Quality of life (QOL) is a broad, multiply determined construct with both objective and subjective components. Objective indicators of QOL can include physiological markers of fitness and disease, a nation’s Gross Domestic Products, marital status, church attendance, or even the number of minutes per day spent laughing. But objective indicators do not always reflect one’s own assessment of or satisfaction with life: Cancer patients can exude vitality, rich people can think that they don’t have enough, married people can feel isolated, church goers can experience meaninglessness, and laughter can be a sign of anxiety. It becomes clear, then, that emotional state, belongingness, and cognitive judgments are important in the assessment of QOL.

These subjective components of QOL are typically measured by self-report methods, including surveys or interviews. However, self-report methods suffer from their own shortcomings. Surveys are susceptible to response bias. The reference group on which a respondent heavily relies to make comparative QOL judgments is often unknown. Furthermore, surveys are constrained by what the researcher assumes constitutes QOL. Standardized or open-ended interviews can be appealing in getting participants’ broader world views. The recurring frustration with interviews, however, is in finding reliable and efficient ways of coding them.

In this paper, we bring together empirical evidence showing how computerized text analysis programs can assess natural language in order to reveal emotional state, belongingness, and cognitive judgments. We also present data that has linked natural language use to objective indicators of QOL. Our understanding of natural language use within the context of QOL is just in its infancy. Nevertheless, preliminary analyses are beginning to yield some important insights.

Text Analysis and Word Use

It is beyond the scope of this paper to summarize the many computerized strategies available to researchers (for a more comprehensive...
hensive review see Pennebaker, Mehl, & Niederhoffer, 2003). Some methods, for example, simply count words related to particular themes (e.g., the DICTION program, Hart, Jarvis, Jennings, & Smith-Howell, 2005), others look for words or phrases that reveal psychoanalytic concerns (Gottschalk, 1997) or themes related to drives or motives (e.g., the General Inquirer, Stone, Dunphy, Smith, & Murphy, 1966). Several more inductive methods have been evolving from the world of artificial intelligence. One such program is called Latent Semantic Analysis (LSA; Foltz, 1996), which compares the similarity of any two texts in terms of their content.

Much of this paper relies on analyses from a text analysis program that we developed called Linguistic Inquiry and Word Count, or LIWC (Pennebaker, Francis, & Booth, 2001). LIWC searches for and counts both content and style words within any given text file. LIWC was developed by having groups of judges evaluate the degree to which about 2,000 words or word stems were related to each of several dozen categories. The categories include negative emotion words (sad, angry), positive emotion words (happy, laugh), standard function word categories (first, second, and third person pronouns, articles, prepositions), and various content categories (e.g., religion, death, occupation). For each essay, LIWC computes the percentage of total words that these and other linguistic categories represent.

The original intent of this program was to better understand how people used language when writing about emotional upheavals in their lives. Starting in the 1980s, we discovered that when people wrote about traumatic experiences for 3-4 days for as little as 15-30 minutes per day, they subsequently exhibited improvements in physical health (e.g., Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Lepore & Smyth, 2001). LIWC, then, allowed us to see what word types ultimately correlated with health changes.

The development of LIWC resulted in researchers in other labs sending us their own text samples from their experiments to analyze. Soon, we had hundreds, then thousands of essays written by people from all over the English-speaking world in text format. With the rapid development of the Internet, we began to expand our text archive. Although we now have over 400,000 text files in our archive, this article focuses on the analyses of approximately 95,000 text files representing over 80,000 different people. As can be seen in Table 1, the data for part of this paper is based on the analysis of 67 million words across seven written and spoken genres.

**Decoding linguistic content versus style.** Given that computers currently do a poor job of appreciating context, the word counting approaches can be lacking. Ironically, if we were actually
interviewing people ourselves or even reading transcripts of interviews, we would probably do a better job at detecting QOL than all of the computer programs. What do human judges look for that our computers don’t? The most striking difference is that humans are subtly detecting how people are expressing themselves. In other words, human judges pay attention to both what people are saying as well as how they are saying it.

If humans can distinguish between content and style, can computers do the same? Most early content analysis by both humans and computers focused on words that suggested specific themes. By analyzing an open-ended interview, a human or computer can detect theme-related words such as family, health, illness, and money. Generally, these words are nouns and regular verbs. Nouns and regular verbs are “content heavy” in that they define the primary categories and actions dictated by the speaker or writer. It makes sense. To have a conversation, it is important to know what people are talking about.

What accounts for “style”? Consider the ways three different people might summarize the quality of their life:

Person A: I’d have to say that my life is going just fine.
Person B: The quality of my life is certainly quite satisfactory.
Person C: Things are good. Can’t complain.

All three are saying essentially the same thing. But their ways of expressing themselves are hinting at other issues. The three people differ in their pronoun usage, use of large versus small words, verbosity, and dozens of other dimensions. We can begin to detect linguistic style by paying attention to “junk words” – those words that do not convey much in the way of content. These junk words, usually referred to as function words or particles, serve as the cement that holds the content words together.

Function words include pronouns, prepositions, articles, conjunctions, and auxiliary verbs. Whereas the average native English

<table>
<thead>
<tr>
<th>Examples</th>
<th>Descriptions</th>
<th>Experiments</th>
<th>Internet</th>
<th>Published</th>
<th>Personal</th>
<th>Spoken</th>
<th>Natural conversation</th>
<th>TV/radio</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-emotional descriptions of an object, event, daily routine</td>
<td>11,347</td>
<td>12,975</td>
<td>9,537</td>
<td>10,870</td>
<td>34,988</td>
<td>16,782</td>
<td>96,499</td>
<td></td>
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</tr>
<tr>
<td>Expressive writing about emotional events</td>
<td>5,652,475</td>
<td>5,099,444</td>
<td>3,305,468</td>
<td>26,641,920</td>
<td>14,997,848</td>
<td>11,095,099</td>
<td>66,772,274</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blogs, bulletin board posts, chat rooms logs</td>
<td>53,619</td>
<td>41,285</td>
<td>60,927</td>
<td>132,850</td>
<td>79,963</td>
<td>51,466</td>
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<td></td>
</tr>
<tr>
<td>Novels, lyrics, poems, newspapers</td>
<td></td>
<td></td>
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<tr>
<td>Diaries, stories, personal accounts of emotional events</td>
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</tbody>
</table>

Table 1. Text Archive Characteristics
speaker has an impressive vocabulary of well over 100,000 words, fewer than 200 are function words. This deceptively trivial percentage (less than 0.02%) of our vocabulary accounts for over half of the words we use in daily speech. Despite the frequency of their use, they are the hardest to master when learning a new language.

Table 2 lists the 20 most commonly used words in our text archive. All are function words and are used at surprisingly high rates. The top 10 words alone account for over 20% of the words we use. As can be seen, function words are generally very short (usually 1–4 letters), are spoken quickly (at a speed of 100–300 milliseconds – the rate often used in lab studies testing priming or subliminal perception), and glossed over even more quickly when we read. As evidence, estimate how frequently you have seen articles (a, an, the) on the last page. Has this paper used more or fewer articles than you would in normal speech? [Hint: The answer is much more.]

We have a terrible memory of our own as well as other’s use of function words. When composing a letter or making a speech, we might think briefly about these words. In daily conversation, however, we have virtually no control over how they are used. Despite rarely paying them any conscious attention, function words have a powerful impact on the listener/reader and, at the same time, reflect a great deal about the speaker/writer. Returning back to the three hypothetical people describing their QOL, their different use of function words marks them in predictable ways. The ways people use function words reflects their linguistic style.

Function Words, the Brain, and Social Processes

Humans, of course, are highly social animals. If we examine the human brain and compare it with every other mammal, the frontal lobe of the cortex is disproportionately large. In recent years, researchers have begun to emphasize the frontal lobe in guiding our social behaviors (e.g., Gazzaniga, 2005; Damasio, 1995). Most social emotions, skills in reading others’ emotions and intentions, and the ability to connect with others are highly dependent on an intact frontal lobe.

Language, too, has an important link to frontal lobe function. In general, the majority of language functions are housed in the temporal and frontal lobes. Within the left temporal lobe (at least for most people) is Wernicke’s area. Wernicke’s area is critical for both understanding and generating most advanced speech – including nouns, regular verbs, and most adjectives. Broca’s area, on the other hand, is situated in the left frontal lobe. Damage to Broca’s
Assessing QOL through Natural Language Use

Table 2. Frequency of the 20 Most Commonly Used Words as a Function of Genre (from our text archive)

<table>
<thead>
<tr>
<th>Word</th>
<th>Descriptions</th>
<th>Experiments</th>
<th>Internet</th>
<th>Published</th>
<th>Personal</th>
<th>Spoken</th>
<th>Mean</th>
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<td>I</td>
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<td>5.75</td>
<td>2.57</td>
<td>1.04</td>
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<td>3.64</td>
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<tr>
<td>the</td>
<td>3.99</td>
<td>3.18</td>
<td>3.00</td>
<td>4.93</td>
<td>2.98</td>
<td>2.77</td>
<td>3.48</td>
</tr>
<tr>
<td>and</td>
<td>2.48</td>
<td>3.28</td>
<td>1.90</td>
<td>3.14</td>
<td>3.25</td>
<td>3.46</td>
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<td>to</td>
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<td>2.31</td>
<td>2.54</td>
<td>3.20</td>
<td>2.83</td>
<td>2.91</td>
</tr>
<tr>
<td>a</td>
<td>1.99</td>
<td>1.95</td>
<td>1.76</td>
<td>1.84</td>
<td>2.08</td>
<td>2.02</td>
<td>1.94</td>
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<tr>
<td>of</td>
<td>1.96</td>
<td>1.57</td>
<td>1.33</td>
<td>3.02</td>
<td>1.65</td>
<td>1.47</td>
<td>1.83</td>
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<tr>
<td>that</td>
<td>1.29</td>
<td>1.67</td>
<td>1.06</td>
<td>0.90</td>
<td>1.92</td>
<td>2.06</td>
<td>1.48</td>
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<tr>
<td>in</td>
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<td>1.20</td>
<td>1.09</td>
<td>1.83</td>
<td>1.24</td>
<td>1.06</td>
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<td>1.75</td>
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<td>0.65</td>
<td>0.37</td>
<td>1.53</td>
<td>0.99</td>
<td>1.08</td>
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<tr>
<td>is</td>
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<td>0.91</td>
<td>1.29</td>
<td>0.64</td>
<td>1.30</td>
<td>1.15</td>
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<td>0.70</td>
<td>0.84</td>
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<td>0.91</td>
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<td>0.55</td>
<td>0.71</td>
<td>0.69</td>
<td>0.63</td>
<td>0.67</td>
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<tr>
<td>he</td>
<td>0.56</td>
<td>0.64</td>
<td>0.36</td>
<td>0.60</td>
<td>0.80</td>
<td>1.03</td>
<td>0.66</td>
</tr>
<tr>
<td>me</td>
<td>0.55</td>
<td>1.03</td>
<td>0.44</td>
<td>0.31</td>
<td>0.82</td>
<td>0.70</td>
<td>0.64</td>
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<tr>
<td>on</td>
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<td>0.67</td>
<td>0.60</td>
<td>0.65</td>
<td>0.55</td>
<td>0.56</td>
<td>0.63</td>
</tr>
<tr>
<td>but</td>
<td>0.50</td>
<td>0.71</td>
<td>0.48</td>
<td>0.38</td>
<td>0.83</td>
<td>0.80</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Numbers reflect percentage of total words within any given text. For example, in any given text from the Descriptions archive, 2.63 percent of all words are the word “I” (this includes I’m, I’d, I’ll, I’ve).

area – while Wernicke’s area is intact – results in people speaking in a painfully slow, hesitating way, often devoid of function words. A functioning Broca’s area – but damage to Wernicke’s area – results in a completely different social style. These people often speak warmly and fluidly while maintaining eye contact with the target person. The only problem is that they primarily use function words with no content at all (e.g., Miller, 1995). Even at the brain level, then, function words are linked to social skills.

A closer analysis of function words points to their social function more clearly. Pronouns, for example, are words that demand a shared understanding of their referent between the speaker and listener.

“I can’t believe that she gave it to him.”

This is a completely normal sentence. We can imagine someone saying this to us and knowing exactly what is meant. This sen-
tence makes absolutely no sense, however, unless you know who the “I,” “she,” and “him” are, as well as what the “it” is. In a normal conversation, we would know who the various players and objects were, based on shared knowledge between the speaker and listener. Some social skills are required here. The speaker assumes that the listener knows who everyone is. The listener must be paying attention and know the speaker to follow the conversation. So the mere ability to understand a simple conversation replete with function words demands social knowledge.

The same is true for articles, prepositions, and all other function words. Consider the slightly altered sentences:

“I can’t believe that she gave him the book.”
“I can’t believe that she gave him a book.”

The difference between “the” book and “a” book is striking. In this case, both the speaker and listener know exactly what book they are talking about. Words such as “before,” “over,” and “to” similarly require a basic awareness of the speaker’s location in time and space. The ability to use function words, then, is a marker of rather sophisticated social abilities. Talking about nouns and verbs, however, simply requires the ability to understand culturally shared categories and definitions.

**Function Words and Subjective Indicators of QOL**

Why should a self-respecting QOL researcher care about function words? In large-scale studies of Subjective Well-Being (SWB) in which people have been asked to assess the quality of their lives (for a review see Diener, Oishi, & Lucas, 2003), questionnaire items have attempted to measure variables such as the frequent experience of positive emotions along with the infrequent experience of negative emotions, satisfaction in social domains, and having a sense of meaning and fulfillment. In our own studies, we have found that the use of function words in daily speech, interviews, and even formal writing captures such variables without the problems of self-report methods. In fact, the analysis of function words goes beyond self-report methods by giving us the power to predict several objective indicators of QOL.

Although our initial studies focused on emotion word use, it quickly became apparent that the use of positive and negative emotion words in written or spoken text provided a limited picture of people’s psychological states (cf., Pennebaker, Mayne, & Francis, 1997). Indeed, pronouns, articles, and prepositions can tell us as much or more about people’s emotional state, belongingness, and
cognitive judgments than content words. Below is a brief summary of a series of studies that we have been conducting over the last several years using the text analysis program LIWC.

**Emotional State and First Person Singular Pronouns**
Recall that the measurement of SWB includes both the frequent experience of positive affect and the infrequent experience of negative affect. Presumably, people with a high QOL would not be distressed, depressed, or deliberating their own death. To be sure, we’d probably want concomitant evidence of experienced positive affect. Within the culture, there exists a stereotype that people who use a high rate of first person singular pronouns are self-obsessed egotists with overly inflated self-esteem. Ironically, the opposite is true. Across multiple studies, we have found that use of first person singular is associated with:

**Depression** (Rude, Gortner, & Pennebaker, 2004). When asked to write about coming to college, currently depressed students use more first person singular pronouns than either formerly depressed or never depressed students. In addition, formerly depressed students use more first person singular pronouns than never depressed students. In natural speech captured over several days of tape recordings, use of “I” is more frequent among those with high depression scores than those with low depression scores (Mehl, 2004). Interestingly, in both studies, use of pronouns is a better marker of depression than use of negative emotion words.

**Suicide proneness** (Stirman & Pennebaker, 2001). In the analysis of the poetry of suicidal versus nonsuicidal poets, poets who eventually committed suicide used first person singular pronouns at higher rates than those who did not commit suicide.

**Personal distress** (Pennebaker & Lay, 2002). Rudolph Guiliani was mayor of New York City from 1993-2001. He held press conferences multiple times per year answering a wide array of questions. In late spring, 2000, a series of events occurred to him within a month: He announced the breakup of his marriage, his affair with another woman was made public, he was diagnosed with prostate cancer, and he withdrew from the senate race against Hillary Clinton. Text analyses of his press conferences in the months surrounding his personal upheavals revealed that his use of first person singular pronouns increased from about 1% of his words to over 7%. Compare this elevated rate of first person singular pronouns during the time that one might say Guiliani’s QOL was pretty low, to the months that followed. His use of these pronouns dropped to a stable rate of about 4%, when it was reported that his outlook on life appeared to have changed and that he was warmer, contented, and more hu-
Reactions to 9/11 (Cohn, Mehl, & Pennebaker, 2004). In the last decade, millions of Americans have discovered online bulletin boards or weblogs (blogs). One such blog is LiveJournal.com. LiveJournal receives over 40,000 posts per hour from its 2-3 million active members. Working with LiveJournal, we downloaded the postings of over 1,000 people who wrote at relatively high rates in the two months before and after 9/11. Analyses of these 71,800 text files revealed startling changes in pronoun use over time. First, people dropped in their use of first person singular pronouns in the hours after the 9/11 attacks from a baseline of 7.1% to 5.9%. Within about a week, their usage was still significantly below baseline (6.7%) where it remained for the next two months of monitoring. Interestingly, a corresponding increase in first person plural pronouns occurred. That is, people switched from attending to themselves to focusing on friends, family, and others within their group.

Based on the above findings, what does the use of first person singular reflect? At its most basic level, the use of the word “I” suggests that the speaker is briefly paying attention to the self. Too much attention to the self is associated with highly negative emotional states such as depression. Interestingly, relatively healthy people facing the upheavals of 9/11 actually evidenced a drop in “I” words rather than an increase. Feeling sad is quite different from being depressed. To the degree that an emotional upheaval results in people feeling closer to others, it may actually be associated with higher quality of life. Indeed, in a study of Texas A&M students dealing with the tragic death of 12 fellow students, we discovered that the student body used elevated rates of “we” and reduced use of “I” in newspaper articles and letters. All indications are that the students were extremely saddened by the events. However, over the next six months, students went to the student health center for illnesses at much lower rates than they had the year before or in comparison with students at other universities at the time (Gortner & Pennebaker, 2003).

Belongingness and Other Pronouns
Whereas first person singular pronouns suggest attention on the self, most other pronouns implicitly or explicitly suggest that the person is attending to other individuals. Congruent with the social support literature, in general, the more that people make reference to others, the healthier they are. Findings concerning the use of non-first person singular pronouns suggest that their use is linked to:

Better adjustment after expressive writing (cf., Campbell &
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Using an alternative text analysis method based on latent semantic analysis, it was found that people who frequently used high rates of personal pronouns other than “I” when writing about emotional upheavals in their lives evidenced greater health improvements in the months after writing. More recently, we have reanalyzed three previous expressive writing studies and found a positive correlation between non-I pronoun use and subsequent health, $r = .29$, $p < .01$.

**Lower testosterone levels** (Pennebaker, Groom, Loew, & Dabbs, 2003). Two adults (one biological male and one biological female) who were taking testosterone therapy for different reasons provided us with one to two years of their daily text files – personal journal or outgoing e-mails – as well as a history of their testosterone injections. Overall, testosterone had the effect of suppressing their use of non-I pronouns. Contrary to culturally held beliefs about the subjective experience of energy and positive affect thought to be related to this hormone, no consistent mood or other linguistic correlates of testosterone emerged.

**Coping with shared upheavals.** Across every study we have conducted dealing with a cultural and/or community-wide upheaval, we have found elevated use of non-I personal pronouns. These studies include chat room discussions in the wake of Princess Diana’s death (Stone & Pennebaker, 2002), Livejournal blogs following the 9/11 attacks (Cohn, Fredrickson, Brown, et al., 2004), and newspaper accounts of the Texas A&M bonfire tragedy (Gortner & Pennebaker, 2003).

Linguistic and acoustic data from people who happened to be wearing an electronically activated recording device (called the EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001) during and immediately following the 9/11 attacks provided further support for the relation between non-I pronouns and belongingness (Mehl & Pennebaker, 2003). The elevated use of non-I personal pronouns after the 9/11 attacks occurred at the same time that people changed in their patterns of social interactions. Overall, there was a reduction in the amount of time that people spent in groups of three or more whereas a corresponding increase in dyadic interactions occurred. In other words, in the five to six days after the attacks, people spent more time at home with one other person rather than congregating in large or moderate-sized groups. Interestingly, the more that people deviated from this social profile, the less well-adjusted they appeared to be two weeks later. Non-I pronouns were used when people were reaching out to the closest person in their lives. This strongly suggests that the use of non-I pronouns is associated with belongingness and its salutary effects on mental health.
Cognitive Judgments and Other Function Words

Factor analyses of function words produce two reliable categories (Pennebaker & King, 1999; Biber, 1988). The first factor reflects psychological distancing or, its obverse, immediacy. Words that load highly on distancing include use of articles, prepositions, big words, and the non-use of present tense verbs and first person singular pronouns. The second factor, which is made up of certain prepositions and conjunctions, signals a cognitive style of making distinctions.

Distancing and articles (and nouns). The use of articles implies the use of concrete nouns. People who use a high rate of concrete impersonal nouns are individuals who naturally categorize objects and events. In general, males use articles at much higher rates than females. Non-depressed females use articles at higher rates than depressed females. Articles – and by extension, nouns – often signal a more structured or even rigid way of thinking. Indeed, by focusing on concrete objects or events during times of stress, individuals are able to distance themselves from negative emotional experience. The 9/11 data support this. In the wake of 9/11, there was a large and significant increase in article usage that lasted two to four weeks (from Cohn et al., 2004).

Article and noun usage may also be a central feature of Western European – as opposed to Asian – thinking. Peng and Nisbett (1999) argue that Western thought from the time of the early Greeks has been highly categorical. Eastern thinking and philosophy is less guided by categorization and more by movement and process. In our own work, we are finding that translations of Japanese newspapers, poems, and novels have significantly fewer articles and nouns than comparable American works (Chung & Pennebaker, 2005).

Making distinctions and exclusive words. Conjunctions, negations, and certain prepositions are used to make important distinctions about categories. A particularly interesting class of words is exclusive words. These include words like but, except, without, exclude. Factored analytically, these words typically load with negations (no, not, never). Taken together, these exclusive words suggest that the speaker is attempting to make a distinction between what is in a category and what is not in a category. Across multiple studies, we have found that the use of these exclusive words is associated with greater cognitive complexity.

Interestingly, we have found that the use of exclusive words is associated with telling the truth. Across multiple experiments where people have been induced to describe or explain something honestly or deceptively, the use of exclusive words (along with the use
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of first person singular pronouns) predicts honesty (Newman, Pennebaker, Berry, & Richards, 2003). As a side note, one could make the argument that lying indicates a low QOL for a variety of reasons. Depending on the frequency and pervasiveness of lying, it can be associated with physiological markers of distress. Similarly, self-deception or other deception can indicate a lack of acceptance of one’s true meaning or purpose in life. In all likelihood, when someone is making distinctions, they probably have a more complex worldview that is grounded in reality.

In studies on positive emotions outside of our own lab, the use of exclusive words has been shown to correlate with receiving social support \( r = .31, p<.01 \). Inclusive words (such as and, with) were correlated with giving more social support (Cohn, Mehl, et al., 2004). Related work from Cohn, Fredrickson, and Brown (2005) suggest that people made to think about the positive meaning of their daily experiences feel more connected to others and use more inclusive words, indicating that these people are thinking about groups and categories more inclusively.

Summary and Conclusions

Function words have been found to be related to several correlates of QOL. These findings hint that linguistic style measures may serve as proxies in the assessment of QOL interview texts. In this final section, a brief summary of a classroom correlational project will be described. These findings will then be extrapolated to the general text archive. Implications for future QOL research will follow.

QOL and Language Use with a College Sample

In our own research, we have had students in an Introductory Psychology course (n=419) write about their quality of life for 20 minutes as part of a class assignment. In addition, they completed a five-item Subjective Well-Being measure – the Satisfaction with Life Scale (Pavot & Diener, 1993). In addition to correlating the use of function words with the SWLS, we also examined people’s use of positive and negative emotion words.

As can be seen in Table 3, the more that people used non-I personal pronouns, prepositions, or positive emotions words, the higher their SWLS scores. The more that people used first personal singular pronouns, negations, or negative emotion words, the lower their SWLS scores. The overall model could significantly predict SWLS scores. These results provide convergent evidence for the relation between word use and QOL.
Table 3. Multiple Regression and Correlations Using Language to Predict Satisfaction with Life Scale (N=419)

<table>
<thead>
<tr>
<th></th>
<th>Examples</th>
<th>Simple r</th>
<th>Standardized Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>First person</td>
<td>I, me, my</td>
<td>-.11*</td>
<td>-.08</td>
</tr>
<tr>
<td>singular pronouns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All other</td>
<td>she, they, we</td>
<td>.09*</td>
<td>.06</td>
</tr>
<tr>
<td>personal pronouns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Articles</td>
<td>a, an, the</td>
<td>.03</td>
<td>-.06</td>
</tr>
<tr>
<td>Prepositions</td>
<td>except, of, with</td>
<td>.07*</td>
<td>-.07</td>
</tr>
<tr>
<td>Negations</td>
<td>never, nor, not</td>
<td>-.20*</td>
<td>-.15*</td>
</tr>
<tr>
<td>Positive emotion</td>
<td>grateful, hope,</td>
<td>.12*</td>
<td>.05</td>
</tr>
<tr>
<td>words</td>
<td>love</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative emotion</td>
<td>anger, lonely,</td>
<td>-.20*</td>
<td>-.17*</td>
</tr>
<tr>
<td>words</td>
<td>suffer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N=416. *p<.05; #p=.07. The overall model accounts for 7.3 percent of the variance (adjusted R-squared) and is highly significant, F(7, 411) = 5.59, p < .001.

**Implications for Future QOL Research**

Although we rely on them more than any other method, most QOL researchers know the limitations of self-reports. We also know that we can usually get a better sense of people’s lives by simply asking them open-ended questions about their quality of life. Indeed, most of us walk away with a much better and deeper understanding about research participants or clients in clinical practice when we talk to them and draw out their stories. The frustration of dealing with open-ended narratives, of course, is in agreeing on reliable coding strategies.

We do not claim to be experts in QOL. However, our research on computerized text analysis suggests some new ways to think about qualitative data. There is a great deal of information in analyzing the ways people talk about their lives beyond what they actually say. Analyses of the generally overlooked function words – pronouns, prepositions, articles, conjunctions, auxiliary verbs, as well as emotion words – provide a new way of thinking about open-ended responses. Our work has demonstrated that certain function words are reliably related to depression, self-esteem, feelings of isolation and togetherness, self- and other-deception, cognitive complexity, and even hormone levels. These same analyses suggest that word use is related to sex, age, social class, dominance, and a variety of personality dimensions.

Although we have not focused specifically on QOL – other than in a single Introductory Psychology class – there is promising evidence to suggest that language analyses may be of value in the QOL field. We encourage QOL researchers to begin to collect more open-ended questions from participants. The current technol-
Assessing QOL through Natural Language Use

ogy is pointing to the power of function words. However, the computerized linguistic field is expanding at an exponential rate. In the coming years, we will be able to analyze narratives in hundreds of ways that are not yet available. This is a new field with endless possibilities.

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