical complications occurring during cognitive development of these pediatric patients could have long lasting effects on progression in developmental milestones and led to pervasive cognitive delays that affected cognitive gain scores. It is noted that children with traumatic brain injury often have long-term disability and lasting effects related to cognitive functioning (Corrigan, Smith-Knapp, Granger, 1998; Hammond et al., 2001; Langlois et al., 2003).

The number of treatment units delivered by PT and OT is governed largely by the Centers for Medicare and Medicaid Services' (CMS) *three-hour rule*. According to CMS

regulations, all patients in in-patient rehabilitation must receive at least three hours of therapy from PT, OT or other skilled services such as SLP as needed (CMS, 2005). While the coverage status of certain services such as RT varies from setting to setting, CMS universally covers PT and OT in particular, and private insurance sources typically follow the coverage guidelines of CMS (DeWalt, Oberlander, Carey, & Roper, 2005/06). PT, OT and SLP are covered services at the study site for the current study, while RT services are not. This may explain the large amount of treatment units and little variability between amount of SLP, PT and OT treatments that participants received.

Considering the sample consisted of children with various brain dysfunctions, including traumatic and non-traumatic brain injury and unspecified non-traumatic brain dysfunction, it follows that patients received similar amounts of PT, OT and SLP services. Each of the three therapies was used to fulfill the three hour rule requirement, and other therapies such as RT were provided as ancillary services. If these various treatments are indeed successful at promoting functional independence then it would be safe to assume that more treatment would predict greater gains.

Even though RT is not part of the three hour therapy requirement at the study's site, physicians and administrators strongly encourage the use of RT a minimum of 30 minutes (two units) per day for most patients. Perhaps because RT practitioners maintain relative flexibility in determining who receives RT treatment and in what amounts, RT services are delivered neither as often nor as consistently as OT, PT, and SLP. There may be therapeutic merit in consistent and protocol-based approaches to providing services, and a more frequent and consistent delivery of RT services could prove beneficial.

While not a significant predictor of change in total WeeFIM scores, amount of RT was a significant predictor of change in cognition and psychosocial Wee-FIM scores. Amount of units of RT had a smaller significant negative correlation with admission total FIM scores (r = -.071) than other therapies. Although not strong evidence, it is worth noting that this finding may suggest a bias in favor of RT, namely that it appears that RT tended to work with patients who were likely to show significant gains due to their greater functional independence at admission. Results indicated that older children received more RT services, and the older children tend to make larger gains in functioning. Amount of RT units' failure to predict positive changes in total functional independence may at least partially have been due to relatively limited exposure to the participants. Additionally, any relationship between amount of RT units and functional gains may have been confounded by the relatively large number of treatment units delivered by other therapies.

Interestingly, the number of RT treatment units was significantly positively correlated with change in total and all subscales of the Wee-FIM except mobility Wee-FIM subscale scores. This could be due to RT services not addressing goals specifically targeted to improving mobility and ambulation goals with pediatric patients, and certain goals addressed by RT may not be captured by the Wee-FIM. Overall these results suggest that even though RT units were not strong enough to predict change in overall Wee-FIM functioning, there is support for RT services contributing to gains made by pediatric patients while in rehabilitation.

It is important to note that amounts of each therapy were significantly correlated with one another, with the strongest correlations between PT, OT, and RT units. This similarity among frequency of treatments should be considered when interpreting the findings of the regression models. Such co-linearity in a regression model makes it difficult to tease out the influences of the independent variables. Heinemann et al., (1995) reported similar challenges with co-linearity in their analysis of functional status and intensity of therapeutic services provided to patients with spinal cord injury and traumatic brain injury in in-patient rehabilitation. A possible explanation is possible the disciplines were so related that they were statistically influencing results beyond practical realities.

Age at Admission

By far the largest positive predictor of change in Wee-FIM scores was age at admission. This single variable was a significant predictor in each model (β ranged from .570 - .750, $p = .000$). Among the treatments included in the analysis, amount of RT units was the only therapy significantly correlated with age at admission, suggesting that the older pediatric patients received more RT treatment. Additionally, age at admission was significantly positively correlated with change in total and all sub-scales of the Wee-FIM. The older the participants at admission, the more likely they were to make larger gains in total Wee-FIM score ($r = .673$, $p = .000$) and make larger gains in mobility Wee-FIM score ($r = .620$, $p = .000$) as well as larger gains in self-care Wee-FM score ($r = .678$, $p = .000$).

This finding is consistent with expectations of progress with patients at different developmental milestones. Children at a more advanced stage of development could be

reasonably expected to be more functionally independent. Chen, Heinemann, Bode, Granger and Mallinson (2004) noted the significant impact age and impairment had on functional gains made by pediatric patients with traumatic brain injury, non-traumatic brain injury, cerebral palsy, and major multiple trauma. The authors indicated that children aged seven years or older, no matter the diagnosis, made greater gains in their functional abilities than younger children. An explanation for this finding could be the effects of rehabilitation on developmental milestones. Specifically, in a rehabilitation setting, children develop independence in less complex tasks at a younger age and develop independence in more complex tasks at an older age (Braun & Granger, 1991).

Additionally, developmental milestones could possibly explain the large impact age had on the ability to make gains in functioning while in rehabilitation with the pediatric patients. Previous research on the Wee-FIM (Uniform Data System for Medical Rehabilitation, 2005) has indicated the instrument is valid for ages six months to age seven. The instrument can be used with youth over the age of seven provided their functional abilities, as measured by the Wee-FIM instrument, are below those expected abilities of children at the age of seven who do not have disabilities (Uniform Data System for Medical Rehabilitation, 2008). The findings of the current study indicate a small amount of gains made by younger patients when compared to older patients. Despite the previous research reports indicating acceptable reliability and validity of the Wee-FIM, these findings may indicate a weakness of the instrument's sensitivity to measure subtle differences in functioning of younger patients. This conclusion has been suggested by similar pediatric studies using the Wee-FIM as measurement of change

(Garcia et al., 2002). This is a possible explanation as to age serving as such a strong and consistent predictor of change in Wee-FIM scores through all regression models.

The sample of this study had a wide range in ages, making it difficult to analyze the results as a single sample. The varying ages signify patients were at all levels of the developmental milestones spectrum. Examining the overall gains made in Wee-FIM scores by the sample as a whole limited the ability to fully understand the functional gains made by each age group.

Age at admission was also significantly negatively correlated with LOS (r = -.099, p = .046), suggesting the younger pediatric patients had longer lengths of stay. Age at admission was significantly positively correlated with total Wee-FIM scores at admission (r = .501, p = .000), suggesting the younger participants had lower admission Wee-FIM scores than older participants, which also explains why the younger patients tended to have longer LOS.

Due, at least, in part to the functional independence that children gain naturally as they pass developmental milestones, age at admission had an impact on change in functioning for pediatric patients. The younger children presented with lower admission Wee-FIM scores, thus creating longer lengths of stay while in rehab.

Length of Stay

Length of stay was a consistent negative predictor of change in Wee-FIM scores in all subscales (β ranged from -.187 to -.091). Secondary analysis further supported this finding as LOS was significantly negatively correlated with change in total Wee-FIM (r = -.124, p = .012), change in mobility Wee-FIM (r = -.197, p = .000), and change in social

Wee-FIM scores (r = -.101, p < .05). This suggests the shorter LOS an individual has, the more gains he or she made in Wee-FIM scores. This could be explained by the results indicating patients with less functional independence tended to have longer LOS, as expressed in the negative correlation between admission Wee-FIM score and LOS (r = -.450, p = .000).

Having longer lengths of stay can have potentially negative impacts, such as client and family anxiety, increased potential for skin breakdowns, re-hospitalization, fewer opportunities for community reintegration experiences (Loy, Broach, King, & Hufstetler, 2002). This finding supports the negative correlation between admission Wee-FIM and LOS, which indicates healthier patients tend to have shorter length of stay. It is possible that the sicker children had longer LOS, which in turn created additional medical complications that led to additional days in the hospital.

Level of Functioning Upon Admission

Level of functioning upon admission was a consistent negative predictor of change in functional independence between total and all subscales (β ranged from -.231 to - .142). This finding suggests that relatively high admission Wee-FIM scores were not predictive of relatively large gains in Wee-FIM scores, contrary to positive correlations reported between similar variables in several previous studies (e.g. Braun & Granger, 1991; Chen, Heinemann, Bode, Granger & Mallinson, 2004; DeNise-Annunziata & Scharf, 1998; Heinemann, 1995; Heinemann et al., 1994; Msall et al., 1994; Williams et al., 2007). Participants with less functional independence at admission may have benefitted most from treatment due to their relatively large room for improvement.

Some of the findings appear to conflict with one another. For instance, when analyzing impacts of LOS, correlation results indicated that participants with less functional independence at admission had longer LOS, and participants with shorter LOS tended to make larger gains in functional independence. These correlation findings are similar to previous pediatric research studies (Rice et al., 2005). However, regression analysis indicated lower functioning individuals tended to make greater gains in Wee-FIM scores. This could be due to the fact the lower functioning individuals has simply had relatively large room for improvement. A person who scores higher upon admission will have less room to increase his or her final Wee-FIM score, creating a ceiling effect. Previous studies have found possible ceiling effects impacting Wee-FIM scores (Braun & Fiedler, 2000; Garcia et al., 2002).

It is unknown what variables other than those included in the models influenced changes in the dependent variables, and it is not entirely clear why SLP was not a significant predictor in any of the regression models, why OT was a significant predictor of total, mobility and self-care Wee-FIM change, why PT was only a significant predictor of total and self-care Wee-FIM, and why RT was only a significant predictor of cognition and psychosocial Wee-FIM gains. A possible explanation is that different therapies focus on different outcomes and may predict changes that correlate to those foci. Another possibility is that other factors, such as neurologic, developmental, medical, familial, and social factors contribute to functional gains made while in in-patient rehabilitation (Garcia et al., 2002). Alternately, Heinemann and colleagues (1995) offered three possible explanations for their findings that may apply to the findings of the current

study: (a) effects of therapies such as PT, OT, and SLP may not become apparent until after discharge, (b) input from physicians and nursing were not included and may have been contributors to change scores, and (c) specific interventions and activities were not taken into account in the analysis.

Diagnosis

Throughout all regression models the diagnosis of pediatric patients was a negative predictor of change in Wee-FIM scores. This variable was a categorical variable where traumatic brain dysfunction was coded as zero, non-traumatic brain dysfunction was coded as one (1) and unspecified non-traumatic brain dysfunction was coded as two (2). When interpreting the negative predictor results of this variable, the regression is indicating non-traumatic brain dysfunction and unspecified non-traumatic brain dysfunction is contributing to the lack of gains made in Wee-FIM scores.

Conclusions/Implications

These results contribute to recent efficacy research (e.g., Williams, Barrett, Vercoe, Maahs-Fladung, Loy, & Skalko, 2007) using extant data to demonstrate functional outcomes of RT treatment. Data support the continued use of RT in the comprehensive rehabilitation of pediatric patients with brain dysfunctions. Even though regression analysis did not indicate RT was a significant predictor of change in total Wee-FIM score changes, the results support RT as a significant predictor of change in *cognition* and *psychosocial* subscales of the Wee-FIM. Additionally, amount of RT was significantly positively correlated with the total Wee-FIM change scores and each of the subscale change scores.

Despite limitations of regression analysis, it is noteworthy that RT was predictive of gains of two subscales of the Wee-FIM. These findings do not permit causal claims, but they provide evidence of the potential benefits of RT when compared to similar and often more highly regarded therapies. The results also reinforce the importance of an interdisciplinary approach to rehabilitation services in allowing for the combined effect of PT, OT, SLP and RT services on the overall gains in functioning for pediatric patients.

Recommendations and Limitations

It is important to note that at the study site, RT provides co-treatments with other disciplines (e.g. PT, OT, SLP); however, the other disciplines do not co-treat with one another. This presented a challenge of developing meaningful comparisons between the effects of each discipline's influence on overall functional gains (Heinemann et al., 1995) without making false conclusions about effects of rehabilitation at the study site. Additionally, other disciplines such as nursing and child life services provided to the pediatric patients while in rehabilitation are not captured in the analysis models. The amount of these services provided are unknown, thus limiting the ability to know the effects of other services on overall gains made by participants.

Despite the efforts to create a homogeneous sample by trimming the sample to include only patients with brain dysfunction and limiting participants by age, the study would have benefitted from both a larger and more homogeneous sample. Given the nature of pediatrics, the closer in age the sample is, the more similarly the results can be compared. Future studies would benefit from narrowing delimitations by age to limit confounding effects of abilities gained at different developmental milestones.

Additionally, data about severity of brain dysfunction (e.g., Ranchos Los Amigos scale) were not available in the electronic dataset and were not included in the analysis. The severity of impairment can impact a person's length of stay and ability to make functional improvements in rehabilitation (Heinemann et al., 1995). The presence of co-morbidities or significant prior medical history may have also had an effect on a patient's ability to make functional improvements. These effects remain unknown in this study.

Limiting the analysis of the effects of RT services to changes in Wee-FIM scores allow for only a narrow understanding of how RT impacts pediatric patients. By using changes in Wee-FIM as the dependent variables, other outcomes that may have occurred were not captured. RT services address a wide array of patient needs not addressed by other disciplines, and it is difficult to capture the effect any treatment on the overall health of an individual. Some of the RT goals at the study site that are not likely to be captured by the Wee-FIM include: decreased depression, increased access to peer interaction and social opportunities, increased community resource awareness, increased adaptive strategies to leisure interests, increased ability to transition from clinical treatment setting to community, and enhanced preparation for community and school re-entry training. A standardized measure of effects of RT on these goals would allow for a more complete analysis of the impact RT has on pediatric patients with brain dysfunctions.

At the study site, the same practitioners who evaluate patient progress through the use of the Wee-FIM also deliver services designed to improve Wee-FIM scores. While this scenario may appear to present an opportunity for bias in the reporting of progress, it

is the experience of the primary investigator that practitioners are free of bias and receive thorough training in the administration of the Wee-FIM. While possible, it seems unlikely that the evaluation of changes in functional abilities is biased. Additionally, researchers (Braun & Granger, 1991; Buran et al, 2004; Chen et al., 2004; DeNise-Annunziata & Scharf, 1998; McCabe & Granger, 1990) have conducted controlled studies into the psychometric properties of the Wee-FIM and have reported no such bias. Future research would benefit from additional analysis as to the external validity of the Wee-FIM.

While statistically significant changes may lead researchers to conclude that functional independence has changed, questions still remain as to thresholds of change that equate to practical positive changes in the lived experience of participants. While the current study was limited to extant data, researchers may choose to utilize structural equation modeling to examine the structure and effects of the Wee-FIM. That age of participants was such a strong predictor of change in the current study suggests that the Wee-FIM may be more valid an instrument for some children than others.

The nature of extant data entails limitations on the scope of research questions and analyses available. The researcher was not able to control for quality or completeness of the entire dataset (Garcia et al., 2002). Data were originally gathered for routine medical charting and not for the purpose of research. This makes it impossible to retrospectively gather additional data on desired research variables. Future researchers may consider working with medical facilities to design medical charting that can serve multiple purposes that include research.

Additionally, there is widespread agreement among researchers as to the need to examine effects of not only different treatments but of specific interventions. The so-called *black box* of rehabilitation research continues to be an issue (DeJong, Horn, Conroy, Nichols, & Healton, 2005; Whyte & Hart, 2003). In the interest of evidenced-based practice, future researchers could consider methods that would allow acute examination of effects of both therapy types and specific interventions (Heinemann et al., 1995).

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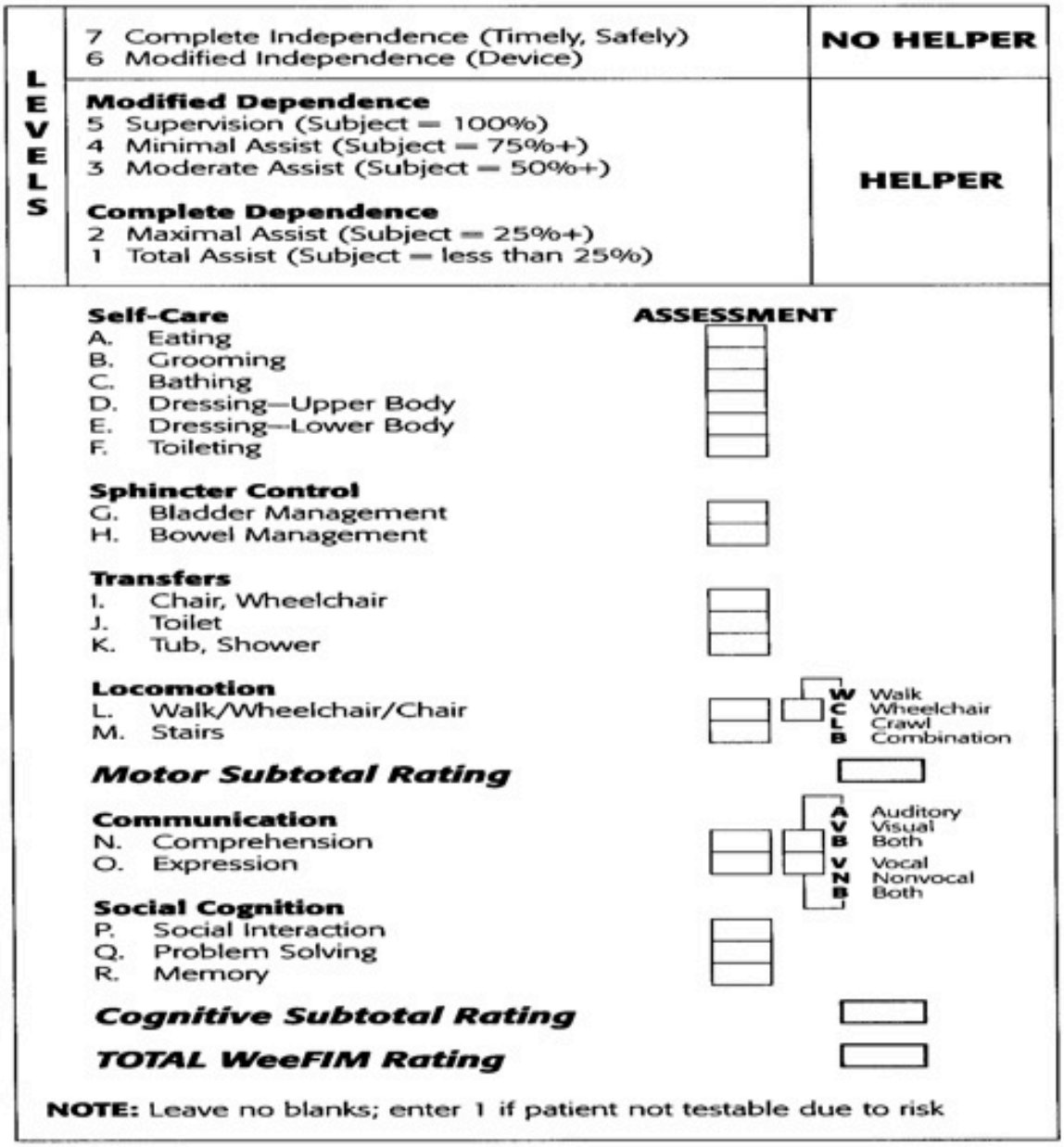
Appendix A: The Functional Independence Measure for Children (Wee-FIM)

(Braun & Granger, 1991)



LEVELS		
	7 Complete Independence (Timely, Safely) 6 Modified Independence (Device)	NO HELPER
	Modified Dependence 5 Supervision (Subject = 100%) 4 Minimal Assist (Subject = 75%+) 3 Moderate Assist (Subject = 50%+) **Complete Dependence** 2 Maximal Assist (Subject = 25%+) 1 Total Assist (Subject = less than 25%)	HELPER

	ASSESSMENT
Self-Care	
A. Eating	
B. Grooming	
C. Bathing	
D. Dressing—Upper Body	
E. Dressing—Lower Body	
F. Toileting	
Sphincter Control	
G. Bladder Management	
H. Bowel Management	
Transfers	
I. Chair, Wheelchair	
J. Toilet	
K. Tub, Shower	
Locomotion	
L. Walk/Wheelchair/Chair	W Walk, C Wheelchair, L Crawl, B Combination
M. Stairs	
Motor Subtotal Rating	
Communication	
N. Comprehension	A Auditory, V Visual, B Both
O. Expression	V Vocal, N Nonvocal, B Both
Social Cognition	
P. Social Interaction	
Q. Problem Solving	
R. Memory	
Cognitive Subtotal Rating	
TOTAL WeeFIM Rating	

NOTE: Leave no blanks; enter 1 if patient not testable due to risk