Dynamic Assessment and Prediction of Learning Potential in Clients With Unilateral Neglect

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We explored the application of dynamic assessment to adults with right hemisphere stroke and unilateral neglect (UN). We compared static and dynamic methods of assessment to determine whether dynamic assessment provides information on responsiveness to cues and learning, which differs from that of traditional static measures.

Static assessments focus on identifying and quantifying the degree of impairment. Performance is measured by the number of errors and is interpreted relative to a normative sample or an external criterion that places abilities along a continuum from low to high (Haywood & Lidz, 2007). Static measures of UN typically involve paper-and-pencil tasks that require detection of target stimuli distributed on both sides of the space. The number of targets omitted on each side identifies the presence and severity of UN. Static assessments provide a baseline from which progress can be measured, but they provide little guidance in selecting effective methods for improving a client’s function.

There are a variety of ways to approach intervention, but it is not always clear which approach may be effective for particular patients. As a result, occupational therapists informally investigate methods to enhance occupational performance in the initial phases of treatment. These investigations can require extra time and resources, particularly for less experienced therapists. It is important to maximize efficiency in selecting intervention strategies, especially with shortened length of treatment. We viewed dynamic assessment as a supplement to static assessment and investigated whether dynamic assessment could provide additional...
information on learning, beyond that provided by static assessments, as a means of narrowing the assessment–treatment gap.

Dynamic assessment is an interactive procedure that systematically and objectively measures the degree of change that occurs in response to cues, strategies, feedback, or task conditions that are introduced during testing (Embreton, 2004; Haywood & Lidz, 2007). Intervention techniques are embedded within assessment procedures in a deliberate effort to produce changes in performance that are systematically observed and measured. In contrast to static assessment, dynamic assessment focuses on individual variations and changes rather than on comparison to normative or typical performance. The goal is to measure how and to what extent performance can improve with guidance (Haywood & Lidz, 2007).

Intervention approaches used by occupational therapy inherently have different underlying assumptions about learning and change. Dynamic assessment that focuses on the clients’ ability to benefit from the teaching–learning process can be used to effectively and efficiently guide treatment planning to enhance occupational performance. Preliminary evidence in children with mental retardation (Hessels-Schlatter, 2002) and adults with schizophrenia (Wiedl, Wienobst, & Schoettker, 2001) supports the premise that dynamic assessment provides unique information on learning that may be useful in further predicting which people might profit most from treatment. However, dynamic assessment methods have not been previously investigated in people with right hemisphere stroke.

Unilateral Neglect

UN, a common symptom of right hemisphere stroke, is clinically characterized by a reduced ability to orient, attend, or respond to stimuli presented on one side of space (Heilmann, Watson, & Valenstein, 2003). Awareness of the deficit is usually limited, and patients do not realize that they are missing information (Tham, Ginsberg, Fisher, & Tegner, 2001).

UN has been identified as a major factor limiting activities of daily living (ADLs) and rehabilitation outcomes in adults who have had a stroke (Chen-Sea, Henderson, & Cermak, 1993; Cherney, Halper, Kwasnica, Harvey, & Zhang, 2001; Gillen, Tennen, & McKee, 2005; Katz, Maier, Ring, & Soroker, 1999). Patients with UN have more difficulty resuming ADLs, have longer hospital stays (Katz et al., 1999), and are at increased risk for accidents (Czernuszenko, 2007). These limitations highlight the importance of investigating procedures for assessment and treatment.

UN can occur as a result of right or left hemisphere stroke; however, a significantly higher frequency, severity, and persistence of UN exists after right hemisphere stroke (Bowen, McKenna, & Tallis, 1999). This phenomenon has been attributed to the hypothesis that the right hemisphere is dominant for spatial attention and directs spatial attention to both sides of space, whereas the left hemisphere directs attention only to the right side of space. As a result, the right hemisphere, with its bilateral representation of space, is available to compensate in left-sided lesions (Mesulam, 2000).

UN is different from a visual field deficit. A person with a loss of vision in his or her left visual field still has awareness that the left side of space exists and will attempt to actively compensate for the visual loss. By contrast, people with UN may have intact visual fields but still fail to attend to the left side (Toglia, Golisz, & Goverover, 2009). They frequently do not realize that they are missing information and appear to experience the world as though it were complete (Tham, Borell, & Gustavsson, 2000).

Cues can heighten awareness and attention to the left and have been found to be effective in reducing neglect symptoms in some people with neglect. Within visual–spatial neglect, further distinction has been made between sensory–representational and motor–exploratory aspects of neglect (Barrett et al., 2006). Strategies and cues that are effective may differ depending on the components of neglect that are most affected. For example, placing a visual anchor may increase attention to the left side in sensory neglect, whereas the use of pointing or feeling the left edge may be helpful in people with motor–exploratory neglect. Analysis of response to cues and variations in task conditions may provide a more comprehensive understanding of the UN syndrome and further differentiate among people with neglect. In addition, response to cues may provide observable levels of the degree of assistance needed to increase awareness and attention before treatment begins.

Background of Dynamic Assessment

Dynamic assessment is based on Vygotsky’s (1978) zone of proximal development, which suggests that different people can have the same baseline score on a static test but may differ in the extent to which they can profit from instruction. Unaided performance on static measures tells us what has already been learned or accomplished, whereas the breadth of the zone of proximal development is thought to provide prospective indications of what can be learned. It has been suggested that the zone of proximal development be called the zone of rehabilitation potential and used as a guiding principal in rehabilitation (Cicerone & Tupper, 1986). This
zone is hypothesized to reflect the clients’ region of potential restoration of function or degree of cognitive plasticity (Calero & Navarro, 2007).

Dynamic assessment requires a different way of thinking about assessment and the abilities being measured. It is based on modern cognitive theories that view abilities and competence as changeable and sensitive to instruction. It assumes that abilities are not static but are in transactional relationships with the world (Haywood & Lidz, 2007). Learning and change are assumed to take place with experiences, including testing experiences and interactions with others. Dynamic assessment, therefore, represents a fundamental change from psychometric assumptions, in which performance is assumed to be stable and consistent. For example, in static assessments, items that show fluctuations or changes within a task or within a brief test–retest period are considered to be poor, unstable, or unreliable. In dynamic assessment, the items that show fluctuations or changes are the focus of interest. Dynamic assessment, therefore, requires a paradigm shift and alternate models of measurement because traditional concepts of reliability and error do not fit with the dynamic assessment approach (Elliot, 2003; Embretson, 2004; Sterngart & Grigorenko, 2002). An assessment framework that assumes that learning and change take place with experience is more compatible with conceptual models in occupational therapy. It is also particularly relevant for adults with stroke who are in the process of relearning and recovering lost functions. In recent years, the literature and interest in dynamic assessment has expanded, and several reviews have been published (Caffrey, Fuchs, & Fuchs, 2008; Sterngart & Grigorenko, 2002; Swanson & Lussier, 2001; Toglia, 2005). The potential value of dynamic assessment has been recognized by several occupational therapists who have provided suggestions and applications in occupational therapy (Cermak, 2005; Katz, Golstand, Bar-Ilan, & Parush, 2007; Lyons, 1984; Missiuna, 1987; Toglia, 2005).

Dynamic assessment does not refer to a specific procedure or technique but is a generic term that describes a wide range of methods. Although dynamic assessment methods differ widely, a core characteristic is their use of an interactive procedure in which the examiner provides guidance, encouragement, and feedback in an attempt to elicit the patient’s best performance (Haywood & Lidz, 2007). This approach is particularly important for optimizing performance in patients with stroke who may have limited awareness, anxiety, or decreased self-esteem. In such situations, dynamic assessments may provide a better estimation of abilities than static assessments because the nonthreatening nature of interaction can maximize active engagement, motivation, or the person’s sense of competence.

Test–Teach–Retest Approach to Dynamic Assessment

The most common approach to dynamic assessment involves training between a pretest and posttest, referred to as the test–teach–retest format. In this approach, training is sandwiched between a static pretest and posttest; thus, performance is measured before and after a period of instruction to determine the level and magnitude of change (Sternberg & Grigorenko, 2002). A good deal of variation exists regarding the content and techniques used in the training phase of dynamic assessment; however, a review by Swanson and Lussier (2001) indicated that strategy training yielded higher effect sizes than scaffolding, progressive hints, or coaching. The use of strategies has the advantage of identifying what is being trained and provides a concrete way to observe the effects of training (Klauer, 2002).

Operationalizing Learning Potential

The construct measured by dynamic assessment has been described as learning potential, responsiveness to instruction, or cognitive modifiability. This construct has been operationalized in different studies as the highest level attained with cues, percentage of improvement made with assistance, use of learning profiles, gain scores, and posttest performance (Grigorenko & Sterngart, 1998). Most authors have suggested that the posttest score alone is the most informative and reliable indicator of learning potential (Lidz, 1991; Sterngart & Grigorenko, 2002). Posttest scores include initial levels of abilities, the added effects of repeated testing, and the effects of training or learning outcome (Budoff, 1987). The posttest score has been used to represent a measure of the ability to transfer learning to tasks that were not directly used during dynamic assessment (Lauchlan & Elliot, 2001). Transfer distance is also used to describe the extent to which learning is carried over to other situations after the training phase. Transfer tasks differ in degree of similarity from those that are similar in physical appearance (near transfer) to those that look completely different (far transfer) but require the same underlying skills and abilities (Toglia, 2005).

In addition to the use of posttest scores and transfer distance, the process of change can be examined within training tasks by using learning profiles. Patterns of change across different items or levels of task complexity can be graphed and used to reflect rate of learning and carryover of training within a task. Guthke and Beckmann (2000) observed that learning profiles in children undertaking tasks of varying complexity can distinguish important differences among learners.
The current study was designed to examine the effect of dynamic assessment on near and intermediate transfer tasks. A teach–test–retest format was used with standard cancellation tasks as pretests and posttests. The teach phase focused on strategy training within a visual object search task to help participants attend to the left. Posttest scores were used to measure learning outcome, whereas learning profiles were used to examine the process of change within the teaching phase of dynamic assessment. Results were compared with those of a control group that received only static assessments (no teach phase) to explore differential effects between the two groups. If dynamic assessment contributes information on learning that is different from static testing, we would expect that performance on the Object Search Task and posttests would be significantly different between the groups because these tasks include the effects of strategy training in the dynamic group.

Research Questions

1. Do people with UN show significant improvements in performance under dynamic assessment conditions compared with static assessment (control) conditions?
2. Do people with UN show ability to carry over cueing effects to similar tasks after dynamic assessment?

Method

Participants

Forty adults with a right unilateral cerebrovascular accident, diagnosed by neuroradiologic findings (computed tomography or magnetic resonance imaging), were recruited from one of five rehabilitation facilities in the New York City area. All participants demonstrated evidence of UN on at least one of three designated tests of UN (described in the Instruments section) as indicated by asymmetrical performance and scores below established cutoffs. Participants were required to be able to follow two-step directions and have competence to provide informed consent. Additional inclusion criteria included functional use of one hand; visual acuity of at least 20/80 (with corrective lenses if applicable); and negative history of significant previous psychiatric disorder, neurological disorder, or chronic alcoholism. Participants who met criteria and signed informed consent were randomized into one of two groups: a control group and a cue group. All participants were currently receiving rehabilitation services and were referred to the study by their occupational therapist.

The sample included 20 men and 20 women, ranging in age from 47 to 82, with an overall mean age of 67.82 years (standard deviation [SD] = 10.97). The majority of participants were White (75%), had at least 12 years of education (87.5%), were within 45 days after onset of stroke (85%), and had an ischemic stroke (82.5%). Table 1 shows the characteristics of each group. The mean age of the control group was 70 years (SD = 11), and the mean age of the dynamic group was 65 years (SD = 11). The control group had more women and years of education, less ethnic diversity, and less time since the stroke than the dynamic group. In addition, the dynamic group had slightly more participants with moderate to severe UN than the control group; however, none of these differences was statistically significant.

Instruments

Line Crossing Test. The Line Crossing Test (Albert, 1973) consists of a page that has lines scattered randomly in various orientations. The participant is instructed to cross out all the lines, and the total number of marked lines is recorded. The maximum score is 36 (18 left and 18 right). Test takers without impairment do not usually make errors on this test; therefore, the cutoff score was conservatively set at <34 marked items (Vanier et al., 1990). The Line Crossing Test is a highly stable and valid measure of UN (Lezak, Howieson, & Loring, 2004).

Star Cancellation Test. The Star Cancellation Test, a subtest of the Behavioral Inattention Test (Wilson, Cockburn, & Halligan, 1987), requires the patient to cross out 54 small stars on a page. The target stimuli are randomly interspersed among 75 distracter items. The maximum score is 54, or 27 in each half. A cutoff score of ≤51 (or ≥23 missed stars) indicates neglect. The Star Cancellation Test is a highly reliable and valid test of UN (Bailey, Riddoch, & Crome, 2004; Lezak et al., 2004) that correlates with functional abilities (Cermak & Lin, 1994; Kizony & Katz, 2002) and predicts long-term outcome (Katz et al., 1999).

Picture Scanning Subtest. Picture Scanning, a subtest of the Behavioral Inattention Test (Wilson et al., 1987), consists of three large, colorful photographs: (1) a meal on a plate, (2) a bathroom sink with toiletries, and (3) a view of a room. The participant is instructed to name and point to all objects in the picture. Two alternate forms of the test are available; one is used for the pretest, and the other is used for the posttest. The maximum score or total number of objects across the three photographs is 24, or 12 on each side. Four or more omissions were conservatively used as the cutoff score (Lezak et al., 2004). Reliability and validity of the Picture Scanning task was reported by Hartman-Maier and Katz (1995), Lezak et al. (2004), and Wilson et al. (1987).

Object Search Task. The Object Search Task, adapted from Toglia and Finkelstein (1991), consists of line drawings of objects rotated and scattered across a page. The task has...
Table 1. Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Control Group (n = 20)</th>
<th>Dynamic Group (n = 20)</th>
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<tbody>
<tr>
<td>Gender</td>
<td>Frequency Percentage</td>
<td>Frequency Percentage</td>
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<td>13</td>
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<tr>
<td>Female</td>
<td>13</td>
<td>7</td>
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<tr>
<td>Age (years)</td>
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<tr>
<td>47–69</td>
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<td>60–89</td>
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<td>80–82</td>
<td>4</td>
<td>20</td>
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<tr>
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<tr>
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<tr>
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<td>10</td>
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<tr>
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<tr>
<td>College degree</td>
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<td>20</td>
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<tr>
<td>Master’s degree</td>
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<td>30</td>
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<td>(or higher)</td>
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<tr>
<td>Days since onset</td>
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<tr>
<td>9–17</td>
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<td>30</td>
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<tr>
<td>18–30</td>
<td>6</td>
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<td>31–45</td>
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<td>&gt;45</td>
<td>2</td>
<td>10</td>
</tr>
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12 pages, each containing 24 objects, with 12 objects scattered on the left side and 12 objects on the right side. Each page is presented in midline, and the participant is instructed, “Tell me all of the objects that you see.” If the person is unable to name the object, he or she is instructed to describe its function or point to it. The test has two levels of task difficulty. The first 6 pages include only stimulus items, whereas pages 7 through 12 include background distractors. A detection score of 1 point is assigned for each item identified. Kline (2000) found that a modified version of this task correlated with functional abilities.

Procedures

Three static pretests (Line Crossing, Star Cancellation, Picture Scanning) were administered in the same order by the participant’s occupational therapist. Within 36 hr of pretest administration, Joan Toglia, who was blind to results of the pretests, administered an Object Search Task. The Object Search Task was administered differently to each of the two groups. In the control group, each of the 12 pages was administered in order without feedback or cues (static assessment). In the dynamic group, the Object Search Task was used as the teaching phase. Participants were provided with cues that included strategy training and feedback if items were missed. The strategies were general and could be applied to a wide range of visual search tasks. In the dynamic group, the number of cues provided depended on the response of the participant. If all objects on a page were located, no cues were provided, and the next page was presented. If some items were missed, the first cue, consisting of verbal feedback, was provided (see Table 2 for a description of cues). If undetected items remained, the next cue was given. Cueing continued until either all objects were detected on the page or all four cues were given (whichever came first). The cues were always presented in the same order. The person was given positive feedback each time spontaneous initiation of a strategy was observed. At the end of each page in which any items were missed, the participant was asked why he or she might have originally missed items. Reinforcement of use of the strategies was provided, for example, “The strategies I showed you will help you check yourself to make sure you have seen everything” and “Remember to use ____ (strategy). It will help you monitor the tendency to miss things.” After the Object Search Task was completed, the three static cancellation tests were repeated in the posttest phase, within the same session. No cues or feedback were provided to either group during the posttests. The length of intervention averaged 30 min and was conducted within a single 60-min session that included an interview and the posttests.

Data Collection. For each test administered, two scores were obtained: the number of items detected and a laterality index. The laterality index reflects symmetry of performance and is the ratio of the total number of items detected on the left side to the total number of items detected. A ratio of .50 indicates equal attention to the right and left sides of the page. An index of 0 to .46 is indicative of a left-sided UN, and an index .54 to 1.00 indicates a right-sided UN (Samuelsson, Hjelmquist, Naver, & Blomstrand, 1995).

Static pretests and posttests. Aggregate total scores for the three pretests and posttests were computed for both the laterality index and the total number of items detected. Test–retest reliability (based on the pretest–posttest correlations for the control group) indicated that the scores were highly reliable (total detection score, $r = .86$; total laterality index, $r = .91$). In the dynamic group, the aggregate posttest score reflects initial levels of abilities, the added effects of repeated testing, and the effects of training or learning outcome. Changes in posttest scores beyond effects of repeated testing represent intermediate transfer of learning in this study.

Object Search Task. In each group, scores for each of the 12 pages, as well as total scores for the Object Search Task, were computed for both the laterality index and the number of items detected. The average scores for each page were graphed and compared across groups and examined for individual participants. In the dynamic group, the detection score for each page (before cues or strategies) reflected near transfer or the ability to maintain the gains achieved with
cues on previous pages, whereas in the control group (no cues), we expected that the number of items detected would remain relatively stable from one page to the next (within the same level of task difficulty). In other words, in the dynamic group, higher scores from page to page created a learning profile that reflected the ability to incorporate instruction from previous pages (the effects of carryover of strategy training) and was an indicator of near transfer learning. An additional measure of learning obtained in the dynamic group included the total number of items detected with cues (baseline plus items obtained with cues) and the laterality index with cueing. For both groups, spontaneous strategy use (1 = present, 0 = absent) and the side on which visual search originated (left = 1, right = 0) were also recorded and added across the 12 object search tasks.

Data Analysis. After data were collected, differences between groups on demographic variables were investigated using chi-square analysis and independent \( t \) tests. A one-way analysis of variance was performed to examine group equivalency on the pretests. No significant differences were found. Assumptions of linearity, homogeneity of variance, and parallel regression were evaluated before use of inferential statistics and showed no violations. An \( \alpha \) level of .05 was established for all statistical tests. Before examining the research questions, static measures of neglect were examined to determine whether the tests measured a common underlying dimension. Aggregate scores were used in subsequent data analysis because a principal components analysis indicated that one factor explained 84% of the variance of the laterality indexes from the three pretests and one factor explained 80% of the variance of the total number of items detected from the three pretests. Descriptive statistics (means, standard deviations, minimum, and maximum) were calculated for all test scores. To determine whether dynamic assessment contributed information that was different from static assessment, differences between groups on the Object Search Task (total number of objects detected and the object laterality index) were examined using a multivariate analysis of covariance (MANCOVA) with the aggregate laterality index of pretests as a covariate to control for differences in initial severity. To examine differences among the groups in posttest scores, a univariate analysis of covariance (ANCOVA), with the pretests as covariates, was used. Differences between groups in origin of visual search and spontaneous strategy use during the Object Search Task were compared with independent \( t \) tests.

Results

Comparison of Groups on the Object Search Task

Results of the MANCOVA indicated significant differences between groups on the Object Search Task (Wilks’ \( \lambda = .785 \), \( F[2, 36] = 4.92, p = .013, \eta^2 = .22 \)). Univariate analysis indicated that both the object detection score (\( F[1, 37] = 9.350, p = .004, \eta^2 = .20 \)) and the laterality index (\( F[1, 37] = 9.60, p = .004, \eta^2 = .21 \)) were significantly higher in the dynamic group than in the control group. Table 3 presents original and adjusted means of the Object Search Task for each group.

A line graph of the laterality index (Figure 1) for each group, across each of the 12 object search tasks, provides closer inspection of group differences. The control group exhibited relatively stable performance for the first 6 search pages and demonstrated declining performance on search pages with background distractors (pp. 7–12). By contrast, the dynamic group (baseline) demonstrated improved performance on pages 2–6 relative to the first search page. When task complexity increased on search page 7, there was an
initial decline in performance (increased UN) that was similar to the pattern exhibited by the control group. The dynamic group, however, demonstrated increased attention to the left side of space on remaining search pages, indicating carryover of strategies across trials. The dynamic group (with cues) showed improved and symmetrical performance when cues were present (Figure 1).

This finding of reduced UN in the dynamic group is further supported by analysis of the side of space on which visual search originated. An independent samples t test indicated that the average search score in the control group was significantly lower than in the dynamic group ($t[38] = -2.962, p < .01$). Both groups showed a small percentage of participants beginning search on the left side for the first 2 search pages (20%–35%), but across subsequent search pages, the dynamic group showed an increase in the percentage of participants who started visual search on the left side (40%–70%), whereas the percentage of participants in the control group remained relatively similar across the 12 pages. These results provide additional support for the finding that cueing was effective in improving attention to the left side of space during the Object Search Task. Both groups used minimal strategies for the first 2 pages of the Object Search Task. In the dynamic group, spontaneous initiation of strategy use increased and remained significantly higher than in the control group ($t[38] = 2.99, p < .01$) across the remaining pages of the Object Search Task.

One disadvantage of group means is that individual variability can be masked. Although average object search scores indicated improved performance in the dynamic group, not all participants benefited equally from cues. For example, some participants exhibited increased performance only when cues were provided but did not show carryover from page to page. One participant showed no changes in performance with cues. Others demonstrated initial improvements in performance, but as task complexity increased, performance deteriorated and did not improve with cues, indicating a lack of ability to use feedback under more demanding conditions. A few participants consistently showed carryover from page to page despite the introduction of more demanding tasks.

**Group Comparison of Pretest and Posttest Differences**

Although evidence indicated that the dynamic group showed learning within the Object Search Task, the next step was to determine whether the dynamic group demonstrated carryover of learning effects. Univariate ANCOVA with posttest scores as the dependent variable and pretest scores as covariates were significant (total detected: $F[1, 36] = 5.34, p = .03$; laterality index: $F[1, 36] = 5.51, p = .02$). On average, the control group showed a decline from pretest to posttest measures, whereas the dynamic group showed an increase in average scores from pretest to posttest measures. This finding suggests that participants within the dynamic group showed intermediate transfer of learning to other visual search tasks (posttests), even after cueing was suspended.

**Discussion**

Dynamic assessment is concerned with measuring the extent to which changes in performance occur as a result of guided assistance. This investigation is the first to explore the application of dynamic assessment to adults with right hemisphere stroke and UN. Specifically, this study examined...
whether dynamic assessment conducted within one session differentiated among those with UN and contributed unique information about learning.

Dynamic assessment produced significant differences between groups on near transfer tasks and intermediate transfer tasks. In addition to higher detection and laterality index scores, participants in the dynamic group demonstrated increased strategy use and a tendency to begin search on the left side. Changes in performance in the current study indicated that learning effects and spontaneous transfer (near and intermediate) can be observed after a 30-min intervention.

The control group showed an unexpected decline with repeated testing, especially as difficulty increased. This finding may be related to the premise that in addition to failure to attend to the left side of space, UN is associated with generalized or nonlateralized attentional impairments, such as decreased vigilance and deficits in selective attention (Thimm, Fink, Kust, Karbe, & Sturm, 2006). Increases in the symptoms of neglect have been observed when greater demands are placed on generalized attentional capacity (Robertson & Halligan, 1999). Decline in the control group may have been at least partially related to decreased awareness regarding performance. When feedback was not provided, sustained requirements for visual search appeared to reduce motivation. Participants appeared to think that the task was easy and that they were doing well. Several participants in the control group commented about the lack of task challenge and were anxious to find out when the task would be over. By contrast, participants in the dynamic group, who received the strategy training described in Table 2, were actively engaged in the task and asked the examiner for feedback, suggesting enhanced awareness and motivation.

Similar observations regarding control group decline and decreased task enthusiasm were observed by Haywood and Miller (2003) in a study with adults who had chronic cognitive deficits as a result of traumatic brain injury (TBI). These observations imply that standardized testing conditions may underestimate the person’s potential, particularly if awareness is decreased.

One could postulate that cues served to increase general levels of attention and arousal in the dynamic group and prevented fatigue. Significant differences, however, in strategy use and symmetry of performance, including origin of search, were observed. The starting point for visual search has been found to be one of the most sensitive indicators of UN. Previous studies have found that participants without UN typically begin search on the left side 80% of the time when stimuli are randomly scattered, whereas those with UN begin on the right side the majority of the time (Azouvi et al., 2002). The reduction in the right-sided orientation bias in the current study appears to reflect changes in automatic orientation of attention. Participants in the dynamic group showed greater spontaneous initiation of search on the left side and strategy use, even on more demanding tasks. This finding indicates that instruction specifically improved attention to the left side rather than just general levels of attention.

Examination of between-group performance across the Object Search Task indicated that the greatest difference occurred under more demanding task conditions (Figure 1). Other researchers have also observed greater differences in performance with complex tasks. For example, Haywood and Miller (2003) found that adults with TBI demonstrated the most dramatic improvement within a group dynamic assessment procedure on the most cognitively complex task. Some researchers have concluded that these findings suggest that mediation is most effective and most needed in complex tasks (Haywood & Tzuriel, 2002). It is possible, however, that higher levels of performance under complex conditions may have been possible only because the person was initially trained within a level that was responsive to intervention.

Increased task complexity had an initial effect of increasing symptoms of neglect in both groups, demonstrated by a decline in performance in the seventh search page. This finding indicates that strategies that are effective at one level of complexity may not spontaneously transfer to another level without explicit training. With cueing, however, performance in the dynamic group improved across the remainder of the search pages. A small number of participants within the dynamic group showed performance deterioration with complex conditions that did not rebound with additional intervention. This observation indicates that for some people, the ability to benefit from training may depend on task complexity.

The control group exhibited a significant increase in UN symptoms, as measured by the laterality index, when background distractions were present. This finding is consistent with findings of other researchers, who have reported that sensitivity to UN increases when stimuli are interspersed with distracters (Ferber & Karnath, 2001).

The test–teach–retest format of dynamic assessment provides information about learning outcome across pretests and posttests. It is also important, however, to examine individual learning within tasks. The dynamic Object Search Task provided repeated opportunity to observe the ability to incorporate the effects of strategy training and feedback from one visual search page to the next across varied levels of difficulty. Profiles of performance within the Object Search Task can reveal individual differences in learning that have implications for occupational therapists. For example, if
changes in performance are not observed with cues, then it is likely that an approach that depends heavily on verbal cues or strategy training would not be successful. If improvements are observed only when performance is supported with cues, caregiver training or environmental supports may be indicated. If carryover of strategy use is observed only without background distractions, then it indicates that strategy training may be indicated within certain types of activities, whereas task modification may be indicated in visually complex situations.

In this study, examination of performance across search pages in the Object Search Task yielded a performance profile that was useful in characterizing patterns of learning within similar tasks (near transfer). By contrast, the highest level of performance attained with cues was not helpful in differentiating among participants because most participants exhibited nearly symmetrical performance when cues were provided. This observation is consistent with those of other researchers, who have found that neglect symptoms can temporarily disappear when cues are present (Halligan & Marshall, 1998). In this sample, the ability to apply a strategy independently in the subsequent search page immediately after instruction was more informative than examining the highest level of performance with cues. The results of this study suggest that further differentiation among learning status may be possible by examining variability in individual learning curves across tasks that vary in complexity and similarity.

Limitations and Future Research

We emphasize that this study focused on visual–spatial neglect, which is only one aspect of UN. Another limitation of the study is the small sample size and the wide range of severity of neglect within each group. Both groups had a subgroup of patients with mild neglect. This situation created a ceiling effect for pre–post comparisons because change could not be adequately measured in people who were high scorers. A larger sample size would allow for analysis of learning patterns within subgroups that differed in level of severity. It would also allow for use of more sophisticated statistical methods, such as latent curve analysis or growth curve modeling. Alternatively, future studies may consider restricting the range of severity levels so that less variability exists within the group. For example, inclusion criteria could require more conservative cutoff scores or symptoms of UN on two different tests.

The format of dynamic assessment, including the brevity of instruction and the structured format for cues, can be considered both a strength and a limitation of this study. Dynamic assessment has been criticized as too time consuming to use in clinical practice (Haywood & Lidz, 2007). The single-session format used in this study addressed this criticism and demonstrated that valuable information could be obtained in a short timeframe. However, posttests were administered immediately after the training tasks, so it is not clear how long the changes were maintained.

In this study, the dynamic assessment procedure was structured and did not allow the examiner to freely choose prompts or strategies. The method of providing guided assistance has been a source of controversy within dynamic assessment research (Elliott, 2003). Several researchers have argued that prompts or instruction should be adapted to the individual needs of the person and should not be structured or standardized (Feuerstein, Feuerstein, Falik, & Rand, 2006; Haywood & Lidz, 2007).

The results of this study indicated that examination of learning patterns within a task deserves further attention. The examiner observed that some participants were unable to cope with increased task demands, and their performance rapidly deteriorated. An option that allows the examiner to return to easier task conditions and to spend additional time training on easier items might produce a different learning effect. Guthke and Beckmann (2003) designed a computerized adaptive test for children that adjusts items to the ability level of the child. This model could be adapted for adults with stroke or brain injury. Criteria that require a person to obtain a certain score on easier items before progressing to more complex items could be built into dynamic testing procedures.

A larger and more important question is whether dynamic assessment is an independent construct that contributes to predicting functional outcome, engagement in occupation, or response to rehabilitation above that of performance on standardized tests. The greatest value and contribution of dynamic assessment, however, may be its ability to inform and guide intervention. Dynamic and static assessment methods provide complementary information. Occupational therapists regularly present clients with opportunities for enhanced learning or adaptation, but the process of learning and change is not systematically measured. The test–teach–retest method of dynamic assessment used in this study challenges practitioners to expand assessment development beyond psychometric traditions and to embrace methods that are designed to stimulate, analyze, and measure the process of intraindividual change as a foundation for guiding occupational therapy interventions. ▲

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