Generalization of Treatment: A Multicontext Approach to Cognitive Perceptual Impairment in Adults With Brain Injury

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Cognitive perceptual remedial approaches used by occupational therapists in the treatment of adults with brain injury have been criticized because of claims that the effects are not generalizable. Little information is available, however, that can guide the therapist in directly addressing the generalization process. This paper proposes a multicontext treatment approach that uses five components identified in the cognitive psychology literature as being critical to the process of generalization: (a) use of multiple environments, (b) identification of criteria for transfer, (c) metacognitive training, (d) emphasis on processing strategies, and (e) use of meaningful activities. A case report is used to illustrate this treatment approach.

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The ability to apply what has been learned in therapy to a variety of new situations and environments is termed generalization (Sufrin, 1984). Transfer of learning is included within the concept of generalization but is narrower in scope and refers only to the ability to apply specific strategies to a related task (Parente & Anderson-Parente, 1989). Both transfer and generalization refer to the use of skills in contexts other than those of their initial use.

Approaches used by occupational therapists in the treatment of perceptual deficits have been categorized by Neistadt (1988) as either remedial or adaptive. Adaptive, functional approaches capitalize on the patient’s assets and are used to provide direct training in activities of daily living. Remedial approaches focus on the impaired area and are used to improve abilities through the retraining of specific perceptual components of behavior with the use of tabletop activities or sensorimotor exercises. These two approaches contain different assumptions regarding generalization. In the remedial approach, generalization of learning is a process that is assumed to occur automatically. For example, retraining specific perceptual cognitive skills with tabletop drills, computer activities, or sensorimotor exercises assumes that observed improvements in specific skill areas will affect performance on other tasks requiring the same underlying skill. In contrast, an adaptive, functional treatment approach uses techniques that minimize requirements for generalization (Neistadt, 1990). In this approach, the patient with brain injury is bound by context and is unable to generalize new information to different contexts. Thus, repetitive practice with specific functional activities is emphasized rather than transfer of learning to a variety of situations (Davis & Radomski, 1989).

These two opposing treatment approaches are reminiscent of arguments regarding transfer of learning that occurred at the turn of the century. In that era, one group of theorists argued that transfer of learning was rare and occurred only when cued by physical similarities (Thorndike & Woodworth, 1901). Other theorists believed that transfer occurred automatically when a task or piece of information learned in one context was relevant to a second context. The more general the skill, the greater the likelihood of transfer (Ferguson, 1956; Hebb, 1949; Judd, 1908).

Recently, a number of studies in the psychology literature have identified conditions that maximize the probability of transfer of learning in nondysfunctional children and adults (Belmont, Butterfield, & Ferretti, 1982; Brown & Kane, 1988; Gick & Holyoak, 1983, 1987). The findings support the contention that transfer of learning does not occur automatically. “One must teach for transfer rather than merely hoping or even praying that it will occur” (Sternberg, 1987, p. 258). These more recent theorists argued that transfer occurs during learning, not after. Transfer is part of the learning process and must be directly addressed throughout the treatment.
process (Brown, Bransford, Ferrara, & Campione, 1983). These findings contain implications for the promotion of transfer of learning with brain-injured adults where difficulty in learning has been identified as a major barrier in rehabilitation (Ben-Yishay & Diller, 1983a).

Current treatment approaches used by occupational therapists contain few guidelines for addressing generalization. In the present paper, I propose a multicontext treatment approach based on a cognitive psychology framework for learning. Literature on learning and generalization is reviewed, and direct applications to treatment with the adult with brain injury are discussed.

Learning: An Organizational Framework

In contemporary cognitive psychology, learning is conceptualized as knowledge acquisition through an interaction of internal and external factors that influence the ability to process information (Brown et al., 1983; Glaser, 1990). Six basic factors have been identified as being critical to the process of learning and generalization. The first three factors—environmental context, nature of the task, and learning criteria—are external to the learner. The last three factors—metacognition, processing strategies, and learner's characteristics—are internal to the learner (Bransford, 1979; Jenkins, 1979). Internal and external factors are interrelated in their effect on learning and generalization. Performance is a result of interaction between the total set of variables. In essence, learning is a function of the relationship between the learner and the task to be learned (Bransford, 1979; Brown et al., 1983; Jenkins, 1979).

**Environmental context.** The familiarity of the environment as well as the type of environment (physical, social, or cultural) can influence learning (Abreu & Toglia, 1987). For example, a crowded, unfamiliar environment filled with auditory and visual distractions can alter the learner's attitude and ability to process and monitor information.

**Nature of the task.** The numbers, spatial arrangement, and familiarity of stimuli as well as the rate of response, task directions, type of materials, and movement and postural requirements can influence the learner's attitude, choice of strategies, and self-monitoring skills (Abreu & Toglia, 1987; Bransford, 1979). For example, as the number of items in a task increases, more demands are placed on the ability to select relevant stimuli, prioritize, screen out irrelevant details, and plan. If the amount of information presented exceeds the patient's processing capacity, the patient will have difficulty developing effective responses and may become frustrated or overwhelmed and withdraw from the task. In addition, the body alignment, positioning, and active movement patterns used during an activity can require different types of information processing and self-monitoring strategies (Abreu & Toglia, 1987).

**Learning criteria.** These are the kinds of tasks used to evaluate the degree of learning or performance outcome. Many different tasks can be used to measure learning. These measures can yield quite different results and conclusions regarding the person's learning capacity (Bransford, 1979).

**Metacognition.** Metacognition includes two aspects that are interrelated: knowledge concerning one's own cognitive processes and capacities and the ability to monitor one's own performance. Inaccurate perception of the nature of the task and its level of difficulty can lead to inability to initiate or choose appropriate task strategies (Brown et al., 1983).

**Processing strategies.** The kinds of strategies that learners use when presented with material (e.g., selecting relevant information, prioritizing, rehearsing, categorizing information, associating, elaborating) depend on the nature of the task (e.g., stimuli parameters, environmental context, movement requirements) as well as the familiarity and perceived difficulty of the task (Brown et al., 1983).

**Learner's characteristics.** These characteristics include previous knowledge, existing skills, attitudes, emotions, and experiences. Information that can be easily related to previous knowledge, experience, and skills will be more easily learned and remembered (Bransford, 1979; Gagne, 1985). The patient's motivation and attitude toward a task can influence the extent to which information is processed and monitored (Bransford, Sherwood, Vye, & Rieser, 1986; Brown, 1988).

The Multicontext Treatment Approach

The multicontext treatment approach is based on the organizational framework of learning described above. It involves the practicing of a targeted strategy in multiple environments with varied tasks and movement demands (Toglia, 1989b). Task parameters are analyzed and graded to place increasing demands on the ability to transfer learning. Direct training of metacognitive skills and self-awareness is incorporated throughout treatment. Treatment begins at the level at which the patient is functioning. Level of difficulty is not increased until the patient is able to demonstrate the ability to apply the targeted strategy to a variety of tasks. The treatment components of the multicontext approach are (a) use of multiple environments, (b) task analysis and establishment of criteria for transfer, (c) metacognitive training, (d) processing strategies, and (e) relation of new information to previously learned knowledge or skills.

Use of Multiple Environments

Generalization involves the differentiation of the strategy or skill from the environment in which it was learned.
Several studies on nondysfunctional children and adults have demonstrated that transfer of information is facilitated when the person is required to apply the newly learned skill or strategy to multiple situations or environments (Brown et al., 1983; Brown & Kane, 1988; Fried & Holyoak, 1984; Gick & Holyoak, 1983; Palincsar & Brown, 1984). This has been shown to decrease the likelihood that a particular piece of information will be associated with a particular context. For example, Nitsch (as cited by Bransford, 1979) found that a combination of single-context and varied-context examples facilitated the ability of adults to learn new concepts. When learning was restricted to single-context conditions, the range and flexibility of transfer was reduced. Gick and Holyoak (1983) reported that transfer of problem solving by analogy in adults increased with the number of examples and situations provided. Brown and Kane (1988) also found that exposing preschool children to a variety of transfer experiences involving problem solving taught them to search for the underlying commonalities. It has been demonstrated that many of the difficulties in transfer involve recognition that a new situation is similar to one previously encountered (Brown & Campione, 1984; Gick & Holyoak, 1980). Studies have shown that telling subjects that a new situation is similar to an old one results in dramatic increases in transfer in both adults and children (Gagne, 1985; Gick & Holyoak, 1983).

Several authors have observed that some adults with brain injury, particularly those with frontal lobe dysfunction and diffuse brain damage, have a strong tendency to be bound by the effects of context (Goldstein & Ruthven, 1983; Gross, 1982; Treder, 1982; Wilson, 1987), that is, they have difficulty differentiating the task from the environment in which it occurs. Goldstein and Scheerer (1941) devised numerous sorting tasks that demonstrated this concrete, stimulus-bound behavior in populations with neurological impairment. Learning involves moving from a context-dependent state to a context-independent state (Brown et al., 1983). Patients with brain injury appear to need help with this process (Cicerone & Wood, 1987). Treatment approaches that grade only the difficulty of the task while maintaining a set context may reinforce context-dependent learning. The benefit of exposure to multiple situations, although demonstrated in the literature on normal learning, has only recently started to be examined in the literature on brain injury. For example, Cicerone and Wood found that generalization of training occurred in one case only after direct and extended training was used in a variety of situations. In addition, Diller, Goodgold, and Kay (1988) compared two conditions of treatment in 37 brain-injured adults with right-hemisphere lesions. In one condition, tabletop training materials were used daily. In the other condition, the emphasis of treatment was on optimization of consistent performance across a variety of activities and contexts. Although gains had resulted from both treatment conditions, they were better maintained by the multicontext training condition.

The therapist may facilitate transfer of learning by asking the patient to apply the same strategy to different contexts during treatment. Brown et al. (1983) stated that "seeing the strategy applied in several contexts allows the learner to understand its significance and infer some of the properties of situations in which it is applicable" (p. 145). Transfer is part of learning and should be required during treatment rather than at the end of treatment. Probability of transfer in nondysfunctional persons has been shown to increase with exposure to situations that vary widely on irrelevant attributes (Gagne, 1985; Gick & Holyoak, 1987). For example, if a left-to-right scanning strategy is emphasized with practice on cancellation tasks, the patient should gradually be required to apply the strategy to other tasks and environments, such as locating an item in a medicine cabinet, counting paintings on the wall or books on a shelf, or identifying a row of items on a store shelf. The situations in which application of the strategy will be practiced need to be carefully selected through detailed task analysis. The learner also needs to practice identifying the situations in which the strategy does not apply (Gagne, 1985). For example, the left-to-right scanning strategy is most efficient in the location of targets when stimuli are arranged in horizontal lines. When stimuli are scattered and nonlinear, the left-to-right scanning strategy may be an inefficient method to use to locate targets.

**Task Analysis and Establishment of Criteria for Transfer**

Transfer of learning is not an all-or-none phenomenon. It occurs in different degrees along a continuum (Campione & Brown, 1987; Gordon, 1987; Perkins, 1987).

In therapy, establishment of criteria is appropriate for the determination of when and to what extent transfer of learning has taken place. These criteria enable the therapist to define what is being trained and to objectively evaluate progress of transfer separately from that of task training (Brown & Campione, 1982). One can establish transfer criteria by identifying a graded series of tasks that display decreasing degrees of physical and conceptual similarity to the original learning situation. It has been demonstrated that the more two tasks or situations are perceived as similar, the easier it is for transfer of learning to occur (Gagne, 1970; Gick & Holyoak, 1983). For example, Gick and Holyoak examined mechanisms that promoted transfer in nondysfunctional adults and found that any manipulation that stressed the similarity of the original problem and transfer situation led to enhanced transfer. Establishment of transfer criteria requires a detailed analysis of the surface characteristics of the task as well as the conceptual characteristics. The task characteristics...
Table 1

Analysis of Surface Task and Underlying Task Characteristics

<table>
<thead>
<tr>
<th>Task Characteristic</th>
<th>Surface Task</th>
<th>Examples</th>
</tr>
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<tbody>
<tr>
<td>Type of stimuli</td>
<td>Objects, shapes, numbers, letters, words, sentences, symbols.</td>
<td></td>
</tr>
<tr>
<td>Presentation mode</td>
<td>Three-dimensional, two-dimensional, photographs, drawings, written form, auditory mode, tactile mode.</td>
<td></td>
</tr>
<tr>
<td>Variable attributes</td>
<td>Color, texture, size, thickness.</td>
<td></td>
</tr>
<tr>
<td>Stimuli arrangement</td>
<td>Scattered, horizontal, rotated, overlapping.</td>
<td></td>
</tr>
<tr>
<td>Movement requirements</td>
<td>Body alignment, positioning, active movement pattern.</td>
<td></td>
</tr>
<tr>
<td>Environmental context</td>
<td>Physical surroundings, familiarity, number of people.</td>
<td></td>
</tr>
<tr>
<td>Rules or directions</td>
<td>Number of steps required.</td>
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The task is physically different from the original task and does not share any surface characteristics with the original task. The ability to independently maintain the skill over time must be identified in terms of transfer distance.

**Near transfer.** In near transfer tasks, only one or two surface task characteristics are changed. The task is physically similar to the previous one and can be described as an alternate form of the original task (Toglia, 1990). An example of near transfer is the ability to spontaneously apply one-handed techniques originally learned in donning a pullover T-shirt to the task of donning a pullover sweater. The task is easily recognizable as being like the initial task; only one surface characteristic — variable attributes of color and texture — is changed.

**Intermediate transfer.** Intermediate transfer tasks share some physical similarities with the original task but are less readily identified. Three to six surface task characteristics are changed (Toglia, 1990). The ability to spontaneously apply one-handed techniques originally learned in donning a pullover sweater in the therapy area to putting on a button-down silk blouse in the patient’s room is an example of an intermediate transfer task. In this case, four surface characteristics are changed — type of clothing, color and texture of material, movement requirements, and environment.

**Far transfer.** Far transfer tasks are conceptually similar to the initial task, but the surface characteristics of the task are either completely different or share only one surface similarity. The task is physically different from the original learning task (Toglia, 1990). The ability to spontaneously apply one-handed principles learned in donning a pullover sweater in the therapy area to putting on a blouse (e.g., dress the affected limb first) to putting on pants or socks is an example of far transfer. In this case, the underlying strategy of dressing the affected side first remains the same, while almost all the surface characteristics are changed.

**Very far transfer.** Very far transfer is generalization, or the spontaneous application of what has been learned in treatment to everyday functioning. Very far transfer may include use of an external aid within everyday activities, for example, reading a checklist or a list of cues placed on the closet door prior to dressing.

Once some evidence of transfer is observed, the ability to independently maintain the skill over time must be demonstrated. For example, a patient may demonstrate intermediate transfer learning but may not be able to maintain the newly learned skill over time.

Table 2 illustrates how the surface characteristics of a letter cancellation task, which is a task typically used in the treatment of unilateral inattention, can be gradually changed so that eventually the task is completely different in physical appearance from the initial task. In all tasks, the amount of stimuli and complexity are generally held constant while the patient learns to apply the same strategy in every task.

Once the patient demonstrates the ability to initiate and successfully use a targeted strategy in a variety of situations with 90% accuracy, the complexity and number of stimuli are increased. It should be noted that there are wide gaps between the various levels of transfer described in Table 2. Task grading and practice in multiple situations need to be combined with other aspects of the multicontext approach. For example, training in awareness and self-monitoring techniques, described below, is critical in the moving of a patient from a cued to an uncued condition.

The tasks used to measure the success of treatment must be identified in terms of transfer distance. Near transfer has been shown to occur effortlessly and spontaneously in the nondysfunctional population (Campione,
Evidence of near transfer has also been demonstrated in persons with mental retardation (Campione & Brown, 1977) as well as in adults with brain injury (Carter, Howard, & O’Neil, 1983). In the examination of the outcome of remediation, near transfer is not a sufficient criterion by which to determine effectiveness. Intermediate transfer tasks have been used most commonly to evaluate outcome of cognitive remediation, but there are problems in relating the changes to everyday function. Use of very far transfer tasks to evaluate outcome is most desirable, but examples in the literature are sparse (Gordon, 1987).

Awareness of the patient’s capacity for generalization can be used as a guide to treatment planning and appropriate goal setting (Cicerone & Tupper, 1986). Near-transfer learning may be the maximum level of success that a patient can achieve and, if so, then this information can be used to plan treatment. For example, domain-specific training, or the learning of task-specific skills, requires only near transfer skills. Domain-specific training involves extensive repetition of a specific task. For example, when teaching a patient to operate a computer through the use of the method of vanishing cues, the patient initially may require more than 100 cues to perform the task. Gradually, these cues are withdrawn.

Glisky and Schacter (1988) studied domain-specific training with adults with brain injury who had severe memory impairments and found that although learning occurred, many more training trials were required, and the knowledge acquired was described as hyperspecific. The researchers described a patient with severe memory problems who was able to apply the skills learned in operating a microcomputer to a data-entry job. In this case, however, the training situation closely resembled the actual work tasks, so the requirements for transfer were minimal and did not extend beyond near transfer.

**Metacognitive Training**

As noted earlier, metacognition refers to awareness and control of one’s own thinking skills (Flavell, 1985). It includes two interrelated aspects: (a) knowledge concerning one’s own cognitive processes and capacities and (b) the ability to monitor one’s own performance. Metacognitive skills include the ability to evaluate the difficulty of a task, predict the consequences of action, formulate goals, plan, self-monitor performance, and demonstrate self-control (Brown et al., 1983). These skills have been identified by several authors as critical components in the learning and generalization processes. Beinert et al. (1982) argued that meaningful transfer can be attained only if such metacognitive skills as strategy planning and self-monitoring are addressed in addition to training for specific skills. They reviewed 114 published studies on the use of cognitive instruction with nondysfunctional, learning-disabled, and retarded persons and found that the 6 out of 7 studies that achieved generalization included training in metacognitive skills, whereas the other 107 studies did not.

Insight, or the degree of awareness one has regarding one’s cognitive or physical capacities, is often impaired in adults with brain injury. Studies have shown that a large number of adults with brain injury underestimate the severity of their deficits (Anderson, Damasio, Damasio, & Tranel, 1989; Anderson & Tranel, 1989; Rimel, Giordani, Barth, Boll, & Jane, 1985). Anderson and Tranel used a standardized interview to measure unawareness and found that 72% of patients with stroke and 68% of patients with head trauma demonstrated poor insight concerning their cognitive deficits. It has been demonstrated that there is a greater incidence of unawareness in patients with frontal lobe injury or right-hemisphere damage, but this phenomenon is still poorly understood (Anderson et al., 1989; Anderson & Tranel, 1989; McGlynn & Schacter, 1989; Stuss & Benson, 1986).

McGlynn and Schacter (1989) stated that it is crucial to differentiate between defensive denial, which can be observed after nonneurological disease, and neurologically based unawareness. In neurologically based unawareness, the patient is not consciously aware that a once-intact function is impaired. Defensive denial signifies a motivated reaction by a patient who is aware of but unwilling to confront his or her problem. Although firm criteria for separating these two types of phenomena are not available, the clinician should be aware that there may be different mechanisms involved in unawareness. A multidisciplinary team approach involving psychological consultation is needed to gain a complete understanding of the patient’s behavior.

Decreased awareness results in an inability to effectively use compensatory strategies. Compensation for disability assumes that a patient recognizes the need to compensate. Patients with brain injury often do not possess this prerequisite skill (Crossan et al., 1989; Diller, 1987). Their concept of what they can and cannot do is based on their cognitive performance before the injury. A person who does not understand his or her true cognitive capacity and limitations may be unwilling or unable to employ various strategies (Cicerone & Tupper, 1986; Wheatley & Rein, 1989). If the person perceives a task as easy, he or she will be less likely to exert effort, use special strategies, or monitor and verify performance outcome. In addition, the inability to accurately evaluate task difficulty in relation to oneself and to predict performance outcomes can create a perceived loss of control that can increase anxiety, decrease motivation, and further impede the learning process (Toglia, 1989b). Several authors have observed a positive relationship between awareness and treatment outcome (Ben-Yishay, Silver, Piasetsky, & Rattok, 1987; Klonoff, O’Brien, Prigatano, Chiapello, & Cunningham, 1989; Prigatano, 1986).

Therapists often complain that the patient’s lack of
insight interferes with treatment. Instead of attempting to teach the patient compensatory strategies, it is suggested that treatment directly address the problem of awareness. Modification of a patient’s perception concerning his or her own problems may “significantly affect the subsequent course of treatment and modifiability of more specific cognitive processes” (Cicerone & Tupper, 1986, p. 78). The literature contains little information, however, that can be used to guide the clinician in awareness training. Feedback has typically been used to help patients gain awareness of their performance (Carter et al., 1983; Craine, 1982), but feedback that provides information about results may be ineffective in improving performance unless the patient understands why the error occurred. The patient must learn how to monitor and evaluate his or her own performance (Bransford, 1979). With the exception of a few small studies, this area has been unexplored in the adult with brain injury. Fordyce and Roueche (1986) attempted to increase head-injured patients’ awareness of their deficits through a patient education program, videotape feedback, group discussions, and consistent reinforcement for behaviors that reflected increased awareness. Nine of the 17 patients who initially greatly underestimated their level of dysfunction showed increased awareness at the end of training. The authors concluded that only some patients with head injury benefit from attempts to increase awareness.

McGlynn and Schacter (1989) described an awareness training program with a severely involved brain-injured patient with memory problems. The program required the patient to predict his recall performance before performing recall tasks. Extensive feedback and discussion concerning the discrepancies between prediction and performance were incorporated into treatment. With training, the patient’s predictions became more realistic, and his responses on a questionnaire reflected increased awareness of his current state of memory function. He was not, however, able to apply his knowledge to other situations. Training did not include practice with a variety of tasks.

The use of self-instruction techniques with adults with brain injury has been documented in a number of single case studies. Self-instruction techniques require a patient to verbalize strategies or a plan before and during the execution of a task. The goal is to help patients focus their attention on the task, organize their thoughts, and monitor the speed and accuracy of their performance (Cicerone & Wood, 1987; Fertherlin & Kurland, 1989; Lawson & Rice, 1989; Webster & Scott, 1983).

Treatment techniques that aim to help the patient detect errors, predict outcomes, estimate task difficulty, and evaluate performance outcome are suggested to increase insight and self-monitoring skills (Ben-Yishay & Diller, 1983b; Cicerone & Wood, 1987; Lawson & Rice, 1989; McGlynn & Schacter, 1989; Pollens, McBratnie, & Burton, 1988). Examples of awareness training techniques that can be integrated into daily treatment activities are self-estimation, role reversal, self-questioning, and self-evaluation.

Self-estimation. The patient estimates one or more of the following parameters before, during, or after completing a task: (a) task difficulty (e.g., the patient is asked to rate task difficulty on a scale of very easy and unchallenging, it will not require any extra concentration or effort [1] to very difficult and beyond my abilities, I will not be able to complete the task even if I try hard [5]); (b) time to complete the task; (c) number correct (or amount of errors); and (d) amount of assistance needed (number of cues). Initially, the patient is asked to estimate his or her performance during or immediately after performing a task. The patient’s self-assessment is compared with the actual results to help the patient evaluate his or her performance. If necessary, a scoring system is used in which the patient is assisted in keeping track of his or her score or time. When the patient can accurately assess his or her performance, he or she is then asked to predict his or her performance before performing a task. The patient’s original prediction is compared with his or her actual performance. The objective is to increase the accuracy of predictions so that they become more realistic; the emphasis is not on improving accuracy of performance. Self-estimation can be incorporated into functional activities, such as dressing or cooking, as well as in computer games or tabletop activities (McGlynn & Schacter, 1989; Toglia & Golisz, 1990). Research on normal populations has shown that adults are remarkably reliable in their predictions of their cognitive abilities (Flavell, 1985).

Role reversal. The patient observes a therapist performing a task. The therapist makes errors and the patient must identify the therapist’s errors and hypothesize why the errors occurred (e.g., the therapist went too fast or did not pay attention to details). The goal is to increase error detection and analysis skills (Ben-Yishay & Diller, 1983b).

Self-questioning. At specific times during a task, the patient is asked to stop and answer the same two or three questions, such as “How am I doing?” “Am I looking all the way to the left?” “Have I followed the directions accurately?” The goals is to help the patient monitor performance during a task (Fertherlin & Kurland, 1989).

Self-evaluation. After performing an activity, the patient fills out a self-evaluation form to help him or her accurately assess outcome. Questions include, “Have I checked over all my work carefully?” “Have I paid attention to all the details?” “Have I crossed out or removed all of the unnecessary information?” “How confident do I feel with my results?” (e.g., “I feel 100% confident that my results are accurate”).

Processing Strategies

Processing strategies are organized approaches, tactics, or rules that operate either unconsciously or consciously.
These strategies help the patient select relevant information from the environment and guide the organization of incoming material for information processing (Abreu & Toglia, 1987). Information processing involves the way information is collected, organized, modified, assimilated, interpreted, and used. Although the amount of information that can be processed at any one time is limited, the quality and amount of information processing is also partially influenced by the kinds of strategies used by the learner (Brown et al., 1983). Examples of strategies are the ability to prioritize, to cluster related information together, or to eliminate irrelevant details. The learner's strategies can determine the depth at which information is processed. Information that is processed at deep levels has been shown to be more readily retained than information processed at shallow or superficial levels (Anderson, 1985).

Brain injury not only reduces the capacity to process information but also decreases the ability to use strategies to order and structure incoming information (Bolger, 1982; Melamed, Rahamani, Greenstein, Grosz, & Nadjenson, 1985). The patient either fails to automatically initiate use of strategies or uses strategies ineffectively (Toglia & Golisz, 1990). Processing strategies can be divided into two groups: situational and nonsituational.

**Situational strategies.** Situational strategies are effective in specific tasks and environments. Examples of such strategies are grouping, rehearsal, association, visual imagery, and left-to-right scanning. Each of these strategies may result in deeper information processing when used in certain situations and may be less effective in other situations. For example, the strategy of rehearsal is best suited to tasks where the amount of information to be remembered is small and where exact reproduction is required (Campione & Brown, 1977). When the strategy of rehearsal is used with large amounts of information, the system becomes overloaded, and information processing is inhibited. The adult with brain injury often chooses strategies that are inefficient for the task (Abreu & Toglia, 1987; Bolger, 1982; Rao & Bieliauskas, 1983).

**Nonsituational strategies.** Nonsituational strategies are effective in a wide range of tasks and environments. Examples of such strategies are planning ahead, removing or blocking out irrelevant information, prioritizing information before beginning a task, using time-management techniques, and using self-monitoring strategies such as self-questioning.

Both situational and nonsituational strategies involve the elaboration or reorganization of information to allow for deeper processing of the material to be learned. Learning situations that address a combination of strategies have been shown to be most effective in promoting transfer in children (Brown et al., 1983). The emphasis in treatment of the adult with brain injury may therefore be shifted from specific skills, such as form constancy, figure-ground perception, categorization, memory, or problem solving, to the processing strategies that underlie these skills. Improved use of processing strategies should influence performance on a variety of tasks (Toglia, 1989a).

**Relation of New Information to Previously Learned Knowledge or Skills**

Knowledge and familiarity with a task affects both processing speed and strategy selection (Brown & Campione, 1982). Information is better learned and better retained when the person can relate new information to previously learned skills or knowledge. Information that cannot be connected to experience is devoid of meaning. The learner usually makes attempts to elaborate new information and associate it with experiences to make it more meaningful (Bransford, 1979).

The adult with brain injury may have difficulty elaborating new information or associating it with experience (Rahamani, 1982). In addition, he or she may not be able to automatically access previous knowledge and experiences when needed. For example, in a memory recall experiment, patients with brain injury demonstrated no spontaneous attempt to cluster related words together to help them remember, even though they were able to do so when specifically requested. In contrast, nondysfunctional adults immediately used their knowledge of object and event categories to reorganize the material and help them remember (Mattis & Kovner, 1984). An important prerequisite for learning is the ability to activate knowledge and skills when needed (Bransford et al., 1986).

The nature of the material as well as the way in which the task is presented have been shown to have powerful effects on the degree to which relevant knowledge is accessed in nondysfunctional persons (Bransford et al., 1986). Abstract materials, such as dot matrices and abstract line drawing, were originally used in perceptual remediation and education because they were content-free and conceptually neutral. It was therefore thought that the skills involved were equally generalizable to all applicable situations. These programs, however, failed to show impressive results (Adams, 1989; Sternberg & Bhana, 1986). It has since been argued that if what is taught is abstract and removed from the context and conditions of its application, it will be unrelated to previous experience and learned as an isolated, meaningless structure (Adams, 1989). Conversely, if what is taught is embedded in only one context, such as a dressing task, the skills learned may be accessible only in relation to that specific context (Adams, 1989). The implication is that exclusive use of either abstract tasks or functional tasks results in a decreased ability to transfer the skills learned in therapy to other situations.

Patients must be able to deal with both familiar and novel situations to be independent in the community. At the same time, the patient needs to be able to understand...
the relevance of a treatment activity and be able to connect it to other experiences. In the field of education, it has been shown that a few words or questions that show the student how the new materials relate to previous experiences or knowledge can substantially increase learning and recall (Gagne, 1985). If the therapist cannot help the patient understand the relevance of an activity, then the activity should be discarded. Many different tasks can be used to work on cognitive skills. The task itself is unimportant; the critical component of treatment is the way in which the task is structured, manipulated, and presented to elicit the proper response.

Case Study

The purpose of the following case study is to demonstrate the application of theory to practice. The intent is not to demonstrate efficacy of this approach, but rather, to illustrate how the treatment components of the multicontext approach can be used in an integrated manner during cognitive perceptual rehabilitation. The person studied is a 38-year-old man with a closed head injury resulting from a fall.

On cognitive perceptual testing 5 weeks after the injury, the patient, Mr. R., demonstrated difficulty on a variety of tasks (e.g., memory, visual discrimination, categorization). Use of the dynamic investigative assessment procedure, however, revealed that a factor underlying performance on the majority of tasks was difficulty in switching attention to new tasks or task components. Mr. R. had particular difficulty with tasks that involved moving from one step to the next or tasks that required altering his course of action. Perseveration of thoughts between tasks was observed. Performance improved with cues that assisted the patient in shifting his focus of attention. The initial emphasis of treatment, therefore, was on helping the patient become aware of his tendency to become stuck on parts of a task and on helping him deal with activities that involved shifting attention to accommodate to changing circumstances.

Treatment Program

Treatment encompassed all aspects of the multicontext approach.

Metacognitive training. Self-monitoring techniques (described previously) were used to increase self-awareness. For example, the patient was initially asked to estimate his score during and after the performance of tasks. Eventually, he was required to predict his performance before beginning a task. In addition, at 10-min intervals, the patient was required to answer questions written on a card, such as “Am I following changes in rules?” “Am I remembering to talk out loud when there is a change in the rules?” “Am I doing as I thought I would do or should I change my prediction?” “Am I stopping to take a time-out when I feel stuck?”

Processing strategies. Both situational and nonsituational strategies were emphasized consistently in a variety of activities. An example of a situational strategy was for the patient to shift his attention back and forth with changes in rules. An example of a nonsituational strategy was for the patient to verbalize the plan, goal, or rule to help shift or maintain attention. Another nonsituational strategy used was for the patient to initiate time-out when errors began to increase or when he felt stuck.

Use of multiple environments. Treatment took place in the patient’s room, the occupational therapy clinic, quiet rooms, and hospital corridors. Different movement positions and patterns were required in various tasks. Tabletop as well as gross motor, computer, and functional tasks were used.

Task analysis and criteria for transfer. The tasks used to observe levels of transfer learning were divided into task components and were clearly defined (see treatment tasks below).

Relation of new information to previously learned knowledge. Each task was related to previous treatment tasks and to functional tasks during every session. For example, the patient was told the following: “Just as that tendency to get stuck in one thought makes it difficult to think of other ways of making 45¢, the same thing happened when we looked at the map yesterday and when you tried to call your sister and kept dialing the same number [even though it was wrong]. If you see you are making the same mistake over and over, stop and tell me. Right now that is our major goal.” Problems and behaviors interfering with successful completion of treatment tasks need to be related to difficulties experienced in functional activities so that the patient can understand the connection between them.

Sample Treatment Activities or Tasks

Initial treatment activity. The patient sits on the edge of a mat and throws red shapes into a blue hoop on the floor and blue shapes into a red hoop on the floor until the therapist says “Change.” At this point, the patient throws the red shapes into the red hoop and the blue shapes into the blue hoop. A scoring system by which to calculate the number of correct responses after each change is used and the scores are charted. The patient initially made three to four errors after each change.

Near transfer. The same activity as described above is used, except that the patient throws odd numbers into the blue hoop and even numbers into the red hoop until the therapist says “Change.”

Intermediate transfer. The patient places pennies on all of the red beanbags and nickels on all of the blue beanbags until the therapist says “Change.” At this point,
the patient must place each penny on a blue beanbag and each nickel on a red beanbag. The beanbags are spread around a mat, and the patient has to shift weight and reach in different directions to place the coins on the beanbags.

Far transfer. First, the patient is shown 10 objects that are assigned various prices. The patient is asked to find three objects he could buy with 98¢. Then he is told that two of the objects are out of stock. He is asked to find three other objects to buy for the same amount of money. Second, the patient is presented with assorted coins and is asked to make as many different combinations of 45¢ as he can think of. Third, the patient is asked to find a route from one point to another on a simple map. Once the patient draws the route, he is asked to find another route that could be used to get to the same point.

In near transfer, intermediate transfer, and far transfer, the emphasis is on comparison of performance before a change is requested with performance after a change is requested.

Very far transfer. Very far transfer is not addressed directly during treatment. It involves observation of performance within the context of everyday function. Evidence of very far transfer is obtained through repeated observations of patterns of behavior. Mr. R. initially demonstrated difficulty whenever he was confronted with an unexpected problem. His tendency to become stuck in one thought or course of action overshadowed his performance in both treatment and functional activities. For example, one day he repeatedly looked in the same drawer for his comb. He did not think to look in any other place, even though it was obvious that the item was not in the drawer. On another occasion, he wanted to get soda from a soda machine. The machine had a sign on it saying “Quarters only.” Mr. R. concluded he could not get soda because he had only dimes and nickels. He did not initiate alternative solutions, such as going to the cashier, who was located a short distance away. On another occasion, he wanted to speak to a relative but could not recall the person’s telephone number. His solution was to wait for his relative to call him. Shortly before discharge, patterns of behavior observed in the context of everyday function suggested that Mr. R. had become better at dealing with simple problems. For example, Mr. R. went to the gift shop to buy a thank-you card. He looked carefully in different sections, and when he found that the thank-you card section was empty, he looked in the all-occasion card section and chose a blank card instead. On another occasion, Mr. R. came into the therapy area looking for a telephone book because he wanted to speak to his business partner but did not have his phone number. On another occasion, Mr. R. put on a shirt and realized that it had a large spot on the front. He spontaneously picked out an alternative shirt without difficulty. All of the above observations suggest very far transfer, but the evidence is inconclusive. It is difficult to determine when very far transfer has occurred. Because everyday situations cannot be simulated or contrived, the opportunity to observe the same situation twice may not occur. Additionally, if the same functional situation is repeated, any changes in performance would reflect near transfer skills, not very far transfer skills. Evidence for very far transfer is provided with changes in behavioral patterns across situations rather than in a specific task. Improvements that are observed during treatment sessions, even if related to spontaneous recovery, should be looked for within the context of everyday function. Once very far transfer is observed, treatment activities are increased in complexity.

On discharge to an outpatient facility after 4 weeks of daily occupational therapy sessions of 30- to 45-min duration, the patient demonstrated all levels of transfer with basic-level tasks involving switching attention and was able to identify errors as they occurred. Although he no longer demonstrated perseveration and could alternate his attention back and forth between two or three stimuli, he still had difficulty functioning with more complex tasks. In these more complex tasks, the patient often overattended to unimportant details within a task, while at the same time omitting essential details. Although he still had problems with attention, such problems were no longer apparent in basic-level tasks, that is, in tasks with fewer than 12 stimuli and with gross discriminations of objects or shapes. Instead, the problems were expressed with complex tasks, that is, in those tasks with large amounts of stimuli (e.g., 20) and subtle discrimination of detail. When strategies that emphasized the ability to identify and remove irrelevant task information were introduced, near transfer skills were readily observed.

Summary. Although cognitive deficits interfered with the patient’s ability to perform community living skills and ability to work, he appeared to have learning potential at discharge. These improvements, however, may have been related to many other factors, such as spontaneous recovery and treatments provided through other disciplines. The case example illustrates how the multicontext approach guides the selection and progression of cognitive rehabilitation treatment techniques and activities.

Summary

Remedial treatment approaches that emphasize tools and techniques to facilitate cognitive skills have been criticized, because the results are not generalizable. Functional treatment approaches also have been criticized for training skills that are too narrow in scope and that can be used only in the training context. Remedial treatment is based on the belief that generalization occurs automatically, whereas functional treatment appears to be based on the concept that patients with brain injury do not have
the capacity to generalize. The dissatisfaction with these cognitive perceptual treatment approaches suggests that information is lacking to assist the clinician in examining and addressing the issue of generalization. The educational and cognitive psychology literature proposes that in nondysfunctional persons, transfer of learning does not happen automatically. Instead, learning relies on certain conditions that increase the probability that transfer will occur. Practical guidelines for teaching of transfer skills were extrapolated from this literature, and their use in the treatment of the adult with brain injury was discussed. The result is termed the multicontext treatment approach.

In the multicontext treatment approach, learning is conceptualized as a dynamic interaction between the learner's processing strategies, metacognitive skills, and experiences and the nature of the task, environment, and learning criteria. Treatment based on this approach addresses all of these components. The same strategy is practiced with a variety of carefully selected tasks, movement patterns, and environments. Learning criteria for near, intermediate, and far transfer are identified. The surface similarities of treatment tasks are gradually changed, whereas the underlying skills and strategies required for performance of the task remain consistent across varied conditions. Simultaneously, metacognitive training techniques that emphasize the ability to anticipate and detect errors are employed to assist the patient in developing the self-monitoring skills necessary to move from a cued to an uncued condition.

Advocacy for this treatment approach does not presume that all patients with brain injury have the ability to generalize learning. Instead, this approach asserts that the ability to transfer learning occurs at different levels. Certain conditions increase the probability that some degree of transfer will occur. Patients with brain injury may need more help in transferring the effects of learning. Facilitation of the transfer process may help some patients to gain a higher level of transfer of learning than that which could happen spontaneously. If the patient does not show any ability to transfer learning after a trial period, then this knowledge could be used to plan an intervention program that does not require transfer.

The efficacy of the multicontext treatment approach requires examination with different patient populations and comparison with other approaches used in the management of cognitive perceptual problems. The multicontext approach, particularly, the awareness training techniques that require verbal mediation, probably would not benefit patients with language deficits or severe global cognitive impairments. The level of severity and stage of recovery influence the type of intervention that is most effective.

Many of the topics discussed in this paper, although important to cognitive perceptual rehabilitation, have not been well explored with the adult with brain injury. Strategy use, training in multiple contexts metacognitive skills, awareness training, and effects of the nature of material on learning are just a few of the topics that need such exploration with the brain-injured population. Additionally, the extent to which models of normal learning are relevant to persons with impaired cognition has not yet been determined. Research examining the parameters that influence learning in adults with brain injury is only in its infancy, yet the issue of generalization is critical to rehabilitation. Third-party payers will not continue to reimburse treatments that have not been demonstrated to influence everyday function. In this paper, I have proposed a theoretical foundation for the guidance of clinical practice and research, in the hope that this would stimulate thinking and exploration in a challenging area that is in need of further development and research.

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