Chapter 8

Naming and Word-Retrieval Impairments

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Among individuals with aphasia, one of the most common and persistent signs and symptoms is word-retrieval difficulty or anomia (Goodglass & Wingfield, 1997). Although functionally anomia is evidenced by disruptions in word retrieval during the flow of conversation, its presence is evaluated most commonly in picture confrontation naming tasks. Thus the terms word retrieval and naming are frequently interchanged. A review of the large body of literature in aphasia indicates that naming impairments vary substantially in their cognitive and neural underpinnings among individuals with aphasia. The clinician’s goal in working with individuals with anomia is to understand the distinct patterns of naming failure through a comprehensive naming assessment and then to implement appropriate treatments to address the individual’s naming dysfunction.

Pathophysiology of Naming Impairments

A complex system of lexical mechanisms is implemented in word retrieval (Fig. 8.1), including two critical stages: semantic and phonologic (Hillis & Newhart, 2008; Nickels, 2001). The lexical output stages are initially activated by modality-specific input mechanisms storing representations for familiar, previously learned spoken and written words and viewed objects, among others. In the case of confrontation picture naming, the primary input mechanism involving the object recognition system. Input representations then activate the semantic system, the store of meanings and associated information we have learned about words, objects, or actions. Semantic representations then activate modality-specific output lexicons for spoken and written words and actions. In spoken naming, this would be the lexical phonologic output system. Subsequent to the semantic and phonologic lexical retrieval stages, postlexical phonologic and articulatory processes allow for planning and executing verbal responses. Acquired brain damage that disrupts the activity of this complex system can lead to naming impairments.

The fact that naming impairments arise in almost all aphasia syndromes suggests that the naming system is mediated by a distributed left hemisphere neural network (Hart & Kraut, 2007). Hillis and her colleagues (DeLeon, Gottesman, Kleinman, Newhart, Davis, Heidler-Gary, et al, 2007; Hillis, 2007; Hillis, Chaudhry, Davis, Kleinman, Newhart, & Heidler-Gary, 2006; Newhart, Ken, Kleinman, Heidler-Gary, & Hillis, 2007), in studying patterns of language impairment and recovery in individuals with hyperacute stroke, show the essential role of left temporal, inferior parietal, and posterior frontal lobes in lexical processing. Antonacci, Beeson, Labiner, and Rapcsak (2008) have shown that the left inferior temporal cortex is critical for the mediation of semantic aspects of lexical retrieval in particular. Several investigations have reported that lesions of the inferior temporal cortex are associated with naming impairments that are worse for nouns than for verbs (Damasio & Tranel, 1993; Hillis, Tuffish, Wityk, & Barker, 2002; Tranel, Damasio, & Damasio, 1997), and for
items in the category of living things than nonliving things (Antonacci et al, 2008; Noppeney, Patterson, Tyler, Moss, Stamatakis, Bright, et al, 2007). The neural correlates of lexical phonologic output processing encompass regions of the left superior temporal gyrus and inferior parietal cortex (Goodglass & Wingfield, 1997). Lesions of the left frontal operculum, leading to nonfluent forms of aphasia, have been associated with deficits in naming, often greater for verbs than for nouns (Damasio & Tranel, 1993; Hillis et al, 2002; Tranel et al, 1997). Wilshire and Coslett (2000) proposed that naming impairments in the nonfluent aphasias probably relate to the interface between syntactic and lexical processes in word retrieval. The left thalamus is also part of this complex word retrieval network, as individuals with left thalamic lesions also present with word-retrieval impairments (Raymer, Moberg, Crosseon, Nadeau, & Rothi, 1997).

**Assessment of Naming**

Although subtests for naming assessment are incorporated in virtually all standardized aphasia test batteries, clinical decision making is enhanced through the use of specialized tools for naming assessment. Standardized tests available to assess naming abilities include the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 2001), and an Object and Action Naming Battery (Druks & Masterson, 1999), among others. A systematic assessment of lexical processing abilities, including both naming and comprehension subtests, is necessary to distinguish the different patterns that naming impairments may take. Thus, the revision of the Boston Naming Test to include a picture to written word matching component is a useful modification in such an assessment. Clinicians need to consider several variables when assessing the integrity of the naming system.

**Lexical Task Comparisons**

The naming assessment should include a variety of single-word processing tasks in which the clinician systematically varies input and output modalities, and analyzes patterns of performance across tasks sharing processing modalities (Table 8.1). Published psycholinguistic tests (e.g., Psycholinguistic Assessment of Language Processing Abilities [Kay, Lesser, & Coltheart, 1992]).
1992]; Pyramids and Palm Trees [Howard & Patterson, 1992]) and informal tests such as the Florida Semantics Battery (Raymer & Rothi, 2008) can guide cross-modality assessment of lexical and naming abilities.

Although word-retrieval difficulties can be noted in conversation tasks, systematic naming assessment most likely will be accomplished in structured tasks requiring naming responses to viewed pictures, pantomimes, and spoken and written definitions. Naming to pictures versus definitions can be contrasted to evaluate contributions of visual-semantic access to naming failure. To distinguish semantic versus phonologic bases of naming breakdown, performance can be examined in semantic processing tasks, which will also be impaired in the case of semantic breakdown. Impairment will be observed for all naming tasks as well as word comprehension tasks. Breese and Hillis (2004) showed, however, that a word-picture yes-no verification task (picture: cat, "Is this a dog?") is more sensitive to detecting semantic impairment than picture-word matching (picture: cat, words: cat, dog, horse, cow). Semantic tasks may include category sorting for closely related semantic categories (e.g., summer versus winter clothing), and matching associated pictures according to semantic relationships (e.g., rabbit: carrot).

To distinguish impairments that preferentially affect the phonologic output lexicon, performance can be contrasted across modalities of naming, as performance may be more impaired for oral than written naming. To further evaluate the integrity of the phonologic output lexicon, it may be necessary to administer tasks that tax phonologic lexical processing, such as rhyme judgments for picture pairs (e.g., Do the names of these pictures rhyme? whale-nail). The rhyming task will prove difficult for individuals who fail to activate a full lexical-phonologic representation for the pictures.

### Stimulus Characteristics

Several stimulus characteristics can affect success in naming assessment (Nickels, 1997, 2001). Some individuals show preferential impairments for certain grammatical categories (e.g., nouns versus verbs) and semantic categories (e.g., living versus nonliving items). Within standard aphasia tests currently available, an astute examiner may notice either impaired or spared performance related to selective grammatical or semantic categories, and then explore category distinctions with additional relevant informal test materials.

Several other psycholinguistic variables also affect the ability to retrieve words. Carefully controlled studies have demonstrated that factors such as imageability, length, familiarity, word frequency, and, especially, age of acquisition have a potent effect on noun- and verb-naming abilities (e.g., Hirsh & Ellis, 1994; Kemmerer & Tranel, 2000; Nickels & Howard, 1995). Imageable, familiar, shorter words, and particularly, words learned earlier in life are easier to name under conditions of brain damage. Naming assessment tasks need to incorporate stimulus materials varying in these influential psycholinguistic variables. Results of testing that identifies selective categories of difficulty for a patient may allow the clinician to streamline efforts in rehabilitation.
Error Analyses

Another key concept to consider in naming assessment is the pattern of errors produced across tasks, which may provide important clues as to the mechanism underlying a patient's naming impairment. Comparison of performance in tasks that engage the same lexical mechanism should show a qualitatively similar error pattern across tasks. For example, a severe deficit of semantic processing may lead to unrelated response errors in all comprehension and naming tasks. A phonologic output lexicon dysfunction may result in parallel patterns of phonemic paraphasias in oral picture naming and oral reading, especially for words with exceptional spellings.

Examination of the type of error itself within one lexical task is not sufficient to distinguish the level of lexical impairment responsible for the naming error (Hillis & Caramazza, 1995b). Semantic errors in picture naming are a case in point. On the surface, one might assume that these errors represent semantic system dysfunction. In fact, semantic errors may arise from impairment arising at several stages in the naming process: semantic system (e.g., Hillis, Rapp, Romani, & Caramazza, 1990), visual-semantic access as in optic aphasia (e.g., Hillis & Caramazza, 1995a), semantic-phonologic access (e.g., Raymer, Foundas, Maher, Greenwald, Morris, Rothi, et al, 1997), and phonologic output lexicon itself (Caramazza & Hillis, 1990). These observations underscore the need to analyze error patterns across lexical tasks to develop an accurate diagnosis regarding the source of the naming errors in an individual with aphasia (Raymer & Rothi, 2008).

Nature and Differentiating Features of Naming Impairments

The pattern of naming difficulty, type of errors produced, and accompanying lexical impairments vary depending on which stage in the naming system, semantic or phonologic, is disrupted by the brain injury. Impairments related to the object recognition system can disrupt naming abilities, but these impairments are discussed in the realm of visual agnosias, which are beyond the scope of this chapter.

Semantically based naming impairments are associated with difficulty in all lexical tasks that require semantic mediation, including all naming tasks regardless of input modality (e.g., picture naming, naming to spoken definitions) or output mode (oral and written naming). In addition, the individual will have co-occurring difficulty in spoken and written word comprehension and in interpreting the meanings of viewed objects and gestures, as all of those tasks require semantic mediation for successful performance. Impairment may be quantitatively and qualitatively similar across lexical tasks, that is, with similar proportions and type of errors (e.g., Hillis et al, 1990). Naming errors may take several forms including semantically related responses (e.g., "hammer" for screwdriver), semantically empty naming errors ("a thing you use"), or perseverations (e.g., repeated use of the word "eggs" for all naming attempts). Confusions also will be evident in comprehension tasks (matching, verification) as these individuals will mis-select semantically related foils and even unrelated foils in the event of severe semantic impairment (Raymer & Berndt, 1996). Performance in oral word reading and writing to dictation may not be affected, as these tasks can be accomplished through alternative sublexical or lexical-phonological processes.

Researchers also have described individuals with aphasia whose naming and comprehension impairments fractionate according to specific semantic categories such as living and nonliving things, fruits and vegetables, tools and animals (see Capitani, Laiacona, Mahon, & Caramazza, 2003, for a review). Semantic level breakdown is indicated when these individuals experience difficulties in both comprehension and naming tasks for the specific semantic category, and probably relates to the loss of specific representations in the neural networks that mediate critical aspects of semantic information shared by several members of a given semantic category (Caramazza & Shelton, 1998; Reilly & Poole, 2008).

Impairments affecting the lexical phonologic output lead to difficulty in all tasks requiring the use of stored phonologic representations.
Comprehension abilities are typically preserved. Difficulty is evident in oral naming tasks (e.g., oral picture naming, oral naming to spoken definitions) and in oral word reading, particularly for words with exceptional spellings (e.g., choir, yacht) whose pronunciations cannot be derived correctly through sublexical grapheme-to-phoneme translation processes. Verbal production errors in naming and oral reading may take a variety of forms (Hillis, 2001). Individuals with difficulty activating the output lexicon can make semantic or no-response errors. Others with a disturbance affecting the internal structure of phonologic representations may produce neologistic (“new word,” e.g., ferbis; appleholent; parakatotis) responses if severely impaired (e.g., Kohn, Smith, & Alexander, 1996), or phonemic paraphasias if representations are partially preserved. Patients with selective impairment of phonologic output may have retained performance in written word production (e.g., Caramazza & Hillis, 1990).

Of course, brain damage does not respect the cognitive distinctions among visual object recognition, semantic, and lexical phonologic mechanisms of naming. Therefore, naming impairment can be the result of disruption at multiple stages in the word-retrieval process, leading to severely compromised naming abilities. Moreover, Murray (2000) demonstrated that naming difficulties can be exacerbated by attentional demands at play in the course of cognitive activities.

Treatment of Word-Retrieval Impairments

Clinicians can select from several treatment approaches to address the communication impairment posed by word-retrieval difficulties, some of which are facilitative in nature and others of which tend to promote reorganization in the word-retrieval system (Nickels, 2002). Naming treatments that are facilitative are devised to focus on the specific level of naming impairment and restore functioning in that mechanism. That is, individuals participate in tasks that require them to act upon the semantic or phonologic characteristics of words, with the goal of altering levels of activation or interaction among lexical representations implemented in the normal process of word retrieval. Reorganization approaches are meant to engage intact cognitive mechanisms to support the process of word retrieval in a manner that differs from the normal process, perhaps leading to fundamental alterations in the word-retrieval process over time. So, for example, individuals may be taught to use gesture, reading, or writing during the process of word retrieval to improve access to intended spoken words. With practice, some individuals may ultimately improve word retrieval in the absence of the facilitating cognitive support, though others may need to rely on the supportive process for the long term. Finally, compensatory strategies can be used to help the person circumvent the impaired naming system to communicate an intended message in whatever manner is possible, through circumlocution, gesture, drawing, or writing to convey ideas when spoken words fail them. Some treatment approaches are implemented specifically to encourage the use of communication strategies as conversation takes place in a functional context.

Decisions as to the specific approach to take will be influenced by factors such as the severity of naming impairment, the timing of treatment relative to the onset of injury, the amount of time available to participate in treatment, and personal characteristics and demands for language use. Several specific treatment approaches have been investigated in their effects for word retrieval. For the purposes of this chapter, we limit the discussion to approaches useful in individuals with mild-to-moderate word-retrieval impairments for nouns and verbs, as the severe word production difficulties implicated in global aphasia, for example, may warrant different types of techniques to improve verbal production.

Restorative Naming Treatments

Cuing Hierarchies

When a person with aphasia experiences word-retrieval failure, the listener can often provide a simple cue to overcome the failure (e.g., “You write it”). Clinicians, therefore, have turned to cuing hierarchies in an attempt to
promote long-term changes in the process of word retrieval. In cuing hierarchy training, the clinician systematically provides a series of cues that are more and more potent in their ability to elicit an intended target word that the patient is unable to retrieve, usually the name of a picture (Table 8.2). At the step where the target word is retrieved correctly, the clinician may either rehearse the target word multiple times, or move the person back up the cuing hierarchy, providing each cue in reverse direction until the person once again simply looks at the target picture and produces the intended word upon command. Cuing hierarchies are constructed after preliminary probing to determine which are the more and less effective cues for that individual. Although cuing hierarchies typically incorporate both semantic and phonologic information, consistent with the course of word retrieval, some studies have used cues that emphasize only semantic or only phonologic information during naming training (e.g., Raymer, Thompson, Jacobs, & leGrand, 1993; Wambaugh, Doyle, Linebaugh, Spencer, & Kalinyak-Fliszar, 1999; Wambaugh, Doyle, Martinez, & Kalinyak-Fliszar, 2002; Wambaugh, Linebaugh, Doyle, Martinez, Kalinyak-Fliszar, & Spencer, 2001). Patterson (2001) reviewed the evidence for the effectiveness of cuing hierarchies in nine published studies describing 17 participants with aphasia, and reported that the technique is useful for improving retrieval of trained words for individuals with a variety of naming impairments.

Other variations on cuing hierarchy training have been reported. Freed, Celery, and Marshall (2004), Marshall, Freed, and Karow (2001), and Marshall, Karow, Freed, and Babcock (2002) contrasted word-retrieval training effects when using personalized cues (i.e., a phrase developed by the clients themselves) as compared with phonologic cues (i.e., provided by the clinicians). They reported that the effects of personalized cues, particularly those incorporating semantic information (e.g., “My whiskers need a . . . razor”; “A cold mug of A&W . . . root beer”), surpassed the effects of phonologic cues alone. A computerized version of cuing hierarchy training has been developed (MossTalk Words) (Fink, Brecher, Montgomery, & Schwartz, 2001), allowing patients to extend treatment beyond the clinical setting. Independent or partially guided training with this computerized cuing hierarchy training has led to improved naming of trained words in people with moderate-severe naming impairments (Fink, Brecher, Schwartz, & Robey, 2002; Ramsberger & Marie, 2007).

**Semantic and Phonologic Treatments**

Recognizing the common role the semantic system plays in both word comprehension and word retrieval, some researchers have developed comprehension treatments to facilitate word-retrieval abilities (e.g., Marshall, Pound, White-Thomson, & Pring, 1990; Nickels & Best, 1996). In these semantic treatments, individuals complete a series of semantic processing tasks, such as sorting pictures into categories of increasingly related semantic distinctions, auditory and written word-picture matching with increasingly difficult semantic distractors, and yes/no question verification about semantic characteristics of a target picture. Typically the individuals also are allowed to rehearse the names of target picture in the context of comprehension training, thereby adding a phonologic component to the semantic training. As they complete the semantic task across multiple sessions, naming improvement emerge in a variety of individuals with naming impairments related either to semantic or phonologic dysfunction. Drew and Thompson (1999) investigated the importance of the production (target names) (phonologic activation) in the context of semantic comprehension training. The found that people benefited maximally during training in which the comprehension tasks were combined with the word-production component of training as compared with comprehensive training in isolation. Hence, the comprehension training is most effective when semantic pl
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provided by the clinician. The effects of perseveration incorporating words (e.g., "My whiskers need A&W... root beer"), phonologic cues alone, or cuing hierarchy (MossTalk Words, Raymer, & Schwartz, 2001), and treatment beyond dependent or partially computerized cuing to improved naming of words with moderate-severe dysphasia (Brecher, Schwartz, & Marie, 2007).

Treatments

In role the semantic and phonologic treatments with duals to facilitate word-
mastery (Fink et al., 2001). Patients complete tasks matching spoken and written words to target pictures or words from among semantically related foils. Raymer, Cohen, and Safiell (2006) reported improvements in comprehending and producing words following clinician-assisted training with MossTalk Words, particularly when training took place in a more intensive fashion (four times per week as compared with two times per week). Raymer, Carwile, Matthews, Johnson, and Todd (2009) showed similar training effects with the MossTalk Words matching module for individuals with severe semantically based naming impairments who completed training without clinician assistance.

Another type of semantic treatment, developed on the basis of cognitive theories of how semantic representations are structured, is semantic feature analysis (SFA) training (Boyle, 2001). In SFA, clinicians teach patients to use a viewed matrix of printed cue words (e.g., function, properties, category, etc.) surrounding a target picture. They are then to systematically retrieve the cue semantic information, sometimes leading to production of the target word. Several single participant experimental studies employing SFA treatment have reported improved naming of trained pictures and generalization of the semantic feature strategy to improve retrieval of names of some untrained pictures as well (Boyle, 2004; Boyle & Coelho, 1995; Lowell, Beeson, & Holland, 1995).

Other treatments have targeted the phonologic stage of word retrieval. Because the same lexical phonologic representation is activated in the course of oral reading, word repetition, and oral picture naming, some naming treatment studies have used repeated practice with oral word reading or word repetition to improve word-retrieval abilities for sets of trained words (e.g., Miceli, Amitrano, Capasso, & Caramazza, 1996; Mitchum & Berndt, 1994). The effects of word repetition treatment, however, may not be as great as or as lasting as other comprehension or cuing hierarchy treatments for individuals with naming impairments (Greenwald, Raymer, Richardson, & Rothi, 1995; Raymer & Ellsworth, 2002). Robson, Marshall, Pring, and Chiat (1998) used a phonologic training scheme that paralleled the procedures applied in semantic comprehension treatment. In their phonologic treatment, they required their participant with aphasia to make judgments about phonologic information for target words corresponding to pictures or descriptions, including the number of syllables in the word and the initial phoneme of the word. Their subject demonstrated improvement in retrieving words trained with this strategy and showed some generalization of the process when naming untrained pictures.

Some investigations have directly contrasted the effects of different semantic and phonologic treatments within the same individuals to determine the most effective strategy. Howard, Patterson, Franklin, Orchard-Lisle, and Morton (1985) compared the effects of semantic and phonologic comprehension treatments in a group of individuals with naming impairments and reported an advantage of semantic over phonologic treatment. Raymer and Ellsworth (2002) used a single participant paradigm in which they contrasted phonologic and semantic training for one subject with selective verb retrieval impairment and reported that both treatments led to improvements for trained verbs and increases in the use of grammatical sentences incorporating those trained verbs.

In summary, several studies have reported that facilitative semantic and phonologic treatments are effective for improving word retrieval, primarily for trained words. Little direct correlation is evident between type of word-retrieval
impairment (semantic or phonologic) and most effective type of treatment, however (Hillis, 1993; Nickels, 2002). Either semantic or phonologic treatment seems to improve word retrieval in individuals with either semantic or phonologic impairments, an observation that is compatible with the interactive nature of semantic and phonologic processing in the course of word retrieval during picture-naming tasks (Wilshire & Coslett, 2000). Treatment effects are often more limited, however, in individuals with severe semantically mediated naming impairments (Raymer et al, 2007).

Reorganization Approaches to Naming Treatment

Reading and Writing

Some people with oral-naming impairments, particularly those with dysfunction related to the lexical phonologic output processing, may nonetheless have available some knowledge about the word’s spelling. In turn, this spelling information may be used to generate the spoken word through a phonemic self-cuing process. Persons with aphasia have been taught to type letters into a computer to generate the initial phoneme of a target word (e.g., Nickels, 1992), or to write the first letters of target words and then to pronounce those sounds as a self-generated phonemic cue (Bastiaanse, Bosje, & Franssen, 1996). Over time this written cuing technique resulted in improved naming for the trained words, even in the absence of the computer- or self-generated phonemic cues.

Hillis (1998) described a patient who spontaneously used retained print-to-sound conversion abilities when word-retrieval failure occurred. This person’s naming errors were regularized pronunciations of intended words (e.g., /sup/ for cup). Listeners familiar with this counterproductive strategy could often translate back to a plausible spelling to figure out the word the patient was attempting to say. To circumvent this awkward strategy, Hillis taught her patient to pronounce regularized spellings of common words with exceptional spellings (e.g., kup for cup). Improvements in oral reading also generalized to pronunciations in oral naming of the same words.

Gesture

Individuals often spontaneously attempt to use pantomimes when naming failures occur, sometimes leading to correct production of the words. Luria (1970) was perhaps the first to suggest “intersystemic gestural reorganization,” using intact gesture abilities to activate the impaired language system. Cognitive models of praxis processing recognize the interactive nature of lexical and praxis systems (Rothi, Ochipa, & Heilman, 1997), suggesting that gesture may be a useful means to mediate word retrieval. In verbal and gestural training for picture naming, the person with aphasia practices an appropriate gestured pantomime in isolation, the target word in isolation, and the gesture and word in combination. With repeated practice, the goal is for the gesture to facilitate retrieval of the target word. Several studies have reported improved naming abilities in conjunction with gestural training (e.g., Paslek, 1998; Rose & Douglas, 2001).

Earlier gestural facilitation studies focused primarily on noun-retrieval effects. Verbs seem to have a close association with gestures as well (Druks, 2002), as both involve processing in a similar neural network involving the left inferior frontal cortex, suggesting that gestural facilitation also should have positive effects for verbs. Raymer, Singletary, Rodriguez, Ciampitti, Heilman, and Rothi (2006) examined effects of gestural facilitation of naming for nouns and verbs and found contrasting patterns of results. Some participants improved naming for both nouns and verbs, whereas others improved for just verbs or for just nouns. Even patients with severe limb apraxia, who may not be able to use pantomime as a viable communication mode before training, improved their use of recognizable, communicative gestures following verbal and gestural training. A positive outcome of verbal and gestural training is that those who do not improve word retrieval often improve their use of gestures as a compensatory communication strategy (Rodriguez et al, 2006). In contrast to the symbolic gestures used in verbal and gestural training, Crosson and his colleagues (Crosson, Fabrizio, Singletary, Cato, Wierenga, Parkinson, et al, 2007; Richards, Singletary, Rothi, Koehler, & Crosson, 2002) have
used nonmeaningful limb movements during word-retrieval training. Patients are taught to perform a complex reaching and turning movement of the left arm in left space in an effort to engage right prefrontal systems that may promote the intentional activation of a spoken word through an alternative process. Participation in this “intentional” training has led to improved naming abilities in individuals with nonfluuent forms of aphasia, including some generalized improvements for untrained words in individuals with moderate-severe naming impairments. The advantage of nonsymbolic limb movements in training compared with gestured pantomimes is that these movements can be implemented with any word, regardless of meaning. Current research at Florida State University (Kim, Stierwalt, LaPointe, Alan, & Lewis, 2007) also is exploring the facilitating effects of limb movement on possible spreading cortical activation to language areas of the brain that may affect lexical-semantic retrieval.

**Other Factors in Naming Treatment**

The influence of error production during word-retrieval training has been considered in several studies. These studies were influenced by investigations in memory retraining for traumatic brain injury that demonstrated greater improvements for errorless training over errorful training contexts (Wilson & Evans, 1996). Fillingham, Hodgson, Sage, and Lambon Ralph (2003), in examining the naming treatment literature, found that treatments that were “error reducing” (i.e., errorless) were as effective as treatments that were highly errorful (e.g., cuing hierarchy training). They then tested this principle directly in studies contrasting phases of errorful and errorless naming training (Fillingham, Sage, & Lambon Ralph, 2005a,b, 2006). In errorless training, the clinician provides the person with aphasia with maximum cues to start, including a target picture, a written word, and the spoken name of the word modeled by the clinician. The person is told to respond with the target word only if confident that he or she has the correct word in mind. In contrast to the results seen in memory retraining, Fillingham and colleagues found comparable naming improvements for words trained in errorless and errorful conditions. Importantly, they noted that executive/problem-solving skills and monitoring abilities correlated with improvements in errorless naming treatment (Fillingham et al, 2005b).

A variation of errorless naming training influenced by the memory literature is spaced-retrieval training (Fridriksson, Holland, Beeson, & Morrow, 2005; Morrow & Fridriksson, 2006). Patients are taught to produce small sets of personally relevant target words as the time for retrieval is systematically extended between presentations of that item (e.g., 30 seconds, 1 minute, 2 minutes, 4 minutes, 8 minutes, etc.). At any time an error occurs during word retrieval for the target word, the training stops back to the earlier time interval. As words are retained across sessions, new words are added to the training vocabulary. Fridriksson et al (2005) found that spaced-retrieval training effects for three participants with aphasia surpassed those of cuing hierarchy training in the number of words learned and the amount of time required for training. Morrow and Fridriksson (2006) subsequently showed the same effects when the time intervals used in training varied over several minutes, rather than requiring the systematic doubling of time lags, which is very labor intensive for the clinician.

Another factor that has been considered in word-retrieval training is the intensity of treatment delivery. In a retrospective study, Hinckley and Craig (1998) found that effects of intensive word-retrieval training (23 hours per week for 6 weeks) using a variety of methods (one-on-one treatment, computers, group treatment) surpassed nonintensive training (2 to 3 hours per week for 6 weeks). Amount of training and intensity of training were confounded in this study, however. Other studies have looked at intensity of naming training in a more controlled manner, where the amount of therapy was equated across conditions, and have reported the same effect, favoring a more intensive training schedule (four to five sessions per week) over a less intensive schedule (one to two sessions per week) (Ramsberger & Marie,
Also relevant to this discussion are outcomes reported for constraint-induced language therapy (CILT) in aphasia (Pulvermüller, Neininger, Elbert, Mohr, Rockstroh, Koebbel, et al, 2001). In CILT, treatment is provided on a very intensive schedule (15 hours per week) and requires participants to use only verbal responses as they are shaped with clinician assistance to improved verbal productions. Pulvermüller et al reported significant changes in a standardized naming test following a course of CILT in their group with aphasia. The importance of verbal constraint in the treatment effects also must be considered, however.

Many naming treatment methods tend to report training effects restricted to trained vocabulary. Some efforts have been extended toward examining means to promote generalized improvements to naming of untrained words. One fruitful direction has been to train within semantic categories. For example, Spencer, Doyle, McNeil, Wambaugh, Park, and Carroll (2000) used a phonologically based rhyming treatment to train words in the categories of animals, household items, and tools. In addition to improvements for trained words, increased performance was evident for other untrained words within the same categories. Kiran and colleagues (Kiran, 2007, 2008; Kiran & Johnson, 2008; Kiran & Thompson, 2003) and Stanczak, Waters, and Caplan (2006) have considered the effect of the typicality of words that are trained within a given semantic category (birds, vegetables). They found that naming training for atypical items in a semantic category (e.g., artichoke) leads to generalized naming improvements for typical items in that category (e.g., carrot), whereas training of typical items did not lead to generalization to atypical items. They argue that this pattern of training improvement is a consequence of influences on the overlapping elements of semantic representations across members of a category.

**Conclusion**

Naming impairments are a common manifestation of left hemisphere brain damage. The cognitive and neural bases of naming breakdown vary across individuals with aphasia, and characteristic patterns of impairment can be observed depending on whether semantic or phonological stages of naming are disrupted, or both. The purpose of naming assessment is to reveal the cognitive bases and the lexical characteristic of naming failure. This specified information allows the clinician to select rational treatment interventions and stimuli to most directly impact on the naming and communication abilities of the individual with aphasia. Word-retrieval or naming problems are the principal characteristic complaint among persons with aphasia. They are ubiquitous. They need to be addressed carefully assessed, and treated with all the innovation and effort that clinicians can muster.
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Case Example

Patient 806 is a 48-year-old woman who suffered a left cerebrovascular accident (CVA) 2 years ago. She has a residual aphasia and is seeking assistance for her considerable communicative impairment. Preliminary testing with the Western Aphasia Battery (WAB; Kertesz, 2007) revealed a pattern consistent with Broca aphasia. Because of considerable naming impairment on the WAB naming subtests, she was also administered the Boston Naming Test (Kaplan et al., 2001), where she scored a 16/60, indicating a pronounced naming impairment. During testing, it was noted that 806 often attempted to spell words she was unable to say. We gave her an additional naming test along with a corollary task of word-picture verification for the same 60 nouns. Along with her score of 63% accuracy in picture naming, she also scored 90% correct in the verification task. Compared with normative data, this indicated that she had a mild semantically based naming impairment. In addition, her pattern of poorer performance for spoken naming tasks compared with written naming suggests additional impairment of lexical phonologic retrieval.

Patient 806 then took part in a series of therapy protocols to improve her serious word-retrieval impairment. We contrasted outcomes for an errorless naming treatment protocol as well as verbal and gestural training. She demonstrated improvements in both training protocols, although the improvements were largely restricted to trained words. In addition, because she was fairly young and adept at using a computer, she was interested in using the MossTalk Words program as a therapy option. Over the course of 1 month, she completed the word-matching exercises independently at home. Again, she showed considerable improvement in retrieval of trained words, along with some generalized improvements for some untrained words. During her time in individual therapy, she also participated in our weekly aphasia therapy group. There she was able to attempt to use verbal production along with compensatory communication strategies to effectively participate in the group activities. In her case, the most effective strategy was the use of spelling for words she could not say. She would then be assisted in pronouncing the intended word aloud. She also became very adept at using communicative gestures to get across ideas. Over the course of more than a year of training, patient 806 demonstrated remarkable progress. Whereas in the beginning of therapy, it was very difficult for her to engage in any type of fruitful conversation, she now can communicate very effectively, primarily through the verbal modality. She is a single mother of several children, and she also has grandchildren, and she is able to care for her family and conduct her daily affairs effectively.

Chapter Review

Discussion Questions

1. Describe facilitative and compensatory training methods that might be appropriate in a patient with phonologic output lexicon impairment.

2. How can a cognitive neuropsychological assessment of naming be accomplished efficiently in clinical practice?

3. Why might semantic category effects be observed in the naming error patterns of patients with aphasia?

4. What types of impairment might be indicated by the presence of a semantic error in naming?

5. What are the differences in approaches to use of limb gestures to facilitate word retrieval?
Test Questions

1. A patient with failure in both word/picture matching tasks and naming tasks is likely to have breakdown in this component of lexical processing:
   A. Visual recognition
   B. Semantic system
   C. Lexical phonologic output processing
   D. Articulatory agility

2. True/False: A semantic error in naming is always indicative of semantic system breakdown.

3. In this type of word-retrieval training, a target word is surrounded by a grid prompting the retrieval of key characteristics of that word, such as category, location, action, and use:
   A. Cuing hierarchy training
   B. Gestural facilitation of naming
   C. Semantic feature analysis training
   D. Phonologic comprehension training

4. This mechanism stores familiar spoken words in our language:
   A. Orthographic output lexicon
   B. Lexical phonologic output processing
   C. Action semantic system
   D. Visual object recognition system

5. This type of training incorporates nonsymmetrical limb movements to facilitate word retrieval:
   A. Intentional training
   B. Gestural pantomime training
   C. MossTalk words computerized training
   D. Constraint induced language therapy

Answers: 1: B; 2: False; 3: C; 4: B; 5: A.

Glossary

*Facilitative treatment approaches*: enrichment of the language environment to stimulate language relearning in a manner compatible with the normal system of language processing

*Gestural facilitation*: use of symbolic pantomimes to accompany spoken production of words in training

*Phonologic anomia*: naming impairment in the context of intact comprehension for the same words that cannot be named

*Phonologic errors*: mis-selection of words or pseudo-words that are closely related in sound characteristics to the intended target words

*Reorganization treatment approaches*: use of alternative cognitive systems in the context of language rehabilitation

*Semantic anomia*: naming impairment in which both comprehension and production of words are impaired

*Semantic errors*: mis-selection of words that are related to the target in category or associated meaning

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