CHAPTER

19

The relation of human language to human emotion

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ABSTRACT

Emotions, thought, and language form distinct but overlapping cognitive domains. Thought and language are mutually reliant. An intimacy between thought and emotion is also acknowledged. Although language competence is independent of emotion, most linguistic performance is tinged by emotional content. Affective content in linguistic expression belongs to "paralanguage," which lies outside linguistic structures, but emotional content resides in lexical and phrasal units as well. A prominent paralinguistic component is prosody. Depending on what aspects of prosodic expression and comprehension are studied, right and left hemispheric as well as subcortical structures have been implicated. Brain structures for emotional behaviors and linguistic–affective expression are disparate, but interactional. Current interest in the relations of emotion to language in brain processing has intensified, posing new questions and utilizing advanced neuroscience technologies.

19.1. INTRODUCTION

Language, thought, and emotion form a basic triad in human psychology. Few have doubted the interdependence between the first two, language and thought. In the last century, cognitive psychology proceeded for many years without mention of emotion. But currently the importance of emotion in thinking is well recognized, giving rise to the concept of emotional intelligence, and constituting a new field, emotion psychology. In contrast, only recently has the interface of human language and human emotion received serious consideration. In linguistics, the role played by emotions in language structure and use has been examined indirectly in metaphor analysis, rating studies, and discourse analysis. In psycholinguistics, priming studies have expanded to examine the role of emotion in word storage and retrieval. Functional brain imaging in its many forms aims to identify the interfaces between emotion and language processing. There is now considerable focus on the subtle and intimate interactions of language and emotion, which appear to operate independently and rely on different brain structures. New neuroscientific approaches to behavior can be used to address such questions. The purpose of this article is to revisit and explore the relationship between language and emotion from the perspective of these currents of interest.

19.2. LANGUAGE AND EMOTION: THEORETICAL PERSPECTIVES

When language is viewed as a structural system – as a vehicle that can be used to discuss or describe anything, its relationship to emotional experiencing is tangential. This is the view that language and emotion have no necessary relationship at all. The primary structural levels of language, phonology, syntax, and the semantic lexicon, provide tools, equally capable of verbalizing about the cosmos, an engineer's diagram, or a personal feeling. In this view, language and emotions differ intrinsically, like bicycles and fish. Evolutionarily, it has been suggested that two signaling systems underlie human communication, one with a limbic basis, corresponding to animal vocalization, and the other cortically represented and unique to humans. In this view, emotive considerations belong to paralanguage, which, by definition, lies outside the language system. To understand the evolution of human language, the debate must focus on the emergence of symbol systems and grammar.

Another perspective on the relationship between human emotion and human language holds that language has roots in emotional expression. Cries, songs, and shouts are seen as motivating linguistic development. Emotional language as well as "automatic" or formulaic expressions have their origin in earlier evolutionary development (Code, 2005),

and continue to hold an important place in linguistic competence. In this view, human language is not independent of or separate from emotional and formulaic speech, but is made up of two highly integrated processing modes, novel and holistic (Van Lancker Sidtis, 2004).

Attempts at discovering structure in any one component of the "triad" have been the most successful in the case of language, which is made up of units (e.g., phonemes, morphemes, words, sentences) and rules for combining or organizing them (grammar or syntax). Some structure also has been discovered in thinking, or cognition, through various types of psychological modeling. Emotional phenomena have been the least amenable to codification. Language and emotion have an uneasy coexistence, being disparate entities as well as coworkers in the business of communication. However, disparate language and emotion may be, though, emotional nuances tinge all but the most carefully constructed linguistic expression.

19.3. UNIVERSALITY OF EMOTION EXPRESSION IN LANGUAGE

Universals of emotional expression across languages have been examined in nonverbal aspects of language – prosody and gesture. In humans, cultural differences exist not only in language itself, but also in extra speech sounds, gestures, and facial expressions. Several researchers have found that judgments of affective expression in speech were more difficult across cultural boundaries than within a cultural group (Breitenstein *et al.*, 2001; Scherer *et al.*, 2001; Chen *et al.*, 2004). Processing of emotional adjectives can be investigated using electrophysiological measures, such as electromyography and evoked responses. Studies of emotional words in multilingual speakers reveal interesting findings (Dewaele, 2004). Intensity of emotional content in words has been shown to differ in the first as compared to the second language (Ayçiçegi & Harris, 2004). Evidence that bilingual speakers perceive emotional meanings in their native language more intensely than in the second language comes from greater autonomic reactivity, as measured by galvanic skin response (GSR), to emotional words in the native language. Similarly, recall of autobiographical memories, which often involve use of emotional terms, varies with the language status, first or later learned, used by bilingual speakers (Marian & Neisser, 2000; Matsumoto & Stanny, 2006).

Neuropsychological disorders of emotion affect communicative competence, and conversely, speech and language disorders interfere with efficient communication of emotional and attitudinal information. Therefore, rather than viewing language and human emotion as autonomous and independent, there is ample evidence that emotions, moods, affect, and attitudes underlie and inform nearly every normal spoken expression; that human language contains components that serve to convey this information; that listeners naturally interpret such information from spoken language. The lack of normal sounding paralinguistic material in speech synthesized by computer is a major cause of ratings of unpleasantness or dissatisfaction by listeners. Computer synthesis technology is looking toward enhancing intonational naturalness of speech signal, but this a particularly challenging goal, given the complexity of this domain of speech.

Emotional states may be viewed in terms of their bodily manifestations (e.g., a smile) or the subjective experience of the emotion (e.g., feeling happy). Some knowledge of important cerebral structures and circuits associated with emotional experiencing and emotional behaviors has been derived from animal lesion experiments and from studies of humans with brain damage or psychiatric disabilities. These structures and circuits are heterogeneous and are widely distributed in the brain. Physiological manifestations of emotional states include changes in the autonomic nervous system and the release of neurotransmitters, neuroendocrine secretions, and hormones. Production of emotional words can also be evaluated using these techniques. In this domain of study, verbal signs are examined – distinctive word choices (e.g., strong adjectives), selection of conventional speech formulas with special emotive impact (e.g., *Shut up!*), cursing, or exclamations that may have begun as a reflexive vocalization but have evolved to onomatopoeic words (*ow!*; *wow!*; *ouch!*; *jeez!*). Nonverbal vocal gestures such as sighing, meaningful pausing, or emitting more or less conventionalized cries may also occur. Study of a left-hemispherectomized adult, who developed normally until onset of a brain tumor in his left hemisphere, indicated that a range of vocal-emotive forms, verbal and nonverbal, are supported by the right hemisphere. Following neurosurgery, this patient was profoundly aphasic, but freely utilized emotive vocalizations (see Table 19.1).

19.4. THE LINGUISTIC COMMUNICATION OF EMOTION

Language expresses emotion both indirectly and directly, implicitly or explicitly, intentionally or not, using different "levels" of linguistic form: phonetic, syntactic, semantic, and different "domains," including pragmatics. Infants quickly learn much about communicative interaction from prelinguistic vocal information. Infants recognize their mother's voices shortly after birth. A range of attitudes and emotions is identifiable in the melodies of mother's speech to their infants, which appears across cultures. Developmental studies comparing normal and language delayed children document maturational schedules in abilities to recognize emotions in speech.

Most obvious to the role of emotions in language, the set of words – the language lexicon – provides a rich source of terms to express emotional information about oneself, one's reaction to the world, one's attitudinal judgments, and one's feelings. A prime example of implicit emotional information lies in connotative meanings; connotations convey attitudes, adding to the referential meaning. The lexical items "slim,"

TABLE 19.1 Emotional and Pragmatic Vocal Expressions

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Time (min)	Expletives	Pause-fillers	Nonverbal vocalizations
0	Goddammit	Uh	
	Goddammit	boy, well	umh mmm
		well, no	duhh
		Uh	umh, duh
1	Goddammit	no, eh	
		Ah	neah
		Uh	
2	God –	Nah	ugh
	Goddammit	Ah	(laugh)
		Um	(sigh)
		Mm	mm(sigh)
3		Uh	tsk
		oh, yes	whaa
		No	nah
		well, yes	wha
4	Shit	oh, yes	
	Goddammit		(laugh)
		Ah	
			ahh
5	Goddammit	Oh	
		Ah	
	Goddammit		

*Emotional and pragmatic vocal expressions emitted during 5 min of interview in a profoundly aphasic, right handed, normally developed adult male following left hemispherectomy for treatment of cancer. Verbal utterances and vocal sounds were produced with normal articulation and prosody, in dramatic contrast to severely impaired naming, speaking, and repetition. In many cases, the vocalizations were appropriate to the context. These observations implicate a right-hemisphere-subcortical circuit in competence for these kinds of utterances.

"slender," "skinny," and "scrawny" all refer to physical thinness, but the first two connote approval, while the latter two are derogatory. Emotive factors have been described in diachronic language change. Associations and prejudice contribute to pejorative sense-change. Use of hyperbole in lexical items can result in loss of unpleasant connotations: English adjectives "awful" and "frightful," are now merely adjectival intensifiers, and have lost their semantic content (awe, fear). Hyperbolic expression can occur in the phonology, with expressions such as "jillion," "kajillion," "umptillion," and so on (to mean a very large number). Slang recycles hyperbole continuously, using such terms as "He's wild" and "That's hot." An extreme use of lexical items to convey strong emotive meaning appears in cursing. The neurological substrates for swearing appear to originate in a limbic-subcortical circuit, as is seen in residual, preserved swearing in aphasia associated with left-hemisphere damage, and hyperactivated production in Tourette's syndrome (Van Lancker & Cummings, 1999).

The speaker's intentions and attitude are important components of language and inform the listener as to the emotional stance taken. The term attitude in social psychology refers to a stable mental position, or "stance," consistently held by a person toward some idea, or object, or another person, involving both affect and cognition. In language, word choice and intonation join to convey the attitude of the speaker: irony, incredulity, contempt, disdain, approval, and sarcasm are examples of attitudes conveyed in speech. Voice information is also a rich source of impressions about personality and mood which include a wide array of attributes. As familiar voice recognition is likely processed primarily in the right hemisphere, it follows that many such judgments, heard in the speech signal, are performed by the nonlanguage hemisphere.

19.5. PROSODIC COMMUNICATION

Prosody, or the melody of speech, takes first place in the list of media for linguistically expressing emotion and attitude. Through intonation, feelings are naturally revealed in the prosodic information of each person's individual utterances. The information may be concordant or discordant with the propositional, lexical content. Its authority will usually override contradictory verbal content, as in the utterance "I'm not angry!" spoken with high amplitude (loudness), high fundamental frequency (pitch), and accelerating tempo. Very brief utterances can convey distinctive information depending on prosodic content: the word "right" can imply a broad range of meanings, from casual agreement to condemning rejection. "Right" said with rapidly rising, relatively high pitch, means agreement and reinforcement; spoken with low, falling pitch, longer vowel and creaky voice, the same word indicates sarcastic repudiation. Similarly, "no" and "yes," "well," "sure," "hello," and most other brief speech formulas inhabit a phenomenally rich domain of possible attitudinal and affective meanings, depending on their prosodic content.

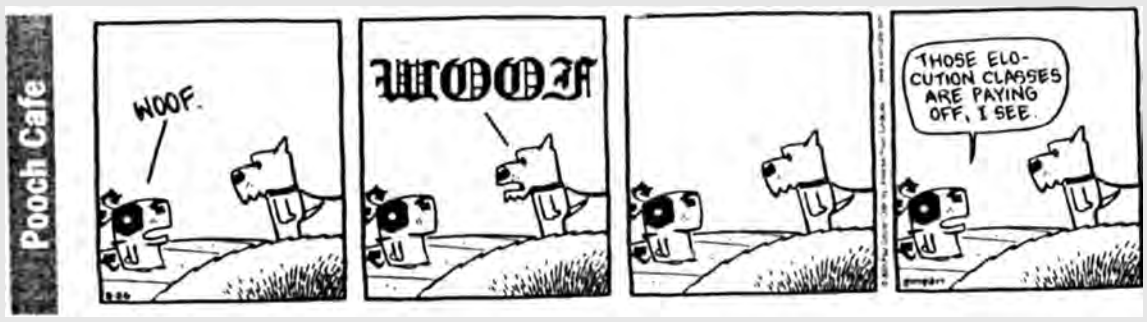
19.6. SYNTACTIC STRUCTURES AS REFLECTIVE OF ATTITUDINAL MEANING

While syntax is probably the most emotion-sanitized component of language, some aspects may indeed contribute subtle attitudinal attributes – a topic yet to be systematically studied in ordinary language use, although elaborated in literary studies of stylistics, which analyze the matching of such grammatical features as sentence complexity, length, and syntactic structure to content. Here "register," referring to a stylistic range from informal to formal, is relevant. Similarly, in speech, usage of simple versus grammatically complex sentence structures may communicate immediacy versus distance, and may elicit

different responses from different listeners (ease versus discomfort). Persons using complex syntactic structures may be perceived as "pedantic," while the terse subject-verb structure may elicit a judgment that the speaker is "sincere." Word order can be used to convey attitude and nuance; importance is given to an element by placing it at the beginning or end of the sentence. Thus placement of connotative lexical items in an utterance can contribute to its impact on the listener.

Box 19.1 Written language

If it is acknowledged that the largest portion of affective expression is present in the prosodic component of speech, written language is relatively impoverished in its ability to communicate emotion, being restricted to words and syntactic structures, with only sparse aid from punctuation (exclamation marks, italics, underscoring, and hyphens) in the formal style. Informally, iconic distortions of letters have a considerable range of expression. Font style or form as well as various diacritics may graphically convey amplitude or category of emotion or attitude. Casual or formal styles, with all their contextual nuances, can be communicated by letter shape choices (see cartoon). For example, large and/or bold face type versus small, light font style may successfully symbolize amplitude range, often correlated with anger or fear; font type may represent category of emotion or attitude: italic or other slanted graphemes may suggest uncertainty, confusion, or bewilderment; font changes and reduplicated punctuation marks (e.g., "You're *leaving*??!") may indicate surprise or shock. These devices, often used in cartoons by graphic artists, are dependent on context for interpretation and have little systematic structure, in comparison to the phonemes, lexemes, and syntactic rules of language.



Cartoon illustrating the use of font type to represent a change in pragmatic style. Pooch Cafe' (©) (2006) Paul Gilligan. Reprinted by permission of Universal Press Syndicate. All rights reserved.

19.7. LANGUAGE AFFECTS EMOTIONS

Verbal expression can affect the emotions of both speaker and listener. The perpetrator of an unintentional pun or a "Freudian slip" may be embarrassed to hear, in retrospect, what was actually said. In the psychodynamic interpretation of speech errors, puns, and malapropisms (a wrong but somehow related word), suppressed feelings about sex or other culturally sensitive topics slip out accidentally into fluent speech, but most speech errors have a more plausible linguistic explanation. Persons expressing anger can fuel their emotional state by their own talk. Producing words about emotions can shape and direct, reduce, or enhance those emotions in the speaker. The "talking therapy" is a standard technique in clinical psychology for accessing and managing emotions. As for the listener, words can intensely affect the emotions. We hardly need elaborate on the ability of words to incite strong emotional responses. Even in a free society, some words are considered so powerful that it is an unacceptable practice to print them in the newspaper or to say them on radio or television and in some social settings, fines are still incurred. The repertory of such words varies considerably across cultures; numerous societies fear and respect taboo expressions in many different ways. A Michigan court recently revoked a 105-year-old state law that banned the use of "indecent, immoral, obscene, vulgar, or insulting language" in the presence of women and children, when the conviction of a canoeist, who swore after falling into a river, was overturned. A cross linguistic study of the vocal tics produced in Tourette's syndrome revealed that taboo items constituted the "coprolalic" (swearing) utterances across all cultures reported, including those in Europe, South America, and India (Van Lancker & Cummings, 1999). These observations on swearing implicate basal ganglia nuclei of the brain, the site of dysfunction in Tourette's syndrome.

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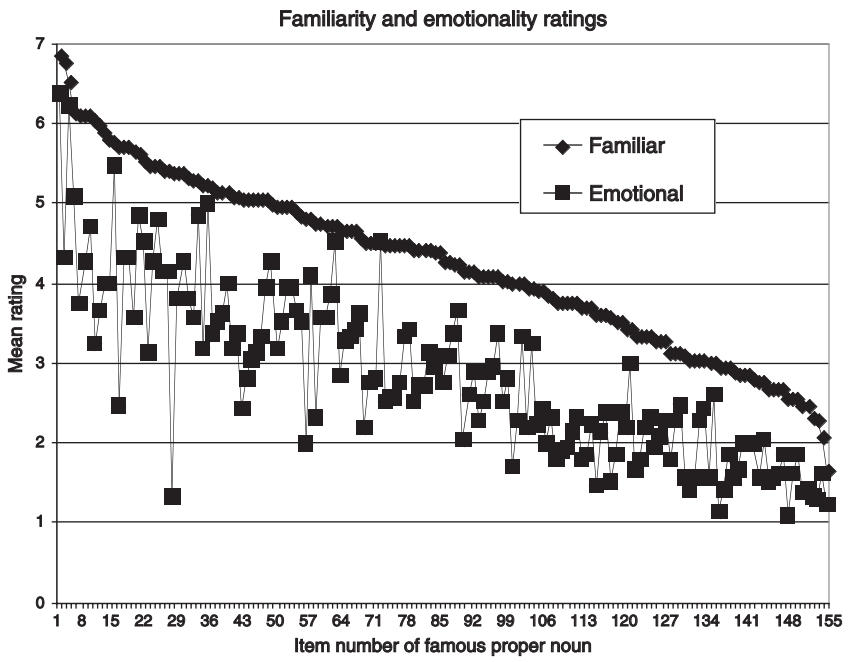

FIGURE 19.1 Ratings by college students of 157 famous names, familiar landmarks, and known brand names on two scales: familiarity and emotionality. Ratings were from 1–7 (least emotional, most emotional, least familiar, most familiar).

19.8. PRAGMATICS – LANGUAGE USE – AND EMOTIONAL EXPRESSION

Nearly all speech formulas, idioms, and proverbs evoke auras of feeling across a broad range of emotional and attitudinal perspectives: the valued, the frightening, the courageous, the hateful, or the noble. For example, "She has him eating out of her hand" connotes attitudes of submissiveness, dependence, haughtiness, and dominance. Other nonpropositional expressions – slang, clichés, exclamations, and expletives, also express and evoke strong emotion. In fact, formulaic expressions have as a primary communicative function the ability to convey emotional and attitudinal perspectives in a manner less direct – and less confrontive – than literal utterances.

Personal relevance – another rich source of emotional experience – influences and determines communication in various ways. The ability to establish, maintain, and recognize personally relevant stimuli (e.g., persons, places) is distinguishable from the processing of unfamiliar stimuli and has an influence on one's affective state. Studies in brain-damaged subjects and in normal subjects reveal a significant role of the right hemisphere in recognizing personally familiar proper nouns, such as names of famous persons and landmarks (Ohnesorge & Van Lancker, 2001). In matters of personal relevance, familiarity ratings are correlated with but not identical to emotional ratings (Figure 19.1). Deficits of
{AQ1} the familiarity sense, such as in Figure 19.1.

Capgras syndrome (i.e., delusional misidentification of people, places, or objects) and agnosias for places, voices, and faces, are associated with right-hemisphere damage. Production of social speech formulas is also impoverished following right sided cerebral dysfunction (Van Lancker Sidtis & Postman, 2006). Because formulaic expressions indirectly convey much in the way of attitude and affect in conversation, these patients may have a communication handicap. In contrast, persons with left-hemisphere damage and aphasia have a higher proportion of formulaic expressions, allowing for some successful communication, despite loss of syntactic function.

19.9. BRAIN STRUCTURES UNDERLYING EMOTIONAL LANGUAGE

Brain damage can affect the experiencing of emotional and attitudinal states, having consequences for linguistic expression. In addition, brain damage can specifically affect expression and perception of emotional and attitudinal information in language and speech, despite presumably intact emotional behavioral function. It is often difficult to determine the source of deficient affective–linguistic function – whether the underlying emotional system or communicative competence itself. Or cast in another manner, it may be controversial as to whether a communicative deficit, for example, dysprosodic (flat) speech, is a secondary result of a primary disturbance, such as abulia (deficit in motivation – see Box 19.2), or is a primary symptom in a behavioral constellation, which includes an amotivational state, reduced intonation variations, and other features (Van Lancker Sidtis *et al*., 2006). A residual "emotional" component in aphasic speech, including swearing, exclamations, and other emotive expressions, has long been identified.

{AQ2}

Box 19.2

Abulia is a motivational deficit that is associated with apathy, loss of will, and lack of initiating behaviors. Mood disturbances may not be primary in this condition, in that the patients claim not to be especially depressed or anxious. They just do not feel like doing anything. A salient linguistic feature of abulia is monotonic or "flat" verbal expression. Damage to nuclei of the basal ganglia is correlated with abulia and the accompanying dysprosody (Bhatia & Marsden, 1994). Patients with dysprosody resulting from abulia present with dysprosodic speech when speaking spontaneously, but are able to successfully imitate utterances produced with emotional intonation (Van Lancker Sidtis *et al*., 2006). Patients with previous musical training may retain the ability to sing in tune. This contrast in speech mode (and singing ability) can be diagnostic of this condition. In evaluating prosodic competence in patients presenting with dysprosodic speech, it is important to obtain speech samples in different task conditions. These cases are also to be distinguished from deficient motor control of pitch production, which follows lesions in the right hemisphere, and which affects spontaneous speech as well as repetition and singing. Abulia may be mistaken for depression or sadness, or primary dysprosody, but in these cases, dysprosodic expression is secondary to the neurobehavioral disease.

Bhatia, K.P., & Marsden, C.D. (1994). The behavioural and motor consequences of focal lesions of the basal ganglia in man. *Brain*, *117*, 859–876.

Van Lancker Sidtis, D., Pachana, N., Cummings, J., & Sidtis, J. (2006). Dysprosodic speech following basal ganglia insult: Toward a conceptual framework for the study of the cerebral representation of prosody. *Brain and Language*, *97*, 135–153.

Psychiatric disturbances such as schizophrenia, psychosis, and mania may give rise to anomalous lexical selections, unusual grammatical structures, and prosodic deficits including monotone or hypermelodic speech and altered rate and rhythm. Abulia (see Box 19.2), mood disorders, and executive planning disturbances all can manifest themselves in dysprosody (defective melody of speech). Executive planning disturbances are associated mainly with frontal lobe dysfunction; other neuropsychiatric and neurobehavioral disorders presenting with deficient emotional expression in speech occur in association with subcortical damage. Subcortical functional disturbance in Parkinson's disease leads to deficient perception and production of prosodic contrasts signaling emotions in speech (Pell & Leonard, 2003). Hypophonic (soft) and slowed speech is characteristic of the depressed patient. The speech timing deficits resulting from ataxic disturbances in cerebellar disease may also – *albeit* erroneously – convey an impression of affective–prosodic disturbance, or difficulty expressing emotional states.

The right hemisphere has been associated with processing of affective–prosodic contrasts in speech (Schirmer *et al*., 2001). Results from functional imaging support the lesion studies in indicating right sided activation (Buchanan *et al*., 2000; Elliott *et al*., 2000; Kotz *et al*., 2003; Mitchell *et al*., 2003; Wildgruber *et al*., 2004). Difficulties in unequivocal interpretation of functional imaging signals have been identified (Sidtis, in press); therefore, this and related findings for cerebral localization of emotional prosodies must await confirmation. Clinical studies suggest that both hemispheres participate in recognition of affective–prosodic contrasts, as shown by errors made by brain-damaged subjects (Sidtis & Van Lancker Sidtis, 2003). The left-hemisphere group misidentified timing information in emotional stimuli, while right-hemisphere individuals misidentified pitch cues. These observations led to the notion that acoustic cues must be taken into account to explain hemispheric specialization for recognizing emotion contrasts in speech.

Dementing disorders may severely impact the comprehension and production of meaningful emotional communication. In the cortical dementias, speech, while well articulated, becomes relatively empty of semantic content, affective as well as informational. Here, the affective–communicative deficits are likely secondary to primary affective–cognitive disturbance. Efforts to test the abilities of Alzheimer's patients to produce and recognize emotional meanings in speech are hampered by the difficulties presented by their cognitive disorder. In one such attempt, a researcher demonstrated in a lengthy training and practice session through gesture and sound how different emotions have different intonations, and attempted to show an Alzheimer patient how to point to one of four faces, representing happy, sad, angry, and surprised, on hearing the utterance played on the tape. When it seemed certain that the subject understood the task, the utterance "Johnny is walking his dog" spoken with a happy intonation was presented, and the subject was encouraged to point to one of four faces on the response sheet. After carefully scrutinizing the four facial drawings on the response sheet, the individual looked up and said "But there's no dog here." Assessing prosodic information in speech, which is "backgrounded" in the speech signal compared to the linguistic information (verbal content), requires the subject to perform a meta-analytic task, which incurs significant cognitive demands.

In Alzheimer's disease, familiar speech formulas, such as greetings and leave-taking, are often used fluently, even in later stages of the disease, when cognitive impairment is

great. These expressions have complex social meanings, but they are sufficiently routinized such that context alone may trigger their use. It is interesting to note that speech formulas often occur inappropriately in these patients; for example, emitting a warm "It's nice to see you again" to a stranger in the clinic, or stating to the examiner, who was performing an evaluation, "Let's do this at a time that is more convenient for you." Demented subjects may use but not correctly understand social speech formulas. This interpretation is supported by the observation that comprehension of idioms and proverbs, which naturally contain complex affective and ideational material, is impaired very early in the course of the disease.

19.10. AFFECT LEXICON

Deficits in processing emotional lexical content in production and comprehension following focal brain damage have been described in various neurological and psychiatric conditions. When recounting stories with and without affective content, patients with right-hemisphere damage utilize fewer affectively laden words than normal control subjects. Autobiographical reports generated by right-hemisphere damaged subjects are impoverished in emotional words, compared reports of their nonbrain-damaged peers. Several studies report greater electrical responses in the brain to emotional words in the right hemisphere than the left, and split visual studies show similar results. Emotional words, in a number of paradigms, generally elicit greater amplitudes in evoked potential studies than neutral words. Increased activity in the amygdala, a major structure in emotional behaviors, appears following administration of emotional words (Hamann & Mao, 2002; Ferstl *et al*., 2005; Landis, 2006).

19.11. DYSPROSODIC DISTURBANCES

While impaired "melody of speech" was long associated with left-hemisphere damage, there are various sorts of evidence for a role of the right hemisphere in processing stimuli containing affective information (Pell, 1998; Baum & Pell, 1999; Berckmoes & Vingerhoets, 2004). Dysprosody of speech has numerous etiologies. In some cases, patients deny significant mood disorder, and yet they speak with low, monotonic pitch. So far, no overall model accounts for the many disparate reports: questions arise about validity of assessments, the meaning of prosodic measures chosen, task, and modality variations. Subcortical involvement (Karow *et al*., 2001) affecting neurobehavioral function may account for affective dysprosody in speech. Motor disabilities in producing pitch contrasts may be accountable, or perceptual deficits in recognizing key acoustic cues to emotional utterances in speech may affect performance.

With recognition of a role of the basal ganglia in affective–prosodic behaviors, a new neurobehavioral model of prosody has been proposed. The importance of subcortical structures to intact prosodic production and comprehension is seen in dysarthrias arising from basal ganglia deficits. Further, basal ganglia regulate the facial and prosodic expression of motivation and mood. Postmorbid dysprosody in production may be due to mood changes, cognitive-programming failure, motor dysfunction, or motivational deficits, while problems in recognizing emotional speech may be attributable either to deficient pitch analysis or to impairment in comprehension of verbal–emotional content.

19.12. PRAGMATIC DEFICITS FOLLOWING BRAIN DAMAGE

Communicative functioning, called "pragmatics" – the use of language in everyday situations – has significant representation in the right hemisphere. Inability to perceive – and sometimes produce – figurative meanings, inferences, indirect requests, and verbal humor contribute to an impoverished emotional communicative function and is often associated with right-hemisphere dysfunction. Certain properties that have been attributed to the right hemisphere converge to provide a general picture of its role in pragmatic function. Language in everyday use involves many facets of paralinguistic meaning, which require a longer time window than do phonetic sequences for speech perception. Attitudes, emotions, perspectives, mood, and personal characteristics are communicated via the intonation contour by pitch, loudness, temporal variables, and voice quality. The longer processing times are better suited to right-hemisphere abilities. The right hemisphere is also superior at discerning patterns and profiles, and at integrating detail into a holistic Gestalt. This type of processing is also well suited to pragmatic functions, which involve recognition of social and verbal context, and involve larger units of discourse carried in longer stretches of speech. Innuendo, connotation, and thematic material are properties of discourse units; performance on these patterned aspects of communication has been found to be deficient following right-hemisphere damage. To further facilitate processing of paralinguistic meanings, the right hemisphere is superior at complex pitch perception, and it is well known that fundamental frequency (the acoustic counterpart of pitch) mean and variation are key cues to emotional and attitudinal contrasts in speech, as well as signaling phrase boundaries and conversation turns. Given these facts – a longer processing window, pattern recognition, and complex pitch perception, it is not surprising that most elements of the pragmatics of communication, including recognition of paralinguistic material such as emotions, sarcasm, irony, and humor; response to conversational cues;

and discernment of nonliteral and inferential meanings in speech are often impaired in right-hemisphere damage.

19.13. ASSESSMENT OF COMMUNICATIVE COMPETENCE FOR EMOTIONAL EXPRESSION

Specific communicative disorders often disturb the affective content of speech, language, or pragmatics. Dysprosody refers to failed signaling or identification of affective and attitudinal cues in the physical speech signal. For language, alexithymia involves defective retrieval of lexical items for emotion, and constrained syntactic choices restrict range of affective expression. In communication, pragmatic deficits involve discourse, including nonliteral meanings, inference, theme, and humor. These are all by nature difficult to assess and quantify, and at present, only research-level protocols are available. One standardized protocol is "The Neuropsychology Behavior & Affect Profile" (NBAP), which was created to assess affective change in brain-impaired individuals; it includes a "pragnosia" (deficient pragmatic functions) dimension as well as dimensions for emotional and attitudinal disturbance.

Tests focused on disturbances in speech and language do not traditionally assess comprehension and expression of emotions and the use of affective language. The Boston diagnostic aphasia examination includes as a measurement the "melody of speech," without reference to its role in affective–prosodic expression. The mini inventory of right brain injury includes in its language processing section a few questions probing the ability to express emotional tone of voice. The inclusion of objective rating items of affect and prosody as part of communication assessment batteries is rare – indeed, reliably assessing prosodic production is difficult. A special competence for determining intonational detail is required. Informal clinical observations and judgments and use of unpublished protocols are the norm in clinically gauging affective expression and comprehension. New evaluation and treatment instruments for prosodic function are under development.

19.14. SUMMARY

Although emotion can proceed without language, verbal communication is ordinarily and normally imbued with affective and attitudinal nuances. If a listener is not sensitive to the emotional nuances of the speaker, he or she can miss much of the meaning. Similarly, when the speaker has lost the ability to project the pattern of his/her attitudes and emotions onto the linguistic expression, the listener will understand the words without being able to discern their emotional pattern. Although language and emotion are deeply intertwined, one is not dependent on the other. Each operates from different brain systems. One of the greatest challenges in neurolinguistic research lies in understanding how brain structures integrate to permit verbal comprehension and production of attitude and emotion in speech.

19.15. CHALLENGES AND FUTURE DIRECTIONS

Goals of understanding the relationship of language to emotion enjoy the benefit that one of these two domains, language, is well described and has heuristically established structure. This provides an advantage over trying to map relations between the other two domains of the triad: thought and emotion, which lend themselves much less easily to structural descriptions. Viewing the well known levels and units of linguistic structure, it is possible to examine how emotional attributes imbue each and all of them in different ways. The great challenge lies in mapping these processes in the brain. Cerebral areas of language representation are fairly well established, and certain brain correlates of emotional processing are known, but interrelating these two neuropsychological domains is at a beginning state. In addition, questions remain about the mental reality of posited linguistic structures. That is, does the brain "know" and utilize linguistic structures, as presented in the textbooks, in a straightforward way? Or is some other "currency" or strategy in use? Attempts to correlate linguistic components and processes posited in performance models with identifiable brain structures or networks have not been consistently successful. This uncertainty will be amplified for aspects of language related to emotion. Further, it is currently held that brain structures for language representation are relatively discrete and localized, while brain structures for emotional processing are heterogeneous and extensive. With the advent of functional brain imaging and advanced therapies such as deep brain stimulation, models of brain processing of language and emotion may rapidly evolve, leading to new approaches to these questions.

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