The Neurology of Proverbs

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Although proverb tests are commonly used in the mental status examination surprisingly little is known about either normal comprehension or the interpretation of proverbial expressions. Current proverbs tests have conceptual and linguistic shortcomings, and few studies have been done to investigate the specific effects of neurological and psychiatric disorders on the interpretation of proverbs. Although frontal lobes have traditionally been impugned in patients who are "concrete," recent studies targeting deficient comprehension of nonliteral language (e.g. proverbs, idioms, speech formulas, and indirect requests) point to an important role of the right hemisphere (RH). Research describing responses of psychiatrically and neurologically classified groups to tests of proverb and idiom usage is needed to clarify details of aberrant processing of nonliteral meanings. Meanwhile, the proverb test, drawing on diverse cognitive skills, is a nonspecific but sensitive probe of mental status.

Introduction

Abilities to recognize and interpret certain kinds of nonliteral language, especially proverbs and idioms, have long been believed to reflect special aspects of cognitive function (Buhler, 1907; Bronner et al., 1927; Piaget, 1923; Benjamin, 1944), and have been used as a tool in evaluation of cognitive and mental status (Lezak, 1983; Fogel, 1965, Cummings and Benson, 1983). Proverbs and idioms are included in intelligence testing (Wechsler Adult Intelligence Scale, 1955; Stanford–Binet Test of Intelligence), in formal psychiatric and neurological evaluation of mental status, (Cummings, 1985; Strub and Black, 1985) and in clinical bedside testing. Interpretation of proverbs and idioms is still routinely used in the diagnosis of inter alia, dementia, psychiatric disorders and confusional states.

Viewed as a problem with "abstract thinking" (Goldstein, 1935; Goldstein and Scherer, 1941), or "verbal abstraction" (Gorham, 1961), a "concrete" interpretation of "People who live in glass houses shouldn't throw stones" (proverb) or "a loud tie" (idiom) is taken as an indication of deficient cognition and/or neurological disease, while a bizarre interpretation may be said to reflect thought disorder (Cummings, 1985). Aging has been associated with an increase in "concrete" interpretations of proverbs (Bromley, 1957). However, the conceptual problems inherent in the abstract/concrete dichotomy are reflected in Lezak's (1983) comment that a
mentally dilapidated elderly patient can "express suitable meanings for familiar (proverbs) while being unable to think abstractly" (p. 261) (emphasis mine; see discussion of familiar versus unfamiliar nonliteral expressions below). In their influential book on behavioural-neurological evaluation, Strub and Black (1985) state that "abstract thinking, which is perhaps the highest level of cognition, may be readily assessed by the use of proverbs...." Indeed, a heady excitement about the "utilization of proverbs as a tool in evaluating mental processes" is reflected in Gorham's (1961) survey of applications of the technique in the 1950s to "psychiatric conditions, LSD, lobotomy, organic damage...simulated high altitude... (and) personnel selection" (pp. 57–58).

Despite the ubiquity and robustness of proverbs and idioms as probes of mental function, there is considerable uncertainty among clinicians about how to evaluate patients' performance and what a response means for the differential diagnosis. Little is known about the qualitative details of patient performance, such as the types of interpretative errors that would serve as a signature of certain focal brain lesions or specific psychiatric conditions; nor is the inverse well understood: a predictable effect of brain damage on proverb performance.

The common practice of using proverbs to evaluate mental status highlights our need to know more about how and where nonliteral language is processed in the brain, and what kinds of brain dysfunction interfere with idiom and proverb interpretation. Better knowledge of normal nonliteral language use and the neuropathology of nonliteral language deficits would make the proverbs test more useful in clinical assessment, and would further our understanding of brain function underlying communicative and cognitive ability. The purpose of this review is to reevaluate issues underlying use of nonliteral language as a clinical tool.

Previous Work

The most well known previous work on proverb interpretation as a psychological tool is by Gorham (1956 a, b), who published results on his test of proverb interpretation, with performance scores averaged from over a thousand subjects, including adults, servicemen, children, and students. Correlations between the Gorham Proverbs Test and 16 other neuropsychological batteries were also provided. This test has been used as a model for screening tests in neurology and psychiatry (Strub and Black, 1985; Cummings, 1985). It is the one most used in clinical research (Brinton et al., 1985; Carpenter and Chapman, 1982; Elmore and Gorham, 1957) and, recently, for further testing in normal subjects (Nippold et al., 1988; Nippold and Fey, 1983; Penn et al., 1988a, b).

The Gorham Proverbs Test consists of two parts. In the first part, free verbal interpretations are elicited and later scored on a 3-point scale corresponding to degree of "concreteness," as subjectively determined by the examiner. In the second part, subjects select one of four multiple choice answers provided for each proverb. Foils (wrong answers) are designed to provide wrong, partial and concrete responses.
The *California Proverb Test*, developed by Delis *et al.* (1984), also using free verbal responses and multiple choice, has also been widely assessed in clinical screening, but normative data have not yet been published.* Expanding the scoring categories from the three levels in Gorham's test, this test provides a set of ten cognitive-linguistic categories for classifying responses.

Strub and Black (1985), following Gorham's format, list five proverbs "in ascending order of difficulty," scoring the "degree of abstraction demonstrated by the patient in explaining the proverb," again as subjectively determined by the examiner.

In clinical practice, for interpretation of idioms, a few standard idioms are given (Cummings, 1985), and clinicians evaluate responses without recourse to published exemplars or standardized scoring criteria.

Two main shortcomings of these tests, touching upon familiarity and evaluation, are reviewed below.

**Familiarity**

The first issue to be addressed is proverb or idiom *difficulty*, which is related to *familiarity*. These tests of proverb interpretation are usually meant to include both "easy" and "difficult" (or "simple" and "complex") exemplars (Cummings, 1985), a scale believed to correlate with degree of "abstractness." According to Strub and Black (1985), "Don't cry over spilt milk" is simpler than "Rome wasn't built in a day," which, in turn, is less difficult than "A drowning man will clutch at a straw" (p. 131). But the criteria for these "difficulty" levels are not obvious. The most difficult, and therefore allegedly also the most abstract, is said to be "The hot coal burns; the cold one blackens." Reflection on these examples suggests that the operational feature is familiarity.

What makes a proverb difficult is that it is unfamiliar, not that it is more abstract. Indeed, studies investigating this problem have shown that familiar and unfamiliar proverbs elicit different kinds of results (Penn *et al*., 1988; Cunningham *et al*., 1987; Popiel and McRae, 1988; Kempler and Van Lancker, 1989). As might be expected, unfamiliar proverbs elicit variable responses or no responses from normal subjects. Similarly, people select figurative interpretations only for idioms they are familiar with, and their preference for idiomatic meanings is correlated with degree of familiarity of the test items (Schraw *et al*., 1968). Normal subjects do not agree in their interpretations of unfamiliar proverbs; instead, subject agreement for nonliteral meanings is found only for familiar items, and only for those in the respondent's native language (Kempler and Van Lancker, 1989).

Surprisingly, the question of familiarity has not been taken into account in traditional proverb testing. Yet, by definition, proverbs and idioms are made up of a *fixed form* associated to a *conventional meaning*. It would not seem useful or reasonable to ask a subject to interpret a conventional meaning of a fixed form that he or she has never heard of before. Taking an example from Strub and Black (1985), it is challenging even for the normal intellect to

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* Unpublished data from 86 normal control subjects were analyzed according to age, education, and age-adjusted vocabulary by Mandala (Delis, 1989)
imagine the “right” response for “The hot coal burns; the cold one blackens.” Because of a given proverb’s unfamiliarity to normal subjects, no consensual agreement emerges, and without such consensual agreement from a sampled population, the patient’s response cannot be validly assessed as right or wrong, normal or abnormal, much less, given the intrinsic vagueness of the most pertinent categories, abstract or concrete.

It might be argued that only unfamiliar proverbs should be used in proverb testing since they are not subject to a “learned response,” but require a newly created, metaphoric, cognitive invention, thereby more directly probing the “abstract attitude.” (Carrying this view somewhat further, one might present the target stimulus in Latin.) This notion, however, misses the point that proverbs and idioms, by definition, mean something other than the standard lexical meanings of their constituent words, and that both the form and meaning must be acquired, or learned. The proverb “While the cat’s away, the mice will play” has nothing to say about cats or mice; the idiom “She has him eating out of her hand” is not referring to a meal or a distal body part, if their conventional meanings are appropriately associated to their fixed forms. Attempts to interpret meanings of unfamiliar proverbs and idioms, such as those translated out of other languages, result in an array of guesses which usually have little in common with the actual conventional meaning (Van Lancker, unpublished data). The degree of “abstractness” is impossible to discern from these varying responses.

The ability to produce the fixed forms and to recognize the conventional meanings is internalized, but directly interpreting the meanings is not. Such interpretation requires both inference and verbal processing, in order to depict, or to “abstract,” the meaning which is not denoted by the constituent words of the expression. (These cognitive skills are discussed below.) Using an unfamiliar proverb or idiom does not make the proverb test more abstract; it makes the task unclear. Requesting or expecting a nonliteral interpretation an unfamiliar expression evokes uncertainty in the subject about the task and uncertainty for the examiner about evaluating the response.

Evaluation

Tests of proverb interpretation usually rely upon elicited verbal responses, involving an explanation by the subject of the meaning of the item. The examiner says, “Do you know the proverb, ‘People who live in glass houses shouldn’t throw stones’? What does that proverb mean?” Two problems arise from attempts to analyze these verbal responses, one involving general task demands, and the other involving evaluation. The two problems are interrelated.

First, the task is demanding. As alluded to above, producing an accurate interpretation requires, in addition to knowledge of the nonliteral item, grammatical skills, adequate verbal expression, the metalinguistic ability to provide a definition, and the cognitive process of making an inference. Patients deficient in these skills are at a disadvantage, and a propositional—or literal—language disorder will surely confound assessment of nonliteral
language, leading to an error in judging cognitive performance. Even more
problematical is the challenge faced by the examiner in the evaluation of the
response.

Scoring of verbal responses is difficult because they are open-ended, and
is compounded by the vagueness of the notions “abstract” and “concrete,”
as Gorham acknowledged:

The greatest difficulty was presented by the responses which were not clearly good
abstractions nor complete failures. In these cases, a value was assigned arbitrarily
and sometimes changed during the process of scoring the original population
(Gorham, 1956, a, p. 9).

Andreasen (1977) found interrater reliability for the Gorham Proverbs test
to be poor, and the validity of the test in a clinical setting to be questionable
(p. 471). Examples from the revised Strub and Black version will further
illustrate the problem (1985). In the Strub and Black test, for the proverb
“Rome wasn’t built in a day,” the answer “Don’t do things too fast” is given
as a score of 1 (semi-abstract), while the answer “It takes time to do things
well” is given a score of 2 (abstract). It is difficult to see why “Don’t do
things too fast” is deemed less abstract than “It takes time to do things well.”

Efforts at revision in the California Proverb Test have not significantly
eliminated the evaluation stumbling block. Instead, the cognitive-linguistic
categories for classifying responses have reportedly proven difficult to use
reliably in rating actual responses (Delis, 1989).

Normative Data

Presumably drawing on Gorham’s work, Cummings (1985) states that
“Proverbs can be understood by most individuals with a high school
education”. But there is surprisingly little other, more recent normative
information on proverb and idiom interpretation, considering the popular-
ity of the tests. Gorham’s (1956c) study provides only group means, along
with correlations with other psychological tests. From these data, we know
only mean performance values for large groups—nothing about types of
errors. As mentioned previously, the California Proverbs Test also has provided
no published normative information. Thus, qualitative descriptions of
typical responses from normal subjects, in comparison with clinical subjects,
are absent, and reliable criteria for evaluating responses are not available.
Without such criteria, the clinician cannot be confident about how to
classify patients’ responses, nor can the effects on performance of education,
cultural differences, occupational history, or intelligence be taken into
account. Much work with normal subjects is needed to establish normative
performance on tests of proverb and idiom interpretation.

The Neurology of Proverbs and Idioms

Given the limited data on normal proverb and idiom interpretation, it is not
surprising that little is known about neuro-anatomical substrates or non-
literal language function. Deficient processing of proverbs and related
nonliteral expressions has been associated with frontal lobe dysfunction (Benton, 1968, see below p. 179; Stuss and Benson, 1986; Cummings, 1985), right hemisphere (RH) damage (Benton, 1968, see below p. 179; Van Lancker and Kempler, 1987; Winner and Gardner, 1977; Brownell et al., 1986; Weylman et al., 1989) and left hemisphere (LH) damage (based on propositional language deficits).

How to differentiate psychiatric groups using nonliteral language responses has been only sparsely investigated. Gorham (1956a) reported that a large group of chronic schizophrenic patients differed significantly from normal-control subjects in performance on his Proverbs Test, but how the groups differ was not presented. Elmore and Gorham (1957) reported that subjects with "chronic schizophrenic and organic (without functional psychosis) diagnoses" differed from matched normal-controls in the multiple-choice form of the Gorham Proverbs Test; but, again, the distinguishing features are not described. (See Gorham's 1961 review of the use of proverb interpretation in psychiatric clinics.) Cummings (1985, p. 13) mentions that "bizarre, paranoid, or idiosyncratic responses" are often elicited from psychotic patients, while "macabre, pessimistic, or hopeless interpretations" often come from depressed patients. Cummings' valuable clinical observations have not yet been supported by controlled research studies.

Overall there is a lack of systematic information on the effect of different kinds of brain damage and dysfunction on understanding and interpretation of proverbs and idioms. Performance differences in neurological and psychiatric groups on comprehension and interpretation of proverbs and idioms remain to be established. Despite their prominence in the clinic, there is as yet no neurology of proverbs.

**Current Status**

The foregoing can be summarized as follows: proverb and idiom screening is potentially useful as a clinical tool, and accurate characterization of these verbal and cognitive deficits could aid in neurobehavioral diagnosis and cognitive rehabilitation; however, available tests are flawed, distinguishing features of normal and aberrant responses have not been codified, and the neuroanatomical substrates of nonliteral language function are not well understood.

What is known from psycholinguistic and neurolinguistic studies is that nonliteral and literal language are organized according to different principles in the mind and represented in different places in the brain. Several sources of information reveal these differences.

In psycholinguistic research, when asked to make judgments, recognize or recall items, people process familiar nonliteral language differently from literal language. Swinney and Cutler (1979) showed that subjects were significantly faster at judging a "natural English phrase" when shown idioms than when shown balanced literal phrases; Osgood and Hoosain (1974), Horowitz and Manelis (1973) and Simon (1974) have shown significant differences in recognition and recall of idioms, compared to novel phrases and sentences. Lieberman (1963) and Van Lancker et al. (1981)
reported that subjects could distinguish idiomatic from novel phrases from the acoustic signal alone. Other studies indicate that people process a figurative meaning first, when listening to a familiar idiom or proverb (Ortony et al., 1978; Gibbs, 1980). That is, normal listeners do not first “try” a literal interpretation, and then turn to a figurative meaning when the literal reading fails (Schweigert, 1986; Schweigert and Moates, 1988). For sarcastic and ironic statements, similarly, normal listeners comprehend the nonliteral (ironic) meaning first, and remember it better, than literal uses of the same expression (Gibbs, 1986). These studies support the notion that literal and figurative language are processed by different mental mechanisms. Therefore, it follows that brain damage, or brain dysfunction, might affect literal and nonliteral language abilities differently.

Neurological Dissociation between Nonliteral and Propositional Language

Nonliteral language can be conceptualized as occurring on a continuum from reflexive or overlearned at one extreme and to novel, newly created, or “propositional,” at the other (Fig. 1) (see Characterization of Nonliteral Language below, p. 19) (and see Van Lancker, 1975, 1988). Using this schema, whereby nonliteral language is made up of “subsets” differing from each other somewhat in specific properties of their fixed forms and conventional meanings, the notion that propositional and nonliteral language are mediated by disparate brain regions is supported by neurolinguistic data. Clinical studies have shown that various types of language along the propositional-nonliteral language continuum are differentially affected by focal brain lesions. In aphasic patients with propositional language impairments, recurrent utterances appear (Code, 1982a), which often include nonliteral speech-expletives, social formulas, stereotyped phrases and cliches, serial and memorized speech—(Jackson, 1915, 1958; Critchley, 1962, 1970; Benson, 1979; Eiscenson, 1962; Espir and Rose, 1970; Van Lancker, 1973, 1975, 1988; Code, 1987). Aphasic patients fluent not infrequently produce nonliteral utterances, but are unable to produce parts of those same utterances in a propositional context; e.g. the patient who says “son of a bitch” cannot volitionally say the word “son” to refer to his male offspring. As the nonfluent patient recovers speech fluency, the repertory of fixed expressions often increases. The progression from a few stereotypies, through a larger number of fixed expressions, to grammatically produced (propositional) speech has been described by Alajouanine (1956). The

![Fig. 1.](image-url)
repertory of residual utterances varies across patients (Van Lancker, 1975; Code, 1987).

In a few patients, specific abilities to perform better on nonliteral speech than on propositional speech tasks have been observed: completion of idioms was reported by Geschwind et al. (1968) and by Whitaker et al. (1976) in patients with severe propositional language deficits. Using the notion that idioms were completed because they are “overlearned” does not fully account for these observations, because many idioms are heard and used only occasionally compared to common propositional expressions. A case of nonpropositional inner speech, consisting of fragments of prayers and hymns, activated by brain injury, was recently described (Ellis et al. 1989).

The question about whether the intact left hemisphere mediates residual aphasic speech or whether the right hemisphere might be involved has been addressed by various investigators (Van Lancker 1975, 1988; Code, 1987). Furthermore, the association of an anterior/posterior axis with production versus comprehension of nonliteral language has been suggested by clinical observations of patients with Alzheimer’s disease. Alzheimer patients, even in middle and late stages of the disease, produce social formulas with ease and fluency. In most Alzheimer cases studied, posterior cortical areas of the brain have become involved before anterior areas, and, as seen on neurological examination, frontal cortex and basal ganglia are relatively functional (Cummings, 1982; Cummings and Benson, 1983). This observation suggests that producing at least some kinds of nonliteral expressions is associated with intact frontal (or frontosubcortical) systems (see discussion of brain model for nonliteral language below).

The Possible Role of the Right Hemisphere (RH) in Nonliteral Aphasic Speech

The level of emotionality, prosodic intactness, and holistic structure of recurrent utterances leads one to implicate the RH in the production of these instances of residual speech, (Van Lancker, 1975, 1987), especially production of real word recurrent utterances (Code, 1982b, 1987), (although probably not production of recurrent consonant-vowel “nonsense” utterances (de Bleser and Poeck, 1985; Code, 1987)). Neurophysiological observations support Jackson’s view that propositional speech can be represented in the LH and nonpropositional (or “automatic”) speech is produced also by the RH. In their study of mouth asymmetry during aphasic speech, Graves and Landis (1985) reported greater openings on the right side of the mouth for spontaneous speech, repetition, and word list generation (propositional tasks), in contrast to greater openings on the left for serial speech and singing (“automatic” speech).

Various neurological observations suggest that residual aphasic speech is most likely represented in the RH (Kreindler and Fradis, 1968). Several clinical cases have been reported in which the nondominant RH appeared to be the site of aphasic speech (Landis et al., 1980; Cummings et al., 1979). Studies using the Wada procedure reported continued aphasic output
during anesthetization of the left (dominant) hemisphere (Kinsbourne, 1971; Czopf, 1981), implying that the residual aphasic speech was produced by the right (unanesthetized) hemisphere. Further, there have been reports of callosal-sectioned patients with linguistic expression via RH mechanisms (Levy et al., 1971; Gazzaniga et al., 1982; Sidtis et al., 1981; Butler and Norsell, 1968). More dramatically, several left (dominant) hemispherectomized adults with little or no propositional speech have been observed to produce exemplars of fluent, normally intoned nonpropositional speech (Crockett and Estridge, 1951; Hillier, 1954; Smith, 1966, 1974; Bogen, 1973). Although alterations in spontaneous speech patterns following RH damage have not been systematically investigated, there are numerous clinical observations about deficient production of social interaction formulas and other instances of nonliteral language in such patients (Foldi et al., 1983; Jaffe, 1978; Myers, 1979). The intrusive prayers and hymns described by Ellis et al. (1989) followed bilateral, but primarily RH, injury. However, many globally aphasic patients, who have intact right hemispheres, do not ever produce significant nonliteral speech (or any other speech beyond nonsense syllables). This fact, in the light of the above evidence for involvement in residual speech, also requires explanation. How active the RH is in spontaneous production of nonliteral language remains to be studied.

That the RH does participate in normal speech production has also been suggested by recent advanced radiographic methods of observing brain function during behavior. Using measures of blood flow in the brain during performance of a task, it has been found that the RH is active in normal speech production (Ingvar and Schwartz, 1974; Larson et al., 1978; Lassen et al., 1978), and Ryding et al. (1987) reported that during automatic speech (pronouncing the days of the week), the RH was more active than the left.

The role of the RH in comprehension of idioms and proverbs is more definite than is the picture for production. First, it is well established that the RH recognizes linguistic stimuli, so long as phonological or grammatical analysis is not involved (Zaidel, 1978, 1981, 1982). As idioms and proverbs do not require such analysis, but are recognized holistically, it is possible that the RH understands considerably more nonliteral than literal language. Indeed, it is often observed by clinicians and family members that aphasic patients with severe language comprehension deficits seem to understand a great deal more in conversational interaction than can be demonstrated in formal testing of propositional language (Holland, 1980). While some of this comprehension may be attributable to affective and gestural cues (Ross, 1981), it is likely that social formulas, idioms, and conventional expressions used in daily interaction are more available to these severely aphasic persons.

Winner and Gardner (1977) were the first to report that comprehension and interpretation of nonliteral expressions such as “heavy heart” are impaired by RH damage. Since then, other clinical studies have shown that comprehension of idioms and proverbs is significantly impaired by RH damage compared to normal-control subjects (Hier and Kaplan, 1980) or to
patients with LH damage (Myers and Linebaugh, 1981; Dronkers, 1984; Van Lancker and Kempler, 1987; Kempler and Van Lancker, 1989). To study comprehension of nonliteral language (idioms, proverbs and social formulas) without requiring verbal output from subjects, the * Familiar and

![Diagram with text: I'd like to give you a piece of my mind (familiar phrase).](image)

![Diagram with text: The dog's trying to give her a ride on the wagon (novel phrase).](image)

**Fig. 2.**
*Novel Language Comprehension* (FANL-C) test was developed (Kempler and Van Lancker, 1985). Nonliteral expressions were matched with literal sentences in word length, frequency of lexical items, and surface grammatical structure, and four line drawings were provided for each test item for a picture-matching response (see Fig. 2). In studies using the FANL-C, LH patients were significantly more impaired on the literal than the nonliteral subtest, while the opposite pattern was seen in patients with RH damage (Van Lancker and Kempler, 1987; Kempler and Van Lancker, 1989).

Another type of nonliteral language recently associated with RH function is the indirect request. Indirect requests are conventional expressions which are normally interpreted nonliterally. For example, “Do you know what time it is?” and “Can you open the door?”, given the appropriate context, are ordinarily not taken as questions, despite their grammatical form, but instead are interpreted as requests (to say the time or open the door). Deficient use of verbal context in appropriately (i.e. figuratively) interpreting indirect requests is associated with RH damage (Weylman et al., 1989). Other studies similarly suggest RH deficits in utilizing verbal and situational context to recognize conventional meanings. Brownell et al. (1986) found RH damaged subjects to be deficient in making the inferences required to interpret nonliteral meanings in texts. Furthermore, RH damaged patients are less able than normal subjects to use context to interpret humorous meanings in jokes (Brownell et al., 1983; Brownell and Gardner, 1988). Thus deficits in perceiving both the stereotyped form and the conventional meaning of nonliteral expressions have been associated with RH damage.

Although evidence for RH involvement in processing of nonliteral language is more convincing, the frontal lobes have also been implicated in the “abstracting” ability thought to be reflected in proverb interpretation (Cummings, 1985; Stuss and Benson, 1986). Only one study using proverbs could be found to support this notion. The study by Benton (1968) mentioned above, using the multiple choice portion of *Gorham Proverbs Test*, reported significantly worse performance in patients with bilateral frontal lobe damage, compared to patients with unilateral left or right frontal lobe damage. However, in that study, patients with right frontal damage performed somewhat worse (mean number correct of 20.1) than patients with left frontal lobe damage (mean correct of 26.4), again pointing to a special role of the RH in the management of proverbs. (Patients with posterior lesions were not included.) In his discussion of these results, Benton (1968) notes that “an unexpected difference in the mean scores of the unilateral groups also appeared, the right frontal patients performing at a lower level than the patients with left frontal disease.” He goes on to note that had the difference gone in the opposite direction, the results would be explained “by the circumstance that the test is a verbal task,” yet analyses of individual subjects reveals that, overall, the LH damaged patients ($n=10$) performed better than the RH damaged patients ($n=8$), with 4 of the 10 LH damaged group “earn(ing) scores that were above the highest score made by the right frontal patients.” This result obtained nearly 25 years
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not necessary for successful processing of nonliteral expressions. In fact, applying that knowledge to an idiom or proverb will result in a wrong answer. Thus, stereotyped form and conventional meaning are the cardinal properties of most kinds of familiar nonliteral language. Unfamiliar nonliteral language, such as newly created metaphors and other poetic usage, has very different properties from either literal or familiar nonliteral expressions, and would lead us into realms of human artistic expression and creativity about which even less is known.

A Brain Model of Nonliteral Language Processing

A brain model of nonliteral language processing must take into account usage of unfamiliar and familiar exemplars. It must distinguish between production and comprehension modalities, and it must recognize a distinction between natural abilities (understanding and producing familiar nonliteral language “on-line”) and additional metalinguistic abilities—those required for test-taking. As mentioned above, how and where poetic metaphor—the ultimate in unfamiliar nonliteral language—might be created and comprehended by the normal language user is much too great a question to ask here. One might speculate that both cortical hemispheres are involved, and a role of the corpus callosum in creativity has been proposed (see Bogen, 1969b).

For familiar expressions, it is likely that in natural language function, form and meaning are processed in the RH. The pattern recognition abilities of the RH (Bever, 1975; Bogen, 1969a; Bradshaw and Nettleton, 1983, Bryden, 1982) store and process the forms, while specialized abilities for contextual and semantic inference (Brownell et al., 1986; Molloy et al., 1990; Sdtis, et al., 1981a, b) of the RH process the special, conventional meanings of familiar nonliteral expressions.

It is further likely that form and meaning in nonliteral language, both processed in the RH, are processed by different cerebral structures in that hemisphere. In normal language behavior, production abilities of nonliteral forms may be associated with anterior structures of the RH, whereas comprehension of nonliteral meanings is likely associated with the posterior RH. This model is based on analogy with the aphasias, whereby motor output is anteriorly programmed and comprehension is processed posteriorly. As described above, studies by Van Lancker and Kempler (1987) and others have shown that comprehension of idioms and proverbs is strongly associated with RH function, but whether posterior sites are more specifically involved remains to be confirmed.

Studies of natural production are more difficult to design, but the evidence implicating frontal areas in production of nonliteral form described above for Alzheimer’s speech is suggestive. As mentioned previously, in Alzheimer’s disease, motor programs for familiar, nonliteral expressions are intact, despite disturbed comprehension of their meanings and despite disturbed output of propositional language. The preserved ability to produce speech formulas may be attributable to intact frontal and/or fronto-
subcortical systems. In support of this view, Grafman (1989) includes the ability to engage in social communication in the set of abilities mediated by frontal lobes (p. 109). This model, namely, that RH mediates nonliteral language, with production and comprehension associated with anterior (subcortical) and posterior structures respectively, predicts that patients with Parkinson’s disease who have advanced frontosubcortical dysfunction will be more impaired in production of nonliteral language forms than comprehension of conventional meanings, the inverse of dementia of the Alzheimer type.

Using this model for processing of familiar nonliteral language, the practice of clinical proverb testing as part of the mental status evaluation can be better understood. First, responses to an unfamiliar proverb or idiom are intrinsically difficult or impossible to assess. Secondly, it is not known where in the brain metalinguistic abilities to “define” are represented. Interpretation of familiar proverbs (whether using a free response or multiple choice format) utilizes the linguistic abilities of the LH as well as inferential abilities of the RH, managed by executive functions of the frontal lobes (Stuss and Benson, 1986; Grafman, 1989). From this perspective, because multiple and diverse higher cognitive functions are called upon for optimum performance, (familiar) proverb testing provides a nonspecific, nonlocalizing but highly sensitive probe of brain state and mental status.

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