NEUROPSYCHOLOGICAL REHABILITATION, 2003, *13* (4), 461–488

Group treatment of problem-solving deficits in outpatients with traumatic brain injury: A randomised outcome study

Joseph F. Rath, Dvorah Simon, Donna M. Langenbahn, Rose Lynn Sherr, and Leonard Diller

Rusk Institute of Rehabilitation Medicine, New York University School of Medicine, New York, USA

Sixty higher-level outpatients with traumatic brain injury (TBI), all at least 1 year post-injury, were randomly assigned to either conventional group neuropsychological rehabilitation or an innovative group treatment focused on the treatment of problem-solving deficits. Incorporating strategies for addressing underlying emotional self-regulation and logical thinking/reasoning deficits, the innovative treatment is unique in its attention to both motivational, attitudinal, and affective processes and problem-solving skills in persons with TBI. Participants in the innovative group improved in problem solving as assessed using a variety of measures, including (1) executive function, (2) problem-solving self-appraisal, (3) self-appraised emotional self-regulation and clear thinking, and (4) objective observer ratings of roleplayed scenarios. These improvements were maintained at follow-up. Baseline performance on timed attention tasks was related to improvement; individuals who processed the most slowly benefited the most. These participants did not show improvements on timed attention tasks, but did improve on problem-solving measures. Such findings are consistent with successful compensatory strategy use—the person may still have deficits and symptoms, but now has effective strategies for reducing their impact on daily functioning.

Correspondence should be addressed to Dr Joseph F. Rath, Rusk Institute of Rehabilitation Medicine, Department of Rehabilitation Medicine, New York University School of Medicine, 400 East 34th Street, New York, NY, 10016, USA. Email: joseph.rath@med.nyu.edu.

This research was supported by grant no. RO1-HD32943 to New York University School of Medicine from the National Institute of Child Health and Human Development (USA), Leonard Diller, Principal Investigator. Some of the data reported here were presented at the 109th annual convention of the American Psychological Association, August 2001, San Francisco. The authors thank Jason Fletcher for his contribution to this study.

http://www.tandf.co.uk/journals/pp/09602011.html DOI:10.1080/09602010343000039

INTRODUCTION

Ben-Yishay and Prigatano (1990) noted that a major goal of all neuropsychological rehabilitation should be improvement in problem solving. Problem solving has been defined as a set of goal-directed cognitive activities that arises in situations for which there is no immediately apparent or available response (Luria, 1966). In such situations, the individual must use cognitive skills to go beyond the information given to find a solution to the problem at hand (Bruner, Goodnow, & Austin, 1956). On the one hand, such a broad definition is a virtue in neuropsychological rehabilitation because it does not limit the range of activities to which problem solving applies (von Cramon & Matthes-von Cramon, 1994). On the other hand, the enormous breadth of real-life problem-solving situations defies easy assessment and treatment. The Functional Independence Measure (Guide for the Uniform Data Set, 1997), for example, focuses on solving problems in daily living with reasonable, safe, and timely decisions regarding financial, social, and personal affairs. At a complex level, problem solving might mean managing a cheque account or participating in discharge planning; whereas at a routine level, it might mean asking for assistance in dressing or eating. Thus, when considering the rehabilitation of problem-solving deficits in persons with traumatic brain injury (TBI), one must ask, "What problems does one address, and how does one assess the outcome?"

Neuropsychologists traditionally have regarded logical thinking or reasoning as the infrastructure underpinning problem solving. Thus, since the early part of the 20th century (Dunker, 1945; K. Goldstein & Scheerer, 1941; Kohler, 1947; Maier, 1930), problem-solving deficits have been assessed by tests of thinking (e.g., categorisation, flexibility, or perseveration). In a 1987 review of the problem-solving literature, F. Goldstein and Levin (1987) recognised the affinity, entitling their review, "Disorders of reasoning and problem-solving ability."

Remedial efforts began with a focus on the cognitive infrastructure of problem solving, but have evolved over the years. Luria and Tsvetkova (1964) interpreted steps in arithmetical operations as steps in logic (e.g., $2 + 4 = 6$ can be phrased as $a + b = c$). They noted that these operations can be differentially impaired in individuals with damage to different regions of the brain and illustrated specific interventions for each region. In a neuropsychological rehabilitation model based on Luria's work, Ben-Yishay, Rattok, and Lakin (1985) analysed the steps involved in problem solving in terms of problem definition, generation of solutions, evaluating solutions based on feedback of the consequences, and offering successive solutions until the demands of the problem are met. In this model, training in thinking (based on task analysis, task restructuring using saturated cuing, and practice) was offered as one of several modules designed to optimise functioning. These modules, in turn, were

embedded in a rehabilitation programme that was highly relevant to individualised personal needs.

Leftoff (1983) described a case in which neuropsychological remediation was used together with psychotherapy in a patient with left hemisphere stroke who manifested concrete thinking. The treatment involved teaching the patient to become aware of his inability to shift perspective and take into account another's point of view. Von Cramon, Matthes-von Cramon, and Mai (1991, 1992), noting that neuropsychological tests failed to capture pathological behaviours reviewed in team meetings (i.e., inertia, rigidity, lability, etc.), adopted a cognitive–behavioural approach to problem solving (see D'Zurilla & Goldfried, 1971). Addressing issues that were relevant to individual patient's deficits, this approach was effective in reducing such behaviours in inpatients with severe cognitive impairments due to acquired brain damage.

From this brief overview, it is apparent that problem-solving skills can be taught to persons with brain injury by teaching steps in thinking/reasoning, but the treatment must utilise materials that take into account individual patient deficits. Although all of the studies reviewed recognise the necessity of intent or motivation, the major demonstrations were in the sequences of steps in problem solving.

In an approach with relevance for neuropsychological rehabilitation, cognitive–behavioural psychologists (D'Zurilla & Goldfried, 1971; D'Zurilla & Nezu, 1982, 2001) have refined the construct of problem solving to emphasise factors that may disrupt intent and motivation and thereby interfere with problem-solving performance. This "social problem-solving" approach, in contrast to traditional neuropsychological approaches, explicitly addresses motivational, attitudinal, and affective aspects of real-life problem resolution (NB, the adjective "social" does not restrict problem solving to any particular domain, but instead indicates that all problem solving, whether *intra-* or *inter-*personal, occurs in the context of the everyday social environment; D'Zurilla & Maydeu-Olivares, 1995).

Social problem-solving plays a pivotal role in the way people process information about the self, the environment, and problems encountered in everyday life (D'Zurilla, 1988). These processes have been conceptualised as consisting of two separate components, *problem orientation* and *problem-solving skills*. Problem-solving skills are the cognitive–behavioural skills or goal-directed tasks that, *if successfully implemented*, would enable a person to solve a particular problem successfully. Similar to the steps proposed by clinical neuropsychologists (see Luria, 1963), the major problem-solving skills are (1) *problem definition and formulation* (identifying the conditions and constraints of problematic situations and setting realistic goals), (2) *generation of alternatives* (brainstorming a range of possible solutions), (3) *decision making* (examining potential consequences of options and selecting an optimal one, given the conditions and constraints of the problem), and (4) *solution*

implementation and verification (enacting solutions, monitoring their effectiveness, and making modifications as necessary; D'Zurilla & Goldfried, 1971; D'Zurilla & Nezu, 1982).

In contrast, *problem orientation* focuses on the person's immediate cognitive–behavioural–affective reactions when first confronted with a problematic situation. These orienting responses include a set of beliefs, assumptions, appraisals, and expectations concerning real-life problems and one's own general problem-solving ability; thus, problem orientation has been defined as the affective, attitudinal, and motivational component of problem solving (D'Zurilla & Nezu, 2001). Impaired problem orientation can lead to negative affect and avoidance, which can inhibit or disrupt implementation of the more purely cognitive problem-solving skills.

Training in problem-orientation processes is geared toward: (1) removal of impediments to effective use of problem-solving skills (e.g., cognitive distortions, misattributions, illogical thinking), (2) facilitating the individual's motivation to apply problem-solving skills to problematic situations, and (3) teaching the person to feel self-efficacious in so doing (D'Zurilla & Nezu, 2001). In a sample of persons without brain injury, Nezu and Perri (1989) demonstrated the relative superiority of a problem-solving group treatment that included problem-orientation training. Problem-orientation training combined with problem-solving skills training was preferable to problem-solving skills training alone, because participants who did not receive training in the problem-orientation process may have been inconsistent in implementing the problem-solving skills that they were taught.

Just as logical thinking or reasoning can be thought of as the infrastructure underpinning problem-solving skills (F. Goldstein & Levin, 1987), emotional self-regulation can be thought of as the infrastructure underpinning each of the problem-orientation processes (Rath et al., 2003). Although problem-orientation difficulties can interfere with the implementation of problem-solving skills even in non-injured persons with intact emotional self-regulatory resources (Nezu & Perri, 1989), persons with TBI seem especially vulnerable to such interference. Affective reactions can intrude upon and impede real-life problem solving after TBI (Tate, 1999), leading to impulsive behaviours or a state of "mental paralysis" described by one patient as, "My mind goes into a Fifth Avenue traffic jam".

Fasotti, Kovacs, Eling, and Brouwer (2000) argued that due to deficits in speed-of-information processing, individuals with TBI may experience "information overload" in daily tasks that were once relatively easy. We posit that this overload may be exacerbated by the subjective experience of information overload, distress due to awareness of impaired cognitive capacities, and emotional overreactions to the situation at hand. The combination of information overload in tandem with emotional overreaction may result in impulsive behaviour or inaction. Such impaired functioning in performing daily tasks

may lead to feelings of incompetence, low self-esteem, various symptom complaints, and mood disturbance.

From a rehabilitation perspective, "good outcome" does not mean that patients no longer have limitations, but rather, that there is awareness and acceptance of such limitations, and compensatory strategies that effectively minimise the functional impact of those limitations are utilised. After participating in neuropsychological rehabilitation, persons with TBI may continue to have deficits and symptoms, but now have strategies for coping with them and reducing their impact on everyday functioning. This approach suggests two possible avenues for intervention: (1) training in emotional self-regulation strategies, designed to encourage positive problem-orientation processes (e.g., accepting the additional time and effort needed to resolve real-life problems after TBI) at the point in which the patient's over-reaction to the experience of information overload may exacerbate the problematic situation; and (2) training in problem-solving skills per se, designed to provide a structured, systematic template for clear thinking at the point at which the patient begins to experience information overload when addressing daily tasks.

This line of reasoning suggests that functional problem solving in persons with TBI can be improved using a remedial programme that aims to reduce difficulties in emotional self-regulation, as well as to facilitate the steps used in problem solving. Thus, a group-treatment protocol incorporating these two elements was developed and delivered to outpatients with TBI. The efficacy of this treatment, which focused on the resolution of personally relevant real-life problems in higher-level outpatients, was compared with that of a conventional neuropsychological rehabilitation programme in terms of improvements on measures of problem solving and conceptually related constructs.

METHOD

Participants

Sixty individuals with TBI, all at least 1-year post-injury, were accessed for treatment, in 5 successive cohorts. A total of 27 participants (after 5 dropouts) completed the innovative treatment and 19 participants (after 9 dropouts) completed the conventional treatment.

Participants were drawn from a large outpatient neuropsychological rehabilitation programme at a major metropolitan medical centre. Selected according to current higher level of functioning, rather than severity of brain injury, participants were required to meet prescribed minimum " basic skills" criteria for inclusion in higher-level (i.e., more cognitively demanding) outpatient neuropsychological remediation groups (see Sherr & Langenbahn, 1992). These criteria, which can be assessed using a clinician rating form (Hanig et al., 1993), included the ability to sustain attention for an hour-long session, take

organised notes, give and receive feedback, state cognitive strengths and weaknesses, and relate to others with adequate social skills. Additional inclusion criteria for the present study included age between 20 and 65 years and English language skills sufficient for testing (i.e., approximately ninth-grade reading level). All participants had documented impairments in social/vocational functioning (e.g., job loss, marital discord), but potential participants whose psychological assessment records indicated psychoses, active substance abuse, other neurological conditions, or severe lateralised deficits (i.e., left visual neglect or aphasia) were ineligible for participation in the study.

The group consisted of 23 men (38%) and 37 women (62%), with a mean age of 43.6 (*SD* = 11.2; range 22–64) and a mean educational level of 15.7 years (*SD* = 2.4; range 11–20). Verbal IQ scores were available for 51 of the participants; the mean score was 105.3 (*SD* = 13.7; range 76–144).

The mean period post-injury was 48.2 months (*SD* = 58.4; range 12–330 months). Injury characteristics (i.e., severity and cause) are reported in Table 1. Although severity of brain injury ranged from mild to severe using an established classification system (Geffen, Hinton-Bayre, Geffen, & Geffen, 1998), this is clearly a well-educated, high-functioning group, with average age and gender characteristics consistent with those reported for mild brain-injury rehabilitation samples (see, e.g., Donders, Tulsky, & Zhu, 2001; Paniak et al., 2000).

It is important to note that the normal range, or better, performance on standard intelligence tests was not reflective of the real-life functional impairments reported by patients and observed by significant others and clinicians in

TABLE 1
Injury characteristics

Characteristic	*n*
Loss of consciousness (severity)[1]	
Less than 5 minutes (mild)	27
5 minutes to 6 hours (moderate)	11
6 hours to 1 week (severe)	5
1 to 4 weeks (severe)	11
4 weeks + (severe)	3
Not available in medical record	3
Cause of injury	
Traffic accident	30
Fall	10
Assault	6
Sporting accident	6
Other type of impact (falling object, etc.)	8

[1] Loss of consciousness/severity classification from Geffen et al., 1998.

this higher-level outpatient sample. All participants had documented impairments in social/vocational functioning and presented with a variety of post-concussive complaints. In addition, Rath et al. (2003) found that an overlapping sample of higher-level TBI patients (chosen using the same selection criteria used in the present study, but including individuals less than 1-year post-injury) demonstrated deficits on timed attention tasks, measures of psychosocial functioning, and problem-solving self-appraisal, as compared to healthy controls.

Measures

Treatment effects were evaluated using both conventional and innovative assessment approaches to problem solving and conceptually related constructs. These approaches included neuropsychological measures, self-report inventories, objective observer ratings, and significant-other reports selected to assess: (1) *cognitive skills* (attention, memory, and reasoning), (2) *psychosocial functioning* (community integration, symptom complaints, and self-esteem), and (3) *problem solving* (executive functions, problem-solving self-appraisal, self-appraised clear thinking and emotional self-regulation, and observer ratings of roleplayed scenarios).

Cognitive skills were assessed with three groups of neuropsychological tests:

1. Attention

Weinberg Visual Cancellation Test, Time and Error scores (Diller & Weinberg, 1993).
Stroop Color–Word Task (Trenerry, Crosson, LeBoe, & Leber, 1989).
FAS—Controlled Oral Word Association Test (FAS—COWAT; Spreen & Benton, 1977).
Will-Temperament Scale (Downey, 1923), Fast Time and Inhibition of Response (Slow time minus Normal Time) scores. Participants are timed as they write a phrase under normal conditions, as fast as they can, and then again as slowly as possible.

2. Memory

Wechsler Memory Scale—Third Edition (WMS III; Wechsler, 1997b), Logical Memory, Immediate and Delayed recall.
WMS III, Visual Reproduction, Immediate and Delayed recall.

3. Reasoning

Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980), Tests 2 + 5 composite score.
Wechsler Adult Intelligence Scale—Third Edition (WAIS-III; Wechsler, 1997a), Comprehension subtest scaled score.

Psychosocial functioning was measured using three groups of tests:

1. Community integration
Sickness Impact Profile (SIP; Bergner, Bobbitt, Carter, & Gilson, 1981), Recreation + Social Interaction composite score.
Community Integration Questionnaire (CIQ; Willer, Ottenbacher, & Coad, 1994).

2. Symptom complaints
Problem Checklist (PCL; Kay, Cavallo, Ezrachi, & Vavagiakis, 1995), Cognitive, Affective, and Physical Severity scales.
Brief Symptom Inventory (BSI; Derogatis, 1990), Depression, Anxiety, and Hostility scales.

3. Self-esteem
Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965).

Problem solving was assessed using four types of measures:

1. Executive function
Wisconsin Card Sorting Test (WCST; Heaton et al., 1993), Perseverative Response score (i.e., the most useful diagnostic measure derived from the WCST; Heaton, 1981).

2. Problem-solving self-appraisal
Problem Solving Inventory (PSI; Heppner, 1988).

The PSI assesses self-appraisal of problem-solving behaviours and attitudes; it may be best understood as a measure of problem orientation (Clum et al., 1996). The inventory consists of 32 six-point Likert-type items, generated to fit D'Zurilla and Goldfried's (1971) social problem-solving model, in which participants rate statements describing their own problem solving. The PSI has high discriminant validity with measures of intelligence and social desirability and convergent validity with behaviours and attitudes, such as locus of control, typically associated with problem solving (Heppner, 1988). Reliability estimates indicate that the PSI is internally consistent (alpha = .90) and temporally stable (r = .89) over a 2-week period. The PSI distinguishes higher-level outpatients with brain injury from healthy controls, is sensitive to improvements following neuropsychological rehabilitation (Rath et al., 2000), and correlates with level of community integration in outpatients with TBI (Rath, Hennessy, & Diller, in press).

PSI scores are calculated by adding three factors: (1) Problem-Solving Confidence (self-assurance while engaging in problem-solving), (2) Approach-Avoidance Style (general tendency to approach or avoid different types of problem-solving activities), and (3) Personal Control (a belief in one's control

over emotions and behaviour while problem solving; Heppner, 1988). Lower scores indicate more positive self-appraisal of problem-solving abilities.

3. Self-appraised clear thinking and emotional self-regulation
Problem Solving Questionnaire (PSQ; Sherr et al., 1996a),[1] Clear Thinking and Emotional Self-Regulation subscales.

The PSQ is a 34-item self-report inventory, developed and validated for the present study to make D'Zurilla and Nezu's (1982, 2001) two-factor approach (problem orientation vs. problem-solving skills) relevant for a TBI population. Designed to address both emotional self-regulation and logical thinking, typical items include asking the individual to rate the frequency of such difficulties as "Having emotional reactions that are out of proportion to situations, such as crying easily or yelling over minor problems" or "Starting to act on a possible solution to a problem without first thinking about if it will work".

Support for the construct validity of the PSQ was found in its significant moderate correlation, $r\,(129) = -.43$, $p < .001$, with the PSI (direction of correlation is negative because lower PSI scores indicate better self-appraised problem-solving abilities). The PSQ demonstrated expected independence from intelligence, $r\,(124) = -.059$, $p = .52$, and a small correlation with social desirability, $r(125) = -.27$, $p = .002$. The measure is internally consistent (alpha = .94), and temporally stable at 2 weeks for both individuals with and without TBI, $r(26) = .88$, $p = .001$; $r(26) = .97$, $p = .001$, respectively. The PSQ can be divided into Emotional Self-Regulation and Clear Thinking subscales.

4. Objective observer-ratings of roleplayed scenarios
Problem Solving Roleplay Test (PSRPT; Sherr et al., 1996b).[2] The PSRPT, an object observer-rating measure developed and validated for the present study, assesses an individual's responses when confronted with a face-to-face interpersonal problem. Five brief scenarios represent the domains of family life, work/school, and friendship, previously identified as important components of everyday life for persons with TBI (Willer et al., 1993). In each scenario, key information, crucial to resolving the problem, must be elicited from a trained interviewer. For example, in one scenario, participants are presented with the following information:

> We'd like you to imagine that Jennifer (i.e., a trained interviewer) is your boss, and she has just told you that you must attend an important business dinner tomorrow evening. You know that this dinner meeting is with a very important client.
>
> However, you promised your child that you would attend parents' night at school that same night. You've missed parents' night the last six times, and your spouse is out of town. So, your child is *really* counting on you to go this time.

---

[1] Readers interested in using this measure may contact the authors for further information.
[2] Readers interested in using this measure may contact the authors for further information.

> You told Jennifer that you already have plans to attend the school function, but she continues to insist that you go to the business dinner. What do you say to Jennifer?

The PSRPT taps real-world problem-solving behaviours such as gathering information, defining goals, generating alternative solutions, and utilising feedback. In the example above, participants must define their goals (e.g., accommodate child's needs, but not jeopardise job) and gather relevant information (e.g., time and location of business dinner). The test resembles a naturalistic situation because it is interactive, with the interviewer providing standardised cues and feedback. The interaction is videotaped and later scored by an independent rater. The PSRPT has high inter-rater reliability, $r(25) = .97$, $p < .001$, and temporal stability at a 16-week interval, $r(25) = .92$, $p < .001$. Support for the construct validity of the PSRPT was found in its significant correlation with psychologists' global ratings of TBI patients' functional problem-solving ability, $r(10) = .79$, $p < .01$ (Sherr et al., 1998).

In addition, significant-other reports were obtained using the SIP, CIQ, PCL, PSQ, and PSI.

Procedure

Over 5 successive cohorts, participants were randomly assigned to 24 sessions of either innovative ($n = 32$) or conventional treatment ($n = 28$). Each group ranged in size from 5 to 8 members. Assessments were conducted at pre-treatment, post-treatment, and 6-month follow-up.

The intensity and format of the innovative and conventional treatments were designed to be as equivalent as possible. Innovative treatment groups met for one 2-hour session per week; conventional groups met for 2–3 hours per week, including separate cognitive remediation and psychosocial components. In both innovative and conventional treatment conditions, a structured agenda was used, with sections for announcements, review of the previous session, and the session's goal and exercise. Group members were expected to take notes and recall important points from session to session, using their notes to deliver a review of the prior week's session. All of the treatment groups were conducted by two group leaders, all doctoral-level psychologists.

In the conventional treatment condition, at least one leader per group had a minimum of 5 years' experience conducting cognitive remediation groups. Weekly staff meetings allowed for peer supervision and review of adherence to treatment goals and materials. Individual patient management issues were handled as they arose, in weekly staff meetings or in group leaders' meetings with individual supervisors.

In the innovative treatment condition, new group leaders were paired with experienced group leaders and trained in the protocol prior to co-leading a group. In the initial weeks, the experienced group leader took the lead in conducting the group, with the new group leader gradually taking a more active

role. Selected treatment sessions were videotaped and reviewed to assure consistent delivery of treatment over time and across different treaters. Group leaders met weekly to provide peer supervision and check adherence to the protocol. Issues of patient management were reviewed in these supervisory sessions.

Participants in the innovative treatment condition received weekly 1-hour "consolidation sessions" for review of materials and notes from each group meeting; consolidation sessions were conducted with 1–3 participants at a time. Similarly, participants in the conventional treatment condition received 1–2 hours of individual cognitive remediation per week.

Innovative group

The 24-session innovative treatment programme was divided into two 12-session components, focused upon "emotional self-regulation" and "clear thinking", respectively. We conceptualise logical thinking or reasoning as the infrastructure underpinning problem-solving skills (see also F. Goldstein & Levin, 1987), and emotional self-regulation as underpinning problem-orientation processes. Specially designed worksheets (described below) were used to direct the learning process through stages paralleling that of an "Antecedent–Behaviour–Consequences" analysis (Wolpe, 1990). Standard group therapy approaches (Yalom, 1995) were modified to address the special needs of persons with TBI. For example, structuring techniques (e.g., instructions, cues, modelling, and other explicit information) were used to guide group members so that they could participate successfully in group interactions and generalise the benefits gained to their daily lives. Specifically, each session followed a prepared agenda and consisted of a review of the previous session, didactic material, discussion, roleplay, and assignment of homework exercises.

In both the problem-orientation and problem-solving skills components of treatment, after reporting a real-life interpersonal problem, group members were prompted to observe their somatic, behavioural, cognitive, and emotional reactions; to report and analyse precursors to the problematic situation; to evaluate their overall satisfaction with the outcome; and finally, to develop a revised plan of action via a structured reframing process. Roleplay and verbal mediation were key elements in both problem-orientation and problem-solving skills reframing.

To facilitate maximal therapeutic gain for each patient, as well as to encourage attendance and participation, group leaders ensured that the treatment was relevant to specific life circumstances of each individual. For example, during each session, application of a given aspect of the treatment was highlighted for one or two group members. At the next session, a different subset of one or two group members was spotlighted, ensuring that specific individual problems, not just hypothetical examples, were addressed.

The overall intent of both the problem-orientation and problem-solving skills components was to convey the general principle that emotional self-regulation and problem resolution are best achieved by assessing conditions and options in a highly structured, systematic manner. This principle was conveyed directly, as well as through the use of specially designed materials and repeated cuing to slow down. Teaching group members to "slow down" was not intended to encourage persons with TBI to be slower in their mental processing. Rather, the intention was for group members to, first, accept the increased time commitment needed for daily tasks after TBI (emotional self-regulation/problem-orientation processes), and then, to use a structured, systematic template when addressing daily problems (clear thinking/problem-solving skills).

Problem-orientation component of innovative group. The twelve 2-hour sessions of the problem-orientation component of the innovative treatment were divided into four three-session modules, described below. Overall, the focus was on removing impediments to effective use of problem-solving skills (i.e., cognitive distortions, misattributions, illogical thinking), facilitating the individual's motivation to apply problem-solving skills to problematic situations, and teaching the person to feel self-efficacious in so doing (D'Zurilla & Nezu, 2001). Cognitive–behavioural techniques (see Beck, 1976) were adapted to meet the special needs of individuals with TBI. Typically, adaptations included the use of written materials, repetition, and concrete examples. For example, group members were taught to correct "negative self-talk" by using individualised written lists of positive statements designed to counteract illogical, irrational, maladaptive, or incorrect beliefs that can disrupt rational thought processes (e.g., "If I can't do something as quickly as I did it before my brain injury, I can't do it at all").

The problem-orientation treatment included teaching group members to recognise and label problems accurately. To facilitate this process, group leaders used specially designed worksheets (introduced and explained in Module 1) to sensitise group members to the "signals and alarms" which suggest that a real-life problem exists (e.g., other people are not behaving as expected or there is a conflict between goals). Essentially, group members were taught to recognise real-life problems when they occur (Module 2). Accurately labelling situations as problems allowed group members to confront such situations rather than ignoring, denying, or avoiding them. Individualised written lists of "brain-injury/personal style pitfalls" (i.e., a person's characteristic maladaptive ways of responding, exacerbated by brain injury) were developed in Module 3 to help group members become aware of the interaction of their usual behaviours with specific problematic internal (e.g., hunger, fatigue, illness) or external (e.g., places, situations, or people) "contexts" that add to the

intensity of the problem. Individualised lists of these problematic contexts were developed and expounded upon in Module 4.

Consistent with our conceptualisation of emotional self-regulation as the infrastructure underpinning problem-orientation processes, a focus on emotional self-regulation was the key factor in the problem-orientation component of the innovative treatment. In contrast, typical problem-solving interventions designed for individuals without brain injury (e.g., Nezu et al., 1998; Nezu, Nezu, & Perri, 1989) assume that most people already have a variety of resources available to them for managing emotional reactions. However, persons with TBI have greater difficulty modulating emotional response and expression (Tate, 1999), and once emotional overreactions occur, they tend to overwhelm cognitive processes and lead to inaction or, conversely, impulsive decisions/actions (Simon, 2001). In addition, TBI survivors often require repeated roleplay and behavioural practice to establish habits of slowing down, calming the emotional reaction, and extending attention past the immediate triggering event. Therefore, as opposed to the typically recommended 1 week of a 10-week training programme spent on problem orientation, training in emotional self-regulation and other aspects of problem orientation was a primary concern, comprising half of the 24-session treatment protocol.

Emphasis was placed on teaching group members to inhibit the tendency to respond impulsively with their initial emotional reactions. To this end, group members were helped to identify the specific ways that they experience emotions in general. This process included teaching group members to observe physiological arousal and somatic changes, such as flushing, muscle tension, or change in heart rate. Group members then learned to manage successively more demanding situations through a structured reframing process that involved the use of "emotional self-regulation strategies". These individualised strategies were generated within the group process, using solution-focused interviewing techniques (DeShazer et al., 1986), and practised within roleplays.

Attention was paid to identifying self-defeating internal dialogue ("self-talk"; Meichenbaum & Cameron, 1974) and learning to substitute positive internal statements, in order to enhance patients' confidence and comfort in approaching real-life problems. This treatment objective addressed both premorbid styles of negative self-appraisal, as well as the loss of self-confidence that may have resulted from loss of mastery over daily tasks that were once simple.

The emotional self-regulation process was concretised in a worksheet used to analyse real-life problematic situations reported by group members. The aim of the Self-Regulation Worksheet (see Appendix A) was to convey the idea that emotional overreactions can be broken down and analysed (i.e., they do not exist in a vacuum, but rather have identifiable precursors and can be modified in a systematic way). To avoid overwhelming group members by presenting too much material at once, the worksheet was introduced in sections. As group

members demonstrated assimilation of material, additional sections were added until the entire worksheet was in use.

In the Observe Reactions section of the worksheet, group members identified the actions/behaviours, feelings/emotions, and thoughts/assumptions that occurred as part of their initial reaction to a problematic situation. Group members then identified the positive and negative consequences of their initial reactions and rated their emotional self-regulation on a scale from 1 to 10.

In the Analyse Precursors section (a "rewind" of the situation), group members took a step backward to review the context of the problematic situation, as well as the warning signs which indicated that an emotional overreaction was beginning. Context/Pitfalls includes the triggering event (i.e., "last straw"), as well as internal and external contexts, and brain injury/personal style pitfalls. Warning Signs consists of the earliest physical, behavioural, cognitive, and emotional signs which suggest that a loss of emotional control is imminent, as well as the signals/alarms that indicate the existence of a problem.

The Reframe/Plan section of the worksheet was used to examine any self-regulation strategies that were even partially effective for maintaining emotional control and to propose new strategies for coping with future problematic situations (plan for improvement).

Problem-solving skills component of innovative group. As in the problem-orientation component of treatment, the twelve 2-hour sessions of the problem-solving skills component were divided into four 3-session modules, described below. Throughout the course of treatment, group members maintained the use of emotional self-regulation strategies acquired in the problem-orientation component of the group, while learning a systematic, step-by-step model of cognitive–behavioural problem-solving skills.

In Module 5, group members used self-regulation strategies, learned earlier in the problem-orientation component of treatment, to stop the emotional overreactions that impede real-life problem solving. The next task was to "think through" a systematic sequence of problem-solving steps; thus, group members were taught to use an image of a stop sign as a cue to "stop and think" (cf. Nezu et al., 1998). Consistent with our conceptualisation of logical thinking or reasoning as the infrastructure underpinning problem-solving skills, group members were taught to compensate for TBI-related deficits by asking "clear-thinking questions" implicit in normal processes of reasoning, in order to "think their way through" each step of the problem-solving skills model.

When "defining the problem" (Module 6), group members were taught to be systematic and structured in their approach (i.e., to gather information, state the problem in clear terms, and to separate facts from assumptions using clear-thinking questions). This step is analogous to the "problem definition and formulation" step of conventional problem-solving models. However, to meet the special needs of individuals with TBI, group members learned to delineate

the specific goals and sub-goals they wanted to achieve in a separate step of "refining goals." The overall aim of Module 7 was to teach group members to use clear thinking questions to produce, evaluate, and examine the potential utility of as many alternative solutions as possible. When "generating options", group members were taught to state possible solutions in clear and unambiguous terms. This step is consistent with the "generation of alternatives" step in conventional models. Comparable to the "decision making" step of conventional models, group members learned to choose among the possible solutions in the "evaluation" step. To accomplish this goal, group members used clear-thinking questions to identify potential consequences, pro and con, of each solution. In the last step, "follow-up", analogous to D'Zurilla and Nezu's (1982) "solution implementation and verification" step, group members were taught to judge the efficacy of their solution by asking if the actual outcome matched the anticipated consequences. If the match was unsatisfactory, the group member was taught to recycle through the problem-solving skills steps. In Module 8, the use of emotional self-regulation strategies and problem-solving skills was reinforced through repeated roleplay and behavioural practice of successively more demanding real-life examples.

The clear-thinking process was concretised in a worksheet that paralleled the self-regulation worksheet. The purpose of the Clear Thinking Worksheet (see Appendix B) was to guide group members through a systematic process for analysing real-life problems, after using previously learned self-regulation strategies to maintain emotional control.

In the Observe Reactions section of the worksheet, group members were required to identify their initial definition of the problem, goals, and options (i.e., their initial reaction to the problematic situation). Group members then weighed the positive and negative consequences of taking their initial option.

The Analyse Precursors section contained a brief synopsis of the self-regulation worksheet. In this section, group members reviewed the warning signs that led them to the realisation that an emotional overreaction was beginning and the self-regulation strategies that they used to stop a loss of emotional control.

The Reframe/Plan section involved a step-by-step process that encouraged a re-examination of the group member's initial reaction to the problem. Here, group members were taught to use a list of clear thinking questions (designed to compensate for deficits in reasoning skills) to make revisions to their initial problem definition, goals, and options. For example, after a group member initially articulated his problem as "My spouse refuses to let me go out and enjoy myself", a series of questions was used to generate alternative ways of defining the problem (e.g., "Is there another way to define the problem? What do I know about the other person and our relationship?"). This led to a redefinition of the problem as, "I tend to overdo things when I go out, so I need to find a way to go out and enjoy myself in a way that will not upset my spouse". Finally,

group members used additional clear thinking questions to evaluate and follow-up on potential alternative solutions.

Conventional group

The conventional treatment included twenty-four 1-hour sessions each of cognitive remediation and psychosocial groups.

Cognitive remediation component of conventional group. The 24 group sessions of the conventional cognitive remediation component (for a detailed description, see Sherr & Langenbahn, 1992) focused on high-level applications of the five basic skills: awareness of strengths and deficits, attention, note-taking, giving and getting feedback, and social skills. Group exercises included paper and pencil exercises such as visual and verbal puzzles, reading and writing tasks, topic discussion arguing pro and con, and planning a co-ordinated group activity such as creating a patient information bulletin board.

Psychosocial component of conventional group. Following the same structured format as the cognitive remediation component, the content of the 24-session psychosocial component was devoted to psychological and social issues (for a detailed description, see Langenbahn, Sherr, Simon, & Hanig, 1999). Aspects of coping with emotional reactions and changes post-injury were addressed by discussion and feedback from group members and leaders. Formal exercises, utilizing worksheets or roleplays, were used occasionally, but were not a routine part of the group structure.

Statistical analysis

To provide analyses with sufficient power to detect meaningful treatment gains, group-level improvements were assessed using one-tailed paired-sample *t* tests. Within each domain (i.e., cognitive skills, psychosocial functioning, and problem solving), critical alpha levels were adjusted using Bonferroni corrections to set familywise error rates (alpha = .05) for variable clusters (e.g., attention, memory, reasoning, etc.). To aid in the interpretation of the results, Cohen's *d* (the effect size index for repeated measures; Cohen, 1988) was calculated using pooled standard deviations (Dunlop, Cortina, Vaslow, & Burke, 1996). According to Cohen, effect-size conventions for *d* are: small = .30, medium = .50, large = .80.

RESULTS

As can be seen in Table 2, the innovative group showed significant improvement in problem solving as tapped by an executive function measure (WCST, Perseverative Response score), problem-solving self-appraisal (PSI),

TABLE 2
Significant improvements and effect sizes (ES):
Innovative and conventional groups

	Treatment group	
Construct	*Innovative*	*Conventional*
Cognitive skills measures (ES)		
Attention	–	–
Memory	Logical Memory, Immediate (.42) Delayed (.39) Visual Memory, Immediate (.64) Delayed (.45)	Logical Memory, Immediate (.69) Delayed (.41) Visual Memory, Delayed (.40)
Reasoning		Watson-Glaser Critical Thinking (.38)
Psychosocial functioning measures (ES)		
Community integration	–	–
Symptom complaints		PCL, Physical Severity (.34)
Self-esteem	RSES (.22)	
Problem solving measures (ES)		
Executive function	WCST (.35)	
Self-appraised clear thinking	PSI (.69) PSQ, Clear Thinking scale (.58)	
Self-appraised emotional self-regulation	PSQ, Self-Regulation scale (.44)	
Observer rating	PSRPT (.62)	
Significant-other report measures (ES)		
Community integration	–	–
Symptom complaints		PCL, Cognitive Severity (.24) PCL, Physical Severity (.52)
Emotional self-regulation		PSQ, Self-Regulation (.37)
Clear thinking	–	–

Watson-Glaser Critical Thinking = Test 2 + 5 composite score; PCL = Problem Checklist; RSES = Rosenberg Self-Esteem Scale; WCST = Wisconsin Card Sorting Test, Perseverative Responses score; PSI = Problem Solving Inventory; PSQ = Problem Solving Questionnaire; PSRPT = Problem Solving Roleplay Test. Effect size (ES) conventions for *d* are: small = .30, medium = .50, large = .80 (Cohen, 1988).

self-appraised clear thinking (PSQ, Clear Thinking subscale) and emotional self-regulation (PSQ, Self-Regulation subscale), and objective observer ratings of roleplayed scenarios (PSRPT). The innovative group also showed significant improvement on Visual Memory, immediate recall (WMS-III) and self-esteem (RSES).

In contrast, the conventional group improved on a test of reasoning (Watson-Glaser Critical Thinking Test, composite score) and endorsed less severe somatic symptoms (PCL Physical Severity subscale). Their significant others observed fewer cognitive and somatic symptoms (PCL subscales) and improved emotional self-regulation (PSQ, Self-Regulation subscale). Improvements approached significance for the conventional group for self-esteem (RSES) and a measure of executive function (WCST, Perseverative Response score).

Both groups improved in delayed Visual Memory (WMS-III), and immediate and delayed Logical Memory (WMS-III). These results are reviewed in detail below:

Cognitive skills

Memory. The innovative group showed significant improvement on Visual Memory immediate recall, $t(26) = -3.93$, $p < .001$. Both the innovative and conventional groups showed significant improvements on Logical Memory, immediate recall, $t(26) = -2.74$, $p = .01$, $t(18) = -3.91$, $p = .001$; Logical Memory, delayed recall, $t(26) = -2.48$, $p = .01$, $t(18) = -2.73$, $p = .01$; and Visual Memory delayed recall, $t(26) = -2.48$, $p = .01$, $t(18) = -2.67$, $p = .01$.

Reasoning. Using a composite score composed of Tests 2 + 5, the conventional group improved on the Watson-Glaser Critical Thinking Test, $t(16) = -2.26$, $p < .05$.

Psychosocial functioning

Symptom complaints. On the PCL, the conventional group endorsed significantly less severe somatic symptoms after treatment, $t(17) = 3.08$, $p < .005$.

Self-esteem. On the RSES, the innovative group reported increased self-esteem after treatment, $t(25) = 1.99$, $p < .05$. Improvement approached significance in the conventional group, $t(16) = 1.46$, $p < .08$.

Problem solving

Executive function. On the WCST, the innovative group made fewer perseverative responses following treatment, $t(24) = -2.16$, $p < .05$.

Problem-solving self-appraisal. The innovative group showed significant treatment gains in PSI total scores, $t(25) = 3.33$, $p = .005$.

Self-appraised clear thinking and emotional self-regulation. Following treatment, the innovative group showed significant treatment gains in PSQ, Clear Thinking and Self-Regulation subscores, $t(26) = –2.74, p = .01$, $t(26) = –2.65$, $p < .01$, respectively.

Observer ratings of roleplayed scenarios. On the PSRPT, an objective observer rating of interpersonal problem-solving scenarios, participants in the innovative group improved significantly following treatment, $t\ (24) = –2.96$, $p < .005$.

Significant-other ratings

Symptom complaints. Using the PCL, significant others rated participants in the conventional group as having significantly less severe cognitive and somatic symptoms after treatment, $t(14) = 2.38, p < .05$; $t(14) = 2.51, p < .05$, respectively.

Emotional self-regulation. Using the PSQ, Self-Regulation subscale, significant others rated participants in the conventional group as having significant improvements in emotional self-regulation skills after treatment, $t(11) = –2.65, p < .01$.

Maintenance of improvement

Using the same test battery as above, follow-up data were obtained for 31 participants (67% of those who completed treatment), 18 from the innovative group and 13 from the conventional group. No significant decrements in treatment gains were found when comparing post-test (T2) and 6-month follow-up (T3) means using paired-samples *t* tests. Because of the small sample size, these inferential statistics were augmented with effect-size analyses of any differences between T2 and T3 means and comparison of confidence intervals generated for T2 and T3 means. Effect sizes of any differences were small in magnitude and confidence intervals around the means showed a high degree of overlap, indicating maintenance of treatment gains over time.

Relationship of baseline cognitive skills, severity of injury, age, and education with improvement

To determine the contribution of baseline cognitive skills, severity of injury, age, and educational level to improvements observed on problem-solving measures, a series of regression analyses examined the contribution of a given domain (i.e., attention, memory, reasoning, age, education, severity of injury) to improvements on each of the problem-solving measures in the battery. For each cognitive domain (i.e., attention, memory, reasoning), *z*-score composite variables were created using measures in the test battery. Preliminary bivariate

correlations of the cognitive composite scores, severity of injury, age, and education with improvements on measures of problem solving were used to assess viability of these variables as predictors in subsequent regression analyses.

Using a criterion of $r = .30$ or greater (i.e., medium magnitude, Cohen, 1988), the attention *z*-score composite was the only variable related to improvements on measures of problem solving (i.e., PSI and WCST only). Based on these preliminary correlations, two regression equations were conducted to assess the proportion of variance in improvement in problem-solving self-appraisal (PSI) and executive function (WCST) measures accounted for by baseline level of attention skills (as indicated by the pre-test *z*-score composite). In the first equation, baseline levels of attention skills predicted a significant proportion of the variance ($R^2 = .29$) in improvement in problem-solving self-appraisal (PSI), $F(1, 25) = 10.36$, $p = .004$ (i.e., after treatment, those with more severe attentional deficits at pre-test showed greater improvement in self-appraised problem solving). In the second equation, baseline levels of attention skills predicted a significant proportion of the variance ($R^2 = .18$) in improvement in executive function (WCST, Perseverative Responses score), $F(1, 23) = 5.18$, $p = .03$ (i.e., after treatment, those with more severe attentional deficits at pre-test demonstrated greater improvement on the WCST).

DISCUSSION

Participants in the innovative treatment programme improved in problem solving as assessed with a variety of measures, including (1) executive function, (2) problem-solving self-appraisal, (3) self-appraised clear thinking and emotional self-regulation, and (4) observer ratings of roleplayed problem-solving scenarios. These improvements were maintained at 6-month follow-up.

Previous outcome studies in persons with brain injury have not addressed the issue of problem-solving self-appraisal. The consequences and correlates of improvement in self-appraisal are unclear. Given Montgomery, Kern, Lund, and Patterson's (2000) finding that confidence in coping ability is highly related to depression and rehabilitation outcome, perhaps the increased confidence level reflected by the improvement in self-appraisal would be more likely to manifest itself in improvements in a broader range of interpersonal situations than traditional improvements in a more narrow set of skills. One might go further and state that, to be maximally effective, neuropsychological rehabilitation should take into account attitudinal, emotional, and motivational factors in addition to training thinking skills, and that treatment should be personally relevant to the individual.

In weighing the impact of the different treatments, it should be noted that the innovative treatment group had fewer dropouts than the conventional group. The use of structured, focused materials appears to engage participants and enhance generalisation of improvements. Although generalisation of improvement is difficult to demonstrate, anecdotal evidence suggests that these improvements do generalise to real-life behaviours. As noted by one participant who completed the innovative treatment: "Now, I try to first recognise that there is a problem and look at it objectively, not emotionally; I'm not afraid to take time to get quiet and think about what I want to do about a situation and plan it out."

The gains in the conventional treatment group are also of interest. Ratings by significant others improved in the conventional treatment group, but not in the innovative treatment group; that is, following conventional treatment, significant others rated participants as having less severe cognitive and somatic symptoms and improved emotional self-regulation. In fact, if significant-other ratings are taken as the principal outcome criteria, then the conventional treatment would seem to have been more effective. Such improvements may be due to the psychosocial component included in the conventional treatment programme. In an evidence-based review of the neuropsychological rehabilitation literature, Cicerone (2001) found that cognitive remediation outcome studies had less favourable results when comparison treatments included a psychosocial component, suggesting that psychosocial interventions are a potent treatment.

In the conventional group, the only indicator of gain directly related to problem solving was the Watson-Glaser Critical Thinking Test, which involves logic-based problems of an academic nature. Improvements in memory scores for both the innovative and conventional groups are consistent with memory improvements noted clinically in our rehabilitation programme for many years (Sherr et al., 1998). It is unclear whether these improvements are a function of practice, or a true gain. Overall, the results suggest effectiveness of the conventional treatment in addressing global rehabilitation needs, while not targeting or achieving improvements in problem solving per se.

The relationship between baseline performance on timed attention tasks and improvement in problem-solving is consistent with the work of Fasotti et al. (2000) who observed that deficits in speed-of-information processing lead to "information overload" in individuals with brain injury. Individuals who processed the most slowly benefited the most, both on a neuropsychological and a self-report measure of problem solving. These participants did not show improvements on timed attention tasks, but did improve on the problem-solving measures. Such findings are consistent with successful compensatory strategy use—the person may still have deficits and symptoms, but now has effective strategies for coping with them and reducing their impact on daily functioning.

It is important to note that the current study was designed for individuals participating in higher-level outpatient neuropsychological rehabilitation. Typically, such individuals are relatively mildly impaired on conventional neuropsychological measures, yet nonetheless experience significant deficits in psychosocial functioning. In these individuals, many of the central problem-solving deficits appear to be in the domain of emotional self-regulation/problem orientation (Rath et al., 2003); whereas in lower functioning patients, although self-regulation deficits may be evident, the primary deficits tend to be in more fundamental neuropsychological skills (e.g., attention, memory, reasoning).

Although there was considerable variation in ability level and premorbid background of the participants in the present study (Verbal IQ scores varied from 76 to 144 and educational level varied from high school graduate to PhD), we would not recommend including those whose "basic skill" levels fall below the minimum criteria noted above for participation in higher-level outpatient neuropsychological remediation groups. Clinical experience has indicated that, even when provided with extra support, patients who do not meet the criteria lag behind the others in meaningful group participation, acquisition of concepts, and ability to complete assignments. Future research will focus on adapting the treatment protocol to address the needs of lower functioning individuals.

In interpreting and advancing our findings, we note that the understanding of problem solving by cognitive–behavioural psychologists has evolved over time. As originally formulated, the therapy developed by D'Zurilla and Goldfried (1971) focused on four steps in problem-solving skills, similar to those proposed by clinical neuropsychologists (e.g., Lezak, 1995; Luria, 1963). The theory evolved (D'Zurilla, 1988; D'Zurilla & Nezu, 1982) to place greater emphasis on problem-orientation processes (i.e., individual beliefs and expectations about problems and confidence about solving them). This theoretical advancement was extended to treatment by Nezu and Perri (1989), who demonstrated the importance of the problem-orientation component of problem solving to therapy. This led to an operationalisation of the distinction between problem orientation and problem-solving skills into separate, measurable, empirically validated scales (D'Zurilla, Nezu, & Maydeu-Olivares, 1997) and a corresponding theoretical elaboration (D'Zurilla & Nezu, 2001) of the problem-orientation component of the model.

Individuals with TBI differ from persons without brain injury in terms of both emotional self-regulation capacity (affecting problem-orientation processes) and logical thinking/reasoning capacity (affecting problem-solving skills), and persons with TBI may vary in focus of difficulty given their individual combination of emotional self-regulation versus logical thinking/reasoning difficulties. Incorporating strategies for addressing underlying emotional self-regulation and logical thinking/reasoning deficits, our

innovative group treatment is unique in its attention to both problem-orientation processes and problem-solving skills in persons with brain injury. Our findings suggest that our treatment is a promising method for improving problem solving, one that may have practical applications for improving the functioning of people with TBI.

REFERENCES

Beck, A. T. (1976). *Cognitive therapy and the emotional disorders.* New York: New American Library.

Ben-Yishay, Y., & Prigatano, G. P. (1990). Cognitive remediation. In M. Rosenthal, E. R. Griffith, M. R. Bond, & J. D. Miller (Eds.), *Rehabilitation of the adult and child with traumatic brain injury* (2nd ed., pp. 393–409). Philadelphia: Davis.

Ben-Yishay, Y., Rattok, J., & Lakin, P. (1985). Neuropsychological rehabilitation: Quest for a holistic approach. *Seminars in Neurology*, *5*, 252–259.

Bergner, M., Bobbitt, R. A., Carter, W. B., & Gilson, B. S. (1981). The Sickness Impact Profile: Development and final revision of a health status measure. *Medical Care*, *19*, 787–805.

Bruner, J., Goodnow, J. J., & Austin, G. A. (1956). *A study of thinking*. New York: John Wiley & Sons.

Cicerone, K. D. (2001, October). *Evidence-based cognitive rehabilitation*. Paper presented at the 78th Annual Conference of the American Congress of Rehabilitation Medicine, Tucson, AZ.

Clum, G. A., Yang, B., Febbraro, G. A., Canfield, D. L., & Arsdel van, M. (1996). An investigation of the validity of the SPSI and SPSI-R in differentiating high-suicidal from depressed, low suicidal college students. *Journal of Psychopathology and Assessment*, *18*, 119–132.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Derogatis, L. R. (1990). *Brief Symptom Inventory*. Minneapolis, MN: National Computer Systems.

DeShazer, S., Berg, I. K., Lipchik, E., Nunnaly, E., Molnar, A., Gingrich, W., & Weiner-Davis, M. (1986). Brief therapy: Focused solution development. *Family Process*, *25*, 207–222.

Diller, L., & Weinberg, J. (1993). Style of response in perceptual retraining. In W. A. Gordon (Ed.), *Advances in stroke rehabilitation*. Baltimore: Andover Medical.

Donders, J., Tulsky, D. S., & Zhu, J. (2001). Criterion validity of new WAIS-III subtest scores after traumatic brain injury. *Journal of the International Neuropsychological Society*, *7*, 892–898.

Downey, J. E. (1923). *The will-temperament and its testing.* New York: World Book.

Duncker, K. (1945). On problem solving. *Psychological Monographs*, *58*.

Dunlop, W. P., Cortina, J. M., Vaslow, J. B., & Burke, M. J. (1996). Meta-analysis of experiments with matched groups or repeated measures designs. *Psychological Methods*, *1*, 170–177.

D'Zurilla, T. J. (1988). Problem-solving therapies. In K. S. Dobson (Ed.), *Handbook of cognitive-behavioral therapies* (pp. 85–135). New York: Guilford Press.

D'Zurilla, T. J., & Goldfried, M. R. (1971). Problem solving and behavior modification. *Journal of Abnormal Psychology*, *78*, 107–126.

D'Zurilla, T. J., & Maydeu-Olivares, A. M. (1995). Conceptual and methodological issues in problem-solving assessment. *Behavior Therapy*, *26*, 409–432.

D'Zurilla, T. J., & Nezu, A. M. (1982). Social problem solving in adults. In P. C. Kendall (Ed.), *Advances in cognitive behavioral research and therapy* (Vol. 1, pp. 201–274). New York: Academic Press.

D'Zurilla, T. J, & Nezu A. M. (2001). Problem solving therapies. In K. S. Dobson (Ed.), *Handbook of cognitive behavioral therapies* (2nd ed., pp. 211–245). New York: Guilford Press.

D'Zurilla, T. J., Nezu, A. M., & Maydeu-Olivares, A. (1997). *Manual for the Social Problem Solving Inventory—Revised.* North Tonawanda, NY: MultiHealth Systems.

Fasotti, L., Kovacs, F., Eling, P. A. T. M., & Brouwer, W. H. (2000). Time pressure management as a compensatory strategy training after closed head injury. *Neuropsychological Rehabilitation*, *10*, 47-65.

Geffen, L., Hinton-Bayre, A. D., Geffen, S., & Geffen, G. (1998). Head injuries in sport. In E. Sherry & S. Wilson (Eds.), *The Oxford handbook of sports medicine* (pp. 152–179). New York: Oxford University Press.

Goldstein, F. C., & Levin, H. S. (1987). Disorders of reasoning and problem solving abilities. In A. L. Benton, M. R. Meier, & L. Diller (Eds.), *Neuropsychological rehabilitation* (pp. 327–344). New York: Guilford Press.

Goldstein, K., & Scheerer, M. (1941). Abstract and concrete behavior: An experimental study with special tests. *Psychological Monographs*, *53*, 151.

Guide for the Uniform Data Set for Medical Rehabilitation (Version 5.1). (1997). State University of New York at Buffalo.

Hanig, B. S., Kaplan, B. C., Diller, L., Sherr, R. L., Langenbahn, D. M., & Simon, D. (1993). *Adjunct Skills Questionnaire*. Unpublished manuscript, New York University School of Medicine, Rusk Institute of Rehabilitation Medicine.

Heaton, R. K. (1981). *Wisconsin Card Sorting Test manual.* Odessa, FL: Psychological Assessment Resources.

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., & Curtis, G. (1993). *Wisconsin Card Sorting Test manual: Revised and expanded.* Odessa, FL: Psychological Assessment Resources.

Heppner, P. P. (1988). *The Problem Solving Inventory.* Palo Alto, CA: Consulting Psychology Press.

Kay, T., Cavallo, M. M., Ezrachi, O., & Vavagiakas, P. (1995). The Head Injury Family Interview: A clinical research tool. *Journal of Head Trauma Rehabilitation*, *19*, 12–31.

Kohler, W. (1947). *Gestalt psychology* (2nd ed.). Oxford, UK: Liveright.

Langenbahn, D. M., Sherr, R. L., Simon, D., & Hanig, B. (1999). Group psychotherapy. In K. G. Langer, L. Laatsch, & L. Lewis (Eds.), *Psychotherapeutic interventions for adults with brain injury or stroke: A clinician's treatment resource.* Madison, CT: Psychosocial Press.

Leftoff, S. (1983). Psychopathology in the light of brain injury: A case study. *Journal of Clinical Neuropsychology*, *5*, 51–63.

Lezak, M. D. (1995). *Neuropsychological assessment* (3rd ed.). New York: Oxford University Press.

Luria, A. R. (1963). *Restoration of function after brain injury.* New York: Pergamon Press.

Luria, A. R. (1966). *Higher cortical functions in man.* New York: Basic Books.

Luria, A. R., & Tsvetkova, L. D. (1964). The programming of constructive ability in local brain injuries. *Neuropsychologia*, *2*, 95–108.

Maier, N. R. F. (1930). Reasoning in humans. *Journal of Comparative and Physiological Psychology, 10,* 115–143.

Meichenbaum, D., & Cameron, R. (1974). The clinical potential of modifying what clients say to themselves. *Psychotherapy: Theory, Research and Practice*, *11*, 103–117.

Montgomery, G. F., Kern, T., Lund, D., & Patterson, B. (2000). Confidence and mood: Critical treatment goals for brain injury rehabilitation [abstract]. *Archives of Clinical Neuropsychology, 15,* 94.

Nezu, A. M., Nezu, C. M., Friedman, S. H, Faddis, S., & Houts, P. S. (1998). *Helping cancer patients cope: A problem-solving approach.* Washington, DC: American Psychological Association.

Nezu, A. M., Nezu, C. M., & Perri, M. G. (1989). *Problem-solving therapy for depression: Theory, research, and clinical guidelines.* New York: Wiley.

Nezu, A. M., & Perri, M. G. (1989). Social problem solving therapy for unipolar depression: An initial dismantling investigation. *Journal of Consulting and Clinical Psychology, 57,* 408–413.

Paniak C., Toller-Lobe, G., Reynolds, S., Melnyk, A., & Nagy, J. (2000). A randomized trial of two treatments for mild traumatic brain injury: One year follow up. *Brain Injury, 14,* 219–226.

Rath, J. F., Hennessy, J. J., & Diller, L. (in press). Social problem solving and community integration in post-acute rehabilitation outpatients with traumatic brain injury. *Rehabilitation Psychology.*

Rath, J. F., Langenbahn, D. M., Simon, D., Sherr, R. L., Fletcher, J., & Diller, L. (2003). *The construct of problem solving in higher-level neuropsychological assessment and rehabilitation.* Manuscript submitted for publication.

Rath, J. F., Simon, D., Langenbahn, D. M., Sherr, R. L., & Diller, L. (2000). Measurement of problem-solving deficits in adults with acquired brain damage. *Journal of Head Trauma Rehabilitation, 15,* 724-733.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Sherr, R. L., & Langenbahn, D. M. (1992). An approach to large-scale outpatient neuropsychological rehabilitation. *Neuropsychology*, *6*, 417–426.

Sherr, R. L., Langenbahn, D. M., Simon, D., Rath, J. F., & Diller, L. (1996a). *Problem Solving Questionnaire.* Unpublished manuscript, New York University School of Medicine, Rusk Institute of Rehabilitation Medicine.

Sherr, R. L., Langenbahn, D. M., Simon, D., Rath, J. F., & Diller, L. (1996b). *Problem Solving Roleplay Test.* Unpublished manuscript, New York University School of Medicine, Rusk Institute of Rehabilitation Medicine.

Sherr, R. L., Rath, J. F., Langenbahn, D. M., Simon, D., Biderman, D., & Diller, L. (1998). Acquired brain damage: Development of the Problem Solving Roleplay Test (abstract). *Rehabilitation Psychology*, *43*, 184.

Sherr, R. L., Simon, D., Langenbahn, D. M., Rath, J. F., Biderman, D. J., Freiman, J., & Diller, L. (1998, November). *An innovative approach to assessment and treatment of impairment in frontal lobe functions: Preliminary data.* Paper presented at the annual Neurorehabilitation Conference on Stroke and Traumatic Brain Injury, Braintree Rehabilitation Hospital, Braintree, MA.

Simon, D. (2001). Enhancing emotional control in persons with acquired brain damage (abstract). *Rehabilitation Psychology, 46,* 330.

Spreen, O., & Benton, A. L. (1977). *Neurosensory Center Comprehensive Examination for Aphasia.* Victoria, BC, Canada: University of Victoria, Neuropsychology Laboratory.

Tate, R. L. (1999). Executive dysfunction and characterological changes after traumatic brain injury: Two sides of the same coin? *Cortex*, *35*, 39–55.

Trenerry, M. R., Crosson, B., LeBoe, J., & Leber, W. R. (1989). *Stroop Neuropsychological Screening Test manual.* Odessa, FL: Psychological Assessment Resources.

von Cramon, D. Y., & Matthes-von Cramon, G. (1994). Back to work with a chronic dysexecutive syndrome: A case report. *Neuropsychological Rehabilitation*, *4*, 399–417.

von Cramon, D. Y., Matthes-von Cramon, G., & Mai, N. (1991). Problem-solving deficits in brain-injured patients: A therapeutic approach. *Neuropsychological Rehabilitation*, *1*, 45–64.

von Cramon, D. Y., Matthes-von Cramon, G., & Mai, N. (1992). The influence of a cognitive remediation programme on associated behavioural disturbances in patients with frontal lobe dysfunction. In N. von Steinbuchel, D. Y. von Cramon, & E. Poppel (Eds.), *Neuropsychological rehabilitation* (pp. 203–214). New York: Springer-Verlag.

Watson, G. B., & Glaser, E. M. (1980). *Watson-Glaser Critical Thinking Appraisal manual.* San Antonio, TX: Psychological Corporation.

Wechsler, D. (1997a). *Wechsler Adult Intelligence Scale-III manual*. San Antonio, TX: Psychological Corporation.

Wechsler, D. (1997b). *Wechsler Memory Scale-III manual*. San Antonio, TX: Psychological Corporation.

Willer, B., Ottenbacher, K. J., & Coad, M. L. (1994). The Community Integration Questionnaire: A comparative examination. *American Journal of Physical Medicine and Rehabilitation*, *73*, 103–111.

Willer, B., Rosenthal, M., Kreutzer, J., Gordon, W. A., & Rempel, R. (1993). Assessment of community integration following rehabilitation for traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *8*, 75–87.

Wolpe, J. (1990). *The practice of behavior therapy* (4th ed.). New York: Pergamon Press.

Yalom, I. (1995). *The theory and practice of group psychotherapy* (4th ed.). New York: Basic Books.

Manuscript received May 2002
Revised manuscript received January 2003

APPENDIX A
SELF-REGULATION WORKSHEET

II. ANALYSE Precursors ☞ *START* I. OBSERVE Reactions III. REFRAME/PLAN

CONTEXT and PITFALLS	WARNING SIGNS of reaction beginning	What was my initial REACTION?	STRATEGIES	PLAN for Improvement
Triggering event External Context Internal Context Brain Injury Personal Style Pitfalls	Earliest Physical Signs Earliest Behavioural Signs Earliest Cognitive Signs Earliest Emotional Signs Signals/Alarms (How did you know that you had a problem?) —Someone else pointed it out to you? —Other people weren't acting the way you expected them to? —Your own "alarm" went off? —You knew from past experience that this type of situation is a problem? —Original plan was blocked? —Conflict between: Goals? Past/present abilities?	Actions/Behaviours Feelings/Emotions Thoughts/Assumptions Self-Regulation RATING + Consequences – Consequences Rating (1 to 10):		

APPENDIX B
CLEAR THINKING WORKSHEET

II. ANALYSE Precursors | I. OBSERVE Reactions *START* | III. REFRAME/PLAN

WARNING SIGNS of Reaction beginning	STOP STRATEGIES used to "STOP"	What was my initial REACTION?	ASK QUESTIONS	MAKE REVISIONS
Earliest Physical Signs Earliest Behavioural Signs Earliest Cognitive Signs Earliest Emotional Signs Signals/Alarms (How did you know that you had a problem?) —Someone else pointed it out to you? —Other people weren't acting the way you expected them to? —Your own "alarm" went off? —You knew from past experience that this type of situation is a problem? —Original plan was blocked? —Conflict between: Goals? Past/present abilities?		1A. Initial Problem Definition	1B.	1C. Revise Problem Definition
		2A. Initial Goal(s)/Subgoal(s)	2B.	2C. Revise Goal(s)/Subgoal(s)
		3A. Initial Option(s)	3B.	3C. Revised Option(s)
		+ Consequences	4B.	4C. Evaluation
		– Consequences	5B.	5C. Follow-up