Cortical-subcortical production of formulaic language: A review of linguistic, brain disorder, and functional imaging studies leading to a production model

Diana Van Lancker Sidtis[a,b,][*], John J. Sidtis[b,c]

[a] Department of Communicative Sciences and Disorders, New York University Steinhardt School, New York, NY, USA
[b] Brain and Behavior Laboratory, The Nathan Kline Institute for Psychiatric Research, Orangeburg, NY, USA
[c] Department of Psychiatry, New York University Langone School of Medicine, New York, NY, USA

ABSTRACT

Formulaic language forms about one-fourth of everyday talk. Formulaic (fixed expressions) and novel (grammatical language) differ in important characteristics. The features of idioms, slang, expletives, proverbs, aphorisms, conversational speech formulas, and other fixed expressions include ranges of length, flexible cohesion, memory storage, nonliteral and situation meaning, and affective content. Neurolinguistic observations in persons with focal brain damage or progressive neurological disease suggest that producing formulaic expressions can be achieved by interactions between the right hemisphere and subcortical structures. The known functional characteristics of these structures form a compatible substrate for production of formulaic expressions. Functional imaging using a performance-based analysis supported a right hemisphere involvement in producing conversational speech formulas, while indicating that the pause fillers, *uh* and *um*, engage the left hemisphere and function like lexical items. Together these findings support a dual-process model of language, whereby formulaic and grammatical language are modulated by different cerebral structures.

1. Introduction

In a New York Times article, a lawyer uses the aphorism *Where there's smoke, there's fire* to convey the gravity of the case against Enron and its accounting firm, Arthur Andersen:

"The destruction of documents would indicate some intent to deceive," said Franklin B. Velie, a former federal prosecutor who is now a partner at the Salans law firm in New York. "Where there's smoke there's fire, and where there is a lot of smoke, like the destruction of documents, there is a lot of fire. This is really beginning to look like a fraud scenario" (Mitchell, 2002).

Key characteristics of formulaic language, consisting of idioms, proverbs, expletives, pause fillers, aphorisms, conversational speech formulas, and a variety of other fixed, conventional expressions, are manifest in this example: length, cohesion with decompositionality, memory storage (known to speakers in the language community), nonliteral, situation-bound meaning, and affective/attitudinal content. It is the purpose of this paper to review these characteristics and to place them in the context of brain processing, highlighting cortical-

subcortical relationships. Evidence is drawn from linguistic studies as well as brain disorder and functional imaging studies. It will be seen that the characteristics of formulaic expressions (FEs) are compatible with known characteristics of the brain structures that modulate them. An original finding (on pause fillers) is offered to contribute to a speech production model of how formulaic and propositional expressions are produced.

1.1. Background

Studies of formulaic language have gained ground in linguistics, sociolinguistics, pragmatic studies, neurolinguistics and first and second language learning (Altenberg, 1998; Bolinger, 1976, 1977; Clark, 1970; Gibbs & Gonzales, 1985; Jespersen, 1933; Katz, 1973; Lyons, 1968; Mackin, 1978; Makkai, 1972; Moon, 1998a,b; Nunberg, Sag, & Wasow, 1994; Redfern, 1989; Wray, 2002). Formulaic language plays an important role in normal verbal communication (Alexander, 1978; Fillmore, 1979; Kuiper, 2004, 2009; Munro, 1989; Pawley & Syder, 1983) and has properties that distinguish it crucially from grammatical language.

* Corresponding author at: Department of Communicative Sciences and Disorders, New York University Steinhardt School, New York, NY, USA.
  E-mail address: diana.sidtis@nyu.edu (D. Van Lancker Sidtis).

1.2. Length and number

The FE example in the New York Times excerpt above is 5 words in length (not counting contractions), which is fairly long to be retained in memory (Miller, 1956; Simon, 1974). FEs are comprised of from one to several words, and very long fixed utterances have been reported, such as poetic and literary expressions (Hoblitzelle, 2008); songs and titles from personal biographical history (Pena-Casanova, Bertran-Serra, Serra, & Bori, 2002); Buddhist prayers (Shinoura et al., 2010), and schemata (fixed expressions with one or more open slots) such as *You can take the __ out of the __, but you can't take the __ out of the __* (Van Lancker Sidtis, Cameron, Bridges, & Sidtis, 2015). The fire and smoke aphorism is one of a very large collection in a speech community. It is probably impossible to reliably establish total numbers of formulaic expressions in the native speaker's repertory. A dictionary of contemporary Czech phraseology, featuring idioms, provides 35,000 entries (Cermák, 1994). The number of known fixed expressions in the cultural cache of a language is probably very much larger (Jackendoff, 1995)—and no upper limit has been identified. A recent study provides an estimate of 42,000 lemmas (unique word stems) present in an adult speaker (Brysbaert, Stevens, Mandera & Keuleers, 2016), with considerable combinatorial potential for a much larger number of multi-word expressions. Studies of incidence in proportion of talk in everyday discourse range from 25 to 60%, depending on types of FEs quantified, topics and speakers, and whether the corpora are written or spoken (Biber, 2009; Biber & Conrad, 1999; Erman & Warren, 2000; Foster, 2001; Sinclair, 1991; Van Lancker Sidtis & Rallon, 2004).

1.3. Cohesion and decomposability

Formulaic expressions, by definition, are unitary, which is to say they are canonically fixed with specific words in a certain order on a stereotyped intonation contour (Hallin & Van Lancker Sidtis, 2015; Lieberman, 1963, 2001; Lin & Adolphs, 2009; McGlone & Tofighbakhsh, 2000; Van Lancker, Canter, & Terbeek, 1981). Formulaic expressions have been shown in experimental studies to be cohesive, holistic, fixed, or unitary in structure (Horowitz & Manelis, 1973; Kuiper, van Egmond, Kempen, & Sprenger, 2007; Osgood & Housain, 1974; Pickens & Pollio, 1979; Simon, 1974; Siyanova-Chanturia, Conklin, & van Heuven, 2011; Swinney & Cutler, 1979), but they can also be manipulated using grammatical rules and extra words. They are flexibly cohesive. In the New York Times example, *a lot* was inserted twice, and a phrase intervened in the middle of the aphorism: "*where there is a lot of smoke*, like the destruction of documents, *there is a lot of fire.*" These kinds of changes are frequent and allowable, as long as the canonical form is recoverable (Kuiper, 2009). Demonstrated compositionality in some experimental contexts—e.g., applying grammatical rules or lexical insertion—has led to a proposed hybrid model (Sprenger, 2003; Sprenger, Levelt & Kempen, 2006), whereby formulaic expressions occur as fixed—existing as a recognizable formuleme—and decomposable into structured parts (Libben & Titone, 2008)—on different "levels." In any case, their integrity and recognizability as a unit distinguishes them importantly from novel, newly created language.

1.4. Known: Familiar and stored as memory traces

The lawyer, Mr. Velie, in using the aphorism, assumes that the readers will recognize the fixed phrase with its concomitant nonliteral meaning. The effect of using the phrase is contingent on familiarity recognition by the reader. FEs are known (stored *in toto* as memory traces), with details of shape, meaning, and social contingencies, to native speakers of the language (Wray and Perkins, 2000). This has been demonstrated in listening studies (Rammell, Pisoni, & Van Lancker Sidtis, 2018; Van Lancker Sidtis, 2003) and surveys (Van Lancker Sidtis & Rallon, 2004). The FEs are familiar, in the sense that faces, voices, persons, and geographical locations can be personally familiar

(Kreiman & Sidtis, 2011, Chapter 6).

1.5. Meaning: nonliteral and situation-bound

FEs are typically nonliteral in meaning and to make sense, they are tied closely to social and interlocutory context. Mr. Velie obviously does not intend to directly refer to fire or smoke in his message. Nonliteral meanings have an indirect effect, which, paradoxically, can have more formidable impact than using a literal message. These qualities emerge in the *smoke and fire* example. Formulaic expressions communicate complex and intricately woven scenarios, and the very vagueness of their meanings gives them power. FEs have been seen to be brought to bear in complaint management (Drew & Holt, 1988), and they often depict complicated social relationships between players, as in *She has him eating out of her hand.*

1.6. Meaning: emotion, affect, and empathy

The fire and smoke aphorism carries emotional content. Nuance, connotations, affect, and attitudinal-emotional meanings inhere essentially in formulaic expressions. Expletives (*Wow!, dammit, shucks, good heavens*) make this point easily, as the cardinal purpose of these expressions is to communicate anger, surprise, shock, disapproval, or excitement (Foote & Woodward, 1973; Gallahorn, 1971; Hughes, 1991; Jay, 2000; Montagu, 1967; Munro, 1989; Van Lancker & Cummings, 1999). The idiom *he's out on a limb* communicates worry, risk, failure, anxiety, and any number of negative affective associations, while a matched literal sentence, *he's out in a boat*, without modifying verbal material (e.g., *a leaky boat, in a storm, relaxing, on a perfect day*) is neutral regarding attitudinal or emotional valence. Perusal of lists of idioms reveals this as a consistent element. Idioms engage emotional arousal, subtle or strong, positive or negative. *Don't bite the hand that feeds you* carries a warning and a criticism; *He pulled the rug out from under us* implies disappointment, dismay, and reproachful anger. Use of an idiom strongly aligns the co-participant with its meaning (Drew & Holt, 1988); idioms manifest "a special resistance to being challenged" (p. 411), due to their success in achieving affiliative responses, partly due to their generality and the assumption of general knowledge in the culture (Kitzinger, 2000).

Conversational speech formulas, such as *right, if you say so, whatever!* weave together affect and attitude, which may be empathetic, reproachful, suspicious, or encouraging. Routine speech formulas form a large part of daily talk, functioning to communicate "beliefs, wants, wishes, preferences, norms and values" (Coulmas, 1979, p. 239) and allowing participants to engage in language play (Bell, 2012). The bonding and affiliative functions of formulaic expressions in conversation have been amply described (Edwards & Potter, 1992; Kecskes, 2000; Potter, 1996; Wray & Perkins, 2000), including in children (Corsaro, 1979; Gleason & Weintraub, 1976). A poignant example of comes from a World War II diary, where, toward the end of the war when Hitler's influence was diminishing, a German citizen noted the return of the traditional greeting "Gruß Gott," (a shortened version of "God greets you") previously suppressed, on the streets of his Bavarian town (Breloer, 1984; reported in Kershaw, 2000). Bonding and group identification is seen in the extensive repertories of formulaic expressions in sports, work settings, families, poetry, and many other social domains (Hickey & Kuiper, 2000; Kiparsky, 1976; Pawley, 1991).

Experimental studies also provide evidence of the role of formulaic expressions in communicating affect. Formulaic expressions were frequently used in autobiographical accounts (Fainsilber & Ortony, 1987; Fussell & Moss, 1998). It may be easier for people to express emotion in the indirect language of nonliteral utterances. Formulaic conventional expressions are liberally used in expressing affection and friendship. In a study of over 100 couples, solidarity in the relationship was positively correlated with types and total numbers of FEs reported by the couples (Bell & Healey, 1992). In another study, "loving, commitment, and