Multicontextual occupational therapy intervention: A case study of traumatic brain injury

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ABSTRACT: *Cognitive deficits after a traumatic brain injury can result in significant functional limitations in all areas of daily living. An individual's ability to generalize learning may be limited, thus making it harder to live independently in the community. Assessing a client's metacognitive skills and awareness level may help to establish a baseline understanding about the supervision required and the most suitable living arrangements. This study describes a multicontextual, community reentry occupational therapy programme directed at awareness training and compensation for cognitive problems in a 34-year-old man with traumatic brain injury. Intervention consisted of metacognitive training, exploration and use of effective processing strategies, task gradations and practice of functional activities in multiple environmental contexts. Strategies such as self-prediction, self-monitoring, role reversal and the use of checklists were used. Results after six months of intervention show improvements in the client's awareness level, enhancement of his occupational function, increased satisfaction with performance and a decrease in the level of attendant care. Additional studies are recommended to validate the findings.*

Key words: cognition, rehabilitation, traumatic brain injury.

Traumatic brain injuries are a major medical and rehabilitation problem in our society. It is estimated that about 200 000 Americans sustain a traumatic brain injury (TBI) each year (personal communication, Brain Injury Association, 1998). Advances in medical care have allowed increased survival rates from this type of injury. However, the cognitive, physical, behavioural and socio-emotional consequences of TBI can significantly alter the person's occupational and life satisfaction (Oddy, 1984; Cicerone and Wood, 1987; Hallett et al., 1994). Depending on the location and extent of the injury, recovery from TBI can extend over many years. According to Jennett (1984), the most rapid and obvious recovery occurs within 12 months after the injury, and,

after that, the improvements diminish. Anderson and Tranel (1989) indicate that a large number of clients with TBI tend to underestimate or deny their cognitive deficits. This lack of awareness about their limitations is one of the major barriers that can seriously compromise an individual's ability to safely and successfully participate in daily occupations of interest. These clients may be unable to apply the necessary skills to compensate for their deficits, thus experiencing ineffective social interactions, decreased ability to fulfil former occupational roles and decreased independence in daily functions. Prigatano et al. (1984) point out that in order for rehabilitation to be successful, TBI clients need to become aware of their difficulties and be willing to master alternative methods to compensate for these deficits.

The nature of intervention for cognitive impairments has traditionally consisted of two different approaches: remedial and compensatory (Randomski, 1994). The remedial approach involves retraining clients in specific component skills related to lost cognitive functions with the goal of attempting to reverse or restore the underlying deficit. The adaptive approach, on the other hand, focuses on teaching clients effective use of residual skills to compensate for lost functions. According to Neistadt (1994), even though these two approaches are based on different assumptions, clients could learn new behaviours in response to either approach. She argues that the potential for learning and functional recovery exists in many cognitively impaired brain-injured clients.

The Multi-Context Treatment Approach to cognitive rehabilitation proposed by Toglia (1991) provides a functional framework for combining remedial and compensatory methods to address awareness deficits and occupational impairments in the population with TBI. This approach is based on the Dynamic Interactional Model of Cognition (Toglia, 1991). According to the model, the individual characteristics, cognitive processing strategies, environmental context, and the nature and complexity of the task to be completed are all considered important elements in treatment. When applying this approach in treatment, a behaviour targeted for change is identified and the client is trained to apply a particular strategy in the context of multiple tasks and environmental situations. Toglia (1991) proposes that transfer of learning can occur at different levels along a continuum. Near transfers occur when an individual is able to perform an alternative form of the same task. Intermediate transfers are those that involve performing tasks that share some features with the original task. Very far transfers are those tasks where the individual is able to apply concepts learned in treatment to everyday occupations. Familiar tasks and environments are said to facilitate the individual's ability to process information and transfer learning (Abreu and Toglia, 1987).

The investigator in this study examined the effectiveness of a multicontextual occupational therapy intervention programme emphasizing awareness training in the occupational performance of a young adult with TBI eight years after injury. The following guiding questions were examined:

1. Does the combination of awareness training strategies and task adaptations have a positive effect on occupational performance?
2. Can an individual with TBI receiving occupational therapy services with a focus on community re-entry achieve increased awareness and satisfaction with occupational performance eight years after injury?
3. If there are gains made during occupational therapy intervention, are they maintained after therapy is discontinued?

Methods

Subject

The client, Mr P, was a 34-year-old African American man who suffered a TBI as a result of a motor vehicle accident. His primary diagnosis was a closed head injury with multiple cerebral contusions. Before his injury, the client was in good physical and mental health. He completed 12 years of education and worked as a warehouseman before joining the Air Force. While in the Air Force he worked as an air transportation supervisor. The client was divorced and was living with his brother at the time of the study.

Background

According to the medical records, the client was unconscious at the scene of the accident. His Glasgow Coma Scale score was 11. His initial Rancho Los Amigos Level was III. At this level the client showed localized but inconsistent and delayed response to simple environmental stimuli. He was dependent in his activities of daily living (ADLs). He received inpatient occupational, physical and speech therapy at a local hospital for about a year. Evaluation showed multiple and severe physical and cognitive deficits such as impaired balance, fine motor coordination, memory, insight and organization. Discharge summary indicated that he required moderate physical assistance and maximal cueing for all his basic ADLs. Neuropsychological testing indicated substantial memory and executive function problems and poor insight about his functional limitations. He required constant supervision in a highly structured environment for his daily activities.

One year after his discharge Mr P was readmitted to hospital and received six months of additional therapy. He was reported to have progressed from level III to level VII of the Rancho Los Amigos scale, from requiring moderate assistance to minimal assistance for dressing and bathing. Standardized cognitive assessments indicated moderate deficits in his cognition. On the Mini Inventory of Right Brain Injury (MIRBI) he obtained a total score of 26, which is slightly below the mean. In the Wechsler Memory Scale the client again showed moderate deficits in memory and orientation. Neuropsychological examination reported the client to be in the moderately impaired range.

His planning ability, mental flexibility, problem solving, memory and insight were substantially impaired. The psychological adjustment profile obtained with the Minnesota Multiphasic Personality Inventory (MMPI-2) showed that the client was defensive and displayed limited awareness and insight. He tended to minimize the extent and severity of his symptoms, presenting them in a positive light.

On the client's discharge from hospital he continued to participate in an outpatient rehabilitation programme once a week. According to the hospital records the programme consisted of a TBI support group, a stretch and exercise group and cognitive training using computer games. However, the client continued to show adjustment difficulties such as feelings of isolation, money management difficulties, impaired awareness about his problems, unsafe behaviour at home and in the community and dependency in some ADL functions such as dressing. The client's case manager referred him to a community re-entry programme for occupational therapy evaluation and treatment.

Occupational therapy evaluation

Initial evaluation consisted of client and family interview, neuromuscular evaluation, administration of standardized tests and task performance rating. The Canadian Occupational Performance Measure (COPM) (Law et al., 1994) and the Kohlman Evaluation of Living Skills (KELS) instruments were administered (Thomson, 1992).

The COPM was used to obtain descriptive information about the client's perceived occupational performance. The COPM is a semistructured interview in which the client identifies his problems in the areas of self-care, work and leisure. This assessment instrument was designed to measure the client's perceived occupational performance and level of satisfaction with performance. A test–retest reliability study conducted by Law and Stewart (1996) found a reliability of 0.79 and 0.75 for COPM Performance and Satisfaction scores in a sample of children with various disabilities. The five most important problems identified by the client are prioritized for treatment programming (Law et al., 1994). The client in this study identified the following as major problems: in self-care – a) tying shoelaces, and b) buttoning shirt; in IADLs – a) using public transportation for visits, and b) shopping. He also expressed difficulty with cooking his meals and keeping his room organized. The client communicated dissatisfaction with his overall daily occupational performance. Figure 1 gives initial COPM scores.

The KELS is a standardized tool designed to evaluate basic living and community living skills. It combines a series of task performances and interviews. The assessment includes a total of 17 items arranged in five categories (self-care, safety and health, money management, transportation/health and finally work and leisure). This assessment tool is used to make general recommenda-

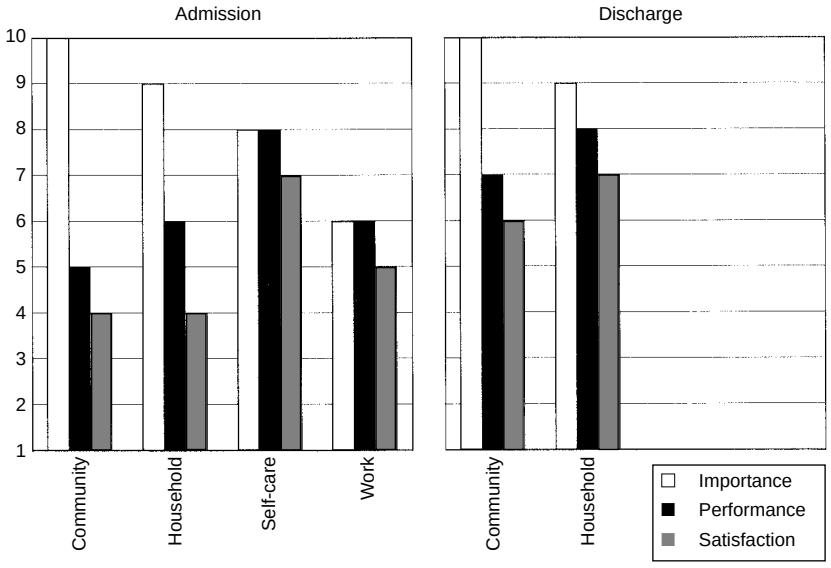

FIGURE 1: Results of the COPM ratings reported by the client at assessment and reassessment.

tions on appropriate training and living situations that will maximize safe occupational function (Thomson, 1992). In a study by Ilika and Hoffman (1981) interrater reliability correlations were reported to be significant at $p<0.001$ in a group of psychiatric clients. The KELS was used in this study to gain baseline information on the client's general occupational function and the level of assistance needed in the indicated areas. Table 1 gives KELS scores.

As part of the initial assessment, the client was asked to perform a series of daily tasks. A self-rating awareness checklist was given to the client before and after the task performance in order to measure the client's level of awareness about his deficits and his ability to monitor his performance. The client showed some level of intellectual awareness by recognizing that he had difficulties performing certain tasks such as remembering appointments with his doctors, cooking meals and dressing. However, his emergent awareness was moderate to severely impaired, as was his anticipatory awareness. Crosson et al. (1989) defined emergent awareness as the ability to recognize and correct problems as they are occurring. Anticipatory awareness is defined as the skill to foresee problems and prepare to respond accordingly. Mr P had major difficulties with planning, keeping track of required steps, and completing simple and familiar tasks. He was disorganized in his approach to daily occupational activities and had difficulty monitoring his performance.

Interviews with the family revealed concern with issues related to the client's money management skills. On several occasions he was reported to have gone on spending sprees – for example, spending money on jewellery and clothing. The family also expressed concern about his safety at home and

TABLE 1: Results of the Kohlman Evaluation of Living Skills administered at initial assessment and discharge

KELS		Initial		Discharge	
		Independent	Assistance	Independent	Assistance
Self-care	Appearance	✔		✔	
	Frequency		✔	✔	
Safety and health	Awareness of danger		✔	✔	
	Identification of appropriate action		✔	✔	
	Knowledge of emergency numbers	✔		✔	
	Knowledge of medical locations	✔		✔	
Money management	Use of money for purchases		✔	✔	
	Obtain/maintain income		✔	✔	
	Budgeting for food		✔		✔
	Budgeting monthly income		✔		✔
	Banking forms		✔	✔	
	Payment for bills	✔		✔	
Transportation and telephone	Mobility in community		✔	✔	
	Knowledge of transit system	✔		✔	
	Use of phone and book		✔		✔
Work and leisure	Plan for future employment	✔			
	Leisure involvement	✔		✔	

in the community – for example, handling tools and equipment, crossing the street and responding to emergencies or dangerous situations. The client had to be supervised on a continuous hourly basis. Institutionalization in a long-term care facility was considered to be an option, as his primary caretaker was no longer able to provide continued supervision in IADLs. Discrepancies were noted with regard to the client's self-report and the limitations reported by family members. For example, the client reported no difficulties in budgeting his monthly income or in doing home management tasks. Family members, on the other hand, said these were problem areas.

In spite of the cognitive and physical problems, the client seemed to be motivated and to have some potential for learning compensatory strategies. Initial treatment goals were established with therapist–client collaboration. The goals included independence in self-care, independence in meal preparation, independence with public transportation for short trips in the community, independence with room maintenance and ability to purchase 10–15 items.

Procedure

Occupational therapy treatment was carried out in the client's home and in the community as part of the community reintegration programme. Weekly treatment consisted of one hour of individualized occupational therapy, and eight hours of supervised life skills practice sessions with a coach. Some of the functional activities performed included self-care, cooking different meals, home maintenance chores, banking, shopping, planning vacations, setting up interviews and doctors' appointments, planning weekly schedules, leisure games and community outings. Total duration of treatment was six months. Change in functional performance was compared from admission to discharge and from discharge to eight weeks after discharge follow-up.

Training in awareness and safety was considered a priority in therapy because of the client's demonstrated awareness limitations and his lack of understanding of its implications. Awareness training was implemented according to Crosson et al.'s model (Crosson et al. 1989). This model describes awareness consisting of three interdependent levels, which are intellectual, emergent and anticipatory awareness. To facilitate increased function at succeeding levels, repetitive education, feedback, self-rating scales and prediction were some of the techniques recommended. Awareness training was formulated in conjunction with daily occupational activities. Treatment incorporated a multicontext approach (Toglia, 1991). According to this approach, the client's processing strategies as well as the nature of the tasks, the environmental context and the interplay between these factors are crucial considerations in treatment. The client was taught to apply some of the skills he already had in new and more effective ways in order to accomplish the tasks. The first 15–20 minutes of each treatment session were spent reviewing

different daily activities, problems encountered during the week, helpful strategies used, followed by planning for the day's session. Emphasis was placed on awareness and safety issues and their implications on daily life situations. This planning and discussion period was then followed by the completion of a functional task. The last 15 minutes of each session were spent discussing and analysing the client's performance of the activity. Some of the non-situational training strategies selected for implementation in treatment included self-prediction of performance (use of rating scale), self-monitoring (for example, use of internal/external cues, error detection), and the use of checklists to facilitate organization and planning. These non-situational strategies are thought to be helpful in a diversity of situations and environments.

For each treatment activity the client completed an awareness and safety checklist. He was asked to rate his predicted performance using a (1–5) rating scale before completion of the activity for the day. After completion of the activity with therapist's feedback he rated his actual performance as being either 'independent' or 'requiring assistance'. The client and the therapist analysed and discussed the discrepancies between the predicted scores and the client's actual performance. Feedback was given on planning and monitoring skills used (for example, gathering of all necessary materials to complete the task, sequencing of steps and timing), the ability to detect errors or potential problems in functional tasks (for example, recognition that an ingredient was missing from a recipe or lack of enough money to purchase a selected item), the type and number of cues needed (for example, giving the client a general verbal cue that something needed to be checked for completeness or pointing to an unsafe situation, and noting the frequency of cues necessary for safe performance), and the ability to recognize and anticipate problems regarding safety (for example, wearing gloves to retrieve a hot meal from the oven, detecting and responding to protruding telephone cord, or using slippers on a wet bathroom floor).

The client performed such activities as cooking, organizing his room, buying groceries and shopping, planning vacations and taking the local bus. These activities were graded from simple and familiar to more elaborate and demanding levels. As he started to apply the learned strategies more consistently, the task parameters were increased to foster transfer of learning. For example, he progressed from making coffee, to preparing a salad, to baking a cake, to cooking a hot meal. He practised reading maps, tracing routes, crossing streets and finally taking the bus to different destinations. He also practised organizing his room by first identifying problems and safety hazards using a checklist followed by problem-solving solutions. He organized items by categories, starting with a drawer and progressing to doing the whole room. Treatment strategies to facilitate performance were emphasized throughout sessions. Appropriate behavioural and social responses were also processed with the client. The life skills coach assisted the occupational therapist with monitoring the client's performance while he was engaged in community activities such as visits to the local mall, taking the bus and making purchases.

The following example illustrates how the multicontextual treatment was applied to specific daily occupational functions. The client and his family had agreed that money management was one of the areas requiring improvement. During treatment sessions, the client practised using coins and bills to purchase different items. Simulated purchases of one or two items were tried out at home. Initially he showed moderate difficulties determining the total amount of money to be paid and monitoring his change. Even though the client was able to identify coins, he experienced a high level of frustration and moderate difficulty in making two-digit calculations and estimating prices. He acknowledged having problems, but tended to minimize his difficulties. He stated that he wasn't really concerned about small differences because 'he was going to be OK'. He required specific verbal and visual cueing as well as task breakdown to identify errors and to master near transfers. The client's emergent awareness about his difficulties was weak, which was a major family concern. Learning strategies of using a notepad and a calculator, predicting his performance based on the difficulty of the task, and the use of self-questioning were used to increase the client's awareness of errors and to help him anticipate problems. In preparation for community outings, the client was trained to generate a list of all items he would need. For example, he listed on a notepad the estimated money needed, identification cards and bus route. He was to gather all necessary items and put them in his waist pouch. Once in the restaurant or department store, he was asked to note the items of interest and write down their prices. He was asked to calculate the total amount of money needed, including taxes and tips. The client was trained to make decisions as to whether he would be able to purchase the items. Safety issues regarding money transactions, especially in the community (for example, using the automated teller machine), were discussed and practised. Emphasis was placed on increasing the client's awareness of mistakes, his gradual use of prediction and self-questioning strategies, and the safety and consistency in initiation of compensatory strategies. As the client advanced in treatment, he was able consistently to apply the non-situational strategies such as using a notepad, a checklist, estimating/predicting performance and self-questioning in near and intermediate level situations. By the time therapy was terminated, he was able to shop for 20 grocery items, purchase bus tickets, buy meals at restaurants, and purchase clothing in a variety of familiar and unfamiliar environments. However, the application of learned strategies to budgeting was not consistent. For example, the client was able to write cheques and use banknotes for purchases but did not spontaneously initiate the monitoring of financial records.

Results

Outcome analysis was done by comparing the differences in the client's perceived performance and satisfaction from evaluation to discharge with the use of the COPM. The performance ratings in the KELS and daily occupational

functions were also compared from initial assessment to the time of discharge. In addition, the client's awareness ratings were compared over time. Finally, the family reports of the client's occupational performance, safety, changes in attendant care and supervision were compared from evaluation to discharge and follow-up intervals.

Readministration of the standardized tests after six months of treatment revealed improvements. Figure 1 shows COPM ratings reported by the client on admission and discharge. Community management skills such as transportation, shopping and finances were rated at a performance level of 5 and a satisfaction level of 4 on initial assessment. At the time of discharge these two areas showed an increase of two points. Household management (cooking, room maintenance and light home maintenance) received a score of 6 and 4 for performance and satisfaction at assessment and improved to 8 and 7 respectively at discharge. Self-care and work performance were no longer identified as problems at discharge. The client reported satisfaction with his performance in these domains. The performance and satisfaction scores in these areas were 6.1 and 5 respectively at initial assessment. These scores were calculated at 7.5 and 6.5 at discharge. The change in performance from assessment to reassessment was 1.4 points and the change in the score for satisfaction was 1.5 points.

Table 1 compares the scores on the KELS on initial assessment and discharge. By the time therapy was terminated the client achieved scores of independence in self-care, safety, health and leisure involvement. Assistance was still needed for budgeting and using the phone book. The client decided not to pursue sheltered or supported employment and instead to continue to remain active in volunteer activities such as working as an escort at the local Veterans Administration Hospital.

Figure 2 shows the client's predicted awareness rating for task performance versus his actual performance rating over time. Initially he tended to underestimate his deficits. His scores were close to 5, which indicated that he judged himself to be able to complete the activities without difficulties, which was not the case. Even though there was some evidence of intellectual awareness, the levels of emergent and anticipatory awareness were low. He acknowledged having problems in some areas but did not foresee the problems or detect them as they were occurring. As he was made aware of his problems, however, and as he acknowledged them and recognized them as they were occurring, his awareness improved. For example, the client acknowledged having difficulties calculating money transactions mentally. When he had to perform computations, he was taught to use a calculator to verify the accuracy of his calculations. He learned to prepare himself for outings where he anticipated having to perform financial transactions by bringing his notepad and his calculator, which he did spontaneously. The client's predicted task performance scores became more accurate and closer to his actual performance. He

showed transfer of learning for near and intermediate transfers. In some situations he was able to apply the learned strategies to more abstract situations such as planning a vacation trip.

Discussion during the final team conference and conclusion of treatment period revealed agreement between problem areas identified by the client and the concerns that had been expressed by the family, such as home safety and money management. At a follow-up phone interview conducted eight weeks after discharge, the client's brother reported that Mr P continued to show increased confidence and improvement in his daily occupations. He said that the client continued to perform tasks such as preparing his own meals, organizing his room, assuming household cleaning chores and making small purchases safely and independently. The family also reported that the client continued to use the compensation strategies learned, such as using a checklist, using a calculator and self-questioning. In addition, the family pointed out that the client had been very cautious and had shown good safety awareness at home and during community outings. They felt more confident about leaving him alone in the house for prolonged periods and allowing him to independently take trips in the community such as to visit his mother and friends.

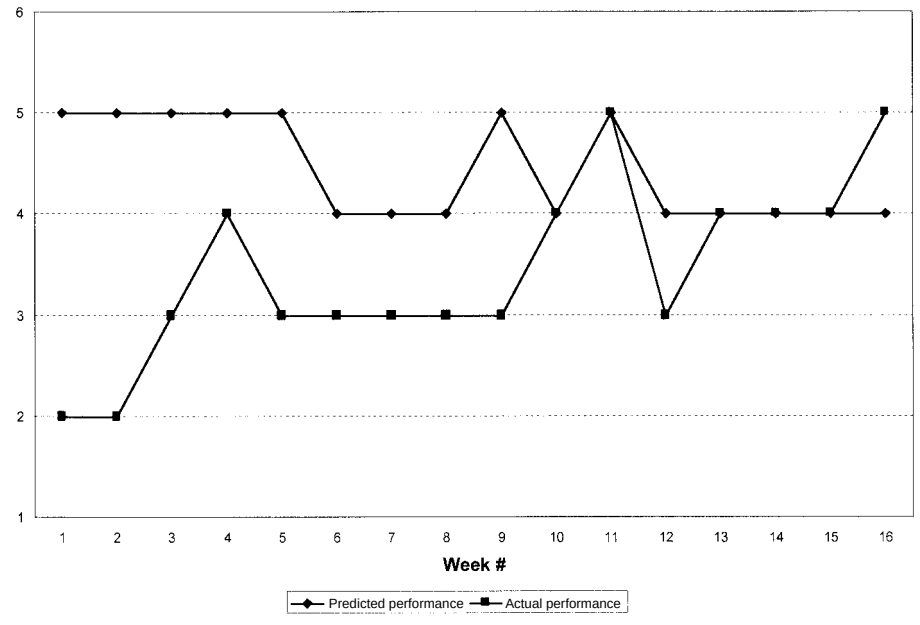

FIGURE 2: Client's predicted awareness ratings for each task performance versus actual performance ratings

Discussion

Analysis of outcome focused on three main areas that included the client's awareness level, occupational performance and satisfaction with occupational performance. The differences between initial evaluation, reassessment and follow up revealed improvements in all areas. The results show that training and education using selected processing strategies (for example, self-prediction, self-questioning, use of notepad and checklists) facilitated improved awareness and occupational function. The application of the multicontextual approach described by Toglia (1998), using both remedial and compensatory strategies, combined with the awareness facilitation strategies suggested by Crosson et al. (1989), were useful in helping the client become more aware of deficits and able to monitor and predict his performance. As a result of his improved awareness and safety, he was able to remain living with family members. He also no longer needed constant supervision from family members.

Even when initial clinical data, ratings of injury severity, and neuropsychological tests indicated severe limitations, he was able to show improvements in measures of occupational performance. He achieved improved occupational function in areas of daily living, home management and leisure activities. For example, the client achieved independence in basic self-care such as dressing and bathing. He was able to participate spontaneously in preparing breakfast and lunch. In terms of home management, he was able to keep up with the organization of his room, and do household chores such as picking up mail, taking out rubbish and house cleaning. In addition, the client was engaging in leisure and community activities such as attending church, visiting friends, taking trips to the movies and local restaurants and making small purchases such as groceries, and shopping for clothing. He showed an increased ability and confidence in meeting the demands of his environment. He successfully participated in activities in his familiar home environment as well as in novel community surroundings. Gains made in treatment were maintained, as reported by the family, eight weeks after discharge. The client showed functional improvements in occupational performance, increased satisfaction with performance and enhanced quality of life.

Literature shows that the most rapid recovery from TBI occurs in the early stages of rehabilitation, and limited spontaneous improvements occur after one year post-injury (Jennett, 1984; Neistadt, 1994). The participant in this study had been injured several years before the initiation of the community re-entry occupational therapy programme. It is therefore reasonable to assert that gains obtained reflect the effects of treatment intervention. Findings support the perspective that functional improvement is possible many years after an injury. The results support the outcomes of Nelson and Lenhart's (1996) study of improvements in daily occupations with the use of metacognitive strategies in a young woman five years after a TBI. The results obtained in this study have significance for the possible need for more aggressive early inter-

vention programmes. Also the continuous and periodic reassessment of clients who may still have the potential for further functional gains beyond the acute stages of recovery is suggested.

Since the occupational therapy treatment was provided in the client's home and his community, in a 'real-world' environment, the results suggest that this context may have been a major factor in the positive outcomes. The collaboration established between the occupational therapist and the trained life skills coach was also valuable in the achievement of results. This collaboration points to a possible, more cost-effective model of service delivery to be explored further in the future.

The major limitation of this study is that because of the uniqueness of each case of TBI and the constellation of deficits that each individual may present, results cannot be generalized. Additional research studies, prospective group and case study designs, should be carried out to evaluate the effectiveness of cognitive rehabilitation techniques implemented in the clients' natural setting.

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