Visual Perception of Objects: An Approach to Assessment and Intervention

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Key Words: perceptual disorders • rehabilitation

This paper proposes an alternative to the deficit-specific approach that has been used to guide the visual perceptual assessment and treatment of brain-injured adults. Recent theoretical advances in visual object perception are combined with a cognitive rehabilitation model to provide a framework for occupational therapy assessment and treatment of object-processing dysfunction. Assessment guidelines are presented that emphasize the analysis of residual function by specifying the task conditions that influence visual perception. A case study illustrates clinical application of this approach. Implications for research are discussed.

Deficit-Specific Approach

The deficit-specific approach categorizes visual perceptual dysfunction into specific deficits. Deficits that produce problems in accurately perceiving objects include visual agnosia and form-constancy or figure-ground impairments. Visual agnosia is a modality-specific disorder of recognition. The patient is able to identify objects through touch but is unable to recognize objects visually despite normal visual acuity (Trombly, 1983). The patient with form constancy impairment is confused by objects with similar shapes (e.g., pencil and straw) and has difficulty recognizing an object placed in an unusual position. In figure-ground impairment, the patient can have difficulty perceiving objects that are not well defined, such as an object in a pocketbook or drawer (Lamm-Warburg, 1988). Although all three of these deficits affect the ability to recognize objects accurately, they are considered to be distinct disorders.

Assessment seeks to identify specific deficits in visual perceptual function (Seiv, Freishtat, & Zoltan, 1986). Typically, the assessment of visual object perception is categorized under visual agnosia. There are no standard procedures for the evaluation of object discrimination. The patient is usually asked to name or to point to common objects chosen by the therapist. Responses are either intact or impaired (Bouska, Kauffman, & Marcus, 1985; Lamm-Warburg, 1988; Seiv et al., 1986; Trombly, 1983). Impaired responses are described as bizarre, unrelated, confabulatory, or perseverative. The patient with visual agnosia has "no concept of what the object is" (Bouska et al., 1985, p. 575) unless he or she is allowed to touch the object.

Treatment emphasizes the direct remediation of observed deficits through tabletop exercises and practice drills. For example, a patient who is unable to perform a form-constancy task or a figure-ground task is given form-constancy or figure-ground practice drills. A patient who is unable to recognize objects practices object-discrimination drills. A compensatory

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approach may be used to help patients use other sensory modalities, such as touch, to recognize objects (Lannm-Warburg, 1988; Seiv et al., 1986).

The deficit-specific approach, which has been influenced by Frostig's (1966) perceptual-motor approach with learning-disabled children as well as by neurological literature that emphasized the neuroanatomical localization of specific disorders (Chusid & McDonald, 1985; McFie, 1969), has several limitations. First, it equates difficulty in the performance of a specific task with a deficit. It does not consider the underlying reasons for failure or the conditions that influence performance. For example, two patients are classified as having a figure-ground problem. The first patient has difficulty picking 1 object out of a box of 10 objects, which causes difficulty in self-care activities. The underlying reason for the difficulty is the patient's overattention to detail, which causes him to misperceive the whole. In contrast, the second patient has no difficulty with 10 objects but has difficulty performing the Ayres figure-ground task (Ayres, 1972). He has no difficulty performing self-care activities but has difficulty quickly locating objects in visually confusing environments such as supermarkets. The underlying reason for his difficulty is a tendency to miss details. Both patients are described as having figure-ground deficits, yet their problems and the conditions under which they occur are very different. This limits the usefulness of these terms in treatment planning. Treatment planning requires an understanding of the underlying reasons for difficulty as well as a delineation of the conditions that influence performance. A deficit-evaluation approach replicates the purpose of neurological and neuropsychological evaluations in that it seeks to define dysfunction. Occupational therapists need assessments that provide information about the type of treatment strategies that will help facilitate function. Ideally, occupational therapy assessments should aim to predict responses to treatment as well as to identify the most suitable treatment approach.

A second limitation of the deficit-specific approach is that it implies that object recognition is an all-or-none process and that figure-ground and form-constancy skills are independent of object-recognition skills. It also assumes that visual agnosia is a single clinical entity (Humphreys & Riddoch, 1987a). For years, many investigators have argued that visual agnosia does not exist. For example, Bender and Feldman (1972) claimed that all alleged cases of visual agnosia could be explained by subtle alterations in perceptual function or by the combined effects of perceptual dysfunction and generalized intellectual deterioration. Other investigators have disagreed on the criteria used to classify patients with visual agnosia. For example, some investigators have described patients who cannot recognize shapes as pseudoagnosic (Warrington & Taylor, 1988), and others have categorized these patients as agnosic (Benson & Greenberg, 1969). Warrington and Taylor discussed visual agnosic patients who could recognize single objects and pictures of objects but who had difficulty when the objects' features were distorted or degraded. Other investigators (Rubens, 1979) have reserved the term visual agnosia for patients who have difficulty recognizing single objects. These discrepancies reflect the lack of clarity inherent in the definition of visual agnosia. The inconsistency in the scope and application of the term visual agnosia has reduced its measurable potential and its clinical value.

Recently, there has been a movement away from the acceptance of visual agnosia as a single clinical entity (Walsh, 1987). Multistage models have been proposed with the belief that visual object processing may be impaired in a number of different ways rather than by a single deficiency (Humphreys & Riddoch, 1987a; Kertesz, 1987). For example, Humphreys and Riddoch (1987a) have identified seven types of object recognition deficits and have abandoned use of the term visual agnosia. This perspective broadens the definition and scope of visual agnosia and suggests that traditional approaches to assessment and intervention of object recognition disorders should be reexamined.

**Information Processing Approach**

*In this approach, visual perception is viewed from the perspective of information processing, which involves the reception, organization, and assimilation of visual information. Visual information processing can be conceptualized on a continuum from simple to complex (Abreu, 1985; Abreu & Toglia, 1987). Simple visual processing, which occurs automatically and involves little effort or analysis, is the ability to recognize objects, colors, and shapes and to make gross discriminations of size, position, and direction. Complex visual processing, which requires concentration, effort, and much analysis, is the ability to accurately perceive detailed visual scenes, make subtle discriminations, and grasp the interrelationships among simultaneously presented visual stimuli (Abreu & Toglia, 1984).* Object processing is a subcategory of simple visual processing skills that specifically pertains to the ability to apprehend the meaning of objects through vision. The term visual object-processing dysfunction refers broadly to any problem that affects the ability to recognize objects. Normally, a person can perceive objects in the environment at a glance. The number of objects present and the angle at which they are presented have little effect on their recognizability. The object-recognition process occurs...
with such ease that it is difficult to comprehend the complexities involved (Humphreys & Riddoch, 1987b).

Visual object-processing dysfunction is described as a decrease in the amount of stimuli that the visual system can assimilate at one time. A visual object-recognition deficit is not an all-or-none phenomenon: It severely reduces the visual system's processing capabilities but does not eliminate them (Abreu & Toglia, 1987). The patient may be able to recognize objects under some conditions. For example, a patient may have difficulty recognizing a familiar object in a testing situation but may have no difficulty recognizing the same object when it is presented with other normally associated objects. Object-recognition breakdown can occur for many reasons. The patient may overfixate on one portion of an object and have difficulty shifting visual attention to other aspects. He or she may miss essential features or have difficulty integrating elements of the object into a perceived whole (Humphreys & Riddoch, 1987b). He or she may also have difficulty absorbing more than one aspect of a stimulus at a time (Luria, 1980). In some cases, the patient may have difficulty remembering what certain objects look like (Farah, 1984) or may assimilate and decode visual information more slowly. Decreased assimilation and decoding speed may produce a halting scanning pattern and prevent the patient from gaining a global impression of the stimulus (Moyra, 1981). A lack of effort in actively scanning and extracting essential features can also contribute to impaired visual recognition (Luria, 1980). The underlying factors that contribute to object-recognition difficulties should be analyzed thoroughly during assessment.

Dynamic Investigation Method

Prerequisites

A visual screening battery, which includes visual acuity, should precede an assessment for visual object recognition. Therapists must remember that a standard visual acuity chart may not be valid with patients who have severe visual perception deficits (Bouska et al., 1985). In such cases, patients should receive only one visual stimulus at a time. A letter or word that is comparable in size to letters on a standard near-acuity chart can be placed in the middle of a white sheet of paper. The therapist should show the patient where to direct his or her eyes by pointing to the stimulus. Patients with severe visual perception disturbances may be able to perceive single small letters, symbols, or shapes when their center of vision is fixated on the stimulus. In contrast, cortically blind patients are unable to use central vision to see small shapes or symbols, even when their eyes are directed toward the stimulus. (Because severe visual perception disturbances have been observed during the recovery of patients with cortical blindness [Brown, 1972; Rubens, 1979], the vision of these patients should be checked regularly within the first 6 months after injury.)

Language deficits must also be ruled out as a factor interfering with object recognition. If a patient cannot name an object but can describe it or make gestures to demonstrate its use (without touching the object), the problem is related to a naming deficit rather than to an object-recognition impairment. If the patient can demonstrate the object’s use only after touching or feeling the object, then the therapist should suspect a severe visual perception disturbance. Matching tasks should be used to rule out a comprehension deficit or an inability to identify named objects. Matching of identical items should be avoided, because a patient may be able to perform exact matches by using color or size cues rather than by object recognition (Rubens, 1979). For example, in a matching task, the therapist should use two different forks (e.g., a silver fork and a plastic fork) rather than two identical forks.

Visual imagery must also be considered during object-recognition assessment. Visual imagery, which requires intact long-term visual memory, involves the ability to visualize what objects look like without seeing them. Drawing and oral questioning are two documented methods to assess visual imagery; however, neither method is completely reliable (Farah, 1984). Nevertheless, it is important to remember that a loss of visual object memory may underlie some object-recognition disorders.

Assessment Method

In contrast to the deficit-specific approach, the assessment of object recognition with an information process continuum is not limited to visual agnosia. This approach emphasizes the need to assess unfamiliar objects as well as common objects under various conditions. Object recognition is not rated as all or none. A dynamic investigation method is used to identify conditions that facilitate object recognition (Toglia, in press). In many cases, errors that seem bizarre and unrelated initially can become predictable when the conditions and reasons underlying the difficulties are understood. Dynamic investigation involves the analysis of task parameters, task grading, and the use of systematic cuing and investigative questioning when a patient has difficulty with an item (Abreu & Toglia, 1987; Toglia, in press).

Task parameters. The following describes the task parameters that influence object recognition. Table 1 summarizes the task parameters that can be
Table 1
Analysis of Task Parameters for Assessing Visual Perception With a Dynamic Investigation Method

<table>
<thead>
<tr>
<th>Task Grading</th>
<th>Environment</th>
<th>Familiarity of Objects</th>
<th>Directions</th>
<th>Number of Objects Present</th>
<th>Spatial Arrangement</th>
<th>Response Rate per Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least difficult</td>
<td>Normal</td>
<td>Self-related</td>
<td>&quot;What is this?&quot;</td>
<td>1-5</td>
<td>Linear, non-rotated</td>
<td>&lt; 0.8 sec</td>
</tr>
<tr>
<td>Moderately difficult</td>
<td>Associated</td>
<td>Non-self-related</td>
<td>&quot;Find the [object]&quot;</td>
<td>10</td>
<td>Scattered, rotated</td>
<td>1.1 sec</td>
</tr>
<tr>
<td>Most difficult</td>
<td>Out of context</td>
<td>Unconventional</td>
<td>&quot;Tell me what you see.&quot;</td>
<td>20</td>
<td>Scattered, rotated, overlapping</td>
<td>1.3 sec</td>
</tr>
</tbody>
</table>

Note. Proposed performance criteria for task grading is based on observations and studies of brain injured and non-brain injured subjects (Humphreys & Riddoch, 1987a, 1987b; Jolicoeur, 1985; Layman & Greene, 1988).

Manipulated to gradually increase the visual information-processing demands of object recognition.

1. Environment—The environment greatly influences object recognition. Object recognition may improve when objects are presented in the normal context in which they are normally used. This normal context provides cues that may facilitate the organization of visual inputs or bias the kinds of interpretations that are made (Humphreys & Riddoch, 1987b). Associated context refers to objects that are removed from their normal environment but are presented in conjunction with those objects with which they are normally grouped. The presence of other objects of the same category may provide cues that facilitate recognition. Global processing can sometimes influence the processing of parts. Humphreys and Riddoch (1987b) described one patient who demonstrated significant improvement in object recognition of pictures when the pictures were presented with a drawing of a scene to which each object belonged. By contrast, an object presented out of context does not contain additional information that can aid the recognition process.

2. Familiarity—The frequency with which an object has been encountered in daily life influences the ease with which it is recognized. Normally, the more familiar the object is, the more quickly it is recognized (Jolicoeur, 1985). Self-related objects are items that are routinely used on oneself (e.g., comb, toothbrush, fork, spoon). Non-self-related objects are items that are not used on oneself or are not used on a daily basis (e.g., flashlight, pliers, stapler, battery, dice). Unconventional objects are items that differ from their typical form and shape (e.g., a curved flowered pen, a watch without a wrist strap that clips onto a pocket, a pencil eraser in the shape of an airplane). The identification of unfamiliar objects places heavier demands on the subject’s ability to evaluate relationships among features (Layman & Greene, 1988).

3. Directions—Directions may provide structure to the task. For example, the direction “What is this?” while pointing to an object tells the patient where to direct his or her visual attention. The visual exploration requirements are minimal. The direction “Find the [name of object]” requires greater visual search skills. The patient is told what object to find but not where to look. The object’s name should elicit a visual image of the object. This can guide the visual search process and make it easier to locate the relevant item. In contrast, the direction “Tell me what you see on the table” provides the patient with less structure. Successful performance requires the patient to independently initiate and organize his or her visual search pattern. This situation is most similar to functional situations in which patients are required to independently recognize objects around them.

4. Amount—Amount refers to the number of objects presented at one time. Patients with severe visual perceptual disturbances may have difficulty perceiving more than one object at a time unless cued to look more carefully. This is thought to be due to a restriction in visual attention (De Renzi, 1982). In addition, some brain-injured patients may show a greater tendency to misinterpret objects when the objects are presented in a large group. As the number of objects increases, the rapid selection of critical features may become more difficult (Humphreys & Riddoch, 1987b).

5. Spatial arrangement—Spatial arrangement refers to the way in which the objects are positioned on the table. In a linear arrangement,
nonrotated objects arranged in a horizontal line provide a familiar and predictable format for visual scanning. Left-to-right scanning is an automatic process in cultures that read from left to right. In addition, a linear format provides a cue as to where the next item is located. In contrast, a scattered arrangement, in which objects are positioned at various angles, is less predictable. The patient has to develop a scanning strategy to locate all of the objects. Changes in the orientation of objects cause changes in surface illumination, hue, and depth (Layman & Greene, 1988). In addition, some surfaces may be hidden. When scattered and overlapping objects are crowded together, the identification of critical features becomes more difficult. Patients may tend to perceive a feature of one object as belonging to another object.

6. Response rate—Familiar pictures of nonrotated objects are normally recognized at a rate of less than 0.8 sec per object. Unfamiliar pictures of rotated objects are normally recognized at an average rate of 1.3 sec (Jolicoeur, 1985). The therapist should investigate any hesitation or delay in object recognition by shortening the stimulus exposure time to see if it affects performance. Some patients may increase their processing time to facilitate recognition.

**Task grading.** Task grading proposes that object recognition involves the ability to recognize a single self-related object in the appropriate context. The most difficult task in object recognition involves 15 to 20 unconventional objects presented in a scattered, crowded arrangement with the instruction “Tell me everything you see on the table” (see Table 1). Actual objects or pictures of objects can be used. Actual objects provide extra cues, which aid in identification. For example, the depth and size of an object are seen when the object is real, whereas such information must be inferred when a picture is used (Humphreys & Riddoch, 1987b). Testing should begin at a middle level and move up or down, depending on the patient’s response. A middle level may be the ability to recognize 10 scattered and rotated, non-self-related pictures of objects with the instruction “Tell me what you see.” If the patient succeeds, the task can be made more difficult (e.g., use of more objects, use of unconventional objects). If the patient does not succeed, the task can be made easier by either modifying the task or providing cues. Task modification consists of the independent manipulation of each parameter to determine which task conditions positively influence performance. The therapist observes the patient’s difficulties and makes a hypothesis about the patient’s performance. The therapist tests the hypothesis with an experimental design in which one task parameter is varied while all of the others are kept constant. For example, if it is hypothesized that the patient’s difficulty is due to the scattered spatial arrangement of the objects, then the spatial arrangement of the objects would be changed to a linear arrangement, while all of the other task parameters remained the same (Ginsburg, 1985).

**Systematic cuing.** The therapist may gain insight into the underlying reasons for a patient’s difficulty by providing a systematic series of cues. The following is an example of a graded cuing system.

1. Repetition cue—The therapist tells the patient, “Look again,” which provides subtle feedback to the patient by implying that the first response was incorrect. The ability to respond to this nonspecific cue indicates that the patient is able to self-correct indicated errors.

2. Analysis cue—The therapist asks the patient to describe the shape, size, color, or weight of the object that was misidentified. Sometimes, the requirement that a patient process other stimulus attributes facilitates a response, because the patient must pay closer attention to the object than he or she had before.

3. Perceptual cue—The therapist emphasizes the critical feature of the object either by pointing to the critical feature and saying “Look here” or by repositioning the object so that the critical feature is in the patient’s center of vision.

4. Semantic cue—The therapist provides the patient with a choice of three categories. For example, the therapist can ask, “Is it food, a tool, or clothing?” If this fails, the therapist tells the patient the category (e.g., tools) (Warrington & Taylor, 1988).

**Investigative questioning.** After a correct response is obtained, investigative questioning is used to ask the patient to explain his or her answer. For example, the therapist might ask, “Why did you think it was a bracelet instead of a watch?” or “How did you know it was a watch?” Answers to these questions can confirm the therapist’s hypothesis and provide insight into the underlying deficit. Responses that initially appear random and bizarre may make sense when the patient explains his or her rationale. For example, one patient mistook a pair of scissors for eyeglasses. During investigative questioning, the patient stated that he had only seen the two holes of the handle. The therapist’s hypothesis was confirmed when it was
noted that as soon as the blades of the scissors were pointed out (perceptual cuing), the patient recognized the object.

Analyses of task parameters, task grading, systematic cuing, and investigative questions are used to distinguish levels of visual object recognition. The assessment is designed to elicit weakened visual recognition skills that emerge with assistance or under special conditions (Brown & French, 1979; Toglia, in press). The dynamic investigation method of assessment may help to predict the patient’s responses to a cognitive perceptual rehabilitation approach. If the patient’s response cannot be facilitated through cues or through task grading, then a treatment approach such as cognitive rehabilitation, which incorporates these tools (Abreu & Toglia, 1987), may not be the treatment of choice; in this case, a sensory motor or functional approach might be more effective.

Treatment: A Multicontext Approach

Treatment aims to maximize existing visual function by providing strategies to enhance the patient’s ability to assimilate visual information efficiently. The three treatment tools described by Abreu and Toglia (1987) — teaching-learning, use of the environment, and body alignment — can be incorporated into the treatment of simple visual impairments. The emphasis is on helping the patient to understand the underlying characteristics of the disorder. The patient’s lack of understanding can produce anxiety as well as a feeling of loss of control. Treatment aims to help patients gain the ability to predict whether a situation will cause them difficulty (Abreu & Toglia, 1987). Once patients recognize the type of tasks that will cause difficulty, they can initiate the use of strategies that will help them overcome these limitations. This provides patients with a sense of control over their problems, thus enabling them to cope more effectively with their disability.

Traditionally, occupational therapy treatment techniques for perceptual deficits have been categorized as either remedial or functional. The proposed treatment shares some similarities with both of these categories. In some respects, it can be considered remedial because weak visual perceptual skills are practiced. At the same time, functional activities and environmental adaptations are used to increase the efficiency of visual processing (Neistadt, 1988). A major difference is that this approach emphasizes the ability to use strategies in various situations: It does not concentrate on one functional behavior or one task-specific skill. Other cognitive perceptual approaches grade the level of difficulty or decrease the level of required cuing within a specific computer or tabletop task such as block designs (Diller et al., 1974), cancellation tasks (Carter, Howard, & O’Neil, 1983; Weinberg et al., 1977), and reaction-time tasks (Piasetsky, Ben-Yishay, Weinberg, & Diller, 1982). In this approach, the use of strategies rather than treatment tasks remains consistent across sessions. The environment, the movement pattern, and the activity change while the same strategy is emphasized and applied in various settings (Abreu & Toglia, 1987).

Case Study

Mr. S. is a 66-year-old business executive with severe visual perception deficits of unknown neurologic etiology. His symptoms had emerged gradually over a period of 2 years. Computerized axial tomography and magnetic resonance imaging scans were normal. Neuropsychological testing revealed a large discrepancy between verbal and performance IQs (verbal IQ = 122; performance IQ = 65). Sensation, range of motion, strength, tone, and control were intact, and Mr. S. ambulated independently. A fine motor coordination impairment of the left upper extremity was functionally insignificant.

On an initial outpatient assessment, Mr. S.’s ability to recognize objects or pictures of objects accurately depended on the task demands (see Table 2).

| Table 2 |
| Visual Perception Evaluation Results of One Patient After 4 Months of a Multicontext Treatment Approach |

<table>
<thead>
<tr>
<th>Environment</th>
<th>Testing 1</th>
<th>Testing 2</th>
<th>Testing 3</th>
<th>Testing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarity of objects</td>
<td>Objects out of context</td>
<td>Objects out of context</td>
<td>Objects out of context</td>
<td>Objects in context</td>
</tr>
<tr>
<td>Directions</td>
<td>Non-self-relevant</td>
<td>Non-self-relevant</td>
<td>Unconventional</td>
<td>Non-self-relevant</td>
</tr>
<tr>
<td>“Tell me what you see.”</td>
<td>“What is this?”</td>
<td>“What is in the cabinet?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of objects present</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Spatial arrangement</td>
<td>Scattered</td>
<td>Scattered</td>
<td>Scattered</td>
<td>Scattered</td>
</tr>
</tbody>
</table>

| TASK PARAMETERS |
|-----------------|-----------|-----------|-----------|-----------|
| RESPONSE ACCURACY | Initial evaluation | 90% | 95% | 90% | 75% |
| | Reevaluation (after 4 months) | 95% | 100% | 75% | 95% |

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Mr. S. had no difficulty recognizing self- and non-self-related objects when stimuli were presented one at a time or when he was told what object to look for or where to look. However, when the task was unstructured and Mr. S. was instructed, "Tell me what you see," he demonstrated a tendency to omit information and misidentify objects in both linear and scattered spatial arrangements. For example, he identified a battery as a lifesaver. He also perceived a pencil as two separate objects—an eraser and a pencil. Mr. S. tended to overfocus on local features and disregard the whole. In 50% of the error responses, his performance was facilitated by asking him to describe the shape and size of the object, whereas in the remaining 50% of the error responses, his performance was facilitated by perceptual cues. Treatment emphasized a teaching-learning approach. Mr. S. was used to approaching visual tasks without much effort or consideration. As he stated, "I used to know where everything on my desk was with a quick glance; now something can be right in front of me and I can't see it." Initially, he was aware that he was having difficulty but he did not understand the need to approach visual tasks in a different way. He was extremely anxious and described his visual problems as unpredictable, stating, "I never know when lightning is going to strike." Treatment for Mr. S. consisted of practice in when and how to use strategies in different activities to increase his ability to process visual information accurately. Strategies were categorized as self-monitoring or situational. Self-monitoring strategies are effective in many tasks and environments (Brown, Bransford, Ferrara, & Campione, 1983; Pressley, Borkowski, & O'Sullivan, 1985).

Self-Monitoring Strategies

Anticipation. Mr. S. practiced predicting the situation in which his visual perception was most susceptible to errors. For example, he learned to anticipate difficulty in new environments or at times when more than four objects were present. The correct anticipation of problems leads to the ability to plan and initiate the use of strategies. Before treatment, Mr. S. did not understand which situations would be difficult for him. He knew that sometimes he perceived things accurately and sometimes he made embarrassing mistakes, but he did not understand why. He felt that his problem was totally unpredictable, which intensified his feelings of helplessness and anxiety.

Checking outcomes. Mr. S. learned that he needed to double-check his interpretations when viewing crowded visual scenes. Previously, he never had to think twice about what he saw. With practice, he realized that he sometimes based his interpretations on partial information. During treatment, he practiced viewing crowded visual scenes or objects from different perspectives. He learned how to always look at things from two angles by turning or tilting his head and by closing his eyes and then opening them to look again. This helped him to correct errors and increased his confidence in making visual judgments.

Pacing. Mr. S. learned to pace his response to visual information. He practiced identifying the conditions in which he needed to slow down (e.g., using a different type of telephone) as well as the conditions in which he could speed up (e.g., using and distinguishing between routine objects in a familiar context).

Stimulus reduction. In treatment, Mr. S. learned that he could increase his accuracy and speed by reducing the amount of visual information to be perceived at one time. Mr. S. then applied this strategy to other areas of his life; for example, he decided to play golf with only four clubs to reduce his difficulty in distinguishing between them. He had previously stopped playing golf because he found it too frustrating.

Situational Strategies

Scanning. Mr. S. tended to overfocus on details. As a result, he frequently missed important information. He did not automatically move his eyes around a visual display, and when he did, it was in an unorganized manner. During treatment, Mr. S. practiced organized methods of viewing visual scenes. For example, before attempting to discriminate between specific objects, he learned to pay attention to the whole by making a conscious effort to move his eyes around the entire scene and appreciate the size, width, and depth of the area. Left-to-right scanning was also emphasized when stimuli were arranged linearly.

Visual imagery. Mr. S. had difficulty finding items in crowded environments such as a store shelf, a medicine cabinet, or a refrigerator. Because he generally did better when he knew what he was looking for, visual imagery was used to facilitate recognition. For example, Mr. S. practiced vividly imagining what the object he wanted to find looked like before he initiated a visual search. He thought of the object in different sizes and colors and imagined it in various locations. Mr. S. reported that previously he had been unable to find an item such as an aspirin bottle in the medicine cabinet because he had a slightly wrong image of what it looked like (e.g., he searched for a red-and-white labeled bottle when the label of the bottle was blue).

Visual analysis. Initially, when Mr. S. was unsure of what he was seeing, he had a tendency to give up quickly. During treatment, he learned that with per-
sistence he could sometimes make sense of confusing visual information. Mr. S. learned that by silently verbalizing such characteristics as the shape, size, and thickness of an object, he could sometimes ascertain the meaning or function of the object. He also practiced viewing objects from different perspectives.

Organization. During treatment, Mr. S. learned that he needed to organize visual information in his environment whenever possible. He realized that he should always avoid placing two objects similar in shape and size next to each other. He recognized the need to designate specific locations for the placement of important items (e.g., to always put his reading glasses in the right drawer of his desk rather than among other items on the top of his desk). He arranged items in small clusters whenever possible, because he worked best with small groups of visual information.

Mr. S.'s treatment included tabletop tasks, computer activities, gross motor activities, and functional activities. He was treated in both crowded areas and quiet, private rooms. Movement requirements varied between standing, sitting, reaching, and walking. Although the activities, environment, and movement requirements varied, the same general strategies and rules were practiced in every treatment session. The goal was to help Mr. S. learn to apply internal and external strategies in many different situations.

During treatment, Mr. S. increased his self-confidence and his ability to cope with his disability. He began engaging in activities he had previously avoided. Although his neurological prognosis was guarded, a treatment approach that maximized the use of residual visual perception skills decreased his errors in functional tasks by 50%. A retest of visual object perception revealed a decrease in errors (see Table 2) after 4 months of 1-hour, twice-a-week treatment sessions.

Summary

Occupational therapists have emphasized a specific-deficit approach to the assessment and treatment of visual perception dysfunction in adults with brain injuries. This perspective views object-recognition dysfunction as a single clinical entity, separate from other aspects of perception.

The alternate approach proposed in this paper conceptualizes visual processing on a continuum from simple to complex. Object-recognition dysfunction is not an all-or-none phenomenon, but a complex process that can break down for many reasons. A dynamic investigation method of assessment analyzes visual object perception with consideration of changes in the environment, complexity, task directions, the number of objects present, the spatial arrangement, and the response rate. Levels of recognition can be distinguished through systematic task analysis, cuing, and investigative questioning. This nontraditional approach to assessment is aimed at identifying the types of cues and task conditions that facilitate correct responses. Information obtained from this type of assessment is directly related to treatment and is thought to be helpful in predicting response to a cognitive rehabilitation approach. The relationship of assessment results to functional levels needs to be clearly established through research.

Treatment emphasizes the use of general and specific strategies in a variety of activities, environments, and movement patterns (Abreu & Toglia, 1987). The case study presented in this paper illustrates the application of this approach to the treatment of dysfunction in visual object perception. These concepts can be easily applied to the assessment and treatment of other cognitive perceptual deficits such as unilateral neglect, visual-spatial disorders, memory dysfunction, and problem-solving impairments.

Future research is needed to study the efficacy of this treatment approach and to compare it with other cognitive remediation approaches. The responses of various patients to different types of cognitive remediation approaches must also be investigated. This paper described one approach to the assessment and intervention of cognitive perceptual disorders. With the increasing emphasis on cost-effectiveness, occupational therapy assessments should be geared toward predicting responses to treatment as well as toward delineating the patient's strengths and weaknesses.

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