Where in the Brain Is Nonliteral Language?

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This review examines brain processing of nonliteral expressions that are familiar in form and meaning to the native speaker, such as idioms, proverbs, swearing, and speech formulas. The properties of stereotyped form and conventional meaning distinguish nonliteral utterances from novel expressions. An historical overview of preserved “automatic” speech in aphasia and impaired nonpropositional speech in other neurological diseases suggests that these kinds of language are stored and processed in the brain differently from newly created language. For production, lesion studies and other neurobehavioral observations associate nonliteral expressions with right hemisphere and subcortical structures. Comprehension studies implicate the right hemisphere. Although the entire brain is required for optimal performance, a right hemisphere—subcortical circuit may be important for processing of nonliteral expressions. A dual process model comprised of a holistic mode for nonliteral expressions and a compositional mode for novel language, drawing on disparate neurological structures but continuously in interplay, is proposed.

The study of nonliteral language can be approached from many directions. This volume of *Metaphor and Symbol* is focused on how and where in the brain the various types of nonliteral language are stored and processed. Even in this more restricted domain, the protean phenomenon of nonliteral language can be viewed in different shapes. This article, therefore, begins with a definition and characterization of nonliteral language as a foundation for the rest of the article. This represents only one perspective on nonliteral language, a perspective that lends itself well to addressing neurolinguistic questions.
As mentioned in the introduction to this volume, a useful, broad definition characterizes nonliteral language as “what we say is not what we intend to convey.” This presupposes that during the utterance of a nonliteral expression, the regular, routine associations of words to meanings and grammar in the language are suspended, inoperative, or replaced by other, very different rules, associations, or conventions. The ubiquity and social importance of nonliteral expressions are now well accepted (Aijmer, 1996; Bolinger, 1975, 1977; Cermák, 1994; Gallahorn, 1971; Jay, 1992; Jespersen, 1933; Lyons, 1968; Mieder, 1984; Pawley & Syder, 1983; Schegloff, 1988; Tannen, 1989; Wray & Perkins, 2000), but formulaic language remains to be well incorporated into models of language (Chafe, 1968; Fillmore, 1979; Fillmore, Kay, & O’Connor, 1988; Katz, 1973; Nunberg, Sag, & Wasow, 1994; Peters, 1983; Van Lancker, 2001a, 2001b; Weinreich, 1969). How people communicate a meaning that is different from what they are apparently saying remains a challenging topic.

DELINEATION OF TOPIC

Figurative, metaphoric, and nonliteral language covers a very large domain. This review is concerned with known, or familiar, nonliteral language, such as idioms, proverbs, sayings, slang, speech formulas, and the like, with very little to say about novel metaphoric and figurative language, the kind that is newly created and appears, not only in daily speech, but also in literature and poetry. To approach the study of cerebral processing of familiar nonliteral language, it is useful to consider both the form and content of each expression. One way of talking about this is to identify two components: stereotyped form and conventionalized meanings. In this approach, the focus is on nonliteral language comprising (more or less) fixed expressions—expressions that are known and recognized as familiar by the native speaker.

FORM AND MEANING IN FORMULAIC EXPRESSIONS

Talking about stereotyped form leads to description of relatively straightforward constituent surface properties. Speech formulas, idioms, sayings, proverbs, and so on have certain words that appear in a certain order, and usually prosodic shape is restricted to one or a few possibilities. The expression “No man is an island,” for example, requires precisely those words in exactly that order to yield the recognizable, familiar expression, and the main stress is on the first syllable of island. The acoustics of prosody figure importantly into the stereotyped form of the utterance: pitch height and contours, word lengths, intensity, and voice quality all contribute
to the naturalness of the nonliteral utterance (Lieberman, 1963; Van Lancker, Canter, & Terbeek, 1981). Even the briefest utterance, utilizing prosody to cue irony (Kreuz & Roberts, 1995), can signal a meaning that is opposite to the standard lexical meaning: the response, “right,” to the comment “That was a great movie,” given with low, falling intonation and creaky, pharyngealized voice quality, indicates a negative opinion of the movie. The stereotyped form of nonliteral utterances can be specified, quantified, and described in detail (the potential for flexibility will be discussed later). Questions about the status or integrity of this stereotyped or canonical form in speakers’ competence for formulaic expressions can be examined. The notions of stereotyped form, as in “I met someone” (intoned on a lower pitch and spoken with light voice quality), and conventionalized meaning (as in “There may be a new significant other in my life”), serve as vehicles for study of brain processing of nonliteral language.

Conventionalized meanings in formulaic expressions are more elusive, as is usually the case for semantics, but many properties that distinguish literal from nonliteral expressions can be described. The meanings of nonliteral expressions typically involve a conflation of social, political (in the sense of relations between persons), contextual, attitudinal, and emotional factors (Bell & Healey, 1992; Van Lancker Sidtis & Rallon, 2004; Wray, 2002). The majority of nonliteral expressions fit this description. Take, for example, the comment “It’s a small world.” The meaning of this expression is more intricate than a comparable literal expression, say, “It’s a small tree.” For this nonliteral expression to be used successfully, a grouping of unique and interactive features are required: a chance meeting of mutually acquainted persons at a location where such a meeting would not be expected, the affect of surprise and perhaps delight, and so on. The literal counterpart is simply that a tree is not as large as other trees.

Affect, attitude, social and political implications, and contextual dependencies have the capacity to be neutral in the typical literal expression. Of course, these elements can be added, by prosody and additional lexical items—for example, “Fortunately, it is a small tree.” But these features inhere in most nonliteral expressions, in part because their manner of conveying meaning is different from literal expressions. A survey of typical nonliteral expressions, such as “While the cat’s away, the mice will play,” “He was skating on thin ice,” “Break a leg,” “Get a grip,” “Take it easy,” or “Shut up,” consistently supports the notion of complex, conventionalized meanings laden with connotations contained in the expression as a whole. In contrast, the literal expression is better characterized as an aggregate of concatenated, lexical meanings, which may or may not contain affective and attitudinal connotations. Conventional (complex) meaning is one of the characteristics that distinguishes nonliteral from literal language in communicative function, and that, as is discussed in the rest of this article, forms a basis for distinctive neurological processing.
FLEXIBILITY OF FIXED EXPRESSIONS

It is well known that the stereotyped form of many or most nonliteral expressions is considerably flexible. Too many studies addressing questions about stereotyped form of nonliteral expressions have been published to review them all here (see Van Lancker Sidtis, 2004a). This topic has been amply explored in the field of idioms, utilizing the notions of degrees of frozenness, noncompositionality, opacity, and so on, in attempts to lay out a hierarchy whereby some idiomatic shapes are more malleable or carry more lexical weight in the minds of speakers than others (e.g., Burt, 1992; Cutting & Bock, 1997; Gibbs, 1980; Gibbs, Nayak, Bolton, & Keppel, 1989; Peterson, Burgess, Dell, & Eberhard, 2001; Titone & Connine, 1994, 1999). Although there is no question that relative flexibility can be demonstrated in experimental studies for different groupings of idioms utilizing a variety of performance tasks, the notion of stereotyped form remains viable, in the sense that idioms have a canonical shape that speakers recognize (Horowitz & Manelis, 1973; Osgood & Housain, 1974; Pickens & Pollio, 1979; Sprenger, 2003; Swinney & Cutler, 1979).

Native speaker knowledge of fixed expressions appears in various forms. Such knowledge is reflected in the idiom effect in word association studies, which means that consistent performance (in the specific words associated) for some words can best be explained by proposing that the speakers know certain phrases (Clark, 1970). Idiom and proverb completion tasks are often used in neurological, psychiatric, psychological, and language testing (Andreasen, 1977; Dilsaver, 1990; Goodglass & Kaplan, 1972; Strub & Black, 1985). These tests are based on a generally held assumption that it is normal to know the form and meaning of numerous nonliteral expressions, especially idioms and proverbs. However, only modest efforts to quantify general knowledge of proverb meanings have been undertaken (Gorham, 1956; see Delis, Kramer, Kaplan, & Ober, 2000; Van Lancker, 1990).

Recently, native speakers’ knowledge of idioms, proverbs, and speech formulas was directly tested. Participants identified missing words from a randomly presented written array of these expressions, and, in a second condition, judged whether an expression was novel or familiar (Figure 1a). These results supported the notion of known canonical forms for nonliteral expressions. Survey participants recognized 91% of the nonliteral and 66% of the literal expressions. Further, there was significantly greater agreement on the missing word (recall task) in the nonliteral (76%) than in the literal expressions (32%; Van Lancker Sidtis & Rallon, 2004; see Figure 1b). The finding that a random sample of native speakers demonstrates competence in recognizing a random sample of formulaic expressions is especially notable, considering the very large numbers of these expressions.

Storage capacity in the native speaker is apparently very high for fixed expressions (Bolinger, 1976; Fillmore, 1979; Harris, 1994; Jackendoff, 1995), as suggested by recent corpus studies (e.g., Altenberg, 1998; Arnaud & Moon, 1993;
Moon, 1998a, 1998b; Sinclair, 1987), in which no upper limit to the number has been identified. It is likely that memory capacity in language processing has been underestimated (Harris, 1994). From the perspective that formulaic utterances are stored and processed with stereotyped form and conventional meanings, the search for generative rules underlying their structure, although possible, is not pertinent to their status in the speaker’s competence. It is possible, because all fixed expressions can receive grammatical operations, depending on communicative need and

1. Recall task
   I can’t _______ myself

1. Recognition task
   I ought to have my head examined! F N

FIGURE 1a Sample of survey study showing recognition and recall tasks for formulaic and novel expressions. Participants circled “F” or “N” in the recognition task, and filled in a word in the recall task. Tasks were always presented in this order.

FIGURE 1b Graph of results of survey of speakers’ knowledge of formulaic expressions from results on a recall (dotted bar) task, for which participants filled in a missing word, and a recognition (dark bar) task, for which participants identified each utterance as formulaic or novel.

Moon, 1998a, 1998b; Sinclair, 1987), in which no upper limit to the number has been identified. It is likely that memory capacity in language processing has been underestimated (Harris, 1994). From the perspective that formulaic utterances are stored and processed with stereotyped form and conventional meanings, the search for generative rules underlying their structure, although possible, is not pertinent to their status in the speaker’s competence. It is possible, because all fixed expressions can receive grammatical operations, depending on communicative need and
context. Yet their unitary nature remains intact. If I were standing with another native speaker of English before a field of destroyed cows and sheep in England following the devastating measures taken to combat mad cow disease, I could say “The bucket was certainly kicked here” and be perfectly understood.

Speakers’ knowledge of conventionalized meanings of nonliteral expressions is more difficult to verify, but considerable work has been published probing this question in normal adults (e.g., Cacciari & Tabossi, 1993), child language acquisition (Nippold & Duthie, 2003), child language disorders (e.g., Kerbel & Grunwell, 1998; Qualls, Lantz, Pietrzyk, Blood, & Hammer, 2004), and in second language learning (e.g., Bortfeld, 2003). Although inconsistencies in meaning attribution doubtless occur across native adult speakers, approximate common knowledge of meanings of familiar nonliteral meanings is generally assumed.

Despite local controversies, there is considerable reason to believe that the large set of fixed, nonliteral, nonpropositional expressions under discussion here have a special status in linguistic competence; they occur both as fixed and as flexible in their surface shape, but they have an identifiable canonical form; and their stereotyped form and conventional meanings are known to the native speaker. The focus of this review is on clinical and experiment evidence leading to proposals about where and how in the adult brain nonliteral language, as characterized, is stored and processed.

**NONPROPOSITIONAL SPEECH**

The study of brain processing of nonliteral expressions began with the notion of automatic or nonpropositional speech, as distinguished from propositional speech (Hughlings Jackson, 1874/1932). In the times of these discussions, and for the next 100 years, the left hemisphere (LH) was believed to dominate all of language function, but Hughlings Jackson proposed that the intact right hemisphere (RH) was capable of “the automatic reproduction of movements of words” (p. 133). He spoke of emotional speech, including greetings, “simple and compound interjections” such as “God bless my life,” exclamations, oaths, and “well organized conventional expressions” such as “Not at all” (p. 133 in Taylor, 1932). MacDonald Critchley (see 1970 for collected writings), the influential British neurologist born in 1900, and Luria (1981), the widely admired Russian neuropsychologist, embraced and promoted Hughlings Jackson’s views of aphasic speech.

Since then, aphasiologists, neurologists, and speech pathologists describing clinical syndromes of aphasia invariably mention the universal phenomenon of certain kinds of preserved speech in moderate or severe aphasia. Across authors, a similar list of utterances is provided (e.g., Benson, 1979; Espir & Rose, 1970; Kriendler & Fradis, 1968; Van Lancker, 1988, 1993). The resiliency of the notion of preserved automatic speech can hardly be exaggerated.
Hughlings Jackson’s (1874/1932) notion of preserved automatic, inferior, or emotional speech has evolved to encompass a broader range of utterance types, as reported by clinical observations, and to be viewed from a different perspective. The residual speech observed in aphasia—exclamations, swearing, proper nouns, speech formulas, nursery rhymes, prayers, recited material, counting from 1–10, and so on—is best described as configurational and unitary, rather than formed of permutable lexical items (Van Lancker, 1973, 1988, 1993). The influence of *chunking* in memory processes for speech performance is well established (Simon, 1974; Zhang & Simon, 1985). These utterances are often used to communicate, obviating the value of the rubric *automatic*. Other kinds of utterances have come to be recognized as preserved in aphasic speech, as the understanding of formulaic language has grown. Clinical studies reveal that great variability in utterances exists across individual speakers. This becomes understandable, considering that estimates of nonpropositional expressions in English approach tens or hundreds of thousands (Fillmore, 1979; Jackendoff, 1995; Weinreich, 1969). This variability may have contributed to a view of preserved utterances as idiosyncratic, rather than forming a coherent class of nonpropositional language.

Preserved utterances in aphasia are generally described as having normalsounding articulation and varieties of intonation contours, spoken with prosody serving the communicative intent. Types of utterances are idioms (“He’s turning over a new leaf”), proverbs (“Rome wasn’t built in a day”), slang (“Get with it”), clichés (“The pursuit of happiness”), indirect requests (“It’s getting late”), conventional expressions (“As a matter of fact”), expletives (“God damn it”), memorized phrases (“I pledge allegiance ...”), serial speech (1, 2, 3, 4, 5), pause-fillers (“well”), sentence stems (“I think”), back-channels (“um”), and familiar proper nouns (Blanken, Wallesch & Papagno, 1990; Code, 1989; Van Lancker Sidtis & Postman, 2006). These categories have been observed in aphasic speech, contrasting in competence with novel utterances, which are relatively impaired. A classic example is represented by the aphasic patient who often said “son of a bitch” with normal articulation and prosody, but was unable to use the word *son* to refer to his male offspring. Although short utterances are the most common in aphasia, longer forms also occur (Buckingham, Avakian-Whitaker & Whitaker, 1975; Critchley, 1970; Hughlings Jackson, 1874/1932; Peña-Casanova, Bertran-Serra, Serra, & Bori, 2002; Van Lancker Sidtis, 2001). A dissociation between automatic and propositional competence has also been reported for writing (Simernitskaya, 1974). These observations, combined with the developing evidence that modes of processing distinguish the cerebral hemispheres, have supported the notion that nonpropositional utterances are stored and processed differently in the brain from novel language.

Terminology for identifying and classifying nonpropositional utterance types remains somewhat chaotic (see Wray, 2002). Numerous subsets appear to make up a continuum from novel to fixed (Van Lancker, 1988; Van Lancker Sidtis, 2004a). In this review, *nonpropositional* is used interchangeably with *formulaic* language,
primarily to distinguish all the various categories from newly created, novel, or propositional language.

PRODUCTION OF NONLITERAL UTTERANCES IN NEUROLOGICAL CONDITIONS

The anecdotal evidence describing preserved automatic speech in aphasia was first systematically evaluated and confirmed by Code (1982). Using survey methods, Code (1982, 1987, 1989) and Blanken (1991; Blanken & Marini, 1997) documented recurrent utterances in chronic, severely aphasic persons. Whether in British English or German patients, similar utterance types were observed: swear words, interjections, greetings, numbers, sentence stems, and proper nouns. This study took automatic speech from anecdote to descriptive research status. Confirmation using a non-Indoeuropean language described similar utterances in aphasic Cantonese speakers (Chung, Code, & Ball, 2004). These observations have led to the notion that formulaic expressions have special evolutionary significance, constituting the beginnings of human speech, and now woven into the highly evolved complex language function (Code, 2005), an idea previously advanced by Jaynes (1976).

Lum and Ellis (1994) conducted the first group study of the clinical observations. Propositional and nonpropositional tasks were matched and compared in aphasic patients. Counting was compared to identifying numbers; naming pictures with cues from familiar nonliteral expressions (e.g., “Don’t beat around the BUSH”) was matched with naming pictures using novel phrase cues (“Don’t dig behind the BUSH”); and repetition of well known phrases was compared with novel expressions. Better performance on nonpropositional tasks for number production and picture naming was found; the advantage for phrase repetition was less notable. Van Lancker and Bella (1996) reported similar results in aphasic patients comparing matched propositional and nonpropositional expressions, with better nonpropositional ability for sentence completion than repetition. It is interesting that careful phonetic analysis of the contrasting repetition tasks did not reveal differences in articulatory skill between the two tasks. This suggested that the mechanisms differentiating propositional and nonpropositional speech modes occur most saliently in spontaneous speech. This observation relates directly to Hughlings Jackson’s (1874/1932) original distinction between voluntary and involuntary (i.e., automatic) utterances in aphasic speech. Differential motor speech competencies for spontaneous and repeated speech are reviewed and described in Kempler and Van Lancker (2002).

A recent examination of the proportion of formulaic expressions in the spontaneous speech of stroke patients was conducted using transcribed interviews of five LH damaged, five RH damaged, and five age- and education-matched normal—
control participants. Nonliteral language categories, which were selected based on observations in neurological disorders, were (a) idioms (e.g., “lost my train of thought”); (b) conventional expressions (e.g., “as a matter of fact”); (c) conversational formulaic expressions (e.g., “first of all”); (d) expletives (e.g., “damn”); (e) sentence stems (e.g., “I guess”); (f) discourse particles (e.g., “well”); (g) pause fillers (e.g., “uh”); (h) familiar proper nouns (those personally known to the speaker) and (i) numerals (Van Lancker & Postman, 2006). Patients with RH damage had significantly fewer words (16%) making up formulaic expressions than normal (24%) or LH damaged patients (29%), and LH damaged patients had significantly more than the other groups (Figure 2a). To compare incidence subsets in the three groups, categories 1–4 were combined as formulaic expressions, as shown (Figure 2b; no expletives occurred in this sample.) One observes relatively fewer proper nouns in the LH group, supporting the hypothesis of LH specialization for production for this category.

Another analysis on spontaneous speech was conducted using videotaped clinical sessions of a 50-year-old right-handed male, with 14 years of education and no prior psychiatric or neurologic history, who suffered a RH stroke. Percentage of words compromising formulaic expressions in extended discourse (1,249 words of spontaneous speech) was 15.7%, a result that corresponded well to results from the RH patients (16.5%) in the group study previously discussed (Van Lancker Sidtis, Canterucci, & Postman, 2006).

Preserved formulaic language in quantity was observed in a person with transcortical sensory aphasia. His spontaneous speech consisted of over 90% formulaic
expressions (Van Lancker Sidtis, 2001). A similar phenomenon, referred to in an overview of transcortical aphasia as “coined expressions,” is mentioned by Berthier (1999; p. 76). Successful idiom completion was seen in this and other cases of transcortical sensory aphasia due to focal, cortical lesions (Nakagawa et al. 1993; Whitaker; 1976). Preserved idiom, proverb, and other formulaic completion has been observed in brain damage that encircles speech centers in the LH (isolation of the speech area; Geschwind, Quadfasel, & Segarra, 1968). Repeated sentence stems were observed in an aphasic speaker by Buckingham et al. (1975). Ellis, Young, and Critchley (1989) described an individual who experienced “intrusive inner” (p. 581) automatic speech following bilateral brain injury. Another patient developed an intrusive syllable in his speech immediately following extensive and lengthy spinal surgery, the result of a small intraoperative stroke. The speech deficit occurred more frequently (56% of words) on automatic (counting, reciting) than propositional (spontaneous) speech (10% of words; Van Lancker, Bogen, & Canter, 1983; see Table 1). These various observations suggest that different brain mechanisms underlie nonpropositional and propositional language processing, and that brain damage affects these two modes differentially.

Dramatic support of a RH role in nonpropositional speech production arises out of an interview by N. Geschwind with a left hemispherectomized adult (Smith, 1966; Smith & Burklund, 1966). This right-handed individual developed normally until afflicted by an infiltrating brain tumor in his left cerebral hemisphere. Although profoundly aphasic following neurosurgical treatment, this patient pro-
duced well-articulated expletives (“God dammit”), sentence stems (“I can’t”), and discourse elements (“well”, “oh boy”; Van Lancker & Cummings, 1999; see Table 2), verbal items similar to those observed in severe aphasia. In another case report, loss of ability to produce nonpropositional speech, such as the Lord’s prayer, Pledge of Allegiance, and produce the familiar song “Happy Birthday” was associated with greater atrophy of right than left frontal and temporal cortex (Ghacibeh & Heilman, 2003).

### ROLE OF RIGHT HEMISPHERE IN PRODUCTION

It has remained controversial whether or not, in the typical case of aphasic residual utterances following LH damage, the intact RH is contributing significantly to these expressions (Code, 1997). Many people have been reluctant to attribute any speaking function to the RH. However, depictions of RH function derived from other neuroscientific disciplines permit at least a possibility that the stereotyped form and conventional meanings of nonliteral language might be compatible with RH competencies. Pattern recognition and comprehension of several types of stimuli, such as faces, chords, complex pitch, graphic images, and voices, has been described as superior in the normal RH or significantly deficient in the impaired RH (Bradshaw & Nettleton, 1983; Gordon, 1970; Sidtis, 1980; Van Lancker, 1997; Van Lancker, Cummings, Kreiman, & Dobkin, 1988). The RH has been generally described as more adept at processing configurational stimuli. Although these findings pertain more specifically to comprehension processes (discussed later), this interpretation of RH processing ability also supports the possibility of RH

### TABLE 1

Excerpts of Spontaneous Speech from a Subject With a Motor Speech Disorder Affecting Nonpropositional More Than Propositional Speech

<table>
<thead>
<tr>
<th>Nonpropositional</th>
<th>Propositional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fourzis, sixxis, sevenzis, eightsis, ninezis, ten, Elevenz, twelvezis, thirteenz, forteneenz, fifteenzis. Violetzis are bluezis. Rosezis are redzis and sugarzis is sweetsiz and sozis are youzis. And to the Republic for which it standzis. One nation individualzis for libertyzis and justicetis for allzis. Yatzis.</td>
<td>But I think that I get … I think I dizis better when I concentratesis onzis it. She was with them for I think about 2 or 3 yearzis. But she has not worked for quite a few yearzis. Course I’ve been sicksis now for 4 yearzis. So naturally she could not worksis. And fortunatelyzis, I get a little small veteran’s compensation, and a … with social security, that sort of think and some investments I have, we get along beautiful. We have never had no financial problems at all.</td>
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</tbody>
</table>
storage and retrieval of the stereotyped form of formulaic utterances. Other findings suggest a specialized RH predilection for the conventional meanings of nonliteral language. In normal individuals, word recognition in the RH appears to relate more readily to real world context than to linguistic features (Drews, 1987). Deficits in involving social context, emotional meanings, musical connotations, and various facets of pragmatic communication have been associated with RH damage (Brownell & Joanette, 1993; Foldi, Cicone, & Gardner, 1983; Gardner, Silverman, Denes, Semenza, & Rosenthal, 1977; Kaplan, Brownell, Jacobs, & Gardner, 1990; Rehak, Kaplan, & Gardner, 1992; Winner & Gardner, 1977). As discussed, these kinds of social, attitudinal, and emotional connotations feature importantly in the meanings of nonliteral expressions.

Questions about the role of the RH in the production of residual aphasic speech, and in nonliteral language processing in particular, have been addressed in various ways. This question has immense clinical importance, as it addresses mechanisms of language recovery (Gainotti, 1993). The Smith and Burkland (1966) patient previously described, whose preserved speech could only arise from an intact RH, presents a most compelling case. RH involvement in residual speech is also

<table>
<thead>
<tr>
<th>Time (Minutes)</th>
<th>Expletives</th>
<th>Discourse Elements/Fillers</th>
<th>Sentence Initials</th>
<th>Numerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Goddammit</td>
<td>um</td>
<td>I can’t</td>
<td>one</td>
</tr>
<tr>
<td></td>
<td>Goddammit</td>
<td>boy</td>
<td>That’s a</td>
<td>three</td>
</tr>
<tr>
<td></td>
<td>well, no</td>
<td>well</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goddammit</td>
<td>well</td>
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<tr>
<td></td>
<td>uh</td>
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<td>no</td>
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<td></td>
<td>eh</td>
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<td>2</td>
<td>God—</td>
<td>ah</td>
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<td></td>
<td>Goddammit</td>
<td>ah</td>
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<td></td>
<td>nah</td>
<td>uh</td>
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<td>ah</td>
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<tr>
<td>3</td>
<td>um</td>
<td>mm, uh</td>
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<td></td>
<td></td>
<td>oh, yes</td>
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<td>shit</td>
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<td></td>
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<td>yes</td>
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<td></td>
<td></td>
<td>no</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Goddammit</td>
<td>well, yes</td>
<td>I don’t</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ah</td>
<td></td>
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</tr>
<tr>
<td></td>
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<td>no</td>
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<td></td>
<td></td>
<td>I couldn’t</td>
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<td></td>
<td></td>
<td>ah</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Goddammit</td>
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TABLE 2
Residual Utterances in a Profoundly Aphasic Adult Left-Hemispherectomized Subject. Swearing, Discourse Elements/Pause Fillers (Well, Um), and Sentence Stems (I Can’t) Are Clearly in Evidence in His Speech.
suggested by speech changes in aphasic patients after temporary RH inactivation by intracarotid amobarbital injection (Czopf, 1981; Kinsbourne, 1971) or diminution of residual speech brought about by a new stroke to the previously intact RH (Cummings, Benson, Walsh, & Levine, 1979; Mohr & Levine, 1979). Further addressing the question of which cerebral hemisphere might underlie automatic speech, Graves & Landis (1985) measured mouth openings in aphasic speech during production of automatic and propositional utterances. Despite right side weakness in some of the patients, greater right-sided mouth openings were measured for spontaneous speech, repetition, and word list generation; serial speech and singing were associated with greater openings on the left side of the mouth. As the neurological control of movement is contralateral (the RH in large part controls the left side of the face and body, and the LH controls the right side of face and body), this provided evidence for a dissociation in hemispheric control for propositional versus automatic speech.

EVIDENCE FOR BASAL GANGLIA INVOLVEMENT IN PRODUCTION

Other evidence leads to the notion that swearing, as a preeminent subset of automatic speech in aphasia and formulaic speech in normal language use, is produced by neural mechanisms other than those underlying other speech behaviors. Incidents of swearing were reported in a coma patient (Schiff, Ribary, Plum, & Llinas, 1999). Several observations implicate the basal ganglia as the neurological site of action for some subsets of nonliteral language. The most well known emanates from the presentation of coprolalia (Greek for “foul speaking”) in Gilles de la Tourette syndrome (Shapiro, Shapiro, Bruun, & Sweet, 1983). Cross-linguistic studies reveal similarity in the vocalizations—swearing and taboo words—in any language reported (see complete listing in Van Lancker & Cummings, 1999). Current opinion regarding the site of brain damage in Gilles de la Tourette syndrome implicates the basal ganglia (Balthasar, 1957; Cummings, 1993; Eidelberg et al., 1997; Gates et al., 2004; Georgiou, Bradshaw, Phillips, Bradshaw, & Chiu, 1995; Nauta, 1982; Palumbo, Maughan, & Kurlan, 1997; Regeur, Pakkenberg, Fog, & Pakkenberg, 1986; Singer, 1997).

A related observation comes from intrasurgical procedures involving deep stimulation in the brain. In stereotaxic surgery, in which brain areas are first probed using electrodes, various behaviors are elicited. This procedure is undertaken to determine the most useful site of surgical intervention for relief of motor disorders. Using deep stereotaxic electrical stimulation of deep brain structures, such as putamen and globus pallidus, Schaltenbrand (1965) elicited stereotyped compulsory utterances, such as “thank you” (see also Schaltenbrand & Woolsey, 1964).
Schaltenbrand likened this speech behavior to observations in aphasic patients described by Hughlings Jackson (1874/1932).

Lesions studies have associated basal ganglia damage with specific loss of production of some types of nonpropositional speech. One reported loss of ability to recite familiar verses, serial speech, singing, recited rhymes, overused phrases in spontaneous speech, and swearing following a right basal ganglia lesion, despite preserved propositional speech (Speedie, Wertman, T’air, & Heilman, 1993). Another described a patient with subcortical injury, who reported using fewer conversational expressions such as greetings and other speech formulas in daily conversation, and using less swearing than in preinjury communication (Van Lancker Sidtis, Pachana, Cummings, & Sidtis, 2006). Analysis of her spontaneous speech obtained in interviews and conversations revealed that 11% of the words in the 1,127 word corpus constituted formulaic expressions (Van Lancker Sidtis, Canterucci, & Postman, 2006), a number considerably lower than those obtained in other similarly derived incidence counts (Van Lancker Sidtis et al., 2003; Van Lancker Sidtis & Rallon, 2004; see Figure 2a). In patients studied by Brunner, Kornhuber, Seemueller, Suger, and Wallesch (1982), automatisms and recurrent utterances occurred only in the case of cortical and subcortical lesions. Lieberman (2000, 2001) associated the overlearned motor behaviors of speech with the highly evolved basal ganglia in humans. How the basal ganglia nuclei interact with LH or RH cortical areas to hyperactivate, normally produce, or reduce formulaic language is not yet understood.

FUNCTIONAL IMAGING STUDIES OF PRODUCTION

The site of brain processing of nonpropositional speech has been investigated by a number of functional imaging studies. Early studies using Single Photon Emission Computed Tomography (SPECT) technology reported bilateral representation of automatic speech tasks (Lassen & Larsen, 1980; Ryding, Bradvik & Ingvar, 1987), but the meaning of these findings is overshadowed by subsequent studies that have reported bilateral brain signals for many propositional tasks (Van Lancker Sidtis, in press). In one study (Van Lancker, McIntosh & Grafton, 2003), five aphasic patients who had suffered a single, unilateral stroke in the perisylvian region were compared to nine normal–control paticipants, all right-handed, and matched in age and education. Tasks were three sets of 90-sec activation sessions producing (a) animal names, (b) vocalized syllables, and (c) counting. Behavioral measures differed significantly between normal–controls and patients for generation of animal names, but not for vocalizations or counting. Using partial least squares analysis (McIntosh, Bookstein, Haxby, & Grady, 1996), greater left frontal activation was identified for naming and nonverbal vocalization; however, more RH and basal ganglia areas were identified for counting. For aphasic patients, naming and nonverbal vocalization were associated with relatively more bilateral structures.
Another study using Positron Emission Tomography (PET) imaging in normal individuals employed two speech tasks traditionally considered to be automatic: a serial task (months of the year) and a well rehearsed, memorized text (the Pledge of Allegiance) compared to tongue movements and consonant–vowel syllable production (Bookheimer, Zeffiro, Blaxton, Gaillard, & Theodore, 2000). Continuous production of the Pledge of Allegiance showed activation in traditional language areas, but reciting the months of the year engaged only limited language areas (Brodmann areas 44 and 22). Tasks did not include counting, which is the automatic speech behavior most frequently observed in aphasia, and is most commonly used in intraoperative cortical mapping for speech. In a preliminary report using PET imaging, differences in brain activation patterns for counting compared with storytelling were described (Blank, Scott, & Wise, 2001). A later report addressing the same question indicated extensive bilateral activation for propositional and nonpropositional tasks alike, with no differences in brain sites between speech modes (Blank, Scott, Murphy, Warburton, & Wise, 2002).

Together, although difficulties in interpreting signals derived from functional imaging have been noted and interpretations can be speculative (Sidtis et al., 1996; Van Lancker Sidtis, in press), these studies suggest that counting, the most commonly retained residual automatic speech in aphasia, is stored and processed in the brain differently from newly generated speech production.1

COMPREHENSION STUDIES

The majority of group studies of nonliteral language processing in the brain address questions about comprehension, and most of this work is designed in the paradigm of hemispheric specialization for different types of communicative functions. Specialized representation in the LH of phonology, syntax, and lexical semantics has long been assumed from lesion and other neurolinguistic studies (see Van Lancker, 1997, for review). These and split-brain studies (testing epileptic patients in whom the corpus callosum has been sectioned) have consistently indicated that in the RH, phonological, lexical, and syntactic processing is severely limited or nonexistent (Gazzaniga, Ivry, & Mangun, 2002, p. 411; Zaidel, 1976). Thus, it has been of special interest to discover that comprehension of various types of formulaic language appears to implicate the RH. Idioms (Bryan, 1988; Burgess & Chiarello, 1996; Myers & Linebaugh, 1981), fixed metaphoric expressions (Winner & Gardner, 1977); indirect requests, which are frequently formulaic (Weylman, Brownell, Roman, & Gardner, 1989); and conversation (Rehak, Kaplan, & Gardner, 1992) show deficient processing in the patient with RH dam-

1 The functional imaging studies evaluating comprehension of nonliteral language have addressed processing of creative metaphors (Bottini, et al., 1994; Rapp, Leube, Erb, Grodd, & Kirchner, 2004) and will not be reviewed here.
age. There is now a well-established range of pragmatic deficits associated with RH damage (Joanette, Goulet, Hannequin, & Boeglin, 1989; Myers, 1998; Tompkins, 1995). These results further support the notion of a neurological dissociation in processing of novel and formulaic language.

Some approaches to idiom processing in RH-damaged patients required a verbal response, such as a definition or interpretation of the nonliteral expression. Somewhat different results obtained using online idiom comprehension have suggested that the RH deficits reported in some studies might be due to task conditions (Tompkins, Boada, & McGarry, 1992). To avoid imposing verbal demands on the participants, Kempler and Van Lancker (1996) employed an instrument called the Formulaic and Novel Language Comprehension (FANL-C) Test, in which 20 formulaic utterances (idioms, proverbs, and speech formulas) were matched (in length and sentence structure) to 20 novel expressions, with four line drawings as responses. Here the focus was on ability to process the two types of form: familiar–nonliteral versus novel–literal utterances. When this test was administered to unilaterally brain-damaged patients, a double dissociation was observed: LH-damaged patients performed poorly on literal expressions but relatively better on idiomatic and formulaic language, and RH patients performed relatively worse on formulaic and idiomatic language than on novel expressions (Kempler, Van Lancker, Marchman, & Bates, 1999; Van Lancker & Kempler, 1987). These studies assaying hemispheric function for nonliteral expressions, whether form or meanings were emphasized, implicate the RH as significant moderator.

Lack of support of a RH contribution to nonliteral processing has also recently been reported (Oliveri, Romero, & Papagno, 2004), using written stimuli and transcranial magnetic stimulation (magnetic signals applied at the scalp temporarily disrupt cortical function), a technique that is still in the development stage. In another study of 10 aphasic patients (Papagno, Tabossi, Colombo, & Zampetti, 2004), comprehension of “opaque” idioms read aloud to the participants was impaired with a bias toward the literal (implausible) drawing. No RH patients were tested. This study differs from the previous study using the FANL-C (Van Lancker & Kempler, 1987), in which a literal response is not provided as an option. This design was adopted for the FANL-C based on the belief that it is difficult to interpret the meaning of a technically correct, literal response to a nonliteral expression.

THE RIGHT HEMISPHERE IN COMPREHENSION OF NONLITERAL LANGUAGE

Numerous studies of the pragmatics of language, previously reviewed, have associated RH damage with deficits in various aspects of communicative function. Many of these findings pertain to nonliteral language studies. An early study by Benton (1968), performed before notions of an RH role in nonliteral communica-
tion, was designed to evaluate the role of the frontal lobe damage on a number of verbal functions, including proverb interpretation. The results were greater impairment in patients with right side frontal lobe damage, but at the time, there was no explanation for this finding.

The role of the RH in formulaic language comprehension is likely to be subtle, reflecting more about mode of processing than actual achieved goal. Tasks, stimuli, and response modes may affect the results. For example, patients with either RH or LH damage are sometimes able to copy a complex figure adequately, but the strategies for arriving at a suitable copy differ between the two groups (Lezak, 1995). Groups of persons with RH or LH damage make a similar number of errors in recognizing the emotional prosody of spoken utterances, but the errors are based on the misuse of different acoustic cues by each group (Van Lancker & Sidtis, 1992). This difference in hemispheric strategy has been repeatedly demonstrated (Bever, 1975; Bogen, 1969; Martin, 1979). One can assume that the hemisphere dominant for language, the LH, can somehow accomplish the better part of most verbal tasks. But many studies indicate that the RH makes an important contribution to verbal communication, including those involving comprehension of nonliteral language (see Joanette et al., 1989; Myers, 1998; Paradis, 1998). Identifying and demonstrating that contribution requires care and caution in experimental design.

In normal persons, both hemispheres are probably required to fully and normally perform the task of nonliteral language comprehension, and LH damage can be expected also to disrupt this ability. In fact, it appears that compromise of brain function is often associated with deficient nonliteral language abilities. Nonliteral language comprehension is below normal in Parkinson’s disease (Kempler & Van Lancker, 1993), Down’s syndrome (Papagno & Vallar, 2001), and organic brain damage of many kinds is associated with deficient processing of various types of nonliteral language functions (interpreting proverbs and recognizing idioms). Nonliteral language tests have sensitivity, but not specificity, to psychiatric and dementing conditions. These more general deficits may relate back to the previously popular, but now somewhat antiquated, idea that the brain-damaged patient has lost aspects of the abstract attitude of normal cognition, and retains mainly thinking in the concrete attitude (e.g., Head, 1987).

OTHER BRAIN DAMAGE EFFECTS ON NONLITERAL LANGUAGE

A study examining the impact of callosal absence suggested strongly that communication between the two cerebral hemispheres is required for effective processing of formulaic language (Paul et al, 2003). Normally intelligent adult males with agensis of the corpus callosum but without focal brain damage were evaluated us-
ing the FANL-C (Kempler & Van Lancker, 1996) and the Gorham Proverbs Test (Gorham, 1956). The individuals with agenesis of the corpus callosum were significantly impaired on the nonpropositional (formulaic) items of the FANL-C, but were not different from controls in comprehension of propositional items. Their responses on two of the Gorham proverbs are shown in Table 3. When their responses were scored for completeness of form (structural parts of proverb) and meaning, their performance was found to be deficient (Paul, Van Lancker, Schieffer, Dietrich, & Brown, 2003). These persons with agenesis of the corpus callosum had intact right hemispheres and basal ganglia, but lacked normal interhemispheric integration.

Another observation suggests that two hemispheres are required for nonliteral language comprehension. A 50-year-old adult male who had undergone a left hemispherectomy at age 5, but developed normal language function and had normal IQ scores on the Wechsler Adult Intelligence Scale, was extensively tested on a series of language and other cognitive protocols (Van Lancker Sidtis, 2004b). His performance was normal throughout the testing, with only a few exceptions. One was the FANL-C. He performed normally on the literal portion of the FANL-C, but performed subnormally on the nonliteral exemplars.

Using the FANL-C, loss of nonliteral language comprehension has also been seen in early stages in Alzheimer’s disease (Kempler, Van Lancker, & Read, 1988). This finding was compelling, because nine of the participants, who were mild in their disease progression, had confirmed diagnoses of Alzheimer’s disease following biopsy. It appeared that performance on nonliteral expressions might be a sensitive marker of early dementia. A failure to find significantly poorer processing of nonliteral language in Alzheimer’s disease was later reported, using in a task employing verbal interpretation (Papagno, 2001). However, differences in performance in the Alzheimer group between literal and nonliteral stimuli was also reported in that study, again supporting the notion that the two types of language involve different processing requirements. A later study (Papagno, Lucchelli, Muggia & Rizzo, 2003) reported significant idiom recognition deficits in persons with mild Alzheimer’s disease under certain task conditions.

It is a common clinical occurrence that persons in the advanced stage of Alzheimer’s disease, who have lost most higher cognitive function, utilize what is referred to as empty speech (Cummings & Benson, 1983). Some of this speech is constituted by express nonpropositional expressions, especially interactional speech formulas (Kempler, 1991). It is interesting that many persons with Alzheimer’s disease retain communicative production of formulaic expressions well into the progression of their disease. This is a common clinical observation, although it has not yet been systematically demonstrated. This dissociation in Alzheimer’s disease between production of formulaic utterances, which is retained until late stages, and cognitive comprehension of nonpropositional expressions, which is impaired early on, might be accounted for by the known cerebral involvement in the disease. Temporal—parietal cortical areas become affected first, yielding the characteristic cognitive—lin-
### TABLE 3
Sample of Responses on Proverb Interpretation From Subjects With Agenesis of the Corpus Callosum and Normal Control Subjects. Responses Are Impoverished in Form and Sometimes Incorrect in Meaning.

<table>
<thead>
<tr>
<th>Proverb</th>
<th>Persons With Genesis of the Corpus Callosum: Responses</th>
<th>Normal Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rome was not built in a day.</td>
<td>• It took years to build Rome.</td>
<td>• Although effort &amp; desire are keys, accomplishments still take time and work.</td>
</tr>
<tr>
<td></td>
<td>• You should take your time on tasks.</td>
<td>• Don’t worry about how long it takes to do something.</td>
</tr>
<tr>
<td></td>
<td>• It is a very old town.</td>
<td>• It suggests that when you want to be successful it takes time to achieve it.</td>
</tr>
<tr>
<td></td>
<td>• It took time.</td>
<td>• It takes time for things to happen.</td>
</tr>
<tr>
<td></td>
<td>• Took a long time to build the city.</td>
<td>• It takes time to do big or great things.</td>
</tr>
<tr>
<td></td>
<td>• Great things take time.</td>
<td>• It means that it takes longer than a day to do anything.</td>
</tr>
<tr>
<td></td>
<td>• Take your time.</td>
<td>• Things don’t just happen over night.</td>
</tr>
<tr>
<td></td>
<td>• Great things take time.</td>
<td>• You can’t do everything all at once, things take time.</td>
</tr>
<tr>
<td></td>
<td>• Although effort &amp; desire are keys, accomplishments still take time and work.</td>
<td>• Some things so big can be finished so fast.</td>
</tr>
<tr>
<td></td>
<td>• Don’t worry about how long it takes to do something.</td>
<td>• Patience is a very important quality to develop things take time.</td>
</tr>
<tr>
<td></td>
<td>• It suggests that when you want to be successful it takes time to achieve it.</td>
<td>• Patience.</td>
</tr>
<tr>
<td></td>
<td>• It takes time for things to happen.</td>
<td>• Things take time.</td>
</tr>
<tr>
<td></td>
<td>• It takes time to do big or great things.</td>
<td>• Something cannot be accomplished in a short period of time.</td>
</tr>
<tr>
<td></td>
<td>• It means that it takes longer than a day to do anything.</td>
<td>• It took a long time to build it.</td>
</tr>
<tr>
<td></td>
<td>• Things don’t just happen over night.</td>
<td>• Good things take time.</td>
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<td></td>
</tr>
</tbody>
</table>

(continued)
Barking dogs seldom bite. • Barking dogs sometimes bite. • People who brag how tough they are sometimes aren’t. • They just scare. • Many people use their words but they don’t work to beat up each other. • Words don’t damage as much as something can physically damage. • Some people who claim to be big and tough, all they are is talk, just a bag of hot air. • Impressions may not always be correct: hardened outside nature does not exclude soft inside nature. • People do a lot of talking instead of taking action. • People that always talk sometimes don’t produce. • All noise and no action. • Noise-words without actions are nothing. • Your bark is not as bad as your bite; people are afraid of things they hear until they try it for themselves. • There all talk no action. • If a dog is barking the he is trying to scare away because he is scared. • Loud mouth means action none. • You’re all talk, and no action. • It just wants to seem tough when it’s really not. • Dogs who bark a lot bite a lot. • It is not always what it seems to appear.

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<td>• Dogs who bark a lot bite a lot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It is not always what it seems to appear.</td>
</tr>
</tbody>
</table>
guistic deficits, yet frontal–subcortical systems remain intact until the terminal stages, allowing for longer preservation of vocal–motor functions, which apparently include normal-sounding production of nonpropositional expressions.

COMPREHENSION VERSUS PRODUCTION: DIFFERENCES IN BRAIN PROCESSING?

It is likely that brain processing for nonliteral language differs according to production or comprehension modes. The dissociation of production ability and comprehension deficit in Alzheimer’s disease, as described, provides one compelling example. Differences may be further seen according to type of formulaic utterance. Swearing, counting, sentence stems, and discourse elements may be emitted by the RH, as seen in aphasia and in the adult hemispherectomy patient (Smith, 1966; Smith & Burklund, 1966; Van Lancker Sidtis, 2004b), perhaps in crucial association with basal ganglia nuclei. Other subsets of nonliteral speech production may require the LH or both hemispheres.

Production and comprehension processes for proper nouns, which have different linguistic properties from common nouns (Valentine, Brennen & Bredart, 1996) and may belong to nonpropositional language, differ in human processing (Bredart, Brennen, & Valentine, 1997). Retrieval (production) of proper nouns appears to be impaired by LH damage (Damasio, Grabowski, Tranel, Hachwa, & Damasio, 1996; Semenza, Mondini & Zettin, 1995; Van Lancker Sidtis et al., 2003). Studies of unilaterally brain damaged patients have shown that familiar proper nouns are relatively well processed by severely LH damaged patients, presumably benefiting from the intact RH (Van Lancker & Klein, 1990; Yasuda & Ono, 1998). Some studies of normal individuals suggest that personally familiar proper nouns are processed equally well in both cerebral hemispheres, unlike matched common nouns (Ohnesorge & Van Lancker, 2001). However, some uncertainty about the RH role in proper noun comprehension in normal individuals remains (Schweinberger, Kaufmann, & McColl, 2002), due at least in part to the inherent difficulties in designing group studies of personally familiar stimuli (Van Lancker, 1991; Van Lancker & Ohnesorge, 2002).

DUAL-PROCESSING MODEL OF LANGUAGE

This review of the neurology of nonliteral language processing leads to a model of language that allows for two disparate modes of processing. One mode establishes a competence for novel language, utilizing phonological, morphological, and grammatical rules in accord with a lexicon. The other mode accommodates a very large repertory of formulaic expressions that are processed in terms of canonical,
stereotyped forms and conventionalized meanings. This proposal is not at all new; it has been expressed in many other venues of scholarship. Hughlings Jackson (1874/1932), as a result of his extensive observations of nonpropositional and propositional language abilities in the clinic, spoke of “dual mentation” (p. 169) in normal speech. In Tannen (1989), a model of language alternating of “fixity and creativity” (p. 3) is proposed. Lounsbury (1963) described constructions that are “familiar and employed as a whole unit” (p. 561), in contrast to newly created constructions, claiming that these two types of construction have different psychological statuses in actual speaking behavior. Bolinger (1961, 1976) spoke often of interplay between remembered and newly created speech. Sinclair (1987) posits the “open choice” and the “idiom” (pp. 319–320) principles necessary to describe normal speech.

The dual mode processing model is merely a facet of a dichotomy in human behaviors that has been described in other scientific disciplines. In information processing, it has been referred to as controlled versus automatic processing (Schneider & Shiffrin, 1977); in memory systems, the distinction between habitual and declarative (Mishkin, Malamut, & Bachevalier, 1984) or procedural and semantic memory (Knowlton, Mangels, & Squire, 1996; Squire, 2004) remains viable. For motor systems, Marsden (1982) posited a contrast between automatic and planned execution. For vocalization, the dual mode concept was reflected in Robinson’s (1987) dichotomy of emotive versus elaborated speech and in Ploog’s (1979) view of differential brain bases for human, as compared with animal, vocalizations. A similar dichotomy was elaborated by Koestler (1967), who proposed a hierarchical system from novel to habitual behaviors in the nervous system, corresponding, like the other proposals mentioned, to its vertical organization (from basal ganglia nuclei to cortex). Some individuals interested in this topic have proposed that evolution of human language can be better accounted for by proposing these two disparate modes (Code, 2005; Jaynes, 1976). Finally, the dual mode model is also useful for describing normal language acquisition (Locke, 1997; Vihman, 1982).

Normal language competence consists of a deft interplay of formulaic and novel language, each processed according to different mechanisms and serving distinctive needs. Any fixed expression can be subjected to the rule-governed processes of novel language—hence the demonstrable flexibility of nonliteral utterances in actual language process; yet formulaic expressions, by definition, are known to the native speaker—hence their property of fixedness. Creativity in normal language use consists not only of the generation of new sentences, but also in the continuous convergence of holistic and novel language modes in processing.

CONCLUSION

Evidence from neurologically impaired patients—including those with left or right cortical damage from stroke or dementia, subcortical dysfunction, or agenesis of
the corpus callosum—leads to four conclusions. The first is that the type of language called propositional (i.e., novel, syntactically, and lexically based sentences) and the various types of speech called nonpropositional (including idioms, speech formulas, proverbs, slang, discourse elements, sayings, and any other unitary expressions known to the native speaker) are stored and processed differently in the brain. This is inferred from converging evidence that neurological conditions affect these two modes of language competence differently.

The second notion that is beginning to emerge is that many kinds of nonliteral language, although perhaps not all, are modulated by a RH–subcortical circuit. This appears to be true for comprehension, as well as production. This conclusion is based on group studies on comprehension abilities and deficits, and on group and individual case studies of production abilities and production deficits in unilaterally brain damaged patients. Other neurological clinical observations, such as hyperactivated swearing in Tourette’s syndrome, and preserved speech formula production in Alzheimer’s disease, also point to significant involvement of basal ganglia nuclei and the right cortical hemisphere in at least certain subsets of nonliteral language production.

Third, it appears that both hemispheres are needed for successful production and comprehension of nonpropositional speech. This is seen in reduced comprehension competence in persons with agenesis of the corpus callosum, who have otherwise intact brains, but in whom the communication between the hemispheres is not optimal; it is seen in the fact that damage to the RH or subcortical damage only partially disrupts comprehension and production of nonpropositional speech, that LH damage, as well as brain damage of several other varieties, affects nonliteral language performance.

Finally, neurological evidence suggests that normal language use consists of two modes of processing, one for management of a very large repertory of unitary structures, and a second for assemblage of novel structures according to a set of rules. The model entails the proposal that the generative mode can operate at any time on a fixed expression, producing variations, but the canonical form, with its special characteristics of stereotyped form and conventional meaning, retains its status as part of the speaker’s knowledge. Many observations in idiom studies, aphasic speech, and other language disorders following neurological impairments are well accommodated by this model of language. What is to be further examined is how the various kinds of formulaic expressions differ from each other, and how they are differentially represented in human cerebral structures.

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REFERENCES


Palumbo, D., Maughan, A., & Kurlan, R. (1997). Hypothesis III. Tourette syndrome is only one of several causes of a developmental basal ganglia syndrome. *Archives of Neurology, 54*, 475–483.


Van Lancker, D., & Ohnesorge, C. (2002). Personally familiar proper names are relatively successfully processed in the human right hemisphere, or, the missing link. *Brain and Language, 80*, 121–129.


