

The Impact of Intensive Community Based Rehabilitation on Community Participation and Life Satisfaction Following Severe Traumatic Brain Injury

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1. Introduction

Brain injury represents the leading cause of death and disability worldwide (International Brain Injury Association [IBIA], 2011). While a small percentage of traumatic brain injury (TBI) survivors continue in a persistent state of coma, the vast majority return to the community with some residual cognitive, psychosocial, behavioral, or physical impairment (Kersel et al., 2001). These impairments contribute to a dramatic change in the individual's life course, profound disruption of the family, enormous loss of income or earning potential and large expenses over a lifetime (McKinlay and Watkiss, 2001).

The need for effective post-acute rehabilitation for traumatic brain injuries has emerged out of both the limited effectiveness of inpatient models (Department of Health and Human Services [DHHS], 2001) and health care system changes that support reduced average length of inpatient stay (Canadian Institute for Health Information, 2008). Within a traditional inpatient model, interventions generally center around medications, surgery, and therapeutic exercises / activities. While this approach is recognized as a necessary component of TBI treatment, it has been argued that by fostering the 'patient' role, the inpatient setting has been inadequate for facilitating improvement in important life roles (Willer, et al., 1992). Roles such as parent, spouse, student, employee, and friend are considered essential to successful and satisfying performance in community settings yet are rarely specifically addressed in traditional brain injury rehabilitation models.

Determining what constitutes "successful" rehabilitation following traumatic brain injury has received considerable attention among brain injury clinicians and researchers. Many researchers view community integration as the goal of rehabilitation professionals and the rehabilitation programs (Doig, et al., 2001; McColl, et al., 1998). Successful community integration has been described as settling clients into communities where they are both happy and productive (McColl et al., 1998). Life satisfaction has also been considered an important health indicator and measure of rehabilitation outcome (Department of Health and Human Services [DHHS], 2001).

This study examined community integration and life satisfaction over a one-year period among persons with severe traumatic brain injury who are participated in a residential, interdisciplinary, community based rehabilitation program. It is an extension of the work of Wheeler, et al., (2007) who studied the effectiveness of intensive, life skills training with individuals with severe TBI. Findings from that research supported the treatment approach to improve community integration. However, no change was observed in self-reported life satisfaction at 90-day follow-up.

2. Literature review

In *Healthy People 2010*, a list of objectives designed to serve as a framework for improving the health of people in the United States, both societal participation and life satisfaction are highlighted in the discussion of health related goals for persons with disabilities in the United States (Department of Health and Human Services [DHHS], 2001). Participation is also the core construct of the World Health Organization's *International Classification of Functioning, Disability, and Health* (ICF) (World Health Organization [WHO], 2001). Within the ICF, a disability is considered to be the consequence of thwarted efforts to interact and participate in a variety of environments (Scherer, 2002).

Problems with community participation and life satisfaction are commonly reported in outcomes based research with persons with TBI. Persons with TBI have been found to be less likely to live independently, be fully employed, and participate successfully in housekeeping, parenting, or leisure activities. Additionally, TBI is often associated with profound social isolation. Several studies have shown that persons with TBI experience reductions in the size of their social networks as well as the loss of pre-injury friends (Morton & Wehman, 1995; Kersel, et al., 2001; Siebert, et al., 2002). Hoofien and colleagues (2001) reported that 30% of participants endorsed having no social contacts outside the family system 10-20 years after TBI. Other studies have supported limited social contacts post injury with accompanying feelings of loneliness (Lezak, 1988; Harrick, et al., 1994).

2.1 Community participation following TBI

Gordon, Hibbard, Brown, et al. (1999) used the Community Integration Questionnaire (CIQ) to evaluate differences in community functioning between TBI and non-disabled samples. The CIQ is a measure designed to assess reintegration into the community after TBI (Willer, et al., 1993). Findings of this study were consistent with similar studies (Corrigan & Deming, 1995; Willer, et al., 1993) in that the TBI group had a lower CIQ total score and lower scores on each of the instrument's three subscales than the non-disabled samples. Subscales of the CIQ represent the individual's degree of integration in the home, in social networks, and into productive activities. By focusing on an individual's societal participation as the end objective of rehabilitation, as opposed to more discrete deficit measurement of impairment and activities, treatment planning and programming becomes more sensitive to the interplay among intra-individual and extra-individual factors that characterize the disablement process (Verbrugge & Jette, 1994). Societal participation hence represents the defining characteristic of a life with a disability.

A commonly used indicator of successful rehabilitation and participation following TBI is return to work. Considerable variability exists in return to work rates, ranging from 20% to 66% across studies (Levin, et al., 1979; Brooks, et al., 1987; Olver, et al., 1996). Commonly

cited variables affecting study outcome include age, time since injury, and severity of injury among participants studied identified in the literature. Asikainen, et al. (1998) indicate that the critical age for successful return to work to be 45 years of age, with TBI survivors over that age less likely to return to work. While return to work rates have been found to be affected by time since injury, cross sectional work rates of 23%, 17%, and 25% over a three year period following injury suggest that the nature of this relationship is not clearly established. In a longitudinal study, Olver et al., (1996) found that only 32% of persons with TBI employed at two years post injury were still employed at five years. Analyzing a large (n=208) heterogeneous data set, Doig, et al. (2001) found poor overall community integration and return to work success for persons with severe TBI 2-5 years post-discharge from brain injury rehabilitation.

The importance of environmental consideration in the assessment and treatment of TBI continues to gain importance as clinical outcomes research recognizes the dangers in assuming that treatment gains from the protected medical setting to the more external world is fraught with risks (Varney & Menefee, 1993; Hayden et al., 2000). Barriers to successful community living and quality of life for many following TBI reflect a complex mix of chronic physical, cognitive, and social challenges together with a variety of unmet needs (Gordon et al., 1999). Barriers also include issues of access to needed services within a managed healthcare system. Gordon et al. (1999) indicate that managed care approaches limits access to services, which in turn, "threatens to restrict community integration and quality of life, while increasing the likelihood of secondary disabilities and long-term institutionalization" (p.323). Willer and Corrigan (1994) note that professional and bureaucratic barriers are created when funding sources imposes limitations to type or availability of health services. They summarize the negative impact of the current managed care system on community based rehabilitation services for TBI as follows:

If the payer refuses to reimburse for certain services that may be the most useful, but will reimburse for services that are less useful or even unnecessary, professionals and family members are forced to encourage inappropriate services. Payer requirements often dictate that services be provided in a hospital setting, thus making community based programs inaccessible (p.656).

2.2 Satisfaction with life following TBI

Significant personal and social costs often accompany traumatic brain injury, each contributing to reduced self-respect, dignity, autonomy, and participation in the community (Rowlands, 2001). Evidence from long term follow-up studies indicate that interpersonal relations, employment, and psychological well-being remain problematic long after injury to the brain, and may persist over an individual's lifetime (Thomsen, 1987). Central to the difficulties experienced by persons with TBI in resuming interpersonal relationships is personality change (Bond, 1984). The interaction of unemployment, behavior change and motor and sensory impairment combine to contribute to dissatisfying social relationships. With the passing of time following TBI, studies have found that social relationships increase in number but tend to be superficial, contributing to the common complaint of loneliness (Rowlands, 2001; Willer, et al., 1990). Opportunities to develop new relationships are limited, further reducing self-esteem and contributing to a sense of isolation and depression. New relationships take on a transient quality, lacking many of the features of durable, supportive relationships (Rowlands, 2001).

Life satisfaction is a subjective measure of quality of life according to Dijkers (1999). Flanagan (1982) recognizes the complex issues associated with defining quality of life and categorizes the concept into five groups: (a) physical and material well-being, (b) relations with other people, (c) social, community, and civic activities, (d) personal development and (e) fulfillment and recreation. Given the previously described long-term sequelae that commonly follow TBI, the impact of the condition on quality of life would seem considerable. Using items from the Bigelow Quality of Life Questionnaire (BQOL), Gordon et al. (1999) discovered differences between TBI and non-disabled subjects in the areas of psychological distress, basic need satisfaction, independence, social support, work at home, employability, and leisure time. In all instances, the direction of difference was in favor of the non-disabled group.

Research examining life satisfaction within the TBI population has received increasing attention over the past decade. Burleigh, et al. (1998) examined the relationship between community integration, as measured by the Community Integration Questionnaire (CIQ), and life satisfaction among 30 persons with TBI ranging in age from 26-60 and at least eight years post injury. Findings indicated a significant relationship between life satisfaction and social integration (a component of community integration), such as social interactions with friends and family, leisure pursuits with others, and community activities, but no such relationship between life-satisfaction and total community integration score. The CIQ total community integration score encompasses home integration (meal preparation, home management, etc.) and productivity (work, volunteering, and educational activities) in addition to social integration. Additionally, research looking at life satisfaction among persons with TBI one year after hospital discharge found a positive association between life satisfaction and employment, functional memory capacity, bowel independence, marital status, perceived responsibility for the injury, and family satisfaction (Warren, et al., 1996).

Corrigan, Smith-Knapp, and Granger (1998) evaluated a cross sectional sample of persons with TBI who were six months to five years post-discharge from acute rehabilitation. Findings indicated that functional status (as measured by items on the Functional Independence Measure [FIM]) was not correlated with life satisfaction but that time since injury was correlated with lower life satisfaction for persons one to two years post-discharge. Mood, income, age, race/ethnicity, and degree of impairment also correlated with life satisfaction. These findings are consistent with those obtained by Corrigan, Bogner, Mysiw, Clinchot, and Fugate (2001). These researchers used the Satisfaction with Life Scale (SWLS) with 218 consecutive patients admitted for rehabilitation one and/or two years after injury. Motor independence at rehabilitation discharge, not having a pre-injury history of substance abuse, absence of depressed mood, social integration, and having gainful employment at the time of follow-up were associated with higher self-reported life satisfaction. It was concluded that life satisfaction is an important aspect of a person's quality of life that seems related to one's reestablishing a healthy and productive lifestyle (Corrigan et al., 2001).

Research has shown that depression is a factor in lower life satisfaction among survivors of TBI (Corrigan et al., 2001). A longitudinal study of 324 survivors of TBI showed that persons acknowledging a diagnosis of depression at some point during the first 24 months post-injury showed lower scores on the Life Satisfaction Index at 24, 48, and 60 months post injury than persons surveyed without the depression diagnosis (Underhill et al., 2003). The prevalence of the depression among persons post TBI has been difficult to assess from the literature because of varying definitions of the condition and varying periods of post-injury

follow-up (Underhill et al., 2003). However, it appears that it occurs in somewhere between 22-50% of all TBI survivors (McCleary et al., 1998). Depression complicates the process of recovery and rehabilitation because it contributes to increased cognitive effort in information processing and by creating general apathy toward rehabilitation (Jean-Bay, 2000). As a result, treatment goals to reestablish meaningful social and occupational roles are compromised. Theories attempting to explain the nature of the relationship between TBI and depression include pre-existing depression, pre-injury personality type, social integration after injury, family support, neurochemical imbalances, and site of anatomical damage (Jean-Bay, 2000; Rosenthal, et al., 1998; Ownsworth and Oei, 1998).

A review of the research by Rice, et al. (1980) indicated that people who are satisfied with work also tend to be satisfied with other domains of life and with life as a whole. Among the 324 persons surveyed by Underhill et al. (2003), persons with TBI that were employed reported higher life satisfaction than those unemployed. Similarly, Melamed, et al. (1992) concluded that work involvement significantly contributes to subjective satisfaction with rehabilitation outcome. Positive relationships between perceived quality of life and employment with the TBI population were also found by O'Neill et al. (1998) and Webb, et al. (1995). Unfortunately, returning to meaningful work is a frequently cited problem after TBI. In a study of adults with TBI and role changes, more than 85% of the subjects reported a worker role loss (Hallett, Zasler, Maurer, & Cash, 1994). While such findings of a positive relationship between work status and life satisfaction represent the majority of outcomes in this area, Lindberg (1995) and Johansson and Bernspang (2001) found low self reported life satisfaction following TBI regardless of whether an individual working at the time of evaluation.

Several studies have reported generally low self-reported life satisfaction among persons following TBI (Johansson & Bernspang, 2001; Viitanen, et al., 1988). However, a study of 275 persons with TBI reported high self-rated quality of life (Steadman-Pare, et al., 2001). In addition, a Finnish study of quality of life in 17 persons with very severe TBI found that 70% of the participants were satisfied or rather satisfied with life as a whole 10 years after injury (Koskinen, 1998). Such discrepancies may be attributable in part to differences in severity of injury and the time post injury at which evaluations were conducted (Johansson & Bernspang, 2001).

2.3 Community based rehabilitation approaches

Community based models of TBI rehabilitation vary greatly, ranging from traditional residential programs to home based therapies occurring within an individual's natural environment. O'Hara and Harrell (1991) describe the goals and objectives of TBI rehabilitation in the community setting as seeking to address the following: improved motivation; improved self-control; understanding brain injury and its effects; skill development in problem solving ability, stress management, and socialization; and internal acceptance and redefinition of the self. Community based TBI program models are generally grounded in the philosophy that skills are most likely to generalize when taught in the environment where they are to be used, that environmental manipulations and assistive devices may be needed to function in the community, and that empowerment, self determination and self-respect are important aspects of rehabilitation (Willer & Corrigan, 1994). Many community-based models are designed to serve as a bridge between the structure of the hospital setting and independent life in the community.

Efforts to enhance services for persons with TBI have resulted in the emergence of treatment approaches attempting to address the complexity of problems that has impeded successful rehabilitation (Corrigan, 2001). It is commonly suggested that a more client centered approach is needed whereby treatment environments match information processing and executive abilities of the individual at admission and then are modified as the patient can tolerate increased distractions and decreased structure (Hayden et al., 2000). Personally meaningful settings, activities, themes, and interactions in rehabilitation have also been postulated as critical to overcoming problems of transferring clinical gains in hospital based environments to the community (Feeney, et al, 2001).

Willer and Corrigan (1994) suggest that in order to be successful, TBI rehabilitation programs must give careful consideration to the environmental barriers that an individual may face as well as any needed natural supports that may be necessary for long-term community integration. Their proposed 'Whatever it Takes' model of community based TBI rehabilitation reflects a practical approach to fostering improved community integration outcomes. The model seeks to achieve a maximal level of self-determination for persons with TBI through the development of rehabilitation programs that are based upon the following principles:

1. No two individuals with acquired brain injury are alike
2. Skills are more likely to generalize when taught in the environment where they can be used
3. Environments are easier to change than people
4. Community integration should be holistic
5. Life is a place-and-train venture
6. Natural supports last longer than professionals
7. Interventions must not do more harm than good
8. The service system presents many barriers to community integration
9. Respect for the individual is paramount
10. Needs of individuals last a lifetime; so should their resources

While emphasizing that natural community settings are the ideal setting to foster independence amid the complications commonly associated with living with TBI, the authors acknowledge the challenge of implementing such a model within the context of current healthcare and reimbursement systems that continue to emphasize acute care (Willer & Corrigan, 1994).

Successful community re-entry following TBI has rarely been quantified or measured yet is the primary objective of rehabilitation. In its 1998 *Consensus Statement*, pertaining to the rehabilitation of persons with traumatic brain injury, the National Institutes of Health (NIH) identified investigation into the effectiveness of community based rehabilitation programs as a research priority (NIH, 1998). Willer et al. (1999) point out weaknesses in existing TBI rehabilitation effectiveness research and suggest the need for studies utilizing any form of comparison group, clarity on type and descriptors of program being evaluated, and research evaluating the effectiveness of rehabilitation on both disabilities and handicap.

Willer et al. (1999) compared outcomes of individuals with severe TBI treated in a post-acute residential rehabilitation program with a matched sample of individuals receiving limited services in their homes or on an outpatient basis. Employing the Health and Activity Limitations Survey (HALS) and the Community Integration Questionnaire (CIQ), the researchers concluded that the residential based services appeared to produce greater functional improvement, whereas home-based services were more effective at maintaining

community integration. Warden et al. (2000), employing a qualitative analysis, concluded that a home based rehabilitation program, consisting of home program activities and weekly telephone calls in addition to multidisciplinary evaluation and medical treatment, "may provide effective care at a lower cost" (p.1101). Additionally, Hayden et al. (2000) reported significant gains in levels of independence for mild head injured patients participating in a "simulated" natural setting. Both studies indicated the need for further research looking at the effectiveness of home and community based models of rehabilitation following TBI. Seale et al. (2002) used the CIQ to investigate community integration for persons discharged from a post-acute rehabilitation program. Participants of the rehabilitation program resided at a facility during treatment which included an individualized plan of medical care, case management, occupational therapy, physical therapy, speech therapy, residential services, therapeutic recreation, vocational services, and neuropsychology. Two groups, one comprised of individuals admitted for treatment less than one year post-injury and another comprised of persons admitted for treatment 1-5 years post-injury, were evaluated after discharge using a phone interview. Results of the study indicated that the rehabilitation program was beneficial for both groups of individuals, although those admitted less than one year post injury demonstrated more pronounced positive change based upon CIQ scores.

After examining the relationship between community integration and life satisfaction, Burleigh et al. (1998) recommended the need for rehabilitation programs to provide long-term assistance with community-based social integration. In their study, participants receiving home based rehabilitation demonstrated improvements in the performance of home management but did not develop a greater level of social participation over the course of treatment. These authors emphasized the need to discover more effective treatment strategies to develop the social skills and improve social participation among persons with TBI.

Using a design similar to that of the current study, Prigatano et al. (1984) studied a sample of 18 patients with severe TBI ranging from 6 months to 54 months after injury and participating in a comprehensive post-acute community integration program. A control group of 17 patients never enrolled in the program were matched to the treatment sample on gender, age, education, and severity of injury. After six months in the rehabilitation program, 50% of the treatment sample was employed versus 36% of persons in the control group.

Malec, et al. (1993) reviewed outcomes from post-acute rehabilitation program for 29 individuals with mixed medical conditions, 20 of which were TBI. The researchers concluded that the program effectively met its objective of improved community integration based on the fact that 90% of participants were living independently at discharge versus 48% at admission. In addition, improvements in work status were noted, with 61% of persons completing the program being employed at discharge (including competitive employment and employment with temporary supports). However, as with the majority of outcome based TBI studies, the lack of comparison group makes it impossible to fully dissociate the effect of treatment from spontaneous recovery.

2.4 Research study overview

This study assessed the impact of an intensive, residential transitional program for persons with traumatic on both community participation and life satisfaction. It was hypothesized that the intervention program would have a positive impact on both variables.

3. Methods

3.1 Sample

Rehabilitation outcome scores were reviewed for a convenience sample of 41 consecutive admissions (meeting study inclusion criteria) to Radical Rehab Solutions (RRS), LLC, a community based, residential rehabilitation program in West Virginia and Kentucky. The program, located in West Virginia and Kentucky, utilizes both intensive life skills and group therapy to facilitate community integration. Like many post-acute brain injury treatment models, the program is grounded in the philosophy that skills are most likely to generalize when taught in the environment where they are to be used. RRS is designed to serve as a bridge between the structure of the hospital setting and independent life in the community. All participants in RRS received similar individualized life skills training, daily group therapy, and services from an interdisciplinary team of rehabilitation professionals including occupational therapy, speech therapy, and psychology. A detailed description of the program is provided in section 3.2.

Due to the retrospective data collection technique used in the study (medical record review and program evaluation data review), individuals were not aware that they would be involved in a research study at the time the intervention was provided. The scores used in the study were part of the RRS program evaluation model.

Individuals whose cognitive deficits prevented competent completion of the Satisfaction with Life Scale were not included in the study. Determination of competence was established by an RRS licensed clinical psychologist. RRS participants included in the study were those who:

- Were between the ages of 18 and 55 years;
- Were considered to have suffered a moderate to severe TBI as determined by duration of coma of one hour or longer;
- Had the ability to self-complete baseline and follow-up evaluation measures;
- Had no history of severe neurological or psychiatric illness, e.g., previous severe TBI, stroke, multiple sclerosis, or psychosis; and
- Were full time participants in RRS based on full-time, residential status.

Additionally, the researchers limited eligibility for the treatment group to those RRS participants receiving training for a minimum 10 week consecutive period.

3.2 Intervention

Radical Rehab Solutions (RRS), LLC is a provider of community-based transitional living programs for individuals with brain injury in West Virginia and Kentucky. Transitional living programs serve as a “bridge” between the brain-injured individual’s discharge from the hospital-based rehabilitation and their return to independent living in the community. The following program description is reprinted with permission based upon the information provided in the RRS policy and procedure manual and summarized in RRS print (Implement Neurorehabilitation, 2000) and online resources (www.radicalrehab.com).

The RRS transitional living program provides intensive social learning via four avenues: I) intensive one-on-one **Life Skills Training**; II) participation in a **therapeutic community/milieu**; III) daily process-oriented **cognitive re-training group**, and IV) weekly group **goal-setting sessions**.

1. **Intensive Life Skills Training**: Each program incorporates the services of a one-on-one Life Skills Trainer (LST) to maximize the client’s level of personal accountability, to

provide immediate and consistent feedback regarding the social appropriateness of the client's behavior, and to provide ongoing training in the use of compensatory cognitive strategies. The LST provides continual intervention to facilitate and enhance the client's independent living skills via verbal cuing, training in compensatory skills, structuring of daily activities, redirection, assistance with problem-solving, encouragement of targeted behaviors, and cuing for safety awareness. LST's are from varied educational and employment backgrounds but all receive a minimum of 40 hours of training in brain injury and life skills coaching prior to interacting with clients.

2. **Therapeutic Community/Milieu:** All RRS clients participate in daily group activities, including a process-oriented, cognitive re-training group, a structured day treatment program, and community outings that utilize the power of the relationships in the group to reinforce desirable behavior and extinguish undesirable behavior. These group activities provide the opportunity for interpersonal learning - for the client to learn how they are perceived by others and for the client to practice new behaviors in a supportive environment. Within the context of these group activities, clients are provided with immediate feedback from their co-clients regarding the appropriateness of their behavior. Further, clients set weekly attainable goals in the presence of the community and receive positive or negative feedback from the group when progress toward goals is reviewed each week.

One of the most important therapeutic elements of the RRS program is that, on an ongoing and frequent basis, clients are provided with social feedback - both positive and negative - from their co-clients. This feedback occurs during the daily cognitive retraining group, during weekly goal-setting sessions, during the weekday day treatment program, and on community outings. For example, if a client makes an inappropriate verbalization (e.g., sexual or rude remark, repetitive or irrelevant statement), the activity will be temporarily halted and the leader will query the group as to their response to the verbalization (e.g., "What does the rest of the group think about what <client> said?). Similarly, if a client achieves a goal or experiences a success (e.g., ambulating into class with a walker, responding to orientation questions correctly), the group will provide positive feedback (cheers, applause).

3. Clients participate in a daily, process-oriented, **Cognitive Re-Training Group** that a) provides intensive education regarding cognitive, neurobehavioral, and psychological issues related to brain injury, b) intensive training in compensatory techniques for managing cognitive and behavioral changes, and c) provides daily opportunities to utilize the power of the relationships in the group to reinforce desirable behavior and extinguish undesirable behavior. Each week the daily cognitive retraining group focuses on a different theme. Therapists from each of the treatment modalities - occupational therapy, speech therapy, physical therapy, and psychology - focus their therapy sessions on the same theme to provide repetition of the concepts associated with the weekly theme.
4. Weekly **Goal-Setting Groups** are conducted as part of the daily Cognitive Re-Training Group. Each Friday morning, all clients, LST's and therapy staff gather so that clients may set attainable goals (typically 3-5 specific objectives) for the following week and receive positive or negative feedback - depending on their success at meeting their weekly goals - from the remainder of the group when progress toward goals is reviewed. Setting weekly attainable goals provides the individual with a brain injury with the very important feedback that they are continuing to recover - thereby

increasing their self-efficacy, i.e., their belief in their ability to do what is necessary to cope with their brain injury.

3.3 Instruments

The instruments used in the study were consistent with current state of the research pertaining to TBI outcomes in regards to community integration and life satisfaction. The measures were among those being used by RRS for the purpose of program evaluation and quality assurance. The study measures are administered by RRS staff as components of neuropsychological and occupational therapy initial evaluation and follow-up. The use of patient self-evaluation was consistent with a client-centered approach that emphasizes the inherent worth of individuals and their experience of problems (Law & Mills, 1998). Subjective measures, as used in this study, also reflect the importance of evaluating the unique person who is influenced by cultural and social factors.

3.3.1 Measure of community participation

The Community Integration Questionnaire (CIQ) is a 15-item self-report inventory that was developed within the context of the WHO model of disablement to measure level of handicap of individuals with TBI after discharge from hospital (Willer, Ottenbacher, & Coad, 1994). Willer and Corrigan (1994) note that the CIQ was developed for program evaluation purposes and, although not its original intent, recommend its use for individual assessments. The measure considers community integration to be made up of three areas of community functioning: control over one's home environment, integration into a social support network, and integration into productive and meaningful daytime activities (Willer and Corrigan, 1994). The items on the CIQ produce a total score that reflect three subscales: the extent of an individual's integration within the home, in social networks, and into productive activities. The range for total CIQ score is 0-29. The larger the score, the more integrated the individual.

Evidence for the instruments validity and reliability with the TBI population is well established by the test developers and by other researchers in subsequent investigations (Sander et al., 1999). Test-retest reliability coefficients have ranged from .83 to .97, and concurrent and discriminant validity have been established (Willer, Rosenthal et al., 1993; Willer et al., 1994; Corrigan & Deming, 1995; Sander et al., 1997). A three-factor structure was confirmed by a factor analysis based upon a sample of 312 subjects (Sander et al., 1999). The three factors are represented in the instrument's three subscales: home integration, productivity, and social integration.

Subscale scores for home integration, productive activities, and social integration have demonstrated predictable relationships with measures of functional independence and severity of injury (Heinemann & Whiteneck, 1995). CIQ subscales and total score have been found to correlate with degree of impairment and disability, time since injury, and subjective quality of life (Heinemann and Whiteneck, 1995). Additionally, the available research shows that the CIQ can validly distinguish between persons with TBI and non-disabled controls (Gordon et al., 1999; Corrigan and Deming, 1995; Willer et al., 1994). Gordon et al. (1999) found that a group of 298 individuals living in the community following TBI had a lower CIQ total score (16.1 vs. 19.5) and had lower scores on each of three CIQ subscales than a non-disabled comparison group. Furthermore, in the Willer et al. (1994) study, CIQ scores distinguished between three groups of persons with TBI living in

settings differentiated by supervision/support level: independent in the community, in the community with some (natural) support, and in an institution such as a nursing home, rehabilitation facility, etc.

Contrasting findings to those noted above were found in a comparison between individuals with mild TBI and normal controls (Paniak, et al., 1999). In this study, individuals with mild TBI scored significantly lower on the productivity subscale but there were no differences between the two groups in the home and social integration subscales. Gordon et al. (1999), in comparing differences in scores among studies using the CIQ suggest that time since injury may affect scoring related to community participation, particularly in regard to participation in vocational activities. Differences in severity of injury may also play a factor in the measures sensitivity given the fact that functional outcomes for mild brain injuries tend to be more favorable than those for more severe injuries.

The CIQ represents the current standard for measuring community integration in the area of brain injury rehabilitation (McColl, et al., 2001). It represents one of the main outcome measures of the TBI Model Systems National Data Base and is the most commonly used comprehensive measure of community integration following TBI (Dijkers, 1997). While frequently used in research to quantify functional status, studies using the CIQ to measure change over time following rehabilitation are rare. Employment rates and independent living status (both included among CIQ questions) have historically served as variables for measuring the effectiveness of rehabilitation programs focusing on community integration (Prigatano et al., 1984; Johnston & Lewis, 1991; Cope, et al., 1991; Ben-Yishay, et al., 1987). Sander et al. (2001) used the CIQ as part of a longitudinal cohort study that sought to investigate maintenance of gains after discharge from a post-acute rehabilitation program. The researchers describe reliability in CIQ scores across evaluation periods based upon high correlations (greater than .60) at rehabilitation program discharge and one year and four-year post discharge follow-up periods.

In the current study, CIQ scores were obtained through structured interview by RRS rehabilitation program staff who collect CIQ scores as part of initial evaluation and follow-up. Community integration has been traditionally recognized as a difficult to measure construct. The validity and reliability data supporting the psychometric properties of the CIQ along with the instruments easy to administer format made a suitable measure of community participation for this study.

3.3.2 Measure of life satisfaction

Self reported life satisfaction was measured in this study using the Satisfaction with Life Scale (SWLS) (Diener, Emmons, Larsen & Griffin, 1985). The SWLS is a measure of general life satisfaction, a factor of the more general construct of subjective well-being. By design, items of the SWLS measure general life satisfaction as opposed to satisfaction with specific life areas for the purpose of avoiding assumptions about the importance each individual ascribes to satisfaction with particular domains of their life (Bogner, et al., 2001). The SWLS has five items with a 7-point Likert-type response format that are added to create a total score ranging from 5 to 35. Scoring criteria range from “strongly disagree” to “strongly agree” in response to five statements that include:

- In most ways my life is close to my ideal
- The conditions of my life are excellent
- I am satisfied with my life

- So far I have gotten the important things I want in life
- If I could live my life over again, I would change almost nothing

A score of 20 represents a neutral point at which the respondent is equally satisfied and dissatisfied. Most non-clinical populations obtain scores between 23 and 28 (Pavot & Diener, 1993). By design, items of the SWLS measure general life satisfaction as opposed to satisfaction with specific life areas for the purpose of avoiding assumptions about the importance each individual ascribes to satisfaction with particular domains of their life (Bogner, et al., 2001).

The validity and reliability of the SWLS are well established (Pavot, et al., 1991; Shevlin, et al., 1998; Pavot & Diener, 1993). The initial item selection for the SWLS included 48 items that all had face validity as indicators of one's appraisal of life. Construct validity of the SWLS can be drawn from a number of investigations. For instance, test-retest stability has been found to decline as time between testing increases, suggesting that the instrument is sensitive to changes that occur with life and not just a direct effect of stable personality traits (Pavot, et al., 1991). The SWLS has also been found to change in the expected directions in response to major life events, such as elderly caregivers who had a spouse diagnosed with primary degenerative dementia (Vitaliano, et al., 1991), and patients receiving psychotherapy (Pavot & Diener, 1993).

Criterion validity studies correlated the SWLS with ten other measures of subjective well being (Pavot et al., 1991). Most measures correlated at an $r = .50$ or higher for each of the two samples from the original work. Subsequent studies have found comparable or higher correlations with other populations when interviewer ratings, informant reports, or other objective measures are used (Shevlin, et al., 1998; Neto, 1993; Arrinddell, et al., 1991). The SWLS has been administered in conjunction with measures of positive and negative affective appraisal. The SWLS tends to correlate with scales measuring both constructs even though the two are unrelated. The absolute values of these correlations range from .26 to .47, indicating that the SWLS taps a dimension of subjective well-being different from either positive or negative affectivity. Also consistent with theoretical postulations about subjective well being, SWLS scores have been positively correlated with extroversion and inversely correlated with neuroticism (Diener et al., 1985; Pavot & Diener, 1993, Pavot et al., 1991). The SWLS has consistently shown good internal consistency with alpha coefficients consistently exceeding .80 (Pavot & Diener, 1993). Test-retest reliabilities have ranged from .54 for a four-year interval to .84 for a two-month interval. Additionally, Pavot and Diener (1993) reported a test-retest correlation coefficient of .89 for subjects tested after two weeks.

3.4 Data collection and data management

CIQ and SWLS scores for 41 consecutive subjects meeting study criteria were reviewed by the researcher. Information on severity of injury (duration of coma), time since injury, gender, and age was obtained through medical record review. Permission to complete the program evaluation was obtained by both Radical Rehab Solutions and the West Virginia University Institutional Review Board.

To investigate changes between baseline and follow-up periods, the Wilcoxon matched pairs test was used. This test is the nonparametric alternative to the dependent t test (Munro, 1997). The test is used to compare two groups of matched subjects designs or to compare one group when one group of subjects was evaluated in two or more conditions (Munro, 1997). Nonparametric tests were used for the analysis of both community

integration and satisfaction with life due to the fact that both CIQ and SWLS are ordinal data scales and to the fact that general assumptions necessary for the use of parametric measures (large sample size, normal sample distribution) could not be met (Berg and Latin, 2004). The significance level was set to $p = .05$. SPSS version 19.0 was used for all statistical calculations.

4. Results

Analysis of each variable at baseline, 90 day, and one year follow-up periods, along with an analysis of the relationships between variables, is detailed below.

4.1 Community participation / integration

Overall community participation is summarized in figure 1. While mean overall CIQ scores improved at each evaluation period, only scores from baseline ($x=9.78$) to 90-day follow-up ($x=13.19$) and baseline to 1 year follow-up ($x=14.57$) increased to a level of statistical significance ($p<.05$). Overall mean CIQ scores did not improve significantly after the 90-day evaluation period.

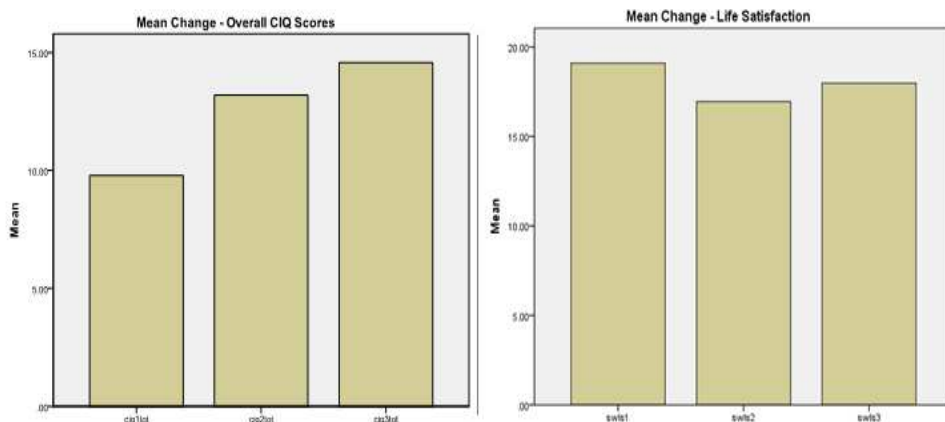


Fig. 1. Mean changes in CIQ and SWLS scores from baseline to 90 day and one year follow-up.

These findings were consistent with those from the CIQ home integration subscale and social integration subscales (see table 1). On the CIQ productivity subscales, statistically significant gains were noted at both follow-up periods. Mean baseline productivity levels increased from 1.61 to 2.80 at 90 day follow-up. At one year, productivity levels had increased to a mean of 3.90. Analysis of individual scores showed that 82.9% (34/41) of the subjects had increased their level of community integration at 90 day follow-up while two others scores indicated no change. Five subjects had a lower overall CIQ score at the first follow-up period. At one-year follow-up, 18 of the 34 subjects showing initial gains, made additional gains while three others had an equal overall score. 90% (37/41) of subjects had a higher CIQ score at one year follow-up while 4 subjects had a lower total CIQ at one year follow-up compared to baseline.

4.2 Satisfaction with life

Mean SWLS scores and standard deviations for baseline and follow-up periods are summarized in table 1 and figure 1. Mean SWLS scores showed a statistically significant decrease from initial evaluation ($x=19.09$) to 90-day follow-up (16.95). From 90 day follow-up to 1 year ($x=17.98$), scores showed a non-significant gain ($p<.05$). Analysis of individual subject responses showed that only 26.8% (11/41) of subjects reported higher life satisfaction at the 90 day follow-up period. The remainder of the subjects either indicated no change (6/41) or a decrease in life satisfaction (24/41). However, of those 30 subjects reporting no or decreased life satisfaction at 90 day follow-up, 21 indicated higher life satisfaction at one year follow-up. Of the 11 subjects reporting higher life satisfaction at 90 day follow-up, 7 indicated reduced satisfaction at one year follow-up.

	Baseline - mean (SD)	90 day follow-up - mean (SD)	1 year follow-up - mean (SD)
Total CIQ	9.75 (3.75)	13.1 (4.63) A. ($p=.000$)**	14.56 (3.58) B. ($p=.000$)** C. ($p=.078$)
Home Management - CIQ	2.68 (2.04)	4.01 (1.70) A. ($p=.000$)**	3.95 (1.40) B. ($p=.002$)** C. ($p=.770$)
Social Integration - CIQ	5.51 (2.02)	6.39 (2.20) A. ($p=.006$)**	6.73 (2.19) B. ($p=.001$)** C. ($p=.395$)
Productivity - CIQ	1.60 (1.37)	2.80 (1.87) A. ($p=.000$)**	3.90 (1.91) B. ($p=.000$)** C. ($p=.002$)**
Satisfaction with Life - SWLS	19.10 (8.84)	16.95 (6.77) A. ($p=.050$)*	18.00 (9.45) B. ($p=.545$) C. ($p=.125$)

Table I. Mean comparisons among study variables. A = baseline and 90 day reevaluation comparison; B = baseline and one year reevaluation comparison; and C = 90 day reevaluation and one year comparison.

4.3 Relationships among variables

Spearman rank order correlations were used to determine the level of association between community integration and satisfaction with life. The results indicated no such relationship at baseline and follow-up periods with the exception of total integration and social integration where, at one-year follow-up, significant correlations were found with life satisfaction. The relationships (indicated by Spearman's rho) are summarized in table 2.

5. Discussion

The current study evaluated the effectiveness of an intensive, transitional living rehabilitation program with a group of individuals following moderate to severe TBI. The program evaluation was consistent with the International Classification of Functioning, Disability and Health (ICF) (WHO, 2001) through its examination of the interface between the person following TBI and the environment. The notion of societal participation served as a primary dependent variable in the study and was measured using the Community Integration Questionnaire (CIQ), an instrument derived to measure the relative impact of an impaired body system on community integration (Kaplan, 2001). The CIQ was developed with special consideration of the challenges that individuals face during the process of recovery from TBI (Willer, et al., 1993; Dijkers, 1997). Community integration was conceptualized as participation in home, social, vocational, and community activities. In using the CIQ, this study expanded upon the current state of TBI research using this measure by evaluating post-acute rehabilitation outcomes.

The scope of the present study expanded beyond community participation to include a measure of self-reported satisfaction with life. Life satisfaction has been frequently identified as an important indicator of health and hence serves as a critical adjunct to the determination of rehabilitation program outcome (Fuhrer et al., 1992). The construct of life satisfaction was evaluated in study participants using the Satisfaction with Life Scale (SWLS) (Diener et al., 1985). Using both CIQ and SWLS simultaneously allowed separate evaluation of the impact of life skills coaching on community participation and life satisfaction as well as examination of the relationship between community participation and satisfaction with life. Such a relationship has received increased attention among researchers working with individuals with TBI and other disability populations (Heinemann & Whiteneck, 1995; Huebner, et al., 2003).

	SWLS 1	SWLS 2	SWLS 3
CIQ Total - baseline	.138	.042	.139
CIQ Total - 90 day	.100	.029	.139
CIQ Total - 1 year	.380	.303 *	.428 **
CIQ Home - baseline	.154	.079	.236
CIQ Home - 90 day	.040	-.049	.059
CIQ Home - 1 year	.257	.053	.143
CIQ Social - baseline	.079	.097	.164
CIQ Social - 90 day	.064	-.036	.220
CIQ Social - 1 year	.272	.266	.490 **
CIQ Prod. - baseline	.173	-.002	.141
CIQ Prod. - 90 day	.160	.286	-.043
CIQ Prod. - 1 year	.297	.286	.127

*Significant at $p < .05$ ** Significant at $p < .01$

Table II. Correlations among overall CIQ and subscale scores with SWLS scores.

It was hypothesized that the interdisciplinary transitional living program would improve community participation and increase self-reported life satisfaction with a group of moderately to severely brain-injured individuals. In this study, improvement in overall level

of community integration showed statistically significant improvement between baseline and ninety day follow-up. These gains were maintained at one year follow-up. The study's findings did not support the hypothesis that such an improvement results in increased self-reported life satisfaction however. Subjects reported a significant decrease in satisfaction at 90 day follow-up before returning to baseline levels of life satisfaction at one year follow-up.

5.1 Community participation

The findings from the study support the effectiveness of community-based rehabilitation in facilitating community integration in terms of home management, social participation, and productive activity. Participants of the study demonstrated significant gains across all areas measured by the Community Integration Questionnaire at 90-day follow-up. Overall, these gains were maintained at 1 year follow-up in home integration and social participation and further significantly improved from 90 day to one year for the CIQ productivity subscale which looks at paid work, volunteer work, or involvement in school. This finding was consistent with that by Willer et al. (1999) who reported a significant improvement in productivity at discharge for persons participating in a post-acute rehabilitation program over a group of matched comparisons.

The possibility that RRS interpersonal learning model can positively influence the attainment of occupational roles with this population warrants some discussion. Individuals with severe TBI have historically been considered "too disabled" (Wehman, et al., 1999, p. 327) to benefit from rehabilitation and as a result have received little support from state vocational rehabilitation programs. In a study by McCordie, et al. (1990), it was reported that of individuals with a length of coma greater than one day, only 5% of those surveyed had returned to full-time work an average of 6.7 years post-injury. Wehman et al. (1999) point out that the emergence of services for persons with severe disabilities in combination with mandates from the Rehabilitation Act Amendments of 1992 show promise in reversing these historical trends for this group of individuals. The life skills training inherent in the RRS model evaluated in this study appears well suited to the return to work process by emphasizing the functions of skill teaching, evaluating worker performance, and advocating for the worker. Each of these steps represents essential aspects of vocational rehabilitation following TBI (Wehman et al., 1999). As described by Jones et al. (1991), life coaching involves not only skill acquisition, but also the application of these skills in everyday environments. Not all studies on post-acute rehabilitation have reported statistically significant increases in productivity however. In the Goranson et al. (2003) study, in which follow-up was conducted at 6-18 months post-discharge, improvement in CIQ productivity score were described as *non-significant* when compared to a group of matched control subjects.

In the present study, home integration scores also significantly improved between baseline and follow-up periods. Home integration, as measured by the CIQ involves performance of normal household activities such as cleaning, meal preparation, and child-care. Such activities represent responsibilities of typical adult roles and are often targeted treatment areas of a TBI rehabilitation program (Huebner et al., 2003). Cognitive deficits commonly associated with TBI contribute to issues in home safety and hence become a treatment plan priority (McNeny, 1999). With market pressures to shorten the length of stay of acute hospitalizations, persons with TBI are leaving acute settings with greater severity of acute deficits.

While the CIQ measures participation in home management activities, scores do not however represent the degree of safety by which such tasks are completed (Seale et al., 2002). In the present study, subjects reporting home integration status may or may not have been performing these activities safely. No data was collected in this study to investigate the qualitative aspects related to the performance of these tasks.

In this study, the level of social integration by subjects over the ninety-day follow-up period showed statistically significance improvement. This finding contrasts with other studies that demonstrated no difference in social integration after post-acute TBI rehabilitation at one-year follow-up (Willer et al. 1999), at 6-18 month follow-up (Goranson et al. ,2003), at 90 day follow up (Wheeler, et al., 2007) ,or least one month post-discharge (Seale et al. 2002). It is possible that the extent focus of the RRS program on group work and community activities facilitated a higher degree of social participation.

As with most other rehabilitation programs, continuation in the RRS transitional living treatment program is based on a number of factors including financial resources, discharge planning, and treatment goal attainment. As a result, study participants were likely at various stages of their individualized programs – some discharged and others relatively early in their involvement in the program. Admission and discharge decisions were the sole responsibility of the program administration and hence could not be controlled or influenced by the researchers.

5.2 Satisfaction with life

Hagen (2003) describes loss of purpose and meaning in one's life as the major long-term consequence of traumatic brain injury. Additionally, social isolation is common because a number of factors including the inability to both understand and respond to another's needs, wants, thoughts, and feelings (Hagen, 2003). He concludes that profound psychosocial disability and social isolation result in decreased life satisfaction and he emphasizes the need for treatment to address this. In the present study, it was hypothesized that a program designed to improve one's skills and abilities related to home and community functioning would also result in an increase in self-reported life satisfaction. Such a relationship was not supported suggesting the need for a greater understanding of the concept of life satisfaction and the factors that influence it following TBI.

Wheeler, et al. (2007) did not find a significant increase in self-reported life satisfaction at 90-day follow-up despite increases in community integration as measured by the CIQ. In the current study, a significant decrease in life satisfaction was reported over this period followed by a return to baseline levels at one year. Such findings may lend insights into the development of self-awareness and the impact of intensive life skills training and group work. It is possible that individuals working on life skill deficits and receiving ongoing feedback within the therapeutic community became increasingly dissatisfied as they became more aware of the amount and extent of their difficulties.

There is some support for this notion in the literature. Prigatano and Schacter (1986) describe awareness, also referred to as insight, as a complex construct involving the information from both external reality and inner experience. Given that awareness of deficits, including the nature of psychosocial and physical problems, influences ones perception of their severity, the relationship between this and life satisfaction requires further exploration. Dirette (2002) explains that attaining awareness following TBI is a slow process that involves comparing performance on functional tasks in a familiar setting with

their pre-morbid functional level. If participation in treatment raises awareness of problems previously not perceived as present by the individual, it is reasonable to presume a negative impact on life satisfaction despite functional treatment gain. Struchen, et al. (2011) noted an unexpected increase in depressive symptoms at the conclusion of a three month peer mentoring program. The researchers concluded that this may have been the result of an increased self-awareness of depressive symptoms resulting from the intervention. Peer mentors in the study discussed with their client TBI related issues, such as recovery course and social, family, and vocational changes experienced after injury. While awareness was not measured in the study, the researchers found it conceivable that clients experienced increased awareness through these interactions. Anson and Ponsford (2006) found that those with poorer self-awareness showed an increase in depressive symptoms following participation in a coping skills group intervention. They also hypothesized that increased depression was related to increased awareness of injury related deficits.

In the present study, life satisfaction was viewed as a highly personal and subjective matter and hence would be prone to considerable variation among individuals. These individual differences in all likelihood contributed to the relative absence of relationships between life satisfaction and community participation. Warren et al. (1996) emphasize that rehabilitation researchers must recognize that living with a disability invariably holds different meanings for different individuals. The qualitative nature of such an experience perhaps limited the study's attempt to capture life satisfaction following TBI through quantitative methods.

The current study found a positive relationship between overall community integration and life satisfaction at one year follow-up. These findings suggest that an extended period of rehabilitation may be required to allow clients to adjust to their disability and appreciate the functional progress that they are making. If continued progress is a required for rehabilitation support, then life satisfaction appears to represent an inaccurate indicator of treatment effectiveness in the early stages. In fact, it appears that an initial decrease in life satisfaction may be a necessary component of treatment for those persons whose lack of awareness of deficits is impeding successful community participation.

The positive relationship between social integration and life satisfaction at one year follow-up, after the significant decrease in life satisfaction at 90 day follow-up, supports the notion that many individuals need an extended period of time to develop self-awareness and manage the dissatisfaction that may accompany it. Additionally, this relationship supports the impact of the RRS model on improving both of these historically treatment resistant constructs. Hagen (2003) theorized that a sense of belonging among friends, family, and community is critical to experiencing life satisfaction and that patient needs in this area are not addressed in traditional rehabilitation interventions. Burleigh, et al. (1998) indicates that over time, many persons with TBI lose their pre-injury social network and become socially isolated because they lack the skills to develop new relationships. These authors found a statistically significant correlation between life satisfaction and the social integration subscale of the CIQ with the TBI population. Having a good family life and being married are among those factors found to contribute to life satisfaction in neurological populations (Warren et al., 1996). Sokol, et al. (1999) also reported higher life satisfaction for persons that were married and who perceived that their friendships had not changed for the worse since their injury.

In this study, no relationships were found between CIQ productivity scores and life satisfaction. This contrasts with findings with numerous other studies. According to Csikzentmihaly (1997), the ability to perform an occupation that is meaningful to the

individual is of vital importance for life satisfaction. In the Wheeler, et al. study of 18 subjects, individuals with higher levels of productivity (school, work, volunteer activities, and time in community) did report significantly greater satisfaction with life. This finding was consistent with larger scale studies investigating this relationship. Heinemann and Whiteneck (1995) studied the relationship between disability, using the CIQ, and self reported life satisfaction among a sample of 758 individuals with TBI and found that both social integration and productivity were related to satisfaction with life. The positive productivity–life satisfaction relationship following TBI was also reported by Underhill et al. (2003) in a study where persons employed post-injury reported higher life satisfaction over a 36-month follow-up period as well as in other studies (Steadman-Pare et al., 2001; O'Neill et al., 1998).

In the present study, no statistically significant relationships were found between improvements in home integration activities, such as housework and cooking, and self reported life satisfaction. It has been postulated that the impact of improving home integration is not enough to enhance satisfaction with life because individuals desire additional independence in the community (Huebner et al., 2003). For some, these activities may be outside their personal interests or perceived as undesirable (Huebner, et al., 2003). In the Heinemann and Whiteneck (1995) study, home integration was the only one of the CIQ subscales not related to life satisfaction.

6. Conclusions

Findings from the study support the value of the RRS transitional living program to address various aspects of community participation and life satisfaction. The impact of the program on social integration is perhaps most noteworthy given that published research on post-acute treatment programs has demonstrated little effectiveness in social integration following TBI. Brain injury experts point to the challenges of addressing social functioning after TBI. Hagen (2003) suggests a community based treatment approach that involves training and feedback in natural environments to overcome issues such poor social awareness and resultant socially inappropriate behaviors. McNeny (1999) emphasizes social skill retraining that involves group therapy and family involvement and describes the implications of poor social skills. These include troubling families, destroying friendships, and limiting vocational opportunities. The findings of this study suggest that the combination of the therapeutic community, social learning, group therapy, and individual skill building inherent in the RRS model may be an effective approach.

There were a number of limitations in the study which impact its internal and external validity. The absence of control subjects and the use of a relatively small convenience sample limit the confidence by which findings can be generalized to the brain injury population. Additionally, while efforts were made to use sensitive and relevant measures for evaluating community integration and life satisfaction, interpretation of subject performance on the chosen tools revealed their limitations. Such was particularly the case with regards to the CIQ. Despite its popularity, the CIQ may not have had sufficient specificity to capture some aspects of the gains made by subjects. For example, questions addressed participation in areas such as home, community, leisure, work, and school but did not assess whether supervision was required during accomplishment of the tasks or activities. Also, the measure does not differentiate between sheltered and regular work environments, which should be reflected in rehabilitation program outcomes. Similarly,

questions on social integration allow performance of social activities within the treatment program to improve scores without necessarily improving performance in the community.

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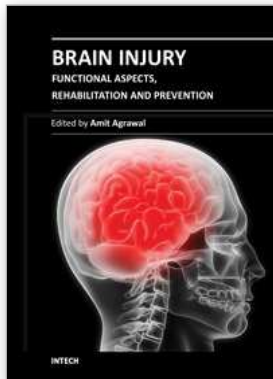
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The present two volume book "Brain Injury" is distinctive in its presentation and includes a wealth of updated information on many aspects in the field of brain injury. The Book is devoted to the pathogenesis of brain injury, concepts in cerebral blood flow and metabolism, investigative approaches and monitoring of brain injured, different protective mechanisms and recovery and management approach to these individuals, functional and endocrine aspects of brain injuries, approaches to rehabilitation of brain injured and preventive aspects of traumatic brain injuries. The collective contribution from experts in brain injury research area would be successfully conveyed to the readers and readers will find this book to be a valuable guide to further develop their understanding about brain injury.

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