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PSYCHOLOGICAL ASPECTS OF NATURAL LANGUAGE USE: Our Words, Our Selves

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■ **Abstract**   The words people use in their daily lives can reveal important aspects of their social and psychological worlds. With advances in computer technology, text analysis allows researchers to reliably and quickly assess features of what people say as well as subtleties in their linguistic styles. Following a brief review of several text analysis programs, we summarize some of the evidence that links natural word use to personality, social and situational fluctuations, and psychological interventions. Of particular interest are findings that point to the psychological value of studying particles—parts of speech that include pronouns, articles, prepositions, conjunctives, and auxiliary verbs. Particles, which serve as the glue that holds nouns and regular verbs together, can serve as markers of emotional state, social identity, and cognitive styles.

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INTRODUCTION

The ways people use words convey a great deal of information about themselves, their audience, and the situations they are in. Individuals' choice of words can hint at their social status, age, sex, and motives. We sense if the speaker or writer is emotionally close or distant, thoughtful or shallow, and possibly extraverted, neurotic, or open to new experience. Although several *Annual Review* chapters have summarized research on language acquisition, production, comprehension, and its links to brain activity, this is the first to discuss how language and, more specifically, word use is a meaningful marker and occasional mediator of natural social and personality processes.

That the words people use are diagnostic of their mental, social, and even physical state is not a new concept. Freud (1901) provided several compelling examples in his discussion of parapraxes, or slips of the tongue. He pointed out that common errors in speech betray people's deeper motives or fears. Drawing heavily on psychoanalysis, Jacques Lacan (1968) extended these ideas by suggesting that the unconscious asserts itself through language. Indeed, language, in his view, is the bridge to reality. Philosopher Paul Ricoeur (1976) argued that the ways we describe events define the meanings of the events and that these meanings help us keep our grasp on reality. Similar assumptions are implicit in much of the work in sociolinguistics (e.g., Eckert 1999, Tannen 1994), narrative and discourse analyses (Schiffrin 1994), and communication research (Robinson & Giles 2001).

This article explores the methods and recent findings on word use rather than language per se: the styles in which people use words rather than the content of what they say. The distinction between linguistic style and linguistic content can be seen in how two people may make a simple request. "Would it be possible for you to pass me the salt?" and "Pass the salt," both express the speaker's desire for salt and direct the listener's action. However, the two utterances also reveal different features of the interactants' relationship, the speaker's personality, and perhaps the way the speaker understands himself.

Because word use is a relatively unstudied phenomenon, this article focuses on four broad topics. The first deals with ways researchers have tried to study the ways people naturally use words. By "natural," we refer to relatively open-ended responses to questions, natural interactions, and written or spoken text. The most common methodologies include manual word counts and, more recently, computer analyses of language. The second section of this article explores recent findings linking word use to individual differences. The final two sections consider the links between word usage and social or situational differences and how we can use words to mark psychological change.

METHODS OF STUDYING LANGUAGE USE: PSYCHOLOGICAL WORD COUNT APPROACHES

Although many of the assumptions about language as a psychological marker are shared, the methods of studying language and word use have often been a battleground. Most narrative researchers assume that language is, by definition, contextual. Consequently, phrases, sentences, or entire texts must be considered within the context of the goals of the speaker and the relationship between the speaker and the audience. Because of the complexity of communication, this strategy assumes that the investigator must attend to the meaning of the utterances in context. However defined, meaning is believed to be sufficiently multilayered to only be decoded by human judges who then evaluate what is said or written. Qualitative analyses, then, provide the researcher with broad impressions or agreed-upon descriptions of text samples. Very few discourse analyses rely on numbers or statistics (e.g., Schiffrin 1994).

An alternative perspective is that features of language or word use can be counted and statistically analyzed. Quantitative approaches to text analysis have gained increasing popularity over the past half century (for reviews see Popping 2000, Smith 1992, Weber 1994, West 2001). The existing approaches can be categorized into three broad methodologies. *Judge-based thematic content analyses* typically involve judges who identify the presence of critical thematic references in text samples on the basis of empirically developed coding systems (Smith 1992). Thematic content analyses have been widely applied for studying a variety of psychological phenomena such as motive imagery (e.g., Atkinson & McClelland 1948, Heckhausen 1963, Winter 1994), explanatory styles (Peterson 1992), cognitive complexity (Suedfeld et al. 1992), psychiatric syndromes (Gottschalk 1997), goal structures (Stein et al. 1997), arousal patterns associated with cultural shifts (Martindale 1990), and levels of thinking (Pennebaker et al. 1990).

A relatively new approach, *word pattern analysis*, has emerged from the artificial intelligence community. Rather than exploring text "top down" within the context of previously defined psychological content dimensions or word categories, word pattern strategies mathematically detect "bottom-up" how words covary across large samples of text (Foltz 1998, Popping 2000). One particularly promising strategy is latent semantic analysis (LSA) (e.g., Landauer & Dumais

1997), which is akin to a factor analysis of individual words. By establishing the factor structure of word use within a large number of writing samples, it is possible to learn how any new writing samples are similar to one another. Traditionally, this technique has been used to determine the degree to which two texts are similar in terms of their content.

The third general methodology prominent in quantitative text analysis focuses on *word count strategies*. Psychological word count strategies exist for both the analysis of content (what is being said) and style (how it is being said). Whereas they sometimes require rather complex linguistic analysis (e.g., active versus passive voice or metaphoric language use), most current approaches involve simple word counts, such as standard grammatical units (personal pronouns, prepositions) or psychologically derived linguistic dimensions (e.g., emotion words, achievement-related words). Word count strategies are based on the assumption that the words people use convey psychological information over and above their literal meaning and independent of their semantic context. Although some language researchers consider this assumption problematic, others see unique potentials in analyzing word choice because of judges' readiness to "read" content and their inability to monitor word choice (e.g., Hart 2001). With only one exception (Weintraub 1989), the most commonly used approaches presented below are computer based. In this section we briefly review six widely used methods that have evolved from very different theoretical perspectives.

The General Inquirer

Developed by Stone and colleagues in the early 1960s, the General Inquirer (Stone et al. 1966) is generally considered the "mother" of computerized text analysis. The General Inquirer is a compilation of a set of rather complex word count routines. It was designed as a multipurpose text analysis tool that was strongly informed by both need-based and psychoanalytic traditions. Historically, three thematic dictionaries, the *Harvard III Psychosociological Dictionary*, the *Stanford Political Dictionary*, and the *Need-Achievement Dictionary* have been applied the most, with the *Need-Achievement Dictionary* receiving special attention in psychology. The *Need-Achievement Dictionary* was created in an attempt to replace the complex judge-based scoring of achievement imagery in thematic apperception test (TAT) stories by computerized content analysis.

The General Inquirer goes beyond counting words. In a two-step process it first identifies so called homographs (ambiguous words that have different meanings depending on the context). It then applies a series of preprogrammed disambiguation rules aimed at clarifying their meaning in the text. For example, human judges score the statement "He is determined to win" as achievement imagery. The General Inquirer identifies the word "determined" as an ambiguous NEED word and "win" as an ambiguous COMPETE word (because they both can have non-achievement-related meanings) and codes a statement as achievement imagery only if both aspects are present and occur in the NEED-COMPETE order.

The General Inquirer is unique in its flexibility. It can be used to study virtually any topic of interest by creating a user-defined dictionary. Its most critical advantage, the power to perform context-dependent word counts, is also its most serious pragmatic drawback. The construction of a custom dictionary with the specification of disambiguation rules is time consuming and in many cases not worth the extra effort (as compared with simple word counts). Nevertheless, it is not overstated to say that the General Inquirer has given birth to and still continues to shape the scientific field of computerized text analysis.

Analyzing Emotion-Abstraction Patterns: TAS/C

Mergenthaler and his research group realized the need for computer-assisted text analysis when trying to characterize key moments in psychotherapy sessions. Based on Bucci's (1995) referential cycle model, they developed a computer program called TAS/C that focuses exclusively on two language dimensions, emotional tone and abstraction. According to the theory, emotion-abstraction patterns occur periodically in psychotherapy sessions with insight processes (abstraction) following emotional events (emotion) with a time lag (Mergenthaler 1996).

For the analysis of emotional tone, defined as the density (rather than the valence) of emotion words in a given text, a dictionary was developed that contains more than 2000 items. The final restricted list of emotion words captures the three dimensions of pleasure, approval, and attachment which account for roughly 5% of the words of a text (Mergenthaler 1996). Abstraction is defined as the amount of abstract nouns in a given text. Abstract nouns are identified via the use of suffixes such as -ity, -ness, -ment, -ing or -ion. The abstraction dictionary includes 3900 entries and accounts for about 4% of the text. There is no overlap across the two dictionaries.

TAS/C analysis of emotion-abstraction patterns has been successfully applied to verbatim therapy protocols (Mergenthaler 1996) and attachment interviews (Buchheim & Mergenthaler 2000). More recently, TAS/C has been extended to include a measure of referential activity (Bucci 1995). Referential activity refers to the ability to verbalize nonverbal experiences, characterized in speech by concreteness, specificity, clarity, and imagery (Mergenthaler & Bucci 1999). It is captured by counting third person pronouns and prepositions. The TAS/C approach to analyzing language is theory driven and limited to a very narrow spectrum of linguistic styles.

Weintraub's Analysis of Verbal Behavior

At the core of Weintraub's (1981, 1989) explorations into what he calls verbal mannerisms lies the clinical observation that individuals speaking under stress often reveal important information about their degree of psychological adaptation. Drawing on his medical experience, Weintraub argued that psychological defense mechanisms manifest themselves in speech patterns obtained under

mildly stressful conditions. For the assessment of these defense mechanisms, he developed a standardized procedure for sampling naturally occurring language. Participants are asked to talk into a microphone for 10 minutes on any topic.

The transcripts are then submitted to a linguistic analysis. Unlike other word count approaches, Weintraub's linguistic analysis is performed by naïve judges who "can score . . . [the transcripts] without extensive knowledge of lexical meaning." (Weintraub 1989, p. 11). The linguistic features he and his colleagues have been interested in are largely intuitively derived and are drawn from clinical experiences of how psychopathology surfaces in patients' language use. Weintraub's most recent work has focused on 15 linguistic dimensions including three pronoun categories (I, we, me), negatives (e.g., not, no, never), qualifiers (kind of, what you might call), expressions of feelings (e.g., I love, we were disgusted), and adverbial intensifiers (really, so).

Weintraub has explored people's verbal behavior in multiple ways. In addition to his main field of interest, the language of psychopathology, he also analyzed the Watergate transcripts, characterized speaking styles of post–World War II U.S. presidents, identified linguistic correlates of intimacy, and related language use to personality. Overall, Weintraub's approach can be considered stylistic. A strong emphasis is put on research that is clinically relevant and can inform psychoanalytically oriented psychotherapy.

Analyzing Verbal Tone with DICTION

Researchers in the area of language use in politics generally tend to focus on the content of political speeches (Winter 1973, Zullow et al. 1988). Roderick Hart (1984) is a communication researcher concerned with the subtle power of word choice. Over the past two decades he has developed and refined a computerized word count program called DICTION (Hart 2001). DICTION is designed to reveal the verbal tone of political statements by characterizing text on five statistically independent master variables: activity, optimism, certainty, realism, and commonality. The rationale behind these master variables is that "if only five questions could be asked of a given passage, these five would provide the most robust understanding." (Hart 2001, p. 45). The five master variables are composed of 35 linguistic subfeatures (e.g., optimism: praise, satisfaction, inspiration, blame, hardship, denial).

DICTION relies on 10,000 search words that are assigned to the categories without overlap. The output is either a profile of absolute values or norm scores based on 20,000 samples of verbal discourse. Special features of DICTION are the ability to "learn," i.e. update its database with every processed text, and a statistical weighting procedure for homographs, words that are spelled the same but have different meanings. DICTION has been used to analyze presidential and campaign speeches, political advertising, public debates, and media coverage. The DICTION approach is style focused and attempts to cover a broad range of linguistic aspects.

Linguistic Inquiry and Word Count

Linguistic Inquiry and Word Count (LIWC) (Pennebaker et al. 2001) was originally developed within the context of Pennebaker's work on emotional writing (Pennebaker & Francis 1996, Pennebaker et al. 1997). It was designed to discover which features of writing about negative life experiences could predict subsequent health improvements. More recently the use of LIWC has been expanded to tracking language use in text sources spanning classical literature, personal narratives, press conferences, and transcripts of everyday conversations (Pennebaker & Graybeal 2001).

LIWC uses a word count strategy whereby it searches for over 2300 words or word stems within any given text file. The search words have previously been categorized by independent judges into over 70 linguistic dimensions. These dimensions include standard language categories (e.g., articles, prepositions, pronouns—including first person singular, first person plural, etc.), psychological processes (e.g., positive and negative emotion categories, cognitive processes such as use of causation words, self-discrepancies), relativity-related words (e.g., time, verb tense, motion, space), and traditional content dimensions (e.g., sex, death, home, occupation). The LIWC dimensions are hierarchically organized. For example, the word "cried" would fall into the categories "sadness," "negative emotion," "overall affect," and "past-tense verb." The program is sufficiently flexible to allow for user-defined categories as well.

Whereas some of the LIWC categories were initially derived from psychological theories (e.g., inhibition words, discrepancy words), most categories try to capture information at a very basic linguistic (e.g., pronouns, articles, prepositions) as well as psychological level (e.g., positive emotions, negative emotions, cognitive words). In its current version LIWC has been most effective in tracking stylistic aspects of language use. However, researchers can use the traditional content categories (e.g., achievement, religion, sexuality) as well as create their own user-defined dimensions.

Biber: Factor Analyzing the English Language

Although Biber's (1988) work on language use was developed as a tool to understand the English language, it has important implications for psychology. Biber, an English professor, undertook an extensive empirical investigation in which he studied which linguistic dimensions emerge when discourse function rather then grammatical function is taken as the organizing principle. The purpose of this inductive approach was to factor analyze language and identify linguistic dimensions that would constitute a useful framework for describing language variations across different text types and genres.

Biber's study comprised two separate steps. The first sampled text from 23 spoken and written genres such as science fiction, humor, and press reports. A total of 481 texts with almost 1,000,000 words were submitted to a broad computerized

word count analysis. The linguistic target features were selected without theoretical interest. Among the 67 selected variables were pronouns, adjectives, adverbs, adverbials, tense markers, nominalizations (words with -tion, -ment, -ness, or -ity suffixes), passive voice, and negations.

In the second step Biber submitted these 67 linguistic variables to a factor analysis. Generally words are considered to cluster together according to their grammatical function (e.g., pronouns, articles, prepositions). Biber's factor analytic approach clustered word patterns according to their natural co-occurrence. This provided useful information of a common discourse function behind certain words. Passive voice, for example, tends to statistically co-occur with nominalizations (Biber 1988). This then can help determine the role of words in creating the tone or character of a specific type of text. Biber found 6 general factors: informational versus involved production, narrative versus nonnarrative concerns, explicit versus situation-dependent reference, overt expression of persuasion, abstract versus nonabstract information, and on-line informational elaboration. He later demonstrated that the factors could separate the different linguistic genres of writing. Biber's analyses are groundbreaking in that they restructure the English language according to how it is used in text across different written and spoken genres.

Summary and Evaluation

Word count strategies count words within a given text sample irrespective of the context in which the words occur. They have an undisputed advantage of being able to perform reliably and efficiently with the use of computers. Word count approaches differ among each other in their specificity, i.e., in their attempt to either capture a maximum of words in a given text (e.g., Biber's approach, LIWC) or concentrate on only some linguistic aspects (e.g., TAS/C, need-achievement). In a compelling review of word count approaches, Hart (2001) compares judge-based or discourse approaches with more detached word count strategies by drawing on a metaphor of two people trying to understand a city by driving on the streets or viewing it from a helicopter. Both get quite different—but equally valid—pictures of a city. Whereas the helicopter is likely to miss details at the corner of a specific street, it is able to pick up differential patterns of light. Whereas word count approaches sometimes miss what elementary students could see, they provide linguistic information "from a distance," a distance that normal readers do not have because it is virtually impossible to ignore what is being said and concentrate on how something is said.

WORD USE AS A REFLECTION OF INDIVIDUAL DIFFERENCES

Clearly, there have been a variety of theoretical and methodological approaches to understanding how individuals select their words in natural writing or conversation. A research approach that takes advantage of linguistic styles has not been a staple

of most current social, personality, or clinical perspectives. In this section we stand back and summarize psychological features of relatively natural word use. The psychometrics of word use are examined—with particular attention to words that tap linguistic styles. Some of the basic dimensions of word use are then demonstrated to be related to a variety of individual difference variables, such as demographic markers, traditional personality measures, and differences in mental and physical health.

Psychometric Properties of Word Use

The first step in exploring the links between word use and various individual difference markers is to establish the psychometrics of words themselves. That is, do people's word usage patterns fulfill the basic psychometric requirements of stability across time and consistency across context. Several investigators have begun to address this problem.

Gleser et al. (1959) had people talk for 5 minutes about an interesting life experience and obtained a measure of internal consistency by calculating split-half reliabilities. Across 21 language categories (e.g., word count, adjectives, substantives, pronouns, feelings) the average correlation between successive 2-minute intervals was 0.51, providing the first evidence that word choice is stable within a very short time frame. Using the General Inquirer approach, Schnurr et al. (1986) provided further support for the temporal stability of language use by reporting high within-person rank order correlations for the 83 variables of the Harvard III dictionary over a period of one week.

Pennebaker & King (1999) analyzed a large body of text samples taken from diaries, college writing assignments, and journal abstracts written across days and even years and demonstrated good internal consistency (across text type) for 36 language dimensions. The language variables were taken from the LIWC dictionary and comprised standard linguistic dimensions (e.g., articles, prepositions, pronouns) as well as broader psychological concepts (e.g., emotion words, causation words, words indicating social processes). Across several studies, word use in written language emerged as reliable across time, topic, and text source.

In a recent naturalistic field study, Mehl & Pennebaker (2002a) sampled students' everyday conversations twice for two days separated by 4 weeks using a newly developed minimally intrusive recording device called the electronically activated recorder (EAR) (Mehl et al. 2001). Again, the linguistic analyses showed that students' spontaneous word use is stable over time (average test-retest correlation for standard linguistic variables: r = 0.41, psychological processes: r = 0.24) and consistent across social context (e.g., word use at home versus in public places or in an amusement versus work context). These last two studies provide particularly promising evidence, as they demonstrate reliability based on an extremely large body of text samples (Pennebaker & King 1999) and spontaneous word use sampled from the entire spectrum of participants' everyday real life conversations (Mehl & Pennebaker 2002a).

Taken together, existing studies on the psychometrics of word use suggest that people's word choice is sufficiently stable over time and consistent across topic or context to use language as an individual difference measure. This is true for both basic grammatical categories as well as more psychologically based language dimensions.

Demographic Variables

With language use fulfilling the psychometric properties of an individual difference marker, are there basic differences in word use as a function of age and sex?

AGE   Whereas a fair amount of research exists on discourse and aging (Coupland & Coupland 2001), virtually no studies have addressed how word use changes over the life-span. In two overlapping projects Pennebaker & Stone (2002) explored the links between language use and age. In a cross-sectional analysis, multiple written or spoken text samples from disclosure studies from over 3000 research participants from 45 different studies representing 21 laboratories in 3 countries were subjected to computer text analyses to determine how people change in their use of 60 text dimensions as a function of age. A separate longitudinal project analyzed the collected works of 10 well-known novelists, playwrights, and poets who lived in the past 500 years. The results of the two projects converged in that both studies found pronounced differences in language use over the life-span. Whether famous authors were expressing themselves through their literature, experimental research participants were writing about traumatic experiences, or control participants were writing about their plans for the day, people exhibited remarkably consistent changes in their linguistic styles. With increasing age, individuals used more positive emotion words, fewer negative emotion words, fewer first person singular self-references, more future tense, and fewer past tense verbs. Age was also positively correlated with an increase in cognitive complexity (e.g., causation words, insight words, long words). In addition to challenging some of the cultural stereotypes on aging, these results suggest that language use can serve as a subtle linguistic age marker.

GENDER   In contrast to other demographic variables, the link between word use and gender has been extensively studied. Differences in women's and men's language have received widespread attention within the scientific community as well as in the popular media. Lakoff (1975) published a seminal work relating gender differences in language use to differential access to social power. She argued that women's lack of power in society results in their using a less assertive speech that manifests itself in a higher degree of politeness, less swearing, more frequent tag questions (e.g., "It is . . ., isn't it?"), more intensifiers (e.g., really, so), and more hedges (e.g., sort of, perhaps, maybe; also known as qualifiers or uncertainty words). Other early literature reviews (Haas 1979, Jay 1980) generally supported

these findings. Overall, men were more directive, precise, and also less emotional in their language use.

Recently, Mulac et al. (2001) summarized the findings of more than 30 empirical studies and reported relatively unambiguous gender effects for 16 language features. According to this, typical male language features include references to quantity, judgmental adjectives (e.g., good, dumb), elliptical sentences ("Great picture."), directives ("Write that down."), and "I" references. Typical female language features among others comprise intensive adverbs (e.g., really, so), references to emotions, uncertainty verbs (seems to, maybe), negations (e.g., not, never), and hedges. Contrary to Lakoff (1975), no consistent gender differences were found in tag questions. Also, this review did not find that men and women reliably differed in their use of first person plural or second person pronouns as well as filler words in their natural speech (e.g., you know, like).

In evaluating these results, it is important to consider that, despite the comparatively large number of studies that went into the review, some of the findings are based on only a couple of studies with sometimes rather small language samples and only one text source. The evidence for men using "I," "me," and "my" at a higher rate than women, for example, comes from two studies conducted by Mulac and his colleagues that derived language exclusively from nonpersonal writings such as picture descriptions (Mulac & Lundell 1994) and fourth-grade impromptu essays (Mulac et al. 1990). Gleser et al. (1959)—not listed in Mulac et al.'s (2001) review—reported significantly higher first person singular self-references for women in transcripts of oral narratives about an interesting or dramatic personal life experience. Similarly, Pennebaker & King (1999) also found a higher use of "I," "me," and "my" in female students' stream of consciousness and coming-to-college writings.

Mehl & Pennebaker (2002a) sampled daily conversations of 52 college students in their natural environment using the EAR technology (Mehl et al. 2001). Overall men, compared to women, in their everyday conversations used nearly four times the amount of swear words and considerably more big words (consisting of more than six letters), anger words and articles. Women used more filler words (e.g., like, well), more discrepancy words (would, should, could), and more references to positive emotions, though not more emotion words in general. Again, the transcripts of women's spontaneous everyday speech contained more first person singular references.

Across the various studies women's and men's language differs on a variety of dimensions. Whereas these differences are consistent with a sociological framework of gender differences in access to power, at least some of them are also open to alternative explanations such as women's higher social engagement (e.g., Maccoby 1990). Despite the comparatively large number of studies available on gender differences in language use, no clear picture has yet evolved. Future research must more carefully consider and distinguish among different language sources. Is the data based on written or spoken language? Directed or spontaneous speech? Were same-sex or opposite-sex interactions sampled? Was the language

derived from personal or nonpersonal, emotional or neutral material? Also, because language use is an inherently social phenomenon, one has to consider potentially bi-directional effects. In a recent study of e-mail conversations, Thomson et al. (2001) showed, for example, that participants spontaneously accommodate to gender-preferential language used by their conversation partners.

Traditional Personality Measures

As early as 1942, Sanford (1942) argued that verbal behavior was a powerful marker of personality. Several researchers have echoed this observation (e.g., Furnham 1990, Scherer 1979, Weintraub 1989). Although the empirical support is growing, the research linking self-reports of personality and word use is still in its early stages.

THE BIG FIVE   To our knowledge, only one study has attempted to correlate word use to the Big Five personality dimensions (self-reports of extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience). Using multiple writing samples of several hundred college students, Pennebaker & King (1999) found modest but reliable effects of personality on word choice, with correlations ranging between 0.10 and 0.16. Overall, neuroticism was positively correlated with use of negative emotion words and negatively with positive emotion words; extraversion correlated positively with positive emotion words and words indicative of social processes; agreeableness was positively related to positive emotion and negatively to negative emotion words. In addition, neuroticism was characterized by a more frequent use of first person singular, a finding that is consistent with the idea that excessive use of first person pronouns reflects a high degree of self-involvement (e.g., Davis & Brock 1975, Ickes et al. 1986, Scherwitz & Canick 1988, Stirman & Pennebaker 2001, Weintraub 1989).

MOODS AND EMOTIONS   Only a handful of researchers have looked at how other personality variables are linked to unique word choices. Weintraub (1981, 1989) reported that an anxious disposition correlates with the use of first person singular and a high amount of explainers (e.g., because, since, in order to) and negatives (e.g., no, not, never). Self-ratings of anger are associated with an absence of qualifiers and a high use of negatives, rhetorical questions, and direct references to other objects or people. Weintraub (1989) also found that a dominant personality was associated with a high rate of commands, interruptions, and obscenities.

NEED STATES   Pennebaker & King (1999) examined the linguistic correlates of the needs for achievement, power, and affiliation. Whereas the language of achievement motivation assessed with a TAT measure was characterized by a low degree of immediacy (few first person singular pronouns, frequent use of articles, long words, and discrepancy words), an orientation towards the social past (frequent use of past tense and social words, infrequent use of present tense and positive

emotions) and a lack of rationalization (infrequent use of insight and causation words, frequent use of negative emotion words), no such pattern was obtained with the Personality Research Form (PRF) measure of achievement orientation. The need for power showed no significant correlations with any of the language factors, either with the TAT or with the PRF measure. Somewhat counter-intuitively, participants high in TAT-based need for affiliation scored low on the social-past language dimension, which suggests that whereas they frequently used positive emotion words and present tense, they did not use many social words and past tense. In the PRF measure the need for affiliation was negatively correlated with making distinctions.

SELF-ESTEEM, SELF-MONITORING, AND MACHIAVELLIANISM   What is the relationship between language and stable aspects of the self? In an attempt to evaluate different measures of implicit self-esteem, Bosson et al. (2000) had participants write for 20 minutes about their deepest thoughts and feelings. Participants' explicit self-esteem assessed with various self-report scales correlated (sometimes marginally) with the use of negative emotion words. Use of self-references, however, were unrelated to both explicit and implicit measures of self-esteem.

Ickes et al. (1986) sought to discriminate between two conceptually related psychological constructs, Machiavellianism and self-monitoring. Coding participants' personal pronoun use in unstructured dyadic interactions, they found that Machiavellianism was related to an increased self-focus as reflected by more frequent use of first person singular pronouns. In contrast, however, self-monitoring was characterized by an increased other-focus as indicated by participants' higher use of second and third person pronouns. The analysis of spontaneous word choice in this study was important in identifying a linguistic marker of focus of attention. This marker helped in clarifying a subtle but critical distinction between two related impression management strategies.

SUMMARY   Although self-reports of personality are often associated with word use, the magnitudes of the relationships are surprisingly small. One explanation is that personality self-reports reflect people's theories of who they are. A self-theory can often be at odds with the ways people present themselves linguistically. Indeed, in at least two studies in which people either wrote about emotional topics (Pennebaker & Francis 1996) or talked about themselves on camera (Berry et al. 1997), judges' ratings of the emotionality of the text samples were more highly correlated with language use than with the writers' or speakers' self-reports of emotionality. This raises the traditional question about the "gold standard" of personality or emotionality: Should we rely on what people say about themselves or what others say about them (e.g., Hofstee 1994)?

Mental Health and Psychopathology

Does language carry diagnostic information about a person's mental health? Is there evidence for distinct psychopathological linguistic styles? The link between

language use and clinical disorders has captured researchers' interest for more than 70 years and has resulted in a comparatively large number of clinical case studies as well as empirical investigations (for reviews see Jeanneau 1991, Rieber & Vetter 1995).

GENERAL PSYCHIATRIC DISORDERS   Oxman, Rosenberg, and their colleagues engaged in an extensive enterprise to use the General Inquirer as a diagnostic tool for psychiatric disorders. In a series of studies they showed that computerized linguistic analyses of speech samples are capable of reliably and accurately classifying patients into diagnostic groups, such as schizophrenia, depression, paranoia, or somatization disorder (e.g., Tucker & Rosenberg 1975, Oxman et al. 1982). In a comparison of the computer diagnosis against the diagnosis of professional psychiatrists, the computer diagnosis emerged as superior to clinicians' unstructured reading of the transcripts of patients' speech (Oxman et al. 1988).

DEPRESSION AND SUICIDALITY   In a study of the spontaneous speech of five elderly depressed individuals, Bucci & Freedman (1981) found depression to be related to an elevated use of first person singular pronouns and a lack of second person and third person pronouns. The authors interpret these findings as reflecting a weakness in connecting to others. Similarly, Weintraub (1981) found that when depressed people are asked to talk about any personal topic for 10 minutes, they use "I" at a higher rate than healthy individuals. Rude et al. (2002) confirmed this linguistic self-focus in depression for written language use. In their study, currently depressed students compared with never depressed students used significantly more first person singular pronouns in their personal essays. Interestingly, the effect was exclusively produced by a higher use of the word "I." The use of "me," "my," and "mine" was comparable between the two groups.

Stirman & Pennebaker (2001) sought to learn whether suicidal ideation could be linguistically detected. In an archival study, they compared the language use of 18 suicidal and nonsuicidal poets based on the corpus of their work over their careers. In line with a social disengagement model of suicide, suicidal poets were found to use first person plural pronouns at a lower and first person singular pronouns at a higher rate. They also made fewer references to other people and used more words associated with death. Finally, Lorenz & Cobb (1952) analyzed the language of 10 manic patients and also found that manics use first person singular references at a higher rate. Taken together, the convergent results from studies of depression, suicidal ideation, and mania suggest that affective disorders are characterized by a high degree of self-preoccupation. Attention habitually focused on the self linguistically surfaces in a more frequent use of the first person pronouns such as "I," "me," and "mine" (e.g., Davis & Brock 1975).

SUMMARY   Despite the sometimes conflicting results, language use can be an attractive as well as subtle diagnostic marker. Future clinical studies should be more

rigorous in specifying clear clinical inclusion criteria and must rely on well-defined or standardized language samples. Better control conditions are also needed that allow inferences about the uniqueness of word use patterns in clinical versus non-clinical populations. Finally, it is necessary to shift toward a more theoretically fueled approach that helps explain the links between psychopathology and language.

Physical Health and Health Behavior

Can language use inform us about physical health from an individual difference perspective? Can word use distinguish healthy from unhealthy individuals? Studies linking language use to physical health are sparse. However, a small group of studies hints that features of disease- and/or health-related behaviors may be tied to language use.

HEART DISEASE PRONENESS   In a series of studies, Scherwitz (for reviews, see Scherwitz et al. 1985, Scherwitz & Canick 1988) has linked self-involvement to the Type A behavior pattern and coronary heart disease (CHD) outcomes. Self-involvement is operationalized as the frequency and density with which a person uses first person singular pronouns in answering the questions during the structured Type A interview. Results indicate that Type A is positively correlated with the use of first person singular. Of more clinical importance, however, are the findings that first person pronoun use in the structured interview is also related to systolic and diastolic blood pressure, coronary atherosclerosis, and prospectively to CHD incidence and mortality. Interestingly, the relationship between self-involvement and CHD outcomes in most cases remained significant even after statistically controlling for traditional risk factors such as age, cholesterol, cigarette smoking, and Type A behavior (Scherwitz et al. 1985, Scherwitz & Canick 1988).

MORTALITY   Drawing on the growing body of evidence that positive emotional processes can impact health in a salutary way, Danner et al. (2001) analyzed auto-biographical sketches from 80 nuns written in their early 20s for emotional content. A strong positive relationship between the number of positive emotion words and life expectancy emerged from the longitudinal data. Although impressive, it again raises the question about which kind of language samples predict which kind of psychological and physical phenomena. Does the fact that nuns used more positive emotion words in a carefully produced one-page essay mean they approach their world in a more positive way in general or is this positivity effect restricted to specific verbal samples only?

Taken together, very few studies have linked word choice, physical health, and health behaviors. The findings, however, are encouraging considering that simply knowing how often an individual uses the words "I," "me," and "my" can provide important information about a risk for future CHD or that simply counting how often a person uses positive emotion words can carry information

about that person's life expectancy—information with substantial real-life social importance.

WORD USE AS A REFLECTION OF SITUATIONAL AND SOCIAL PROCESSES

What we say and how we say it changes depending on the situation we are in. Piaget (1926) and other early developmentalists (e.g., McCarthy 1929) noted that young children changed the ways they spoke depending on the context of their interactions. As adults, we know that we use different words when addressing an audience of our peers versus when talking with a close friend. Although research on how language varies as a function of social situations has been systematically addressed in psychology and sociology, very little has relied on word use per se.

Perhaps the first in depth discussion of situational and social variations in language was by Goffman (1959) in his *Presentation of Self in Everyday Life*. Drawing on dramaturgical metaphors, Goffman argued that we all play different roles depending on the situation. In his analyses of groups, for example, Goffman suggested that voice characteristics and other nonverbal and paralinguistic cues shift depending on the formality of the situation, the nature of the audience, and the degree to which the speaker is integrated with or excluded from the other actors. Although he did not focus on the words people used, his work served as an important foundation.

Later research attempted to define which dimensions within social situations are most likely to be associated with language and, eventually, word usage. Hymes (1974), an anthropologist and a founder of sociolinguistics, argued that any speech act must be considered within eight dimensions ranging from the setting of the utterances, who the participants were, the goals of the interaction, etc. Other researchers such as Brown & Fraser (1979) and Forgas (1985) expanded on the idea of developing taxonomic structures of situations to help identify when and how language shifted. Psychological dimensions of situations related to language and communication included the situation's formality, cooperativeness, and involvement. Note that these approaches focused more on the nature of the interactions than on the word usage (Forgas 1985).

Formal Versus Informal Settings

Perhaps the most studied situational variations in the use of language have been between formal and informal situations. In addition to some of the early work on code switching, more recent research on politeness and verbal immediacy mark word shifts as a function of setting.

Code switching refers to changes in language, dialect, accent, or even forms of address that occur—often automatically—among interactants. Among U.S.

Spanish-English bilinguals, for example, it is common for individuals to use Spanish in informal social settings and English in more formal situations. Analyses of bilingual radio programs suggest that speakers may switch to Spanish when talking about emotional topics and English when discussing work, finances, or politics. Parallel findings can be seen in the use of the formal versus informal "you" in Spanish (Usted versus tu), French (vous versus tu), and German (Sie versus Du) (Brown & Gilman 1960, Sebeok 1960, Vaes et al. 2002).

Inherent in formal settings are disparities in power among interactants and an adherence to culturally proscribed norms of behavior. Goffman (1967) suggested that within such status-discrepant situations, individuals engage in "dramaturgic" work to sustain and enhance their public face. Brown & Levinson's (1987) politeness theory takes into account an individual's efforts to preserve the "face(s)" of others with whom one communicates. Whereas politeness theory is comprised of specific linguistic strategies to minimize threat to another's face, most studies are concerned with these tactics at the phrase level. Typically, the corpus of language is independently coded by human judges noting the frequency of each tactic. However, in many of Brown & Levinson's tactics word-level markers of politeness can be parsed out. For example, they propose impersonalizing the speaker and hearer by avoiding the pronouns I and you, using past tense to create distance and time, diminishing the force of speech by using hedge words such as perhaps, using slang to convey ingroup membership, and using inclusive forms (we and let's) to include speaker and hearer.

In an interesting application of the language of politeness in organizational studies, Morand (2000) had participants engage in laboratory role-plays in which they were required to address a hypothetical other of a given high or low status. Morand then independently coded the transcripts for the presence of politeness tactics. At the word level participants used more hedge words, past tense, subjunctive, formal words, honorifics (sir, Mr.), and apologies. Similar word-level findings are embedded in the phrases detected in the majority of politeness studies (Ambady et al. 1996, Brown & Gilman 1989, Brown & Levinson 1987).

A separate group of studies has found support for the centrality of the formal/informal dimension based on inductive analyses of language use. Wiener & Mehrabian (1968) and Mehrabian (1971) posited that a basic dimension to language was verbal immediacy. Individuals who were verbally immediate tend to use the present tense, are more personal in their interaction, and draw on the speaker and audience's shared realities. Markers of verbal immediacy were found to be more common in informal settings than in formal ones. Interestingly, parallel and independent findings have been reported by two other labs. Biber (1988), in his factor analysis of words, considered his first factor to be a marker of formality/informality. Words that loaded on the factor included first person singular and present tense verbs. Indeed, speech samples high on the informality factor tended to be personal conversations or informal writing samples. Using a much larger and homogeneous sample of students' writings, Pennebaker & King (1999)

also found that the first and most robust factor was immediacy, which included first person singular, present tense verbs, short words, discrepancy words (would, should, could), and the non-use of articles.

Deception and Honesty

One of the more productive arenas for exploring word use has been in the deception literature. Multiple labs have attempted to discover if people change the ways they talk when being honest versus deceptive. In general, three classes of word categories have been implicated in deception: pronoun use, emotion words, and markers of cognitive complexity. Knapp et al. (1974) found that liars often avoid statements of ownership either to "dissociate" themselves from their words or owing to a lack of personal experience (see also Buller et al. 1996, Dulaney 1982, Knapp & Comadena 1979, Mehrabian 1971). Similarly, Wiener & Mehrabian (1968) reported that liars were more "non-immediate" than truth-tellers, and referred to themselves less often in their stories. In an analysis of five laboratory studies wherein participants were induced either to tell the truth or to lie about their thoughts or behaviors, truth-tellers consistently used a higher rate of first person singular pronouns (Newman et al. 2002).

Other studies have found that when individuals are made to be self-aware they are more "honest" with themselves (e.g., Carver & Scheier 1981, Duval & Wicklund 1972, Vorauer & Ross 1999) and self-references increase (e.g., Davis & Brock 1975). Finally, individuals who respond defensively (i.e., self-deceptively) when discussing personal topics tend to distance themselves from their stories and avoid taking responsibility for their behavior (Feldman Barrett et al. 2002, Schütz & Baumeister 1999, Shapiro 1989). In short, deceptive communications are characterized by fewer first person singular pronouns (I, me, and my).

In addition to pronoun use, the act of deception is generally associated with heightened anxiety and, in some cases, guilt. Several labs have found slight but consistent elevations in the use of negative emotion words during deception compared with telling the truth (e.g., Knapp & Comadena 1979, Knapp et al. 1974, Newman et al. 2002, Vrij 2000).

Finally, some promising results suggest that markers of cognitive complexity are associated with truth-telling. One such word category, referred to as exclusive words, is made up of prepositions and conjunctions such as but, except, without, and exclude. Exclusive words require the speaker to distinguish what is in a category from what is not in a category. In the Newman et al. (2002) studies, truth-tellers used far more exclusive words than did liars. In the act of deception, it is far too complex to invent what was done versus what was not done.

Emotional Upheavals

During periods of stress, trauma, or personal upheavals, people shift in the ways they think and express themselves. The words people use during stressful times change as well. Several studies of both personal and shared traumatic

experience suggest that pronouns, emotion words, and other parts of speech subtly change.

PERSONAL UPHEAVALS   Capturing people's word use during times of personal crisis is often difficult and ethically questionable. One strategy is to capture the ongoing speech of public figures during tumultuous and quiescent times. One recent study examined the way Mayor Rudolph Giuliani spoke during his press conferences over his 8 years as mayor of New York City (Pennebaker & Lay 2002). During his first 5 years in office he was generally viewed as hostile, uncompromising, and cold. Indeed, LIWC analyses of his language in 14 press conferences during this time indicated that he used a very low rate of first person singular pronouns, a relatively low rate of positive emotion words, and a high rate of big words. In his sixth year of mayor he was diagnosed with prostate cancer, separated from his wife, and withdrew from the senate race against Hilary Clinton—all within the space of two weeks. In the weeks after these events the press reported that his personality seemed to have changed and that he was becoming a warm person. Analyses of his press conferences during this time found that his use of first person singular almost tripled, his use of positive emotion words increased slightly, and his language became simpler. A year and a half later, in the aftermath of the September 11 attacks, his language switched again. His first person singular pronouns dropped slightly and his use of specific and inclusive first person plural pronouns increased. His use of both positive and negative emotion words increased and his language remained simple but with increasing cognitive complexity (as measured by exclusive words).

SHARED UPHEAVALS   A common observation is that during a shared crisis, people come together. Several studies have demonstrated that immediately after a large-scale trauma individuals drop in their use of the word "I" and increase in their use of "we." In online chat groups immediately after the announcement of the death of Princess Diana, for example, use of first person plural increased by 135% and use of "I" dropped by 12% for approximately a week. By 10 days after the event pronoun use returned to normal levels (Stone & Pennebaker 2002).

More striking was an ongoing study of natural conversations that took place in the weeks surrounding the September 11 attacks. Approximately 15 students wore the electronically activated recorder (EAR) (Mehl et al. 2001) that recorded for 30 seconds every 12.5 minutes for up to two weeks after the attacks. All participants had previously worn the EAR for at least 1–2 days within the weeks prior to the attacks. The language analyses indicated that use of first person plural increased and first person singular decreased for at least 5 days following September 11. Interestingly, the use of "we" words was rarely in reference to the participants' country, ethnic group, or other abstract entity. Rather, the use of "we" generally referred to people in the participants' immediate setting (Mehl & Pennebaker 2002b).

Finally, analyses of the language used in the school newspaper of Texas A&M in the weeks before and after a tragic bonfire accident showed comparable effects. That is, first person plural pronouns doubled, as did the use of negative emotions, and use of big words dropped by over 10% (Gortner & Pennebaker 2002).

Social Interactions

In most cases, when two people interact they use words. Remarkably little research has been conducted on the ways the interactants use words with each other. An exception to this is a study by Cegala (1989), who sought to identify linguistic correlates of conversational engagement and detachment. In the study, 120 participants who did not know each other were asked to engage in a brief casual interaction with a same-sex peer. Participants were preselected on self-reported dispositional involvement in interactions and high-high, low-low, and high-low involvement dyads were created. Contrasts between the couple types showed that highly involved couples used a higher amount of certainty expressions, a higher degree of verbal immediacy, and more relational pronouns (we, us, our).

Beyond word use, numerous studies have pointed to the coordination of communicative behaviors during conversation. Indeed, the development of communication accommodation theory (Giles & Coupland 1991) has explored how individuals adapt to each other's communicative behaviors in order to promote social approval or communication efficiency. According to communication accommodation theory, individuals negotiate the social distance between themselves and their interacting partners, creating, maintaining, or decreasing that distance. This can be done linguistically, paralinguistically, and nonverbally. Specific accommodative strategies may include speech styles, speech rate, pitch, accent convergence, response latency, use of pauses, phonological variations, smiling, or gaze. Most tests of the theory have not focused on word use.

To our knowledge, only one project has explored linguistic accommodation at the word level (Niederhoffer & Pennebaker 2002). In two studies from Internet chat rooms, individuals getting to know one another in dyads exhibited linguistic style matching on both the conversational level as well as on a turn-by-turn level. This coordinated use of language occurs at a remarkably low level and includes word count and use of articles, prepositions, affect words, and cognitive words. These effects appear to hold up across the perceived quality of an interaction, the length of the interaction, whether face-to-face or on an internet-like chat, whether for experimental credit or, in the case of a separate analysis of the Watergate transcripts, to avoid impeachment and imprisonment.

Yet another interesting domain in which to consider communication patterns is within marital interactions. Gottman (1994) created couple typologies on the basis of communication patterns. Similarly, Ellis & Hamilton (1985) proposed that married couples can be distinguished by linguistic themes such as elaboration, complexity, and personal reference (see also Acitelli 1992). However, the majority of research is on a broader level than word use, per se.

One notable exception is the research of Sillars et al. (1997). Using a large sample of married couples, these researchers analyzed the first 40 utterances of discussions about marital problems. They found evidence for linguistic markers of relational characteristics such as increased usage of "we" pronouns in traditional (interdependent), satisfied and older married couples as compared to "I" usage in more autonomous couples. Interestingly, marital relationship subtypes (traditionals, separates, or independents) did not vary in linguistic elaboration (words per utterance, number of nouns and adjectives); however, language use was related to education. More educated participants had longer utterances and used more qualifiers. Similar research suggests that in less traditional couples there is increased usage of uncommon adjectives, nouns, and adverbs (Ellis & Hamilton 1985). Taken together these findings support the idea that surface features of language carry relational meaning. Furthermore, personal pronoun use (I, we) in marital interactions can reflect differences in the degree to which couples frame their relationship as inter- or independent.

WORD USE AS A REFLECTION OF PSYCHOLOGICAL AND HEALTH CHANGE

Since 1986 dozens of studies have demonstrated that writing about emotional upheavals can affect people's psychological and physical health. The typical disclosure studies require participants to write for 3–5 days for 15–30 minutes per day about either emotional or superficial topics. The writing intervention has been found to reduce physician visits for illness (e.g., Pennebaker & Beall 1986, Smyth 1998), improve medical markers of health (e.g., Smyth et al. 1999), bring about higher grades among students (Pennebaker & Francis 1996), and result in higher re-employment rates among adults who have lost their jobs (Spera et al. 1994). These effects have been found for individuals across multiple cultures, age groups, and instructional sets (for a broad review, see Lepore & Smyth 2002).

Why does writing or talking about emotional upheavals affect physical and psychological health? This question, of course, goes beyond the writing paradigm and addresses the broader question of why psychotherapy itself is effective. Several overlapping possibilities exist. One deals with the construction of a narrative. That is, individuals who write about traumas naturally come to a coherent understanding of the event. Further, this understanding is thought to be inherent in the cognitive language of their disclosure. Other possibilities include changes in perspectives when writing that may influence individuals' social orientations.

Use of Cognitive and Emotion Words

One of the primary motivations for developing the LIWC program was to learn if the language individuals use while disclosing emotional topics could predict long-term health changes. Based on the Pennebaker & Francis (1996) pilot study,

we found that a particular linguistic "fingerprint" was associated with reductions in physician visits following participation in the disclosive writing. Those who wrote about traumas were more likely to benefit if, over the 3 days of writing, they used a high number of positive emotion words, a moderate number of negative emotion words, and, most important, an increasing number of cognitive (i.e., causal and insight) words from beginning to the last day of writing.

These effects were applied to six writing studies in a more systematic way (see Pennebaker et al. 1997). Again, the same linguistic pattern predicted improved health. The implications of these findings are intriguing. First, use of emotion terms is moderately important. Positive emotion words are linearly related to health, whereas counter to our earlier predictions, negative emotion words are curvilinearly related (an inverse-U function). These findings support current views on the value of optimism (e.g., Scheier & Carver 1985, Peterson et al. 1988). At the same time the negative emotion findings are consistent with the repressive coping literature (Jamner et al. 1988) in that those people who do not use negative emotion words in describing traumatic events are at greater risk for subsequent health problems than those who use at least some negative emotion words.

Most striking, however, are the relative effect sizes for changes in cognitive words. An increasing use of cognitive words accounted for far more variance in health improvement than did emotion words. These data, as noted below, suggest that the construction of a story or narrative concerning an emotional upheaval may be essential to coping. Particularly exciting is that this pattern of effects has now been reported by three independent labs. Keough et al. (KA Keough, J Garcia, CM Steele, unpublished) found that cognitive change over a 2-week diary-writing period was linked to health improvements. In a lab study with medical students, Petrie et al. (1999) discovered that the more individuals' cognitive word counts increased over the 3 days of writing, the greater their lymphocyte counts after each day after writing. Klein & Boals (2001) have reported that an increase in cognitive word use over the days of writing is linked to measures of greater working memory up to 12 weeks after the study.

Use of Word Analyses in Psychotherapy

A small group of psychoanalytically oriented researchers have been interested in the ways clients use language in therapy sessions. Bucci (e.g., 1995) and Mergenthaler (1996) have separately and together (Mergenthaler & Bucci 1999) identified word patterns that predict positive therapeutic outcomes. As noted above, the authors identified three categories of words that are easily captured in computer analyses: emotional tone, abstraction, and referential activity. Using this coding system, the authors argue that successful therapy requires clients to move from highly specific referential activity and high emotional tone to high levels of abstraction. Indeed, analyses of selected psychoanalytic therapy sessions (Mergenthaler 1996) as well as written disclosure essays (Bucci 1995) support these predictions. These patterns of effects are remarkably consistent with the LIWC analyses of Pennebaker et al. (1997).

References to Self and Others: Pronouns and Perspectives

As mentioned above, an alternative computer-based approach to linguistic analysis such as latent semantic analysis (LSA) relies on more inductive ways of establishing the pattern of word use (e.g., Landauer & Dumais 1997). This technique has been used to determine the degree to which two texts are similar in terms of their content. In theory, one might predict that the more similar the content of trauma essays over the 3–4 days of writing, the more the person's health would improve. If one made such a prediction, however, one would be wrong. LSA analyses of three writing studies failed to uncover any relationship between linguistic content and health.

An alternative way to think about writing is to focus on writing style as opposed to writing content. Style is, to a large extent, determined by the most commonly used words, referred to as particles—pronouns, articles, conjunctions, prepositions, and auxiliary verbs. Interestingly, most LSA techniques routinely omit particles because they do not carry the same information as more content-heavy nouns and verbs. Across a series of style-based LSA analyses, we have discovered that particles in general and pronouns in particular have been found to strongly correlate with health improvements. Basically, the more individuals shift in their use of pronouns from day to day in writing, the more their health improves. Across three separate studies, pronoun shifts among trauma writers correlated between 0.3 and 0.5 with changes in physician visits (Campbell & Pennebaker 2002). Closer inspection of these data suggest that healthy writing is associated with a relatively high number of self-references on some days but not others. Alternatively, people who always write in a particular voice—such as first person singular—simply do not improve.

Although the LSA studies are still in the early stages, they suggest that the ability to change perspective in dealing with an emotional upheaval may be critically important. The data also indicate that pronouns may be an overlooked linguistic dimension that could have important meaning for researchers in health and social psychology. After all, pronouns are markers of self-versus group identity (e.g., I versus we) as well as of the degree to which people focus on or relate to others. Pronouns may provide insight into people's level of social integration as well as self-focus.

FUTURE DIRECTIONS IN THE STUDY OF WORD USE

This review is intended to whet researchers' appetite for the power of words in natural language. From a methodological perspective, the analysis of word use is simple, reliable, fast, and relatively inexpensive. In addition, samples of words are readily available from open-ended questionnaire items, the Internet, emails, banks of text corpora, and transcripts of spoken text. Despite the practicality of measuring word use, many of the biggest questions surround their meaning and interpretation. In this final section we point to some intriguing and vexing questions raised by the word use approach.

Which Words Should We be Studying?

Most of this review has focused on words that reflect linguistic style rather than content. Markers of linguistic style are generally associated with relatively common words such as pronouns and articles. Many of the more content-heavy words—nouns, regular verbs, and modifiers—have not yielded many consistent social or psychological effects. This may reflect the fact that linguistic content is heavily dependent on the situation or topic the person is instructed to think or talk about. Three general topics that are ripe for investigation are the analysis of particles, emotions, and traditional content dimensions.

PARTICLES OR FUNCTION WORDS   Particles (which include pronouns, articles, prepositions, conjunctives, and auxiliary words) are remarkable for several reasons. In the English language there are fewer than 200 commonly used particles, yet they account for over half of the words we use. Of particular relevance, research on brain damage to the language areas suggests that particles are processed in different regions and in different ways than content words. For example, damage to Broca's area (a region generally associated with the left frontal lobe) often causes patients to speak hesitantly using nouns and regular verbs but not particles. Damage to Wernicke's area (left temporal lobe) has been reported to cause individuals to speak in a "word salad" wherein they use a high number of particles but with very little content (Miller 1995).

Particles serve as the glue that holds content words together. But particles are more than mere glue. They are referential words that have tremendous social and psychological meaning. To use a pronoun requires the speaker and listener to share a common knowledge of who the referent is. Consider the following: "John went to the store to buy some bread. After getting it, he drove home." The pronouns "it" and "he" are place holders and represent the shared and temporary knowledge that it = bread and he = John. Pronoun use requires a relatively sophisticated awareness of the audience's ability to track who is who. Prepositions are also referential. To know the meaning of over, on, to, etc. demands that the speaker and listener have a rudimentary understanding of the relative, real, or symbolic location of the speaker. Similar arguments can be made about articles (the use of "a" versus "the") and conjunctions (but, which). More informal settings presuppose a shared frame of reference (cf., Brown 1968). Particles, then, can be construed as having tremendous social implications. From a Grice (1975) perspective, the discerning particle user must have some degree of social and cognitive skill.

All particles, of course, are not equally interesting from a social or personality psychology perspective. Of those that have emerged in the word use literature, pronouns are among the most revealing. Use of first person singular, for example, is associated with age, sex, depression, illness, and more broadly, self-focus. First person plural can variously be a marker of group identity and, on occasion, a sign of emotional distancing (Pennebaker & Lay 2002). Second and third person pronouns are, by definition, markers to suggest that the speaker is socially engaged or aware.

Future research must begin exploring the nature of pronouns and other particles in much greater detail. For example, psychological researchers have naively assumed that all first person singular pronouns are comparable. Even William James (1890) argued that there were profound differences between the "active" I and the "passive" me. In fact, factor analyses of individual pronouns often find that all first person singular pronouns do not always load on the same factor (Campbell & Pennebaker 2002). Some very basic psychometric work is needed on pronouns and other particles at the word level to disentangle their mathematical and psychological meaning.

EMOTION WORDS   Virtually every psychologically based text analysis approach has started from the assumption that we can detect peoples' emotional states by studying the emotion words they use. The reality is that in daily speech, emotional writing, and even affect-laden poetry, less than 5% of the words people use can be classified as emotional. In reviewing the various word use studies, it is striking how weakly emotion words predict people's emotional state.

From an evolutionary perspective, language did not emerge as a vehicle to express emotion. In natural speech we generally use intonation, facial expression, or other nonverbal cues to convey how we feel. Emotional tone is also expressed through metaphor and other means not directly related to emotion words. Taken together, it is our sense that emotion researchers should hesitate before embarking on studies that rely exclusively on the natural production of emotion words.

CONTENT WORDS AND THEMES   Although not emphasized in this article, word count strategies are generally based on experimenter-defined word categories. These categories are based on people's beliefs about what words represent. Hence, they are ultimately subjective and culture bound. Content-based dictionaries that are aimed at revealing what people are saying have not yielded particularly impressive results owing in large part to the almost infinite number of topics people may be dealing with. With the rapidly developing field of artificial intelligence, the most promising content or theme-based approaches to text analysis involve word pattern analyses such as LSA. These purely inductive strategies provide a powerful way to decode more technical or obscure linguistic topics. For researchers interested in learning what people say—as opposed to how they say it—we recommend this new analytic approach.

SOME FINAL WORDS: LIMITATIONS AND POSSIBILITIES

The adoption of a word use approach to the analysis of naturally occurring written or spoken language is fraught with problems. Virtually all text analysis programs that rely on word counts are unable to consider context, irony, sarcasm, or even the problem of multiple meanings of words. Many of the traditional problems studied in communication, such as ingroup-outgroup status, formality of settings,

and requests, are not easily detected with word counts (cf., Krauss & Fussell 1996). In a discussion of the potential shortcomings of a computer program such as the General Inquirer, Zeldow & McAdams (1993) have questioned whether lower-level word counts can have true psychological meaning. Although this review points to the covariation between word counts and meaning, no one has yet devised a compelling psychological theory of word usage.

The words a person uses clearly have an impact on the listener or reader. Just as the words people choose when talking or writing may betray their thoughts and feelings, those words may be processed at a low or nonconscious level by the listener or reader. Indeed, the speed by which we read or hear words like "the" or "my" in a sentence competes with traditional primes used in experimental or social psychology. The presumed power of the media or of great speakers or writers may ultimately reside as much in how they use words as in what they say (cf., Hogenraad et al. 1995).

Far more topics surrounding word use have been overlooked than covered in this review. We have not discussed differences between English and other languages, the differences between written and spoken language, or the difficulties of second language learning (where most of us make errors in particle use rather than content words). We have not mentioned issues such as intelligence, stereotype communication, language proficiency, or the early development of word knowledge and use.

Despite these shortcomings, the spotty history of word count approaches points to their potential value in psychological research. Most of us are adrift in a sea of words—from the time we awake listening to the radio, to reading the morning paper, to talking with family, colleagues, and friends. And we are spitting out words at almost the same rate at which we are taking them in. Words are a central feature of social, clinical, personality, and cognitive psychology. It is time that we started taking them a bit more seriously and using them as tools in understanding who we are and what we do.

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