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Alexandra L. Bartell



**The Effect of Linguistic Explicitness and English Language Proficiency on the  
Credibility of Online Medical Information**

Alexandra L. Bartell

A dissertation,  
submitted in partial fulfillment of the  
requirements for the degree of

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Department of Human Centered Design & Engineering

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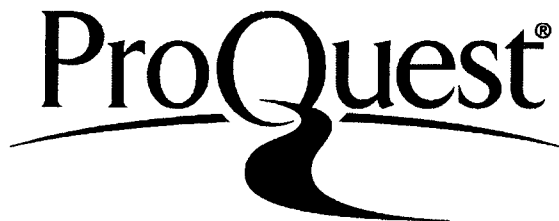
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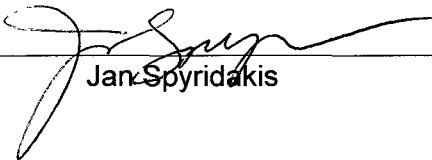
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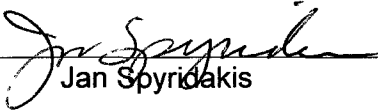
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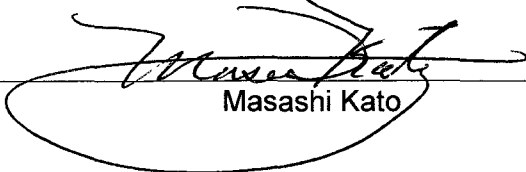
  
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**Abstract**

The Effect of Explicitness and English Language Proficiency on the  
Credibility of Online Medical Information

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Perceived credibility is important to consumers of online medical information because it frequently forms the basis for making treatment choices. While credibility is important to users around the globe, most medical Web sites have been designed primarily for audiences within specific cultural contexts. Many medical Web sites created by low-context Western institutions may lack the graphics or interactivity that users from high-context Eastern cultures expect, forcing these users to depend on the words of a site for meaning rather than the context of the communicative situation.

The Formality/Contextuality continuum model suggests that communicative situations with less context have a greater need for linguistic precision. Moreover, the preference for the level of explicitness has been shown to differ among nonnative users of a second language where those with less proficiency prefer more explicit communications and those with greater proficiency prefer more implicit communications.

This exploratory study analyzed the effect of linguistic explicitness in an experimental medical text on the credibility of 102 Japanese Internet users who had different levels of

English language proficiency. The participants were randomly assigned to one of two experimental conditions where they read a medical text with one of two levels of explicitness and then answered a survey designed to measure their credibility perceptions.

This study added to the theory and practical applications of credibility research by showing that style in the form of explicitness does affect the credibility judgments of online medical information for high-context readers. Participants found the explicit text significantly more credible than the implicit text; however, their English proficiency levels did not appear to affect their credibility perceptions. These results suggest that increasing the explicitness level by increasing the frequency of nouns, adjectives, prepositions, and articles may enrich the context of a text and fill in the communicative gap for nonnative English readers who come from high-context cultures, thus improving their credibility perceptions. More studies should be conducted with larger samples, different types of readers, and other communication media to ascertain how the credibility of online medical information can be enhanced by increasing the explicitness of texts and reducing extraneous cognitive load.

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## **Dedication**

To my beloved parents, who gave me everything and more...

and to

Earl, my love

Curtis, my miracle

Jan, my inspiration

## Chapter 1. Introduction

Wired consumers of the 21<sup>st</sup> century use the Internet in almost every facet of their lives to make online purchases, enjoy social networking opportunities, manage their finances, pursue degrees through distance education, and make important decisions based on the information they read. One of the areas where the web has become increasingly important to online consumers is the area of e-health; more and more people around the globe are turning to the Internet to seek advice on treatment options, research findings on medical diagnoses and treatments, solicit opinions about specific conditions from authoritative medical experts, and interact with people who have the same or similar conditions as themselves (Madden & Fox, 2006).

The Pew Internet and American Life Project (2010) estimates that 80% of Internet users have searched for health information on the Web. In the United States on an average day, more Americans seek health information on the Web than those who go to a health provider (Madden & Fox, 2006). The number of daily searches for online health information is now on par with other common online activities such as paying bills, blogging, or hunting for addresses or phone numbers (Fox, 2006). Many e-patients say the internet has had a significant impact on the way they care for themselves or for others.

Several factors likely contribute to the increase in online health information searches:

- Larger numbers of users (63%) now have high-speed, broadband Internet connections.
- More users now have six or more years of Internet experience (Fox, 2006).
- Information on the Internet is “free” and available 24 x 7.

- The often longer waiting times to get medical appointments and the pressure on many health professionals to push patients quickly through their appointments make alternate sources of medical information appealing.

Globally, the number of e-health consumers is astounding. In a 2003 study, Eysenbach and Kohler estimated that at least 6.75 million searches for health information were occurring every day worldwide. With the tremendous growth of Internet users over the last decade, those numbers are likely much larger today.

While the number of e-health consumers is increasing globally, cross-cultural research reveals similarities but also significant differences among health information seekers from different countries (Morahan-Martin, 2004). The differences range from the types of health Web sites accessed, searching patterns, and the frequency of searching for online health information, to the number of users who say the Web has a significant impact on how well they understand their health problems and the probability that they would buy prescription medication on the Web without consulting a doctor (Taylor & Leitman, 2002a; Taylor & Leitman, 2002b).

### Credibility of Online Medical Information

While online health searching behaviors may differ among cultures, one quality that is of interest to all cultures is the **perceived credibility** of online health information, an information factor that is especially important because people make treatment choices based on such perceptions. This is particularly relevant for people who have a vested interest in the information (for example, those who have a specific condition like cancer or heart disease or those who know a friend or relative with a medical condition).

Many factors have been found to affect the credibility of online medical information; however, no studies have looked at how language proficiency, communication styles, or a

combination of these two factors might affect credibility judgments for audiences from different cultures. Fogg (2003) contends that culture plays a part in credibility judgments; however, to date little research has identified what cultural factors play a role.

### The Influence of Socio-Cultural Contexts on Credibility

People from different cultures around the globe are accessing medical information from Web sites that have been designed primarily for audiences within a specific cultural context.<sup>1</sup> If the Internet can be viewed as a communication medium within varied social contexts, the importance of *meanings* and *messages* becomes as important as the accuracy of health information content (Cline & Haynes, 2001).

In fact, the way messages are framed has been shown to influence how people perceive risk information—for example, information that may point to a possible diagnosis of a serious illness—and the *style* of the message has been shown to affect people differently depending on their cognitive styles (Edwards et al., 2001). “Cognitive style” is a cognitive psychology concept that identifies the ways people process thoughts, perceptions, and memories as well as their inclinations for using these mechanisms to handle situations. Recent research indicates that cognitive processes are influenced and molded by cultural contexts (Nisbett & Miyamoto, 2005). This research suggests that people from different cultures may process information on the Internet differently depending upon their cultural background—even if they are using a common language to access the Internet.

While Web sites worldwide now include a large number of languages, globalization has contributed to the increased use of English as a common language<sup>2</sup> in international

---

<sup>1</sup> This study uses the Ruhnke et al., (2000) definition of culture as a “set of learned values, beliefs, customs, and behaviors that are shared by a group of interacting individuals.”

<sup>2</sup> The term “common language,” attributed to G. Poncini (2004), is used in this study rather than the more common term “lingua franca” because it refers to both native and nonnative speakers of a language. Lingua franca commonly refers only to nonnative speakers.

business, academia, and education (Crystal, 2003; House, 2002). In its estimates of the top ten languages used on the Internet, Internet World Stats lists English in the top position (2009).

Currently 53% of international students learn in English (Graddol, 2006). In fact, within the next 10 – 15 years, Graddol (2006) predicts that about 2 billion people will be learning English. In spite of this growing trend, research has shown that people using English as a common language still carry their cultural values when communicating in English (Meierkord, 2002), which means that language must somehow communicate medical information credibly to multicultural audiences. Given the global prevalence of online medical information and the use of the English language worldwide, it is possible that people from different cultures may perceive the credibility of English e-health Web sites differently depending on their culturally-mediated communication styles.

This study examines how the explicitness of a message and English language proficiency might affect nonnative English readers' credibility judgments of online medical information. The study's design is informed by prior research on the communication styles preferred by different cultures, the ways in which people process information to make credibility judgments, how cognitive load affects information processing, and how the explicitness level of a message might affect the comprehension and credibility of online medical information. The next sections review the relevant theories and prior research that inform this study, describe the methods, discuss the results and conclusions, and provide suggestions for future studies.

## Chapter 2. Literature Review

Researchers in intercultural communication have developed various theories and paradigms to explain the attitudinal and behavioral ways in which cultures differ from each other. The theoretical framework for this study was based on four theories that informed the research. The first theory is Edward T. Hall's high-context/low-context cultural dimensions of interaction, an extensively cited and tested theory about the ways in which different cultures prefer to communicate. Second, the Formality/Contextuality Continuum Model provides a way to understand, quantify, and analyze linguistic explicitness. Third, the Elaboration Likelihood Model (ELM) is a scaffold that can aid in understanding the levels of cognitive processes readers use to make credibility judgments about information and how those processes are affected by culturally-mediated communication styles. And last, Cognitive Load Theory provides a way to understand how the disorientation and multitasking demands of online environments can affect comprehension and perhaps influence the credibility of users with the added cognitive burdens required to process information in a second language.

### Cultural Dimensions of Communication

#### **High-Context/Low-context Theory**

Edward T. Hall, a well-known anthropologist, is widely considered to be the founder of intercultural communication theory. Perhaps Hall's most researched construct is his high-context/low-context continuum of cultural orientation that defines how people interact—one aspect being communication styles (1981). Communication styles in low-context cultures are generally explicit with the message embedded in the language of the communicator, whereas high-context communication is implicit and dependent on the

beliefs, body language, the use of silence, and the situational variables of the interlocutors (Gudykunst & Nishida, 1986; Hall, 1981; Infante, Rancer, & Womack, 1997; Keegan, 1989; Wurtz, 2006). Low-context communication, then, focuses on *what* is said and high-context communication focuses on *how* it is said (*italics added*) (Onkvisit & Shaw, 1993).<sup>3</sup>

The *how* factor of high-context communication, then, is dependent on the many nuances available with face-to-face communication. This type of communication is considered “rich” in the sense that multiple nonverbal channels such as tone and body language are used (Morand, 2003; Webster & Trevino, 1995). In contrast, electronic forms of communication are considered “lean” because face-to-face communicative modalities are absent and there is more reliance on language only (Morand, 2003). Social attributes such as power and social status are not easily conveyed in “lean” media that do not have visual or other nonverbal cues (Sproull & Kiesler, 1986).

### **Comparative Studies of Low-Context/High-Context Web Sites**

Not surprisingly, the growth of the internet has taken place mostly in low-context cultures (Wurtz, 2006). However, with the global spread of the Internet over the last decade, high-context cultures are designing Web sites that provide contextual information more in keeping with their particular communication styles. A cross-cultural comparison of high-context and low-context Web sites by Wurtz (2006) showed that the communication of visual information and the use of animations as a means of providing context were more

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<sup>3</sup> It is important to note that Hall's characterizations of culture are not without critics. One of the criticisms of his work lies with his concept of “culture,” which he presumes is identified with nation-states and which does not account for the heterogeneity of populations in some countries such as the United States, which has long been referred to as a “melting pot” of different ethnic groups (Ess & Sudweeks, 2006; Ferraro, 1990). While culture is arguably too complicated a concept to reduce into categorical dimensions, high- and low-context communication have been shown to exist in every culture and one or the other generally dominates (Gudykunst & Nishida, 1986). These constructs, therefore, provide a useful way to understand cultures from a high-level, “broad brush stroke” perspective.

prevalent on the Web sites of high-context cultures; Web sites of low-context cultures placed less emphasis on graphics and more emphasis on words.

While culturally-situated Web sites target a slice of the cultural pie, sites that hope to appeal to multicultural audiences must find ways to communicate their material in ways that multiple cultures find acceptable.

## Relationship of Explicitness to Communication Contexts

### **The Formality/Contextuality Continuum Model**

While Edward Hall's cultural constructs of communication can be used to understand the communication preferences of different cultures, they do not explain how the constraints of communication media that are slanted toward one culture or another might influence the credibility of online medical information. Medical Web sites created by low-context Western institutions may not contain the graphics or interactivity that users from high-context Eastern cultures expect. Thus, users from these cultures may be forced to depend on the words of a Web site for meaning rather than the context of the communicative situation. The syntax and semantics form the overall conceptual *style* that characterizes the message of the site.

There are various dimensions of style, which include:

- The use of figurative language
- Diction
- Tone
- The use of active versus passive voice
- The use of first, second, or third person

One aspect of style that figures prominently in cultural communication styles is *formality*. The concept of formality is widely used by disciplines such as ethnography and

linguistics but a universally-accepted definition does not exist. However, the literature points to three general categories of formality (Irvine, 2001) as shown in Table 1.

**Table 1. Types of Formality (Irvine, 2001)**

Category	Description	Example
Language	The properties of the language used for communication.	The degree of code structuring that involves elements such as syntax, intonational patterns, and linguistic organization.
Situational Context	The socio-cultural situation in which language is used. This kind of formality may be based on social hierarchies where distance and intimacy are predicated on social position.	Some languages have formal and informal ways of addressing others depending on whether the interlocutor is considered lower or higher in social status than the recipient. In French, for example, a young person would address an older person with the more formal “vous” rather than the more informal “tu.”
Genre	Technical descriptions with a high degree of explicitness and linguistic precision.	Scientific, government, and legal texts.

The “Language” category in Table 1 refers to the kind of *explicitness* that explains language-based communication as accurately as possible in order to reduce ambiguity and misunderstanding (Cummins & Swain, 1986). This type of formality is not to be confused with the kind of formality often associated with politeness, which can variously entail the use of “formal” or prescribed words for socio-cultural rituals, a show of respect or courtesy, or the saving of “face” in social situations that Brown and Levinson (1978) conceptualized in their theory of Politeness. This type of formality derives from the message content itself rather than the social situation in which the message was produced.

A theory that quantifies this kind of linguistic explicitness is the Formality/Contextuality continuum model developed by Heylighen and Dewaele (1999), which suggests that language explicitness inversely relates to implicitness. In other words, the lower the implicitness of a communicative situation, the more the need for linguistic precision. Conversely, when implicitness is high, there is less need for explicit language to disambiguate meaning.

This theoretical model has its roots in Edward T. Hall's low-context/high-context concept of situational variables in communication. However, while Hall's observations are based mostly on anecdotal observations and experiences, Heylighen and Dewaele (1999) have developed and tested an empirical measure of explicitness (the F-measure) that uses the following formula:

$$F = \frac{\textit{noun frequency} + \textit{adjective frequency} + \textit{preposition frequency} + \textit{article frequency} - \textit{pronoun frequency} - \textit{verb frequency} - \textit{adverb frequency} - \textit{interjection frequency} + 100}{2}$$

The frequencies in the Heylighen and Dewaele formula are the percentage of words from each of these categories in relation to the total number of words in a text. Subtracting the total frequencies of implicit words from the total frequencies of explicit words, and normalizing the sum to 100, yields an empirical measure of explicitness that ranges from 0 to 100%.

Research using this formula has shown that the higher the *F* score, the higher the level of explicitness (Dewaele, 2008; Heylighen & Dewaele, 2002). In an interesting juxtaposition, Heylighen and Dewaele (2002) applied their *F-measure* to Richard Hudson's (1994) categorization of word types in various communication genres (see Table 2<sup>4</sup>). Informational writing—the category most closely related to informational Web sites in general and health Web sites in particular—scored the highest in explicitness ( $F = 61$ ). While these data are obviously a generalization, the score can still be useful in establishing a reference framework or baseline with which to judge where text of online health Web sites might fall within the Formality/Contextuality Continuum Model.

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<sup>4</sup> Hudson's original categorizations (from which Table 2 is derived) includes three types of writing: informational writing, imaginative writing, and writing. It is assumed that the "writing" category must include other types of writing than imaginative or informational. Yet these categories do appear to have some overlap as they are listed.

**Table 2. Explicitness Scores for English-Language Communication Genres (Hudson, 1994)**

Communication Genre	Explicit (% of total)			Implicit (% of total)			Explicitness Score
	Nouns	Prepositions	Adjectives	Pronouns	Verbs	Adverbs	
Phone conversations	14	7	4	17	25	11	36
Conversations	15	8	4	16	24	11	38
Spontaneous Speeches	18	9	5	15	21	9	44
Interviews	18	11	6	13	21	10	46
Imaginative Writing	22	10	6	15	22	7	47
Prepared Speeches	21	11	5	11	19	8	50
Broadcasts	24	12	6	7	14	12	55
Writing	28	12	7	9	18	5	58
Informational Writing	30	13	8	7	17	5	61

The theoretical underpinning of the F (formality) formula is based on the categorization of words into two categories: explicit and implicit.<sup>5</sup> This categorization is based on the linguistics concept of *deixis* where some types of words need context in the form of other spatial, temporal, or communicative information for meaning (Heylighen & Dewaele, 1999). The explicit category includes nouns, adjectives, prepositions, and articles. These parts of speech are non-deitic words because they are relatively invariant and retain their meaning regardless of context; for example, words such as red, woman, or tree. (Heylighen & Dewaele, 1999, 2002). The implicit category, on the other hand, includes pronouns, verbs, adverbs, and interjections. These parts of speech are deitic words because they have variable meanings depending on their context (Heylighen & Dewaele, 1999, 2002). Levelt (1989, p. 45) grouped deitic words into three categories: spatial words that have to be connected to a specific place (e.g., outside, indoors), temporal words that must be attached to a specific time (e.g., after, before, intermittently), and communicative or discourse types of words (e.g., however, therefore). The discourse category includes anaphoric references; in other words, references to things that have happened previously. Conjunctions have not been shown to have any reference either to an implied context or to an explicit object, so they are not classified as deitic or non-deitic and are therefore, not displayed or counted in the *F*-formula (Heylighen & Dewaele, 2002).

To calculate deixis in the most precise way possible, an average degree of deixis would need to be assigned to all of the words in a language (Leckie-Tarry, 1995). However, this kind of calculation would be extremely time-consuming and complex and would have to be performed for every language (Heylighen & Dewaele, 1999). Heylighen and Dewaele's formula might seem very mechanistic in that parts of speech are forced into categories by definition and not by context. While both researchers acknowledge that their *F*-formula is

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<sup>5</sup> While Heylighen and Dewaele use the terms "formal" and "contextual," this study uses the terms "explicit" and "implicit" to distinguish linguistic formality from situational or social formality.

less precise than Leckie-Tarry's concept, it is more practical because it does not require the enormous investment in time and effort. Their main purpose in proposing this formula is to strike a balance between validity and practicality with two objectives

- The formula should not be difficult to apply to large bodies of data without needing particular rules for dealing with all the nuances and exceptions of a language or situation.
- The formula should be able to clearly differentiate explicit from implicit text in a general sense.

One of the main advantages of Heylighen and Dewaele's (1999) formula is that it is not dependent on language. Research over the last three decades suggests that the explicitness/implicitness dimension seems to be a universal characteristic that differentiates styles and genres in different languages (Dewaele, 1995; Dewaele, 1996; Heylighen & Dewaele, 2002). Heylighen and Dewaele's studies of *F* scores in English, French, Italian, and Dutch are supported by similar previous studies applied to Somali, Korean, and even Nukulaelae Tuvaluan—a rare language spoken on a tiny Polynesian island by only several hundred people (Besnier, 1988; Biber, 1988; Biber, Conrad, & Reppen, 1994; Bieber & Hared, 1992; Kim & Biber, 1995). Seven languages in four distinct language families have been empirically shown to share the explicitness/implicitness dimension conceptualized by Heylighen and Dewaele.

Interestingly, the preference for level of explicitness has been shown to differ among nonnative users of a second language: those with less language proficiency use explicit communications and those with greater language proficiency use more implicit communications (Dewaele, 2008). These preferences may be due to several factors. First, interlanguage<sup>6</sup> users with lower proficiency may gravitate toward more explicit forms of

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<sup>6</sup> Interlanguage refers to the linguistic system learners of a second language use to acquire the targeted norms of a second language (Davies, 1989; Dewaele, 2008; Palmberg, 1977; Tarone, 1983).

communication because their grasp of implicit styles is not yet routine. Second, these users may be afraid of misunderstanding a communication because of their lack of proficiency in the second language, thus preferring more explicit styles that disambiguate meaning (Dewaele, 2008).

It is already well-known that e-health consumers make treatment decisions based on the information they read online, so it is logical, then, to assume that such readers might make misinformed decisions with online medical information that they do not fully comprehend because the information is ambiguous (Keselman et al. 2008).

## Cognitive Processes Involved in Credibility Judgments

### **Elaboration Likelihood Model Theory**

Because the structure of explicit language is more complex, it demands a higher level of cognitive resources to process than language that is less explicit (Dewaele, 2008; Heylighen & Dewaele, 2002). This suggests that interlanguage users with lower levels of language proficiency may need to use a more conscious way of analyzing the *meaning* of medical information to make a judgment about its credibility.

A helpful framework to understand the cognitive processes that readers use to make credibility judgments about information is the Elaboration Likelihood Model (ELM) theory of persuasion originated by Petty and Cacioppo (1986), which states that readers use two kinds of cognitive processing for evaluating credibility. The first type is termed the central route, in which readers deliberately analyze the message of a text to judge its credibility. The second type is termed the peripheral route and involves the use of cues that are *extrinsic* to the reader. In the case of Web sites, such cues might include Web design features such as contact or source information.

A number of researchers have empirically tested ELM theory in the realm of online health information (Morahan-Martin, 2004). However, most of these studies have focused on peripheral processing rather than central route processing.

### **The Concept of Credibility**

Before delving into credibility research specific to online health information, it is useful to define what credibility means in the context of online environments. Credibility, as defined by Fogg and Seng (1999), is synonymous with “believability;,” that is, credible information is believable information. Fogg and Tseng further characterize their concept of credibility as:

- A quality that is perceived by individuals. In terms of Web sites, it is not a tangible part of a Web site such as the number of links or words on a page.
- A construct that comprises two components: expertise and trustworthiness.

Expertise refers to the users’ perception of the source’s knowledge or credentials; trustworthiness is the user’s assessment of the source’s truthfulness, good intentions, and objectivity.

Individuals generally use both of these components to make their ultimate credibility judgments (Fogg & Tseng, 1999).

While credibility and believability are synonymous terms, it is important to realize that the terms credibility and trust are not (Fogg & Tseng, 1999).<sup>7</sup> *Trust* suggests a perception of dependability or assurance about a process, object, or person (Rempel, Holmes, & Zanna, 1985; Rotter, 1980).

Fogg and Tseng (1999) suggest that credibility is important in human computer interactions when computer products function as sources of knowledge or help in making decisions—both of which apply to online health sites.

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<sup>7</sup> While this study uses the definition of credibility proposed by Fogg and Seng, other researchers use the terms “trust” and “credibility” interchangeably. The term “trust”—as used by other researchers—is assumed to refer to credibility in this study when it aligns with Fogg and Seng’s definition of credibility.

## Credibility Research for the World Wide Web

The Persuasive Technology Lab (PST) at Stanford University has conducted several large-scale studies about credibility on the Web.<sup>8</sup> In one study with 1,400 participants, they discovered that five elements increase the perception of credibility:

- Degree to which a site mimics the “real-world” nature of the organization it represents.
- Ease of use in terms of navigation and organization.
- Expertise as evidenced by the inclusion of citations, references, and author credentials.
- Trustworthiness by featuring site content policies and links to outside resources and materials.
- Customization and personalization of users’ experiences on the site.

Conversely, elements that damage credibility are commercial ads, source information not cited, the exclusion of the last modified date, poor design, and the lack of a seal of approval from a reputable third party (Fogg et al. 2001; Fogg et al. 2000; Madden & Fox, 2006). Poor design appears to be one of the strongest influences on credibility evaluations. In a study involving 2,684 participants, Fogg et al. (2003) discovered that almost half of them commented that the look-and-feel of a Web site influenced their credibility judgments of a site more than other factors.

While a significant amount of research has been conducted about credibility on the Web in general, researchers have discovered that credibility can also be “field-specific (Stanford et al. 2002). In other words, the user criteria for credibility may vary with different kinds of Web sites (e.g., health, commercial, finance). These differences in credibility criteria

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<sup>8</sup> The credibility studies conducted by Fogg et al. did not use real web sites to test their participants’ credibility ratings. Their research method consisted of questionnaires about variables that could affect credibility based on a compilation of user interviews and experts’ opinions.

make sense when one considers that a user's motivation and investment in credible online health information about a serious health challenge are likely very different than those involved in shopping online for a refrigerator.

### **Credibility Research for Online Health Web Sites**

To date, most research about credibility for online health Web sites has focused on variables that affect the peripheral processing route. In a study investigating whether the inclusion of contact information on health Web sites had an effect on credibility, Freeman and Spyridakis (2008) discovered that the presence of a "Contact Us" link was processed by most participants as a peripheral cue rather than one requiring central processing. Freeman and Spyridakis (2004) also discovered that participants visiting external links used the central processing route; the presence of a street address triggered both kinds of processing.

These studies and several others have identified several factors that appear to influence the degree to which users find a medical information Web site credible:

- Visual characteristics (i.e., the "look and feel") such as a site's layout, design, and absence of mistakes.
- The presence of recognized brand names or icons that indicate a "seal of approval" by a trusted authority.
- The perceived quality of information.
- The degree to which the information appears to be tailored to individual users (Sillence et al. 2007).

While researchers agree that these factors play a role in user trust, they disagree on the level of importance each of them plays in promoting trust (Sillence et al. 2007). Sillence et al. (2007) propose a model of trust that takes into account the various stages of trust that occur over time and the different types of cognitive processing strategies users employ to

assess the trustworthiness of a Web site. Other research studies have been conducted using a two-level model that suggests that users who are not motivated or who lack time fall back on heuristics or rules-of-thumb that involve minimal cognitive exertion, while those who are very motivated because of high risk or engagement use more purposeful and deeper cognitive processing (McAllister, 1995; Petty & Wegener, 1999; Sillence, Briggs, Harris, & Fishwick, 2007).

In fact, people with high motivation or involvement toward a message have been found to use this systematic processing strategy while people with low motivation employ less complicated heuristics (Chaiken, 1980). This kind of deliberate evaluation is suggestive of the central route processing proposed in ELM theory and makes sense in the case of online health sites where readers can be very vested in the information—particularly in situations involving serious or life-threatening medical conditions to either themselves or their loved ones.

In addition to motivation, several other perceptions and characteristics can affect readers' perceptions of credibility:

- The level of interest readers have in the text they are reading. Studies show that readers are better able to understand and remember information when the topic is interesting to them (Asher, 1980; Baldwin, Peleg-Bruckner, & McClintock, 1985; Isakson & Spyridakis, 1999; Stevens, 1980).
- Reader perception of a text's level of difficulty. The more difficult a text is perceived to be, the greater the cognitive load (Petros, Bentz, Hammes, & Zehr, 1990).
- Existing knowledge. Readers may assess the credibility of medical information with information they already possess about a topic (Fox & Rainie, 2002).
- Relevance on a personal level. Readers who have experienced their own health difficulties or who have loved ones with health troubles find information on these topics highly relevant (Fox & Fallows, 2003; Fox & Rainie, 2002).

Demographic variables have also been found to affect credibility perceptions:

- Age. Some research indicates that older people are less likely to judge online information as credible than younger people (Finberg, Stone, & Lynch, 2002; Johnson & Kaye, 1998).
- Experience using the Internet. Users with less Internet experience are less likely to find online information credible than users who have more experience (Flanagin & Metzger, 2000).

## Cognitive Load in Online Environments

### **Cognitive Load Theory**

In addition to understanding how cultures differ in their communication styles and patterns of interaction, it is also necessary to understand the cognitive processes readers use to make credibility judgments about information. Cognitive Load Theory provides a framework for understanding how the additional cognitive demands of online hypertext environments—combined with the extra processing effort required to read content in a second language—might affect how users perceive the credibility of e-health information.

The origin of Cognitive Load Theory has been attributed to George Miller (1956) who suggested that human working memory<sup>9</sup> is limited by the number of items an individual can process. The theory was further developed by John Sweller (1988) and others who characterized cognitive load as three distinct categories:

- **Intrinsic cognitive load (ICL)** - Cognitive load attributed to the inherent nature of the information (Pollack, Chandler, & Sweller, 2002).

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<sup>9</sup> Working memory is the supervisory function of short-term memory that manages the retrieval, processing, and removal of information. Working or short-term memory is also synonymous with immediate memory.

- **Extraneous cognitive load (ECL)** - Cognitive load caused by an ineffective design or presentation of the information rather than the nature of the information itself (Pollack, Chandler, & Sweller, 2002).
- **Germane cognitive load (GCL)** - Cognitive load that happens when short-term or working memory is freed up for more extensive schema building related to the tasks at hand (Sweller, Merrienboer, & Paas, 1998).

### **The Effects of Cognitive Load in Online Environments**

Cognitive Load Theory was originally developed as a framework for understanding the way learners solve problems. While the theory has typically been applied to classroom-type learning, readers who are searching for information about a medical condition online can also be considered to be learners because they are "reading to learn"<sup>10</sup> about symptoms, treatment options, and other relevant information (Bartell, Schultz, & Spyridakis, 2006). These readers are thus subject to the cognitive resource limitations posited in Cognitive Load Theory, especially the additional external cognitive load imposed by the competing demands of navigation and other interactive elements found in hypertext environments. These elements—which are absent in printed material—impose higher cognitive loads on readers' attention, recall, and comprehension.

In addition to the additional external cognitive load of hypertext environments, learners of a second language must also contend with intrinsic cognitive load—the nature and composition of the message itself. Pollack, Chandler, and Sweller (2002) discovered that the more complex the information, the higher the intrinsic cognitive load. They define complexity as *element interactivity*. An element is a piece of information that a learner can process as

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<sup>10</sup> Online readers who are searching informational web sites are generally "reading to do" or "reading to learn" (Sticht, 1985; Redish, 1989). Readers engaged in "reading to do" are gathering information in order to accomplish a task, for example, reading instructions on how to download a piece of software. Readers engaged in "reading to learn" are gathering information in order to comprehend it and store it for later use.

one item in short-term memory. The more elements that need to be processed at the same time, the higher the element interactivity and the higher the intrinsic cognitive load.

Pollok et al. (2002) use the learning of language as an example to illustrate the distinction between low and high interactivity. Learning new vocabulary words (each a single element) represents a low interactivity situation because they can be learned on their own without relation to other elements. Thus, learners experience low intrinsic cognitive load because short-term memory has to process only a few items at a time. On the other hand, information that requires a significant knowledge of syntax involves a high interactivity level because each element derives its meaning from its relationship to other elements within a specific context. In contrast to low interactivity situations, many elements must be processed at the same time which results in a higher intrinsic cognitive load.

To deal with situations that involve high intrinsic cognitive load, human cognitive infrastructures build schemata. Schemata are cognitive mechanisms that allow people to structure and organize information into knowledge for long-term storage and recall. This kind of conceptual structuring performs two important functions: it lessens the load on short-term memory by allowing the mind to tune out irrelevant information and it also enables the transfer of knowledge from one situation to others (Rumelhart, 1980; Thorndyke & Hayes-Roth, 1977).

One way of mitigating the effects of high element interactivity is by becoming an “expert” in a particular domain of knowledge. Becoming such an expert depends on the breadth of the accrued schemata and the amount of information that can be applied to average situations in a particular knowledge domain (Chi, Glasser, & Rees, 1982; Larkin, McDermott, Simon, & Simon, 1980; Sweller, Mawer, & Ward, 1983). This kind of expertise minimizes element interactivity by integrating the elements into an individual schema, which lessens the burden on short-term memory.

A group of people who are particularly sensitive to high element interactivity are individuals who are learning a second language (L2). With L2 learners who have not acquired the expertise of native readers (L1), language style is likely an important factor in the way that information is processed in a second language. If the material is written in a manner such that the message is ambiguous, the element interactivity of the message will probably be higher since multiple meanings have to be processed. Dewaele's (2008) research supports this concept by suggesting that L2 learners with lower levels of proficiency may not yet have acquired the automated schemata for language production and comprehension that more proficient L2 learners have. Thus, depending on their level of proficiency in a second language, L2 readers may experience more or less intrinsic cognitive load with material written in that second language.

While intrinsic cognitive load has previously been thought to be immutable, a recent study (Pollock, Chandler, & Sweller, 2002) showed that it can indeed be manipulated. Pollock et al. concluded that the intrinsic cognitive load of complex information can be mitigated by lowering element interactivity. In the case of L2 learners who have not developed the schemata necessary for proficiency, intrinsic cognitive load could theoretically be lowered by using a more explicit or unambiguous writing style that would decrease the level of element interactivity.

### Problem Summary

Perceived credibility is of special importance to consumers of online medical information because it frequently forms the basis for making treatment choices. While credibility is important to users of all cultures around the globe, most medical Web sites have been designed primarily for audiences within a specific cultural context. Many medical Web sites created by low-context Western institutions may not contain the graphics or

interactivity that users from high-context Eastern cultures expect. Thus, users from these cultures may be forced to depend on the words of a site for meaning rather than the context of the communicative situation.

The Formality/Contextuality continuum model suggests that communicative situations with less context have a greater need for linguistic precision, especially for readers from high-context cultures. Moreover, the preference for the level of explicitness has been shown to differ among nonnative users of a second language where those with less proficiency prefer more explicit communications and those with greater proficiency prefer more implicit communications. Because explicit language requires greater cognitive resources to process, it is likely that these readers would use the central processing route postulated in ELM theory to judge the credibility of online medical information. With the added cognitive burdens of navigating hypertext environments, readers may have even more difficulty interpreting medical content that is not explicit enough for them to make a credibility judgment.

### Research Question and Hypotheses

The interplay of these theories and the studies that support them as described in the literature review suggest the following research question: How does text explicitness and English language proficiency affect readers' credibility perceptions of online medical information?

To examine this question, the following three hypotheses were proposed:

- H1.** Participants will rate explicit text as more credible and implicit text as less credible.
- H2.** Participants with lower English language proficiency will rate the experimental texts as less credible and participants with higher

English language proficiency will rate the experimental texts as more credible.

- H3.** Participants with lower English language proficiency will rate the explicit text as more credible and participants with higher English language proficiency will rate the implicit text as more credible.

The hypotheses were formulated to examine whether explicitness alone or proficiency alone would affect credibility perceptions, or whether a combined interaction between the two variables would influence the readers' credibility ratings. The next section describes how these hypotheses were tested by describing the research design, the rationale for administering the study over the Internet, the study texts and how they were manipulated, the recruiting methods that were used, and how the data were collected and analyzed.

## Chapter 3. Methods and Materials

### Methods

#### Research Design

The experimental design consisted of a 2 x 3 factorial design with the independent variables being explicitness (explicit, implicit) and English language proficiency level (basic, independent, proficient). Table 3 illustrates the independent variables and their levels.

**Table 3. Independent Variables**

<b>English Language Proficiency</b>	<b>Explicitness</b>	
	<b>Explicit</b>	<b>Implicit</b>
Basic Reader	basic/explicit	basic/implicit
Independent Reader	independent/explicit	independent/implicit
Proficient Reader	proficient/explicit	proficient/implicit

The primary dependent variable was the credibility judgments of all the participants and the secondary dependent variables were interest, familiarity, engagement, preference, and perceived difficulty.

The English proficiency levels of the participants were assessed using their self-reported reading scores from the widely-used Test of English for International Communication (TOEIC).<sup>11</sup> While the Test of English as a Foreign Language (TOEFL) is also widely used, its focus is primarily on proficiency in academic environments. The TOEIC exam is used worldwide by corporate clients to test the common English abilities of people who work in international settings and thus has broader real-world applicability. TOEIC score

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<sup>11</sup> The TOEIC exam uses the term "user" in reference to writing, speaking, and reading measures. However, this study includes only reading measures; therefore, the participants are referred to as readers rather than users.

descriptors are described by the Educational Testing Service (ETS) as functional skills in "Can-Do" tables. Table 4 describes the "Can-Do" skills levels for reading comprehension.

**Table 4. TOEIC Reading Score Descriptors (Education Testing Service, 2007)**

Level	Strengths	Weaknesses
~ 450 points	<p><b>Test Takers who score around 450 typically have the following strengths:</b></p> <ul style="list-style-type: none"> <li>▪ They can infer the central idea and purpose of a written text, and they can make inferences about details.</li> <li>▪ They can read for meaning. They can understand factual information, even when it is paraphrased.</li> <li>▪ They can connect information across an entire text, and they can make connections between two related texts.</li> <li>▪ They can understand a broad range of vocabulary, unusual meanings of common words, and idiomatic usage. They can also make distinctions between the meanings of closely related words.</li> <li>▪ They can understand rule-based grammatical structures. They can also understand difficult, complex, and uncommon grammatical constructions.</li> </ul>	<p><b>Test takers who score around 450 typically have weaknesses only when the information tested is particularly dense or involves difficult vocabulary.</b></p>

*Continued on next page*

**Table 4. TOEIC Reading Score Descriptors (continued)**

Level	Strengths	Weaknesses
~ 350 points	<p><b>Test takers who score around 350 typically have the following strengths:</b></p> <ul style="list-style-type: none"> <li>▪ They can infer the central idea and purpose of a written text, and they can make inferences about details.</li> <li>▪ They can read for meaning. They can understand factual information, even when it's paraphrased.</li> <li>▪ They can connect information across a small area within a text, even when the vocabulary and grammar of the text are difficult.</li> <li>▪ They can understand medium-level vocabulary. They can sometimes understand difficult vocabulary in context, unusual meanings of common words, and idiomatic usage.</li> <li>▪ They can understand rule-based grammatical structures. They can also understand difficult, complex, and uncommon grammatical constructions.</li> </ul>	<p><b>Test takers who score around 350 typically have the following weaknesses:</b></p> <ul style="list-style-type: none"> <li>▪ They do not connect information across a wide area within a text.</li> <li>▪ They do not consistently understand difficult vocabulary, unusual meanings of common words, or idiomatic usage. They usually cannot make distinctions between the meanings of closely related words.</li> </ul>

*Continued on next page*

**Table 4. TOEIC Reading Score Descriptors (continued)**

Level	Strengths	Weaknesses
~ 250 points	<p><b>Test takers who score around 250 typically have the following strengths:</b></p> <ul style="list-style-type: none"> <li>▪ They can make simple inferences based on a limited amount of text.</li> <li>▪ They can locate the correct answer to a factual question when the language of the text matches the information that is required. They can sometimes answer a factual question when the answer is a simple paraphrase of the information in the text.</li> <li>▪ They can sometimes connect information within one or two sentences.</li> <li>▪ They can understand easy vocabulary, and they can sometimes understand medium-level vocabulary.</li> <li>▪ They can understand common, rule-based grammatical structures. They can make correct grammatical choices, even when other features of language, such as difficult vocabulary or the need to correct information, are present.</li> </ul>	<p><b>Test takers who score around 250 typically have the following weaknesses:</b></p> <ul style="list-style-type: none"> <li>▪ They do not understand inferences that require paraphrase or connecting information.</li> <li>▪ They have a very limited ability to understand factual information expressed as a paraphrase using difficult vocabulary. They often depend on finding words and phrases in the text that match the same words and phrases in the question.</li> <li>▪ They usually do not connect information beyond two sentences.</li> <li>▪ They do not understand difficult vocabulary, unusual meanings of common words, or idiomatic usage. They usually cannot make distinctions between the meanings of closely related words.</li> <li>▪ They do not understand more-difficult, complex, or uncommon grammatical constructions.</li> </ul>

*Continued on next page*

**Table 4. TOEIC Reading Score Descriptors (continued)**

Level	Strengths	Weaknesses
~ 150 points	<p><b>Test takers who score around 150 typically have the following strengths:</b></p> <ul style="list-style-type: none"> <li>▪ They can locate the correct answer to a factual question when not very much reading is necessary and when the language of the text matches the information that is required.</li> <li>▪ They can understand easy vocabulary and common phrases.</li> <li>▪ They can understand the most-common, rule-based grammatical constructions when not very much reading is necessary.</li> </ul>	<p><b>Test takers who score around 150 typically have the following weaknesses:</b></p> <ul style="list-style-type: none"> <li>▪ They cannot make inferences about information in written texts.</li> <li>▪ They do not understand paraphrased factual information. They rely on matching words and phrases in the text to answer questions.</li> <li>▪ They are often unable to connect information even within a single sentence.</li> <li>▪ They understand only a limited range of vocabulary.</li> <li>▪ They do not understand even easy grammatical constructions when other language features, such as difficult vocabulary or the need to connect information, are also required.</li> </ul>

SOURCE: TOEIC Reading Score Descriptors. (2007). In TOEIC\_LR\_Score\_Desc.pdf (Ed.): Educational Testing Service.

While the TOEIC descriptions provide a comprehensive description of what examinees are capable of doing within a certain range of scores, they do not categorize levels of proficiency, a step that is necessary to analyze data using these descriptions. Thus, for the data analysis purposes of this study, the reading proficiency categories that were used are derived from the Common European Framework of Reference for Languages (CEFR) mapped against the TOEIC "Can Do" functional proficiency descriptors. The TOEIC "Can Do" descriptors and their CEFR correlations are described in Table 5.

**Table 5. TOEIC Listening and Reading Score Descriptor Correlations with European CEFR Levels (Education Testing Service, 2008)**

<b>Total Minimum TOEIC Score (10 to 990 pts.).</b>	<b>European CEFR Levels</b>		<b>CEFR General Description</b>
945 pts.	<b>Proficient user - Effective Operational Proficiency</b>	<b>C1</b>	Can understand a wide range of demanding, longer texts, and recognize implicit meaning. Can express him/herself fluently and spontaneously without much obvious searching for expressions. Can use language flexibly and efficiently for social, academic, and professional purposes. Can produce clear, well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors, and cohesive devices.
785 pts.	<b>Independent user - Vantage</b>	<b>B2</b>	Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

*Continued on next page*

**Table 5. TOEIC Listening and Reading Score Descriptor Correlations with European CEFR Levels (continued)**

Total Minimum TOEIC Score (10 to 990 pts.).	European CEFR Levels		CEFR General Description
550 pts.	<b>Independent user - Threshold</b>	<b>B1</b>	Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst traveling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
225 pts.	<b>Basic user - Waystage</b>	<b>A2</b>	Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g., very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.

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**Table 5. TOEIC Listening and Reading Score Descriptor Correlations with European CEFR Levels (continued)**

Total Minimum TOEIC Score (10 to 990 pts.).	European CEFR Levels		CEFR General Description
120 pts.	<b>Basic user - Breakthrough</b>	<b>A1</b>	Can understand and use familiar and everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

SOURCE: Correlation Table, TOEIC Listening and Reading Scores Descriptors and European CEFR Levels. (2008). In TOEIC\_L\_R\_cando\_table.pdf (Ed.): Educational Testing Service

To further simplify data analysis and interpretation, the five European CEFR levels mapped against the TOEIC reading score descriptors were collapsed as shown in Table 6.

**Table 6. Collapsed CEFR/TOEIC Scores and Descriptors**

Original Descriptors and Scores...		Collapsed to...	
English Proficiency Level	Minimum Score	English Proficiency Level	Score Range
Basic User <sup>12</sup> - Breakthrough	120 pts.	Basic User	120 - 549 pts.
Basic User - Waystage	225 pts.		
Independent User - Threshold	550 pts.	Independent User	550 - 944 pts.
Independent User - Vantage	785 pts.		
Proficient User - Effective Operational Efficiency	945 pts.	Proficient User	945 - 990 pts.

Using Heylighen and Dewaele's *F-measure* (2002), the explicitness level of the experimental texts was varied by increasing or decreasing the frequencies of the parts of speech as described in Table 7.

**Table 7. Manual Variation of Explicitness Levels**

To Make the Text...	Increase Frequency of	Decrease Frequency of
More explicit	Nouns, adjectives, prepositions, articles	Pronouns, verbs, adverbs, interjections
More implicit	Pronouns, verbs, adverbs, interjections	Nouns, adjectives, prepositions, articles

The experimental texts consisted of text only, extracted from a medical information Web site in the public domain designed for e-health consumers. Graphics, videos, or other types of visual elements were not embedded in the texts so that they would not affect the

<sup>12</sup> The CEFR categorizes examinees as "users" in the same manner as the TOEIC. The term "user" is meant to encompass reading, speaking, and listening skill levels. However, this study included only reading measures; therefore, the participants are referred to as readers rather than users.

main variable being studied—the explicitness of the texts. However, the study involved reading in an online environment, so all of the elements that users engage with when browsing on the Web—such as clicking hyperlinks or scrolling—were either embedded in the texts or available through the participants' browser interfaces (see p. 47 for a description of the actions required by the participants to complete and navigate through the survey). It was assumed that, while minimal, the demands of the hypertext environment would have some impact on the extraneous cognitive load of the participants, but this effect was not measured in this study.

## Participants

Participants consisted of Japanese Internet users. The choice to use subjects from this cultural group is grounded on three premises. First, as discussed in the literature review, Asian and Western cultures have been shown to differ significantly in several communication variables and dimensions. Japan is near the top of the continuum for high-context cultures whereas the U.S. is near the bottom for low-context cultures (Hall, 1990).

Second, while Web pages, in general, have evolved from primarily text-based to rich multimedia displays that include interactivity, graphics, and animation (Wurtz, 2006), many medical Web sites still eschew visuals for text-only, low-context content. In addition, most of the well-known medical Web sites are hosted by U.S.-based institutions which means they are likely crafted by authors from low-context cultures. Much research exists about factors that influence the credibility of online medical information by users who come from low-context cultures; nothing exists about which factors might influence credibility for high-context users who visit low-context Web sites.

Third, a great deal of empirical research exists about the differences (Ess & Sudweeks, 2006) between American and Japanese culture. Along with Edward Hall, some

of the seminal and most prominent scholars of intercultural communication such as William B. Gudykunst, Clifford Clarke, and John C. Condon, have conducted the bulk of their research on Japanese/American cultural differences (Rogers et al. 2002). In fact, the number of studies about differences between Japanese and American communication styles surpasses those conducted between other cross-cultural pairs (Ito, 1992). This broad research base offers a solid empirical framework from which to compare the communication styles of high-context and low-context cultures.

### **Participant Requirements**

Participants in this study had to meet several requirements in order to participate.

Participants had to be:

- Japanese Individuals between the ages of 18 – 65.
- Comfortable with computers and the Internet.
- Japanese individuals with varying levels of ESL proficiency who had taken the Test of English for International Communication (TOEIC) within the past five years.

Participants were asked to submit their TOEIC score for reading.

### **Participant Recruiting**

Recruiting targeted people from similar demographic segments (e.g., computer users from both genders with similar levels of computer literacy and/or education). All participants were required to submit their TOEIC exam scores, but were assured that their scores would remain confidential.

Recruiting took place over a period of 8 months (June 2010 – March 2011) and occurred entirely over the Internet. Participants were solicited by a variety of means such as e-mails, hard copy fliers, and postings on Web sites. The bulk of the recruiting took place via popular social media sites such as Facebook, LinkedIn, and Mixi (the Japanese version of

Facebook). Both individual participants and relevant groups (such as Japanese student associations or English language programs) were targeted. Appendix A shows some sample recruitment materials.

Recruitment venues also included English language programs located at colleges and universities in the Puget Sound (Seattle) area and the rest of the United States. In addition, recruiting took place in higher education institutions in other countries where English is an official language, (i.e., England, Canada, New Zealand, and Australia).

In return for participation, participants were given the opportunity to win a lottery for gift certificates to Amazon.com or Amazon.co.jp.

### **Informed Consent**

This study fell under the Human Subjects Exempt Research category because participants read material that they could easily have been exposed to by mass media—whether by television, books, magazines, or other means. The risks entailed from participating in the study were no greater than if they had read these materials on their own. Nonetheless, each participant was briefed on privacy rights, any possible risks, and their rights—including the right not to participate or to drop out of the study at any time.

Participants' identities remained confidential throughout the study. However, participants were asked to submit their e-mail addresses at the completion of the survey questionnaire if they wished to participate in a raffle for the Amazon.com or Amazon.co.jp gift certificates.

### **Materials**

The materials for this study included:

- Several baseline medical texts used to establish a general explicitness level for medical web sites from Western institutions.

- One experimental text with two versions of explicitness (one explicit, the other less explicit).
- A survey to assess credibility judgments.
- A medical article unrelated to the experimental texts, as well as a subsequent test designed to assess the English language proficiency levels of participants.

The following sections provide further details about the materials.

### **Baseline Texts**

A preliminary analysis was conducted to determine the explicitness level of five reputable English-language medical Web sites from Western institutions to establish a baseline for explicitness levels.<sup>13</sup> Sample texts of approximately 200 words about Dengue Fever were scored by the researcher and another coder for their level of explicitness using Heylighen and Dewaele's (2002) *F-measure* (see Appendix B for the texts of the five articles).

In order to assess the explicitness scores for each article, the words in the texts had to be deconstructed into their parts of speech. Several methods were used as a form of triangulation to improve the accuracy of the deconstruction. In the first method, the researcher manually deconstructed the parts of speech with the aid of various grammar texts as well as the online version of the Merriam-Webster dictionary (<http://www.merriam-webster.com/>) because many words in the English language function as more than one part of speech, depending on context. In the second method, a PhD student who taught English writing skills at the college level deconstructed the parts of speech using a rubric supplied by the researcher (see Appendix C for the scoring instructions and guidelines, and Appendix D for the manually deconstructed baseline texts).

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<sup>13</sup> SOURCE: CAPHIS: Consumer and Patient Health Information Section of the Medical Library Association (<http://caphis.mlanet.org/consumer/top100all.pdf>).

In the third method, the texts were parsed by the online Infogistics Natural Language Processor (NLP) at <http://www.infogistics.com/posdemo.htm>. Natural language processors used for parts-of-speech tagging use algorithms derived from linguistics, statistics and computer sciences to determine which part of speech a word belongs to. This particular parser uses the modified Penn Treebank set to define the parts of speech used in corpus linguistics (see Appendix E). As such, each part of speech category is broken down into the various forms it may take depending on its context. For example, verbs are broken down as follows:

- VB – Verb, base form
- VBD – Verb, past tense
- VBG – Verb, gerund or present participle
- VBN – Verb, past participle
- VBP – Verb, non-third person singular present
- VBZ – Verb, third person singular present
- MD – Modal auxiliary (helping verb)

(See Appendix F for the baseline texts parsed by the Infogistics Natural Language Processor.)

Because Heylighen and Dewaele's *F-measure* does not differentiate the different forms a part of speech may assume, the Modified Penn Treebank tags were grouped to conform with the parts of speech in their formula as shown in Table 8. For example, all the Modified Penn Treebank tags associated with verb forms (i.e., VB, VBD, VBG, VBN, VBP, VBZ, MD) were rated as verbs, all the tags associated with noun forms (i.e., NN, NNS, NNP, NNPS, POS) were rated as nouns, and so forth.

**Table 8. Parts of Speech Groupings with Modified Penn Treebank Tagset (Infogistics, 2001)**

<b>Penn TreebankTag</b>	<b>Description</b>	<b>Examples</b>	<b>Grouped as...</b>
<i>VB</i>	Verb, base form	Tell, run, shout, bend, talk	Verb
<i>VBD</i>	Verb, past tense	Talked, ran, looked, swam	
<i>VBG</i>	Verb, gerund or present participle	Moving, reading, talking	
<i>VBN</i>	Verb, past participle	Moved, grouped, practiced	
<i>VBP</i>	Verb, non-third person singular present	Shine, drop, cut	
<i>VBZ</i>	Verb, third person singular present	Turns, repairs, reads	
<i>MD</i>	Modal auxiliary (helping verb)	Can, should, might	
<i>NN</i>	Noun, singular or mass	Apple, car, house	Noun
<i>NNS</i>	Noun, plural	Colleges, houses, roads	
<i>NNP</i>	Proper noun, singular	Peter, Africa, Atlanta	
<i>NNPS</i>	Proper noun, plural	Indians, Americans, Smiths	
<i>POS</i>	Noun, possessive ending	Rabbit's, boy's, ball's	
<i>JJ</i>	Adjective	Black, third, dark	Adjective
<i>JJR</i>	Adjective, comparative	Wilder, smoother, creamier	
<i>JJS</i>	Adjective, superlative	Finest, boldest, darkest	
<i>WDT</i>	Wh-determiner	That, what, which	
<i>CD</i>	Cardinal number	2, 1992, three	
<i>PDT</i>	Predeterminer (elements that precede an article or possessive noun)	All, many, this	

*Continued on next page*

**Table 8. Parts of Speech Groupings with Penn Treebank Tags (continued)**

<b>Penn TreebankTag</b>	<b>Description</b>	<b>Examples</b>	<b>Grouped as...</b>
EX	Existential <i>there</i>	There	Pronoun
PRP	Personal pronoun	Her, him, them	
PRPS	Possessive pronoun	Mine, theirs, hers	
WP	Wh-pronoun	That, which, what	
WP\$	Possessive wh-pronoun	Whose	
RB	Adverb	Quickly, broadly, unflinchingly	Adverb
RBR	Adverb, comparative	Fatter, lesser, greater	
RBS	Adverb, superlative	Fattest, biggest, most	
WRB	Wh-adverb	However, therefore, why	
IN	Preposition or coordinating conjunction	Below, above, between	Preposition
TO	<i>To</i> as preposition or infinitive	To	
RP	Particle (one-syllable words that are either directional adverbs or prepositions)	Whole, just, per	
DT	Determiner	All, another, some	Article

The same scoring guidelines used by the first and second coders were applied to the NLP parsed texts. In addition, the NLP texts were normalized as follows:

- Compound nouns such as geographical areas (e.g., United States) that were considered several units by the parser were considered as one unit in the normalized scores.
- As in the manually-coded versions, acronyms following a spelled-out term were not counted; however, acronyms standing on their own were scored.
- Punctuation and symbols used for bulleted list items (SYM tag) were not scored since these elements are not part of the Heylighen-Dewaele explicitness formula.
- Verb phrases with two or more verbal elements such as a helping (auxiliary) verb followed by gerund or present participle (e.g., is helping) were scored as one unit.
- Foreign words were not scored.
- Cardinal numbers, expressed in numeric form or spelled out, were treated as adjectives or nouns, depending on their context.

A comparison of the *F-measures* for the three instances of coding in Table 9 shows that the *F* scores among the two coders and NLP parser were quite close.

**Table 9. Score Comparison for Preliminary Analysis**

<b>Dengue Article Web Sites</b>	<b>Coding Comparison</b>		
	<b>Coder 1*</b>	<b>Coder 2**</b>	<b>Infogistics NLP</b>
Mayo Clinic	78	80.7	79
Web M.D.	83.9	82.5	81.7
NIH	77.6	71.3	76.2
Virtual Hospital	83.4	77.5	79.6
Wrong Diagnosis	79.4	73.7	71.6

\*Coder 1 – Researcher

\*\*Coder 2 – Second Coder

The explicitness score of 61 that Heylighen and Dewaele attributed to "informational writing" was used as a benchmark. Sites that scored higher than this benchmark were considered more explicit; those that scored lower were considered less explicit.

### **Experimental Texts**

The experimental texts consisted of two versions of an article (1,074 words) about Dengue Fever with two levels of explicitness (see Appendix G for the two texts). In the interest of better assessing the ecological validity of real-life medical Web sites, the text was drawn from the Centers for Disease Control Web site (<http://www.cdc.gov>).<sup>14</sup> The material consisted of text only; other elements that have been found to affect credibility were minimized or excluded. In other words, graphics, design elements such as banners or logos, source information such as the name of the article's author(s) or the sponsoring institution, and temporal information such as the last revised date were excluded.

Using the same deconstruction method that was used for the baseline articles, a preliminary assessment of the experimental article by the researcher revealed an explicitness measure of approximately 75 categorizing it as a very explicit text in the

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<sup>14</sup> The CDC website is in the public domain; thus, the use of its material would not be considered copyright infringement.

framework of Heylighen and Dewaele’s explicitness continuum. The researcher corroborated the deconstruction with a professor who had 30 years of experience in teaching grammar with a resulting explicitness score of 78.9 (see Appendix H for the manual deconstruction of the two experimental texts).

The researcher then manipulated the explicitness of the article to make it more implicit, i.e., *less explicit, by substituting pronouns for nouns; reducing the numbers of articles, prepositions, and adjectives; and converting adjectives to adverbs wherever possible (for example converting the word “unintended” [adjective] into “unintentionally” [adverb])*. The manipulations were conducted in such a way that the basic meaning of the original text remained basically intact.

In sentence groups where nouns referring to people or animals were used multiple times, the referent (noun) was stated at the beginning of the chain. When the referent changed (e.g., from “Dengue” to “mosquito” or “virus”), the new noun referent was used. Thereafter, pronouns were used until the referent changed again. The intent was to make the text less explicit but comprehensible.

The more implicit text had a word count of 613. While it would seem that the implicit version would likely be less explicit than the formal version simply because it contained 461 fewer words, it is the overall *F* (explicitness) score based on the frequency of the parts of speech that make the text more or less explicit. Table 10 shows the frequencies calculated for each part of speech category for both the explicit and implicit versions of the article.

**Table 10. Parts of Speech Frequencies**

<b>Text</b>	<b>Noun</b>	<b>Adj</b>	<b>Prep</b>	<b>Art</b>	<b>Pro</b>	<b>Verb</b>	<b>Adv</b>	<b>Int</b>
Implicit	34.7	10.8	6.8	3.6	11.0	21.5	11.6	n/a
Explicit	33.7	20.7	14.8	9.7	3.5	10.9	6.7	n/a

The implicit version shows a higher frequency of pronouns, verbs, and adverbs and a lower frequency adjectives, prepositions and articles<sup>15</sup>, which makes it fall in the less explicit end of the explicitness continuum. Conversely, the explicit version shows a higher frequency of nouns, adjectives, prepositions, and articles, and a lower frequency of pronouns, verbs, and adverbs, which makes it fall in the more explicit end of the formality continuum.

As with the baseline articles, the Infogistics Natural Language Processor was used to parse the parts of speech in both experimental texts (see Appendix I for the experimental texts parsed by the Infogistics Natural Language Processor). Table 11 shows that the explicitness scores of the NLP were fairly close to those of the human coders.

**Table 11. Experimental Text Coding Comparisons**

Experimental Texts	Coding Comparisons	
	Manual	Infogistics NLP
Explicit Text	78.9	80.35
Implicit Text	55.9	59.1

### **Survey Content and Delivery**

The study was administered and delivered by a Web-based survey that measured the credibility judgments, interest, familiarity, engagement, preference, and perceived difficulty for the two experimental conditions. The survey also asked about participant demographics such as age, gender, education, and computer/Internet literacy (see Appendix J for the survey questionnaires). The survey was designed and delivered to the participants using the University of Washington's Catalyst tool (see Appendix K for the survey delivery in Catalyst).

A pilot test was conducted before the experiment began in order to identify any problems with the survey questions or the Web-based survey tool (Catalyst). College-level

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<sup>15</sup> The frequency of nouns in Table 10 is slightly higher for the implicit rather than the explicit texts. However, the frequencies for all the other parts of speech add up to an overall explicitness score of 78.9 for the explicit experimental text and 55.9 for the implicit experimental text.

Japanese students from ESL programs around the Puget Sound area were recruited to participate in the pilot test. Based on their input, the survey was further refined and clarified.

### **Survey Procedures**

Participants were provided with a URL to whichever version of the experimental text (explicit or implicit) they were assigned. Once they reached the study's home page, they used the following procedure for completing and navigating through the survey (see Appendix K for screen captures of all study screens in the Catalyst Web tool):

1. Participants were taken to the initial welcome screen where they read general information about the study and were informed about the approximate length of time it would take to participate in the study as well as the chance to enter a raffle to win an Amazon.com gift certificate at the completion of the survey. Participants were assured of the confidentiality of their responses and provided an informed consent statement that stated they were agreeing to participate in the study by clicking the "Next" link at the bottom of the page.
2. After clicking the "Next" link on the welcome screen, participants were taken to the page containing instructions for completing the survey.
3. Clicking the "Next" link on the instruction screen took participants to the demographic survey where they made response choices by clicking radio buttons or entering text into free-form text fields.
4. The "Next" link on the demographic survey screen took participants to a screen with instructions for reading the experimental text.
5. Clicking the "Next" link then took them to the screen with the experimental text.
6. After reading the experimental text, the participants clicked "Next" to go to the credibility questionnaire where they made response choices by clicking radio buttons or clicking options from pull-down menus.

7. After completing the credibility questionnaire, participants clicked the “Next” link to go to a screen describing the comprehension article and questionnaire.
8. Clicking the “Next” link took participants to the comprehension text (the topic was rheumatoid arthritis).
9. After reading the comprehension article, participants clicked the “Next” link to go to the screen with the follow-on questionnaire which they completed by clicking their response choices via radio buttons.
10. Following completion of the comprehension article questionnaire, participants were taken to the final screen where they were thanked for their participation, reminded that their responses would remain confidential, and invited to submit their e-mail address via a text-form field if they wanted to participate in the Amazon.com raffle for gift certificates.

While a “Next” link was provided on each screen of the study, “Previous” links were not provided in order to discourage participants from referring back to the articles they read. Participants were also asked several times throughout the study not to return to the articles after they completed the subsequent questionnaires.

### **Comprehension Article and Test**

Because participants were required to submit their TOEIC reading scores, a verification measure consisting of a Web-based text unrelated to the experimental texts about the causes, symptoms, and treatment of Rheumatoid Arthritis, followed by 5 – 8 multiple-choice reading comprehension questions (see Appendix L for the text of the comprehension article and test questions) was included in the survey. This additional verification mechanism was included to ensure that their self-reported scores reflected their actual reading proficiency.

## Rationale for Remote-Based Administration and Delivery

The experimental conditions and surveys were delivered remotely via the World Wide Web rather than in a face-to-face lab situation or by regular postal mail. There are many documented advantages to conducting research in this manner; some of the most important include:

- The likelihood that users in naturally-occurring environments such as their homes or offices, at their own leisure, and with varying kinds of equipment, will exhibit more real-world behavior than they would in the controlled setting of a lab, thus enhancing external or ecological validity (Gosling, Vazire, Srivastava, & John, 2004; Laugwitz, 2001; Reips, 2002; Reips, 1997; Spyridakis, Wei, Barrick, Cuddihy, & Maust, 2005). Recent research shows that most online health seekers (80%) look for information from home (Madden & Fox, 2006).
- The potential to reach participants around the globe through the Internet quickly and easily (Buchanan & Smith, 1999; Dillman, 2000; Evans & Mathur, 2005; Gosling et al. 2004; Nosek, Banaji, & Greenwald, 2002; Schmidt, 1997).
- The low cost entailed in creating, publishing, and disseminating Web surveys (Dillman, 2000; Kraut et al. 2004; Llieva, Baron, & Healey, 2002; Wright, 2006). Because this study used the University of Washington's Catalyst survey tool, the survey did not cost anything. Moreover, this kind of electronic surveying eliminated travel costs for the researcher as well as the material costs (i.e., paper, postage, printing) associated with using conventional in-lab or mailed surveys.
- The possibility of increasing statistical power and effect sizes with a potentially large pool of participants (Birnbaum, 2004; Evans, 2005).

- The elimination of manual coding errors because Web-based surveys automate the process of data collection and enable easy data export to statistical packages such as SPSS (Kraut et al. 2004; Umbach, 2004; Wright, 2006; Zhang, 2000).
- The greater anonymity afforded to respondents (as opposed to face-to-face testing), which can reduce the discomfort associated with answering socially or emotionally sensitive questions, (Pealer, Weiler, Pigg, Miller, & Dorman, 2001).
- The reduction of demand and experimenter characteristics such as the Hawthorne Effect (Llieva, Baron, & Healey, 2002; Reips, 2002).

It should also be noted that broad empirical evidence shows that the results obtained from Web-based surveys are comparable to those obtained from traditional paper-based surveys (Benet-Martinez & John, 1998; Buchanan & Smith, 1999; Foster, Campbell & Twenge, 2003; Gosling et al., 2004; Johnson, 2000; McGraw, Tew, & Williams, 2000; Yun & Trumbo, 2000).

While the advantages of Internet-based research are many as described above, disadvantages have been documented as well. These issues should be addressed by any researcher considering remote-based research.

This study attempted to mitigate the risks and possible problem areas inherent in Web-based research by using the best practices and design principles for Web-based surveys documented by various well-known scholars and researchers (Couper, 2000; Dillman; 2000; Dillman & Bowker, 2001; Dillman, Tortora, & Bowker, 1998; Kraut et al., 2004; Spyridakis, Wei, Barrick, Cuddihy & Maust, 2005; Umbach, 2004). These techniques address problems with coverage, nonresponse, or measurement errors, and the potential for drop-out. These errors, problems, and issues are defined as follows:

- **Coverage error** –Coverage error can occur when the sample studied is dissimilar from the target population (the larger group from which inferences are made).

- **Measurement error** – Measurement error can occur when survey responses are not accurate because the questions are not understood in the way they were intended because of poor wording, structure, or the modality of the survey instrument itself (i.e., paper versus online).
- **Nonresponse error** – Nonresponse error can be introduced when survey participants are dissimilar from people in a sample frame who did not respond for reasons that may include the inability to access the survey instrument, lack of time, computer illiteracy, and so forth.
- **Drop-out** – Survey participants may drop out of an online study for some of the following reasons:
  - Questions are too personal or sensitive.
  - The wording of the questions is unclear or confusing.
  - The survey does not provide enough motivation or incentive to complete it.
  - The survey is too long.
  - The online navigation is cumbersome.
- **Ethical issues** can occur when participants' privacy is at stake and when informed consent is lacking or inadequate.

Table 12 describes the specific risk mitigation techniques adapted for this study from the research of the scholars and researchers cited.

**Table 12. Risk Mitigation Strategy for Web-Based Participant Survey (Adapted from Umbach, 2004)**

Design Principle/Best Practice	Error/Problem Type**						Risk Mitigation
	C	M	N	D	R	E	
Format web-based surveys to be similar to those of paper-based surveys.		X	X				Most of the survey responses used structure and formatting similar to those used on paper surveys such as radio buttons, checkboxes, and free-form text fields.
Motivate the participants by using the Welcome screen to encourage them to complete the survey and tell them how to proceed to the next section.			X	X			The Welcome screen thanked the respondents for their participation and stated how their responses would aid the research effort. Participants were invited to enter a drawing for three Amazon.com gift certificates after they completed their survey responses. Clear instructions were given on how to proceed with the study.
Restrict the time to complete online surveys (no more than 20 minutes long).				X			The survey was timed by pilot participants and averaged 20 minutes total (the timing included reading the instructions, the experimental texts, and answering the survey questions).

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- C – Coverage
- M – Measurement
- N – Nonresponse
- D – Drop-out
- R – Reliability
- E – Ethics

**Table 12. Risk Mitigation Strategy for Web-Based Participant Survey (continued)**

Design Principle/Best Practice	Error/Problem Type						Risk Mitigation
	C	M	N	D	R	E	
Divide long surveys into sections.	X	X	X				The survey was divided up into 10 sections. Instructions, experimental texts, and survey questions were not combined on any screen.
Ensure that survey navigation and instructions for completing the survey are unambiguous and straightforward.	X	X					Participants were given simple instructions about what they would do and in what order. They were instructed to click the "Next" link at the end of each section to proceed to the next section of the study. Participants were also told to maximize their browser windows for better viewing of the study Web pages, not to open multiple windows or tabs for the study site, and not to return to the experimental texts after completing the surveys following them.
Use the principles of good survey question structure and wording.		X	X	X			The researcher used Dillman's (2000) criteria and guidelines for writing, structuring, and formatting effective survey questions.
Minimize the use of drop-down menus because they require more effort.				X			Only one question with drop-down menus was used.
Restrict the use of color for grouping or decorative purposes.				X			The survey and experimental texts were formatted entirely in black and white in order to enhance readability, avoid accessibility issues, provide adequate figure-ground contrast, and facilitate navigation.

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**Table 12. Risk Mitigation Strategy for Web-Based Participant Survey (continued)**

Design Principle/Best Practice	Error/Problem Type						Risk Mitigation
	C	M	N	D	R	E	
Clearly inform participants about the confidentiality of their responses.						X	Respondents were informed on the Welcome screen that their names would not be associated with any of the study's data.
Make sure to include some mechanism up front for informed consent.						X	The Welcome screen informed participants about the risks by stating that participation in the study should cause them no more discomfort than reading other information on the Web and answering questions about it. In lieu of a physical signature, participants were informed that they were agreeing to participate in the study by the following statement: "By clicking on the 'Next' link, you are agreeing to participate in this study and are affirming that you are at least 18 years old." Participants were invited to print a copy of the consent form for their records.
Use the "high-hurdle" technique to reduce drop-out. The high-hurdle technique places items that could negatively impact motivation (such as demographic information) early in the study to encourage those who will drop out to do so before beginning the experimental portion of the survey.				X			Demographic questions were placed immediately after the survey instructions at the beginning of the survey.

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**Table 12. Risk Mitigation Strategy for Web-Based Participant Survey (continued)**

Design Principle/Best Practice	Error/Problem Type						Risk Mitigation
	C	M	N	D	R	E	
Use the “seriousness check” technique to reduce drop-out. The seriousness check involves asking participants early on for a degree of seriousness about their participation.				X			Participants were informed on the Welcome screen that their responses would be used help develop guidelines that improve English-language medical Web sites for nonnative English speakers.
Test online surveys on different computer systems to ensure that there are no differences in visual appearances due to different screen sizes, Internet browsers, and operating systems.	X	X	X				The survey was tested on three major internet browsers: Internet Explorer, Safari, and Firefox. It was also tested on mobile devices.
Do not force participants to answer each question before going to the next one.				X			The answering of all survey questions was optional for participants.
Minimize the use of open-ended questions and check-all-that-apply types of questions.		X					Only five questions were open-ended and only one question was a check-all-that-apply type.
Use techniques to discourage multiple submissions. While multiple participations have been found to be less than 3% in most studies, the consensus is that they do not significantly affect the reliability of Web-based studies. (Krantz & Dalal, 2000; Musch & Reips, 2000; Reips, 1997).					X		While incentives in the form of a raffle were used to enhance the motivation for participation, the financial value of the prizes was kept intentionally low to dissuade participants from entering multiple times.

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**Table 12. Risk Mitigation Strategy for Web-Based Participant Survey (continued)**

Design Principle/Best Practice	Error/Problem Type						Risk Mitigation
	C	M	N	D	R	E	
Use consistency and validation techniques to ensure that participants are who they say they are.					X		Various questions were placed throughout the study to ensure that participants were providing truthful information about themselves. For example, if participants rated themselves as having a very high level of English reading ability, but their reported TOEIC score was in the novice range, their responses were excluded from the data analysis.
Conduct a pretest of the online survey materials to collect feedback about problematic questions, misunderstandings, and confusing instructions.		X					The study's pilot test uncovered several areas of confusing wording and response formatting that were corrected in the final study.
Use a software application designed to create and administer Web-based surveys.					X	X	The University of Washington's Catalyst WebQ survey tool was used to create and deliver the study materials. This application maintains the confidentiality of participants, automates data collection, provides multiple question and answer formats, and records drop-out rates.
Use the multiple site entry technique to ensure that the frame sample is representative of the target population.	X						Participants were recruited from a variety of venues that included social media sites such as Facebook groups, LinkedIn, Mixi (the Japanese equivalent of Facebook), e-mails to professors teaching English as a second language, flyers for posting within relevant companies, list serves, and Japan Student Clubs.

## Readability Statistics

Readability statistics were collected for all of the texts used in this study to ascertain the level of reading difficulty because this factor, in addition to the *style* of a text, has been shown to affect the comprehension of online medical information (see Table 13). A synthesis of reading levels for medical articles on the Web implies that their reading levels are often too high (Eysenbach, 2002; Keselman et al., 2008). Researchers have suggested that health material should be geared toward the fifth- or sixth-grade reading levels instead of the 10<sup>th</sup>-grade level or above which is fairly common (McCray, 2005)—and these levels are geared toward American native English speakers, not those for whom English is a second language.

## Data Collection and Analysis

Recruiting and data collection took place over a period of eight months. The data were collected by the University of Washington's Catalyst survey tool and exported to the IBM PASW Statistics 18 package (formerly SPSS) for analysis on a Dell Latitude E6400 laptop computer.

**Table 13. Readability Statistics for Study Texts**

<b>Readability Statistics</b>		<b>Mayo</b>	<b>WebMD</b>	<b>NIH</b>	<b>Virt Hosp</b>	<b>Wrong Diag</b>	<b>Explicit</b>	<b>Contextual</b>	<b>Comp</b>
<b>Counts</b>	Words	241	243	238	251	251	1279	767	679
	Characters	1168	1227	1220	1259	1273	6801	4365	3448
	Paragraphs	11	21	11	14	5	34	37	12
	Sentences	11	9	11	12	14	51	52	38
<b>Averages</b>	Sentences per Paragraph	2.2	3.0	2.7	2.4	2.8	3.4	3.7	3.8
	Words per Sentence	16.5	15.2	18.0	18.0	17.9	22.4	13.0	17.7
	Characters per Word	4.8	4.9	5.0	4.9	4.9	5.1	5.5	4.9
<b>Readability</b>	Passive Sentences	27%	55%	9%	58%	14%	31%	19%	10%
	Flesch Reading Ease	54.4	48.7	45.8	51.0	53.1	37.2	39.0	52.5
	Flesch-Kincaid Grade Level	9.7	10.2	11.3	10.6	10.3	13.4	11.0	10.3

Note: The full names of the baseline and experimental text Web sites and their URLs are contained in Appendix D.

## Chapter 4. Results

A total of 127 people participated in the study; however, responses from only 102 were analyzed. Ten participants with very low TOEIC rating scores were considered outliers and were removed from the data analysis. Another 14 participants were excluded because they did not submit TOEIC scores and one participant was excluded for not meeting the minimum age requirement of 18.

The data from the online survey were analyzed on a Dell Latitude E6400 laptop computer using the IBM PASW Statistics 18 package (formerly SPSS).

The online survey contained 45 questions that were broken down as follows:

- Five questions about participants' comfort level and usage of both computers and the Web.
- Twelve demographic questions about participants' age, gender, education levels, English language proficiency, and whether they had worked or were working as a medical professional.
- Seventeen questions about participants' perceptions of credibility of the experimental texts.
- Five questions about factors such as interest, familiarity, and Web site characteristics that could relate to participants' credibility perceptions.
- Six questions about participants' comprehension of the second article that were designed to provide a rough indication of their English language reading comprehension.

## Demographic Composition

Of the 102 participants analyzed, there was a fairly even distribution of gender with approximately 58% being male and approximately 41% being female. Their ages ranged from 19 – 56 with the average falling between 26 – 35 years of age ( $M=3.08$ ,  $SD=1.06$ , where 1 = under 18 years; 6 = over 56 years).

## Computer and Web Use

As would be expected with young, well-educated individuals, the participants' were largely computer and Web literate and had used the Web for many years. As far as their comfort level with computers, 63% were very comfortable or somewhat comfortable using computers while 23% were somewhat uncomfortable or very uncomfortable ( $M = 3.65$ ,  $SD = 1.37$ , where 1 = very uncomfortable; 5 = very comfortable). A similar pattern occurred with regard to participants' comfort using the Web ( $M = 3.62$ ,  $SD = 1.41$ , where 1 = very uncomfortable; 5 = very comfortable). Eight-eight percent of the participants had used the Web for 7 or more years ( $M = 3.41$ ,  $SD = .934$ , where 1 = 1–3 years; 5 = more than 10 years).

In terms of the types of information participants searched for on the Web, most searched for general information on a regular basis, but fewer searched for medical information. The vast majority of the participants, 93%, said they use the Web to look up general information more than once a week ( $M = 5.83$ ,  $SD = .662$ , where 1 = never; 6 = more than once a week). However, the results were more variable when it came to accessing medical information on the Web, with 47% accessing medical a few times a year, 38% accessing it on a monthly basis, and 11% accessing it on a weekly basis ( $M = 2.83$ ,  $SD = 1.29$ , where 1 = never; 6 = more than once a week).

## Education

All participants received the bulk of their general education in Japan; most of them also learned English there as well. Two-thirds of the participants were well educated with post-secondary degrees, 42% having attained a 4-year Bachelor's degree and 21% having earned a graduate degree ( $M = 5.25$ ,  $SD = 1.93$ , where 1 = junior high school; 7 = graduate degree). Most participants had not had a general education in English-speaking countries: 60% learned English in Japan and only 30% learned it over a period of 1-5 years in English-speaking countries such as the United States, Australia, Canada, and the United Kingdom ( $M = .56$ ,  $SD = .76$ , where 0 = no years; 3 = 11-15 years).

## Participant Involvement with Topic

Participants had little prior involvement with the topics covered in the experimental text. None of the participants reported having had the illness described in the experimental texts; however one participant reported that a friend or relative had contracted it.

## Experience in Medical Professions

While none of the participants reported that they were currently employed in the medical professions, 12 % ( $n = 12$ ) had previously held jobs in those areas (e.g., physician, nurse, researcher).

## Analysis of Ancillary Credibility Variables

Because the level of interest in the topic of the experimental text, its perceived difficulty, and its familiarity can influence perceptions of credibility, independent sample t-tests were conducted to test whether the level of explicitness affected these variables.

None of the results revealed significant differences for interest

[ $t(100) = .376$ ,  $p = .708$ ], difficulty [ $t(99) = 1.347$ ,  $p = .181$ ], or familiarity [ $t(99) = .317$ ,  $p =$

.752]. Most participants (64%) rated the topic as interesting or very interesting to read. Almost half of the participants (46%) rated the topic neutral in terms of difficulty; however, 24% found the information difficult or very difficult and 29% found the information easy or very easy. More than half (57%) of the participants were unfamiliar or very unfamiliar with the topic and only a small percentage (17%) were familiar with it.

Independent sample t-tests were also run to test which characteristics of a web site would most affect the readers' decision to use the online health information they read. These characteristics included author credentials, contact information, the information itself, the sponsoring institution, the layout and design, or other factors. Only one characteristic proved to be significant. Proficient English language users stated that layout and design would influence them significantly more ( $M = 4.89$ ,  $SD = .737$ ) than independent English language users ( $M = 4.21$ ,  $SD = 1.255$ ) ( $t(99) = 2.293$ ,  $p = .024$ ).

#### Analysis of Participant English Comprehension Levels

The participants' scores for the English comprehension article were analyzed as an additional verification measure for their self-reported TOEIC scores. However, the resulting scores from the comprehension survey questions did not correlate with the TOEIC scores submitted by the participants. Several participants made comments after they completed the survey that the comprehension article was difficult for them to understand because it contained more medical terminology than the credibility article. Therefore, the scores from the comprehension survey questions were dropped from further analysis.

Interestingly, the TOEIC scores correlated with the self-reported English language proficiency levels provided by the participants ( $r_s(101) = .391$ ,  $p = .000$ ).

## Principal Components Analysis of Credibility Ratings

To simplify data analysis by reducing the number of dependent variables—thus reducing the potential for an inflated alpha level—the 15 dependent variables related to credibility were reduced to a smaller set of factors by conducting several iterations of a principal components analysis. In order to minimize the impact and distortions of outliers, all ten TOEIC scores in the Basic Proficiency category (the lowest proficiency category) were excluded in the analysis using a PASW filter.

A principal components analysis using Varimax with Kaiser Normalization rotation was conducted by producing a correlation matrix to generate the correlations between the fifteen credibility variables. Two variables—*Information Meaning* and *Information Bias*—were reverse coded to avoid negative valences (these variables had been scored in the opposite direction of the other variables). Coefficients with values of .3 or less were suppressed from the output. The rotated components matrix revealed four factors with Eigenvalues above 1 (Table 14). Although several measures (objectiveness, authoritativeness, clarity, similarity, and organization) cross-loaded across the factors, those crossloadings were relatively low (.438 or lower).

**Table 14. Four-Factor Rotated Components Matrix with Reverse Coding**

Credibility Variable	Component			
	1	2	3	4
Information Believability	.860			
Information Trustworthiness	.838			
Information Correctness	.826			
Information Objectiveness	.462		.351	-.323
Information Quality		.804		
Information Currency		.746		
Information Authoritativeness		.700		.324
Information Meaning			.702	
Information Clarity		.336	.622	.438
Information Detail			.611	
Information Similarity	.403		.490	
Information Bias				.669
Information Amount				.647
Information Organization		.410	.421	.568

Several variables were eliminated for the second factor analysis. The Information Similarity variable was deleted because it did not appear to fit conceptually with the other three variables with which it was grouped (Information Meaning, Information Clarity, and Information Detail). Similarly, the last three variables (Information Bias, Information Amount, and Information Organization) were excluded because they also did not appear to group conceptually. This final factor analysis was thus conducted with a three-factor loading to eliminate seemingly unrelated variables and to reduce the number of cross-factor loadings.

The following criteria were used for the final factor solution:

- Eigenvalues or 1 or more were required for all factors.
- The retained factors had to contain at least three measures with a loading of .6 or above.

- Sampling adequacy had to measure .50 or higher with the Kaiser-Meyer-Olkin (KMO) statistic.

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was .699, which was above the .60 recommended minimum (Pallant, 2010), indicating that the three-factor dataset was suitable for factoring (Table 15). The observed significance level of Bartlett's Test of Sphericity was highly significant ( $p < 0.000$ ) proving that the correlation matrix was not an identity matrix and also indicating that the variables in the correlation matrix were strong enough to proceed with a principal components analysis.

**Table 15. KMO and Bartlett's Test**

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		.699
Bartlett's Test of Sphericity	Approx. Chi-Square	259.677
	df	36
	Sig.	.000

The communalities after extraction were all above .3, further indicating that each item had some common variance with all the other items (Table 16).

**Table 16. Communalities after Extraction**

<b>Credibility Variable</b>	<b>Initial</b>	<b>Extraction</b>
Information Correctness	1.000	.760
Information Believability	1.000	.823
Information Authoritativeness	1.000	.673
Information Clarity	1.000	.661
Information Quality	1.000	.742
Information Currency	1.000	.488
Information Trustworthiness	1.000	.755
Information Reverse Meaning	1.000	.672
Information Detail	1.000	.361

Taken together, the KMO Measure of Sampling Adequacy and the Communalities after Extraction passed the minimum recommended values for proceeding with a principal components analysis.

The final principal components analysis for the three retained factors yielded stronger factor loadings (from .5 to .8) and reduced cross-factor loadings (Table 17).

**Table 17. Retained Factors**

Credibility Variable	Component		
	1	2	3
Information Believability	.883		
Information Correctness	.852		
Information Trustworthiness	.848		
Information Quality		.833	
Information Authoritativeness		.776	
Information Currency		.677	
Information Reverse Meaning			.807
Information Clarity		.363	.714
Information Detail			.575

The total variance explained for the three retained factors was 65.9% (Table 18) with Factor 1 accounting for 33.9%, Factor 2 accounting for 18.0%, and Factor 3 accounting for 13.9%.

**Table 18. Total Variance Explained**

Credibility Variable Components	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3.052	33.914	33.914
2	1.626	18.071	51.984
3	1.256	13.956	65.941
4	.852	9.472	75.412
5	.720	8.000	83.413
6	.483	5.362	88.775
7	.456	5.067	93.841
8	.338	3.753	97.594
9	.217	2.406	100.000

The final retained factors, each containing three measures, were then given a label that conceptually described the distinct constructs. The measures were analyzed by reviewing credibility literature and recognized definitions of credibility constructs and dimensions. Table 19 describes the rationale behind the grouping and labeling of the retained factors.

**Table 19. Retained Factors Groupings**

<b>Factor</b>	<b>Factor Label</b>	<b>Credibility Variables</b>	<b>Related Survey Question</b>	<b>Rationale</b>
1	Trustworthiness	Information Believability	I can believe the information in this article.	Information must be believed before it can be trusted.
		Information Correctness	The information in this article seems correct.	If information is perceived as incorrect, it is unlikely to be perceived as trustworthy.
		Information Trustworthiness	I can trust the information in this article.	N/A (The survey question asks about trustworthiness directly.)

*Continued on next page*

Table 19. Retained Factors Groupings (continued)

Factor	Factor Label	Credibility Variables	Related Survey Question	Rationale
2	Quality	Information Quality	The information in this article is of high quality.	N/A (The survey question asks about quality directly.)
		Information Authoritativeness	The article seems like it was written by someone who is an authority on this topic.	Authoritativeness, based on reputation and credentials is also a quality marker of online medical information.
		Information Currency	The information in this article seems up-to-date.	Currency is a hallmark of quality in online medical information.
3	Accuracy	Information Meaning	The meaning of this article is confusing to me.	If the meaning of a topic is confusing, it is difficult to judge whether it is accurate.
		Information Clarity	The information in this article is clearly written.	If information is unclear, it is difficult to judge its accuracy.
		Information Detail	The words in this article provide enough detail to understand the topic.	Sufficient detail allows one to judge whether a topic is accurate.

Next, a Multiple Analysis of Variance (MANOVA) was conducted to assess the effect of text explicitness and English language proficiency on the three extracted credibility factors: trustworthiness, quality, and accuracy. Significant differences were found for the effect of explicitness (Wilks' Lambda,  $F(3, 95) = 2.890, p = .039$ ). The MANOVA did not prove significant for English language proficiency or for an interaction of text explicitness and English language proficiency.

Finally, the between subjects effects for text explicitness was investigated for the three credibility factors. There was a main effect for explicitness on the **Quality** factor only,  $F(1,95) = 4.131, p = .045$ . Participants in the explicit condition ( $M = 3.50, SD = .62$ ) rated the text as more credible in terms of quality than participants in the implicit condition ( $M = 3.07; SD = .61$ ). There were no significant main effects for the other two extracted credibility factors (i.e., trustworthiness and accuracy).

## Chapter 5. Discussion and Conclusions

The first part of this chapter discusses how the demographic and reader attribute data along with the participants' ratings of interest, familiarity, and difficulty might have affected their credibility perceptions and ratings. The second part interprets the study's results within the framework of the three proposed hypotheses. Study limitations are then discussed in terms of their effect on the outcomes. Finally, the conclusion discusses the theoretical and practical implications of this study and suggests future research.

### Discussion

This dissertation was an exploratory study that analyzed the following research question: How does text explicitness and English language proficiency affect readers' credibility perceptions of online medical information? Three hypotheses were derived from this question and tested with Japanese ESL learners:

- **H1:** Participants would rate explicit text as more credible and implicit text as less credible.
- **H2:** Participants with lower English language proficiency would rate the experimental texts as less credible and participants with higher English language proficiency would rate the experimental texts as more credible.
- **H3:** Participants with lower English Language proficiency would rate the explicit text as more credible and participants with higher English Language proficiency would rate the implicit text as more credible.

The first hypothesis examined only how the level of explicitness might affect credibility ratings, without considering the participants' level of proficiency; the second hypothesis examined only the effect of proficiency levels on credibility; and the third hypothesis

examined whether the level of text explicitness and participant English language proficiency would interact on the credibility measures.

### **Demographic Data**

Since demographic variables have been shown to affect credibility perceptions, it is important to analyze the demographic composition and attributes of participants in credibility studies.

The participants were very Internet literate; 88% had used the Web for seven or more years, lending credence to the likelihood that their experience level would predispose them to find online information credible since studies have shown that users with more Internet experience are likely to find online information more credible than users who have less experience. The participants' level of computer and Internet involvement was undoubtedly bolstered by the extent of their education with most of them (63%) having completed a Bachelor's degree or earned a graduate degree. Because higher education is so intertwined with technological advances these days, almost all post-secondary students around the globe use computers and the Internet to study, write papers, and do research.

While almost all of the participants (93%) said they used the Web for searching general information several times a week, they searched less frequently for online medical information with 47% accessing it a few times a year, 38% accessing it monthly, and 11% accessing it on a weekly basis. The lower frequency may have been due to the relative youth of the participants and the fact that they might not have been at a stage in their life where medical information is important to them.

Another variable that can affect credibility perceptions is age. Previous research shows that older people are less likely to judge online information as credible than younger people because they have not grown up using computers as have today's younger population. The participants in this study were relatively young with the average age falling within 26 – 35, so

their age, combined with their extensive use of computers and the Internet, points to the likelihood that they would at least be open to finding online information credible, basically having grown up with the Internet and having spent a number of years shopping, learning, and socializing in online environments.

### **Reader Attribute Data**

In addition to demographic characteristics that can affect credibility, other perceptions and characteristics can affect the credibility of online medical information such as the level of interest in and familiarity with the topic as well as the perceived difficulty. For example, if readers are too familiar with a topic because they have worked in the medical field, they may disagree with the content or possess additional information that contradicts it. Conversely, if readers are too unfamiliar with a topic they may not have enough prior knowledge to build a schema for processing this new information.

In terms of familiarity, all of the participants—with the exception of one participant who had had a friend or relative with Dengue Fever—had little prior knowledge of the disease covered in the experimental texts. And only a small number of the participants (12%) had previously worked in medical professions where they would have had experience with or knowledge of Dengue. While the participants may not have had much knowledge about Dengue Fever in particular, the 38% who perused online information several times a month may have had some general knowledge about mosquito-borne illnesses such as malaria that might have given them some cognitive scaffolding for understanding Dengue. Other participants may have received some general information about these types of illnesses during the course of their education. Thus, the information in the experimental texts was probably not overly familiar nor too unfamiliar, a situation that might have affected the participants' credibility perceptions.

As far as level of difficulty, 75% of the participants rated the information as either neutral or easy/very easy while 24% found it difficult. These results need to be interpreted in conjunction with the readability statistics that were calculated for each text in the study. The three texts—explicit, implicit, and comprehension—ranged from 10.3 to 13.4 for the Flesch-Kincaid Grade Level, which were comparable to the reading levels for the five texts from real-life medical Web sites that were used in the preliminary analysis.<sup>16</sup> Those texts averaged a Flesch-Kincaid Grade Level of 10.4. The levels for both the experimental texts and the real-life Web sites were far higher than the 6<sup>th</sup> to 8<sup>th</sup> grade level that are generally recommended for online medical information.

Interestingly, the comprehension article had a lower (10.3) readability score than the two experimental texts (explicit = 13.4, implicit = 11.0), yet several participants made comments after the study that they found the comprehension article more difficult to understand than the experimental texts. In fact, these comments seem rather counterintuitive because the comprehension article had fewer words per sentence (17.7) than the explicit text (22.4). This suggests that the level of difficulty may have related to the *kind* of words used rather than their amount. The comprehension article contained many words that could be considered medical jargon such as vasculitis, sicca syndrome, and so on. Both the explicit and implicit texts, on the other hand, contained simpler, less jargon-laden language.

The final variable that might have impacted credibility was the participants' level of interest in the topic. A little over half of the participants rated the topic as interesting or very interesting. Studies have shown that topics that are perceived as interesting enable readers to understand and remember information better, which increases the likelihood that it will be more credible to them. A related variable that could also have affected the participants'

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<sup>16</sup> While the comprehension article was not used to verify the participants' level of self-reported proficiency as originally planned, it provided some useful insights about all the texts used in the study based on post-survey comments from several participants.

credibility perceptions is personal relevance. Readers who have had health challenges or who have loved ones with health difficulties find information about these topics very interesting and relevant and are more likely to perceive them as credible. Since only one participant in this study knew a friend or relative who had contracted Dengue Fever, the probability that relevance would have affected credibility perceptions was low.

In summary, the probability that demographic factors or reader attributes might have influenced the participants' credibility ratings was minimal.

### **Participant Proficiency and Perceptions of Credibility**

While neither the English Language proficiency levels by themselves—or in combination with the experimental text's explicitness levels—affected the credibility ratings of the participants, language proficiency levels did matter with one of the characteristics of Web sites that have previously been shown to be important in influencing credibility evaluations: site layout and design (Fogg et al. 2003). Both Independent and Proficient English Language participants rated site layout and design as being “somewhat important” (1 = most important, 2 = very important, 3 = important, 4 = somewhat important, 5 = not very important) in terms of credibility; however in terms of the actual ratings, the Proficient language participants rated site layout and design as somewhat less important to the evaluation of credibility ( $M = 4.89$ ,  $SD = .737$ ) than the independent participants ( $M = 4.21$ ,  $SD = 1.255$ ). This result is difficult to interpret in terms of the two proficiency levels involved because it is not clear whether the participants were referring to Web sites in their native language (in which case the proficiency variable would be moot), or whether they were referring to English language Web sites. The result does, however, confirm Fogg's and others' findings that good layout and design are important in helping readers make credibility judgments.

### **Credibility Results and Hypotheses**

The first hypothesis was partially confirmed; the other two hypotheses were not. The first hypothesis, that participants would rate the explicit text as more credible and the implicit text as less credible, was partially confirmed. Because credibility has been shown to be a multidimensional construct, the principal components analysis attempted to reduce the 15 credibility variables to three in order to simplify data analysis (trustworthiness, quality, and accuracy). Out of these three variables, only the quality variable proved to be significant, with participants who read the explicit text judging it to be more credible than participants who read the implicit text.

A closer look at the statistics show that although there was a very small spread between the means of the implicit and explicit groups, the observed power (.521) was sufficient to reveal a difference on quality between the explicit and implicit texts. Statistical power determines whether a real difference exists between the treatment groups of an experiment. There are many components that affect statistical power: in this study, the number of participants and the effect size were relevant. The effect size measures the strength of the relationship between the independent variable (in this case the explicitness and implicitness of the topic) and the dependent variable (credibility). The number of participants can also affect power with more participants increasing power and fewer participants decreasing it.

While the recommended level of observed power is usually .8 or above, the fact that even the low observed power of .521 and the small spread in the means between the participant groups for the Quality variable achieved significance means that the strength of the association between explicitness and credibility was strong enough that even a small number of participants could still make a difference. However, while the spreads between means for the Trustworthiness and Accuracy variables was similarly small, the observed

power for each was too small to achieve significance (trustworthiness = .119, accuracy = .191), suggesting that more participants might have made a difference for these variables.

The second hypothesis, which proposed that participants with lower English language proficiency would rate the texts as less credible and participants with higher English language proficiency would rate the texts as more credible, was not proven. Again, the spread between the mean scores was too close and the observed power too low (ranging from .057 to .076 for the three credibility variables).

The third hypothesis suggested that participants with lower proficiency would rate the explicit text as more credible and participants with higher proficiency would rate the implicit texts as more credible. Although this hypothesis was not confirmed, a deeper examination of the data shows an interesting result with the Trustworthiness variable. While the Wilks' Lambda measure was not significant (.933)—precluding any further analysis—it is interesting that in the Between Subjects test for trustworthiness, there was a trend toward significance (.09) for an interaction of explicitness and English Language proficiency as measured by the participants' TOEIC scores. Again, the observed power was low (.396), suggesting that more participants might have made a difference.

### Study Limitations

Several limitations affected the outcome of this study, perhaps the most significant being what turned out to be a small sample size. The power analysis revealed that the power of all the interactions was low, suggesting that a larger sample size may have increased the statistical significance. In addition, 25 participants were dropped from the study as discussed in the Results chapter, which further decreased the analyzable data.

Two factors that may have contributed to the small sample size included the time constraints of the study and the difficulties of recruiting participants remotely. Recruiting

proved to be more time-consuming and involved than anticipated. Part of the problem stemmed from the fact that the Japanese academic schedule for secondary education institutions is different than that of American institutions. A great deal of the recruiting involved Japanese students studying English in Japan and it turned out that the recruiting and data collection phase overlapped with their vacation times so they were unavailable for part of the data collection phase. In addition, the Japanese Tsunami that occurred on March 11, 2011, toward the end of the data collection phase, precluded the recruitment of any further participants from Japan for both ethical and practical reasons.

In addition to these scheduling and event-driven constraints, recruiting materials had to be tailored not only to different audiences (students, professors, and working professionals), but the recruiting material had to be customized for the formatting, length restrictions, and display requirements of social media channels such as Twitter, Facebook, and LinkedIn.

Both English and Japanese versions of the recruiting materials were used. As with the English recruiting materials, the Japanese versions had to be tailored for each type of audience and distribution method (e.g., social media web site postings, newspaper and newsletter advertisements, or e-mail). Care was taken to use the proper tone and appropriate honorifics (such as the suffix “-san” appended to a first name) in direct solicitations to Japanese professors and working professionals.

Yet another problem with remote recruiting—which is also an increasingly promising and tantalizing opportunity—concerns recruiting via the Internet in general and via social media in particular. The proliferation of social media web sites in the last five years provides a seemingly limitless opportunity to recruit millions of participants, either individually or within groups, from all over the world at little or no cost to researchers. However, postings on many social networking sites are ephemeral, lasting only until they are replaced by more recent postings. While a social networking site may have hundreds or even thousands of members,

it could be that only a few individuals are exposed to the posting before it is replaced by another one.

Establishing contacts in other countries (such as professors with possible student participants), sight unseen, is also difficult. Some contacts were willing to help outright but others preferred establishing more rapport before making a commitment, or had doubts about the researcher's credibility, intentions, and ability to safeguard participants' rights and privacy. To this end, the researcher provided a link in the recruiting materials to her LinkedIn profile that described her professional and academic credentials and provided endorsements by her own professors as well as colleagues in the technical communication field.

In hindsight, more participants might have been solicited in a shorter period of time by using the Test of English as a Foreign Language (TOEFL) rather than the TOEIC as a measure of English language proficiency. The TOEIC is more widely administered in Japan than in the United States, and with the recruiting challenges attributed to distance and the inability to make in-person contacts as described above it was difficult to obtain a larger sample size. Soliciting participants who had taken the TOEFL in an area geographically near the researcher would likely have increased the sample size substantially.

*Several other limitations involved methodological issues related to credibility measures and their statistical analyses. While researchers agree that credibility is an important component in the usefulness of online medical information, there is no general consensus about how it should be measured or interpreted. Complicating this issue is the fact that credibility has been shown to have many dimensions or components. Some researchers who conduct credibility studies use the statistical technique of principal components analysis as a way to reduce the number of variables to a more manageable number for examination. However, the conceptual grouping and labeling of variables into meaningful categories is, at best, a subjective judgment of the researchers involved, which makes replication difficult.*

In addition, while it is widely used, there is little agreement about what constitutes an adequate sample size for a principal components analysis, with some researchers advocating subject to ratio heuristics such as 15:1 or 30: 1, and others promoting absolute minimum sample sizes. There is, however, general agreement that a principal components analysis should include several hundred participants at a minimum to avoid uncertain factor loadings, magnified error rates, and the inability to generalize to a larger population. Through consultation with a statistician, the researcher executed a successful principal components analysis on only 100 participants, but this number is below what is considered a minimum sample size for this technique.

Another methodological difficulty concerned the difficulty in correlating the parts of speech parsing from the human coders with that of the Infogistics Natural Language Processor. Parts of speech can change depending on context. The natural language processor is bound by defined rules that frequently do not pick up on meaning informed by context. Parts of speech coding requires judgment. For example, should the range of numbers 3 – 10 days be coded as one unit or two? Natural language processors parse words down into a very literal and granular level. As an example, the Infogistics Natural Language Processor considers the term “Dengue Fever” an adjective and a noun, while the Merriam English dictionary considers the term one unit—a proper noun. In addition, this parser categorizes certain parts of speech in ways that are clearly at odds with most authoritative sources. For example, it considers the DT “determiner” tag a type of article that includes words like “another,” “that,” “every,” and “these” when most experts consider articles to be “a,” “an,” or “the.” For research purposes it is probably necessary to get a reasonable measure of the formality level of a text. But for practical purposes, the explicitness level could be improved simply by increasing the frequency of non-deitic parts of speech to disambiguate meaning and to “paint” a more complete picture, particularly for those high-

context cultures that must try to derive the most complete meaning possible from essentially low-context information on Web sites.

Another challenge of this study involved some of the recruiting venues. The working professionals solicited on the LinkedIn social media Web site tended to have very high TOEIC scores. This may have excluded working professionals who had lower TOEIC scores and possibly introduced coverage error.

Finally, other unaccounted for variables may have confounded the results. The study did not measure other factors that might have affected the level of explicitness such as the use of graphics to make the topic more explicit and to provide context.

In addition, there may have been other elements that might have reduced comprehension and affected credibility ratings in spite of the explicitness of the text. While graphics and other visual elements were not embedded in the texts—allowing the participants to make credibility judgments solely from text—the participants still had to contend with all the mechanisms for reading in an online environment such as clicking hyperlinks to get from screen to screen, filling out the survey with a mouse or keypad, scrolling to read content that was longer than one screen, and so on. The extraneous cognitive load of the hypertext environment combined with the intrinsic cognitive load of the texts may have affected the way in which the readers processed the materials, reducing short-term or working memory for germane cognitive load. Germane cognitive load is particularly important for two reasons in this type of communicative situation. First, the intrinsic cognitive load of the material itself may have been compounded by the proficiency level of the interlanguage readers. Second, the participants were likely using the central route posited in ELM theory to judge the credibility of the experimental texts since interlanguage users are consciously processing syntax and grammar which were not native to them.

## Conclusions and Recommendations for Future Work

In spite of the difficulties in recruiting participants, the methodological and statistical constraints, and the inability to achieve a larger sample size, one of the three hypotheses for this study was partially confirmed. Participants in this study—regardless of proficiency level—found the explicit text more credible on quality than the implicit text. This finding suggests that increasing the explicitness level by increasing the frequency of nouns, adjectives, prepositions, and articles may enrich the context of a text and fill in the communicative gap for nonnative English readers who come from high-context cultures, thus improving their credibility perceptions of quality. Because the participants were all from a high-context culture, they may find that in low-context Web sites where the graphics and interactivity that they are used to are absent, more explicit text fills in contextual gaps and “paints” a more complete picture of the information for them.

It may seem intuitive that the addition of more graphics or interactive elements might clarify meaning for readers from high-context cultures, and in fact, this may be appropriate for some types of informational Web sites. However, it may be completely inappropriate or inadvisable for medical Web sites. For example, a graphic video about a major surgical procedure may be so disturbing to readers who are contemplating it that they may be frightened away from getting a medical treatment they really need. In addition, graphical depictions of very personal or intimate bodily functions such as childbirth may be embarrassing or offensive to some readers, particularly those from cultures where these types of events are very private and not considered suitable for public forums such as the Web.

As the Web evolves, the trend has been to use words more sparingly. There are many reasons to argue for this trend toward minimalism. Part of this trend may be due to studies that have shown that readers get more easily fatigued from reading online material rather

than printed matter. Information overload is another source of reader fatigue that advocates for reducing the number of words and element interactivity in Web sites; many users search for specific information and do not want to wade through masses of irrelevant material. In addition, the proliferation of mobile devices means users are reading information on very small screens that demand an economy of words.

However, online medical information may be an exception because people who are searching for medical information for themselves or a loved one likely want as much detail as possible about the causes, symptoms, and treatment options of medical conditions. The higher the level of risk, the higher the likelihood that these consumers will want and seek detailed information that will answer their questions and help them make decisions.

While disambiguation is important to make sure that the right meaning gets across to e-health consumers who are nonnative English speakers, it may not ensure that they get enough nuanced meaning in order to make informed decisions. One could argue that systematic mechanisms and techniques already exist for disambiguating meaning. Controlled natural languages such as Plain English or Simplified Technical English already perform the function of disambiguating meaning by reducing the complexity of sentence structure and using a limited and standardized vocabulary. However, most controlled languages are used in very specific domains such as aircraft maintenance manuals or government documents and their goal is to limit vocabulary to reduce ambiguity rather than to augment and clarify meaning by adding *more* words.

In the case of high-context readers who are visiting a low-context medical Web site, it may be possible to provide a kind of *semantic enrichment* that enriches and clarifies meaning and paints a fuller picture of the information by increasing the frequency of non-deictic parts of speech such as nouns, prepositions, articles, and adjectives to enhance explicitness while using a lower frequency of deictic parts of speech that depend on context for meaning such as pronouns.

While increasing the frequency of non-deictic words seems like a straightforward approach to enrich meaning, a balance must be struck between using too many words—which may frustrate readers who want to get answers quickly—and not using enough. In addition, overly complex medical jargon that impacts readability levels should be avoided or described in simpler, layperson terms where possible.

Authors of online medical texts must consider ways to reduce both the intrinsic cognitive load of medical texts (which can be daunting given their potentially complex subject matter) as well as the extraneous cognitive load imposed on readers with limited proficiency or from different cultures. Future studies should include larger sample sizes, which in turn might answer the question posed in this study about whether language proficiency for L2 learners interacts with the explicitness of online medical to increase or decrease credibility. Other adult populations that have difficulty reading English might also benefit from an increased level of explicitness in online medical information. These might include elderly people with declining cognitive abilities, individuals with learning disabilities, or those with low literacy.

While this study specifically examined the effects of explicitness on the credibility of e-health information, it might be fruitful to also explore how the extraneous load of hypertext environments might interact with the text's level of explicitness to influence credibility judgments. For example, would a higher or lower level of hypertext interactivity (hyperlinks, scrolling, mouse clicking) with implicit or explicit texts affect readers' credibility evaluations?

Another intriguing direction might be to explore whether an increase in the explicitness level of online medical information matters for low-context readers who speak English as a second language and whether their proficiency levels factor into the equation. Because e-health consumers can be very invested in medical information if they or their loved ones are afflicted with medical challenges, it may be that readers, regardless of their socio-

cultural communication styles, want and need the greater detail and clarity of more explicit information on which to base their medical decisions.

In a related but somewhat different direction, researchers might also consider exploring whether the addition of more signaling devices such as headings and graphical elements such as tables, charts, and bulleted lists might organize information in a visual way that, combined with a higher level of explicitness, might help high-context readers understand and judge information in a better way.

Future studies could also explore whether explicitness could be generalized to paper-based texts to help improve the credibility of medical information. While more of the world's population is accessing the Web every day, there are still millions of people who do not have access to the Web for economical, political, or social reasons. For these individuals, medical information is still available only from brochures in their doctor's offices, in magazines, or through other paper-based media.

As continuing research in the area of online credibility is showing, many variables—from reader demographics and attributes to the way information is designed and displayed—affect the credibility perceptions of readers. While the style of texts, such as the use of active versus passive voice, has been shown to affect these perceptions, the level of explicitness has not, until this study, been explored to see what role it might play in credibility evaluations. This study has added to the theory and practical applications of credibility research by showing that style in the form of explicitness does affect the credibility judgments of online medical information for high-context readers. Because explicitness has been empirically shown to be the most basic and common component of variation in style across languages, its manipulation shows great promise in the attempt to improve the credibility of online medical information across geographic borders.

Authors and sponsors of online medical information should keep in mind that the interest in and concern for human health are shared by people around the globe. Millions of

people are accessing online health information—much of it from English language Web sites—every day around the world. In keeping with the concept of digital inclusion, online medical information for e-health consumers who speak English as a second language must deliver information that is unambiguous but robust enough that readers will feel they are receiving the credible information they need to help them make important health decisions.

## Appendix A – Recruiting Material

### E-mail to ESL Professors at Universities

Subject: Seeking Japanese ESL Participants for an Online Study

Dear Dr. Smith,

I am a Ph.D. student at the University of Washington in Seattle who is looking for Japanese ESL individuals over the age of 18 who have taken the TOEIC exam within the last 5 years to participate in an online study for my dissertation research. The purpose of my dissertation study is to use the input from my survey participants to help develop guidelines that improve English-language Web sites for nonnative English speakers.

I would like to invite your Japanese students to participate in my study. If you think some of your students might be qualified and interested can you suggest a good way for me to contact them? I know you cannot give out names, but I am wondering if you would consider sending your students an e-mail I've prepared that contains details about the study as well as the URL to access it. Alternatively, do you have a Web site where I could post some information?

I am offering several incentives to those who participate. Participation is voluntary and all responses will be kept strictly confidential.

*Many thanks and looking forward to hearing back from you.*

P.S. If you would like to get an idea about my background and credentials, I have a profile on LinkedIn at: <http://www.linkedin.com/pub/sandy-bartell/6/10/7ab>

**E-mail for Professors to E-Mail Their Students**

A Ph.D. student at the University of Washington in Seattle is looking for Japanese ESL (English as a Second Language) individuals over the age of 18 who have taken the TOEIC exam within the last 5 years for an online study. She is looking for recruits with ALL LEVELS OF ENGLISH PROFICIENCY—from beginner to advanced. The purpose of her dissertation study is to use the input from survey participants to help develop guidelines that improve English-language Web sites for nonnative English speakers.

Participation is entirely voluntary. Participants will need to submit their TOEIC scores when they take the survey but all of their responses will be kept strictly confidential.

Participants will read two short articles and answer some survey questions. At the end of the study they will have the chance to enter a drawing for some Amazon.com or Amazon.co.jp (their choice) gift certificates.

To participate in the study, go to the following URL and follow the directions to proceed with the study:

<https://catalysttools.washington.edu/Webq/survey/sandybar/102698>

If participants have other friends or colleagues who might qualify or be interested in participating in this study, the Ph.D. student will be grateful if they pass on this information to them.

## **Classified Advertisement for University Student Newspaper**

Title: Japanese ESL Students Needed for online study.

Eligible participants must be:

- Japanese person between the ages of 18 – 65.
- Japanese individuals with ANY level (from beginner to advanced) of English-language proficiency. They must have taken the Test of English for International Communication (TOEIC) within the past 5 years and will be asked to submit their reading proficiency score.
- Comfortable with computers and the Internet.

The participants will read two online short articles and answer some survey questions.

This will take about 20 minutes and at the end of the study they will have the chance to enter a drawing for some Amazon.com gift certificates. If interested contact:

[sandybar@u.washington.edu](mailto:sandybar@u.washington.edu)

**E-mail to Students or Individuals Who Requested Additional Information**

Dear Morimu,

Thank you for showing interest in my study! It is an online study accessed via the Internet (I will give you the URL). You would read two short articles and answer some survey questions. The whole thing should take around 20 minutes or so. The purpose of my study is to gather data that would help improve English-language Web sites for nonnative speakers.

Requirements are:

- You must be over 18
- You must be a Japanese individual
- You must have taken the TOEIC exam within the last 5 years

You'll be asked to submit your TOEIC score but ALL responses will be kept strictly confidential. At the end of the study you would have the chance to enter a raffle for an Amazon.com or Amazon.co.jp gift certificate (your choice). If you're still interested I can send you the URL.

## Posting on Japanese Mixi Social Network (in Japanese)

オンライン研究の為にTOEICの受験経験のあるアンケート回答者募集中!

アンケート回答者には抽選でAmazon.co.jpのギフトカードを差し? 悉菠蓼埂?

現在シアトルのワシントン大学の大学院研究生がリサーチに参加できるESL(英語が母国語ではない人)で次の条件を満たした日本人アンケート回答者を募集しています。この5年間以内に難度のレベルに関わらずTOEIC( Test of English for International Communication)のテストを受けられた18歳から65歳の日本人の方、パソコンとインターネットが問題なく使える方。

参加者にはTOEICの成績を提出して頂きますが全ての個人情報厳格に保護されます

。

実際のアンケートでは、2つの短い論文を読んで頂いた後、いくつかの質問に答えていただきます。アンケート完了後に、Amazon.co.jpのギフトカードの抽選権が得られます

。

アンケートのURL: <https://catalysttools.washington.edu/Webq/survey/sandybar/9695>

**8** URLを開いた後は、表示された指示に従ってアンケートを完了してください。

**Posting on Japanese Mixi Social Network (English Translation)**

Complete an online research survey for a chance to enter a drawing for some Amazon.co.jp gift certificates!

A Ph.D. student at the University of Washington in Seattle (U.S.A.) is looking for Japanese ESL (English as a Second Language) individuals over the age of 18 who have taken the TOEIC exam within the last 5 years for an online study. She is looking for recruits with ALL LEVELS OF ENGLISH PROFICIENCY—from beginner to advanced. The purpose of her dissertation study is to use the input from survey participants to help develop guidelines that improve English-language Web sites for nonnative English speakers.

Participants will need to submit their TOEIC scores when they take the survey but all of their responses will be kept strictly confidential.

If interested, you will read two short articles and answer some survey questions. At the end of the study you will have the chance to enter the drawing for the Amazon.co.jp gift certificates.

To get the URL for the study, go to:

<https://catalysttools.washington.edu/Webq/survey/sandybar/96958>

Then follow the instructions at that URL to proceed with the study.

**E-mail to Individual ESL Teachers via Facebook**

Hi! I'm a Ph.D. student at the University of Washington in Seattle who is looking for Japanese ESL individuals over the age of 18 who have taken the TOEIC exam within the last five years to participate in an online study for my dissertation research. Do you have any students who might be qualified and interested? They would read two short articles and answer some survey questions. By participating in the study they can enter a drawing to win some *Amazon.com* or *Amazon.co.jp* (their choice) gift certificates. Your students can access the study at:

<https://catalysttools.washington.edu/Webq/survey/sandybar/102698>

Instructions for proceeding with the study are located at this URL. Thank you for your help!

...and if you have any friends or other colleagues whom you think might qualify and be interested, please feel free to give them the URL!

**E-mail to Specific ESL Teachers in a Group on LinkedIn**

Subject: Seeking Japanese ESL Subjects for Online Study

Dear Jim,

I ran across your name in the JALT group on LinkedIn while searching for individuals who might be involved in teaching Japanese people ESL. By way of introduction, I am a Ph.D. student at the University of Washington in Seattle. I am trying to recruit Japanese individuals over the age of 18 who have taken the TOEIC exam within the last five years for my dissertation research.

I've been doing most of my recruiting via Facebook and LinkedIn—and some even on Mixi through a Japanese contact, but so far have not been able to recruit too many participants. Do you have some students or professional colleagues who might qualify and be interested? I am looking for either ESL students or Japanese professionals working in multinational corporations who have taken the TOEIC (ALL levels of proficiency—from beginner to advanced).

My study is online and involves reading two short articles and answering some survey questions. Participants have the chance to enter a drawing at the end of the study to win some Amazon.com or Amazon.co.jp gift certificates (their choice). Participation is voluntary and all responses will be kept strictly confidential. Looking forward to hearing back from you.

P.S. If you would like to check out my credentials, you can find me on LinkedIn at:

[http://www.linkedin.com/profile/edit?id=17937779&trk=hb\\_tab\\_pro\\_top](http://www.linkedin.com/profile/edit?id=17937779&trk=hb_tab_pro_top)

**LinkedIn E-mail to Japanese Individuals Who Have Taken the TOEIC Exam**

Dear Hayashi,

I ran across your name on LinkedIn while searching for individuals who might be involved in teaching Japanese people ESL. By way of introduction, I am a Ph.D. student at the University of Washington in Seattle. I am trying to recruit Japanese individuals over the age of 18 who have taken the TOEIC exam within the last five years for my dissertation research.

I've been doing most of my recruiting via Facebook and LinkedIn—and some even on Mixi through a Japanese contact, but so far have not been able to recruit too many participants. From your LinkedIn Profile, it looks like you have taken the TOEIC. Would you consider taking my survey or do you have some Japanese colleagues who might be qualified and interested? I am looking for either ESL students or Japanese professionals working in multinational corporations who have taken the TOEIC (ALL levels of proficiency—from beginner to advanced).

My study is online and involves reading two short articles and answering some survey questions. Participants have the chance to enter a drawing at the end of the study to win some Amazon.com or Amazon.co.jp gift certificates. Looking forward to hearing back from you.

**E-mail to Directors of TOEIC Test Centers**

Dear Mr. Harper,

I am a Ph.D. student at the University of Washington in Seattle who is looking for Japanese ESL individuals over the age of 18 who have taken the TOEIC exam to participate in an online study for my dissertation research. I ran across your Web site as I was searching for TOEIC testing centers in the United States.

The purpose of my dissertation study is to use the input from my survey participants to help develop guidelines that improve English-language Web sites for nonnative English speakers.

I am wondering whether some of your students who have taken the TOEIC might be interested in participating in my study. The study is online and participants would read two short articles and then answer some survey questions. I am offering several incentives to those who participate. Participation is voluntary and all responses will be kept strictly confidential.

If you think some of them might be interested can you suggest a good way for me to contact them? I know you cannot give out names, but I am wondering if you would consider sending your students an e-mail I've prepared that contains details about the study as well as the URL to access it.

P.S. If you would like to get an idea about my background and credentials, I have a profile on LinkedIn at: <http://www.linkedin.com/pub/sandy-bartell/6/10/7ab>

## Tweet on Researcher's Twitter Account

### Home



**eslresearcher** Need Japanese ESL students >18 years who have taken TOEIC for online study. Incentives offered. Visit: <http://tinyurl.com/6bevzrt>

eslresearcher

## Tweet on other Twitter Accounts

PhD student needs JAPANESE ESL students >18 years who have taken TOEIC for online study. Incentives offered: <http://tinyurl.com/6bevzrt>

**Referral E-Mail from Former Japanese ESL Teacher**

Dear Ashiro,

Your former English language teacher, Stephanie Fuccio, suggested I contact you because I am looking for participants for an online study and she thought you might qualify and possibly be interested. Stephanie asked me to say “hello” to you from her.

By way of introduction, I’m a Ph.D. student at the University of Washington in Seattle who is looking for JAPANESE ESL (English as a Second Language) individuals over the age of 18 who have taken the TOEIC exam within the last 5 years for an online study. I am looking for recruits with ALL LEVELS OF ENGLISH PROFICIENCY—from beginner to advanced. The purpose of my dissertation study is to use the input from survey participants to help develop guidelines that improve English-language Web sites for nonnative English speakers.

Participation is entirely voluntary. If you would like to participate you will need to submit your TOEIC score when you take the survey but all of your responses will be kept strictly confidential.

You would read two short articles and answer some survey questions. At the end of the study you would have the chance to enter a drawing for some Amazon.com or Amazon.co.jp (their choice) gift certificates.

To participate in the study, please go to the following URL and follow the directions to proceed with the study:

<https://catalysttools.washington.edu/Webq/survey/sandybar/96958>

If you end up participating, thank you very much!

**Postings on Facebook and LinkedIn Group pages**

Subject: Seeking Japanese ESL Individuals for Online Study

Hi! I'm a Ph.D. student at the University of Washington. Seeking Japanese ESL individuals over 18 who have taken the TOEIC exam within the last 5 years to participate in an online study. Read 2 short articles, answer some survey questions, and enter a drawing to win some Amazon.com gift certificates. Go to:

<https://catalysttools.washington.edu/Webq/survey/sandybar/102698>

**Japanese Student Associations (colleges or universities)**

Dear Japanese Friends ,

I am a Ph.D. student at the University of Washington in Seattle who is looking for Japanese ESL individuals who have taken the TOEIC exam to participate in an online study for my dissertation research.

Perhaps some of your student members have taken the TOEIC and might be interested in participating in my study. The study is online and participants would read two short articles and then and then answer some survey questions. I am offering several incentives to those who participate.

If you think some of them might be interested can you suggest a good way for me to contact them? I would appreciate any suggestions or advice you can give me. Many thanks!

P.S. I have a prepared text that can be e-mailed to your students if you think this would be a good approach.

**Flyer with Tear Strips**

オンライン研究の為に**TOEIC**を受けたことがある日本人募集中

A researcher from the University of Washington in Seattle is soliciting participants for an online study.

To participate in the study you must be a Japanese individual with **ANY** level (from beginner to advanced) of English-language proficiency. You must have taken the Test of English for International Communication (TOEIC) within the past 5years and will be asked to submit your proficiency score. **All of your responses will be confidential.**

If you choose to participate, you will read two short articles and answer some survey questions. Your input will help develop guidelines that improve English-language Web sites for nonnative English speakers. Your participation will take about 20 minutes and at the end of the study you will have the chance to enter a drawing for some *Amazon.com* or *Amazon.co.jp* (your choice) gift certificates.

To access the study, please enter the following URL into Internet Explorer (or the browser of your choice):

<https://catalysttools.washington.edu/Webq/survey/sandybar/102698>.

Then follow the online instructions for completing the study.

Thank you for participating!

**Recruiting E-Mail from Author's Dissertation Committee Members to Colleagues**

Hello Jennifer,

I am forwarding an e-mail from a graduate student in our department who is working with me on her dissertation study. She is looking for some Japanese individuals who speak English as a second language to participate in her study. Participants will be given the chance to win a raffle for *Amazon.com* or *Amazon.co.jp* (their choice) gift certificates.

Please see below. Feel free to forward her solicitation to any colleagues or individuals you think might be interested.

Thanks,

[Committee Member Name]

## Appendix B – Baseline Texts

### Mayo Clinic (<http://www.mayoclinic.com/>)

Dengue fever is a disease—ranging from mild to severe—caused by four related viruses spread by a particular species of mosquito. Mild dengue fever causes high fever, rash, and muscle and joint pain. More severe forms of the disease—dengue hemorrhagic fever and dengue shock syndrome—can additionally cause severe bleeding, a sudden drop in blood pressure (shock) and death.

No specific treatment for dengue fever exists, and most people recover. But if you have a severe form of the disease, you need hospital care.

Millions of cases of dengue infection occur worldwide each year. Most often, dengue fever occurs in urban areas of tropical and subtropical regions. A few cases have been reported in the United States—particularly in Texas, along the border with Mexico, and in Hawaii.

Signs and symptoms of dengue fever vary, depending on the form and severity of the disease.

With the mild form of the disease, you may experience some or all of these signs and symptoms:

- High fever, up to 105 F (40.6 C)
- A rash over most of your body, which may subside after a couple of days and then reappear
- Severe headache, backache or both
- Pain behind your eyes
- Severe joint and muscle pain

- Signs and symptoms usually begin about four to seven days after being bitten by a mosquito carrying a dengue virus. Mild dengue fever rarely causes death, and your symptoms will usually subside within a week after starting.

**WebMD (<http://www.Webmd.com/>)**

Dengue fever is a painful, debilitating mosquito-borne disease caused by any one of four closely related dengue viruses. These viruses are related to the viruses that cause West Nile infection and yellow fever.

Each year, an estimated 100 million cases of dengue fever occur worldwide. Most of these are in tropical areas of the world, with the greatest risk occurring in

- The Indian subcontinent
- Southeast Asia
- Southern China
- Taiwan
- The Pacific Islands
- The Caribbean (except Cuba and the Cayman Islands)
- Mexico
- Africa
- Central and South America (except Chile, Paraguay, and Argentina)

Most cases in the United States occur in people who contracted the infection while traveling abroad. But the risk is increasing for people living along the Texas-Mexico border and in other parts of the southern United States. In 2009, an outbreak of dengue fever was identified in Key West, Florida.

Dengue fever is transmitted by the bite of an *Aedes* mosquito infected with a dengue virus. The mosquito becomes infected when it bites a person with dengue virus in their blood. It can't be spread directly from one person to another person.

Symptoms, which usually begin four to six days after infection and last for up to 10 days, may include:

- A sudden, high fever
- Severe headaches
- Pain behind the eyes
- Severe joint and muscle pain
- Nausea
- Vomiting
- Skin rash, which appears three to four days after the onset of fever mild bleeding (such a nose bleed, bleeding gums, or easy bruising)

**National Institutes of Health (<http://www.nih.gov/>)**

Dengue fever is an infectious disease carried by mosquitoes and caused by any of four related dengue viruses. This disease used to be called "break-bone" fever because it sometimes causes severe joint and muscle pain that feels like bones are breaking, hence the name. Health experts have known about dengue fever for more than 200 years.

Dengue fever is found mostly during and shortly after the rainy season in tropical and subtropical areas of

- Africa
- Southeast Asia and China
- India
- Middle East
- Caribbean and Central and South America
- Australia and the South and the Central Pacific

An epidemic in Hawaii in 2001 is a reminder that many locations in the United States are susceptible to dengue epidemics because they harbor the particular types of mosquitoes that transmit dengue virus.

Worldwide, 50 to 100 million cases of dengue infection occur each year. This includes 100 to 200 cases in the United States, mostly in people who have recently traveled abroad. Many more cases likely go unreported because some healthcare providers do not recognize the disease.

During the last part of the 20th century, many tropical regions of the world saw an increase in dengue cases. Epidemics also occurred more frequently and with more severity. In addition to typical dengue, dengue hemorrhagic fever (DHF) and dengue shock syndrome also have increased in many parts of the world. Globally, there are an estimated several hundred thousand cases of DHF per year.

#### **Virtual Hospital (<http://www.uihealthcare.com/vh/>)**

Dengue fever, also known as breakbone fever, is a viral illness caused by the bite of a mosquito. Dengue fever is found worldwide, but more frequently seen in Caribbean countries, central and South America, Mexico, the Pacific and tropical countries of Asia, and parts of tropical Africa.

Most of the cases in the United States are seen in people who have traveled to a tropical region. However, with the decrease in mosquito control programs, the numbers of cases of dengue fever have been rising.

The incubation period may range from three to 15 days, however symptoms usually begin 5 to 8 days after being bitten by an infected mosquito. Most dengue fever results in a relatively mild illness.

Symptoms include:

- Sudden onset of high fever

- Severe headache
- Rash
- Swollen glands
- Severe muscle and joint pain
- Nausea and vomiting
- Flushing of the face and
- Pain behind the eyes or with movement of the eyes

The first three symptoms are known as the "Dengue Triad." Dengue fever should be considered in any patient with these symptoms who has a history of traveling to tropical climates throughout the world. If dengue fever is suspected, your healthcare provider will order a blood test to confirm the diagnosis.

The treatment for dengue fever is supportive care with bed rest advised during the period of high fever. Acetaminophen is the preferred treatment for fever and headache because of the blood thinning properties of aspirin. Acetaminophen should not be taken by anyone with known liver or kidney disease.

**Wrong diagnosis.com (<http://www.wrongdiagnosis.com/>)**

Dengue fever, also called dengue, is a potentially serious disease caused by a virus. There are four types of dengue virus that can cause illness in humans. Dengue viruses are transmitted between humans by the bite of an infected *Aedes* mosquito.

Dengue is rare in the U.S., but is common and a serious public health threat in warm sub-tropical and tropical areas of the world. These include areas of Central and South America, Africa, Southeast Asia, China, India, the Middle East, Australia, the Caribbean and the South and Central Pacific. Dengue fever is most common in urban areas and outbreaks occur commonly during the rainy season when mosquitoes breed heavily in standing water.

The incidence of dengue fever is on the rise worldwide, and in some areas of Asia, complications of the disease are a leading cause of serious illness and death in children.

Mosquitoes pick up a dengue virus when they bite a human who is already infected with the virus. The mosquito then carries it in its own blood and spreads it when it bites other humans.

After a dengue virus enters the human bloodstream, it spreads throughout the body. Symptoms appear in about eight to ten days after a bite from an infected mosquito. Symptoms are flu-like and can include high fever, nausea, vomiting, body aches, and headache.

Most people can recover from dengue fever, but some cases can progress into a life-threatening complication called dengue hemorrhagic fever. Symptoms of this disease include severe, uncontrolled hemorrhage and shock.

## Appendix C – Scoring Instructions and Guidelines

### Instructions:

1. Read the articles.
2. Count the number of occurrences for each part of speech (e.g., number of verbs, number of nouns) in the article using the attached Scoring Rubric as a guide.

Parts of Speech	Total
Nouns	
Verbs	
Pronouns	
Adjectives	
Articles	
Adverbs	
Prepositions	
Conjunctions	N/A
Interjections	
Total Words	

**Note:** Do not score conjunctions. They are included in the rubric only to differentiate them from other parts of speech.

Remember that many words can assume a different part of speech depending on their context in a sentence. For example the word “where” can be an adverb, noun, pronoun, or conjunction as shown in the following sentences:

- Adverb – **Where** is the boy?
- Noun – The how, when, and **where** should be considered in the solution.
- Pronoun – **Where** did the man say he was from?
- Conjunction – I will go **where** you go.

If in doubt about a particular word, consult <http://dictionary.reference.com/>. This online resource provides excellent examples of sentences where a word may assume different parts of speech depending on its relation to other words.

3. Use the following formula to calculate the formality score:

$$F = [(noun\ frequency + adjective\ frequency + preposition\ frequency + article\ frequency - pronoun\ frequency - verb\ frequency - adverb\ frequency - interjection\ frequency) + 100] / 2$$

....where *frequency* is the **percentage** of words belonging to a category (e.g.,

nouns, adverbs, adjectives). Calculate by dividing the number of words in the speech part category by the total number of words x 100.

**Example:**  $\frac{135 \text{ nouns}}{1,044 \text{ total words}} \times 100 = 13\%$  (round up or down to nearest integer)

**Other Scoring Guidelines:**

Item	Description	Example(s)	How to Score
Infinitives	To + verb. Can be an adjective, noun, or adverb	<ul style="list-style-type: none"> <li>• <b>To steal</b> is wrong (noun)</li> <li>• He used the key <b>to open</b> the door (adverb)</li> <li>• He uses a knife <b>to cut</b> his meat. (adjective)</li> </ul>	Score as one unit (i.e., as one verb, noun, or adverb)
Verbs		to be, is taken	Score as one unit (i.e., as one verb)
<ul style="list-style-type: none"> <li>• Auxiliary verbs</li> </ul>	Verb-like words that accompany verbs	<ul style="list-style-type: none"> <li>• <b>Should be washed</b></li> <li>• <b>Can drink</b></li> </ul>	Score as one unit (i.e., auxiliary + verb = verb)
Nouns			
<ul style="list-style-type: none"> <li>• Gerunds</li> </ul>	Verbals that end in <i>-ing</i> and function as nouns	The man is <b>eating</b>	Score as a noun
Acronyms	A word created with the first letters of a series of words	<b>CDC</b> (Centers for Disease Control)	<ul style="list-style-type: none"> <li>• <b>Do not score</b> the acronym if it follows the spelled out word. Example: Post Traumatic Stress Disorder (PTSD)</li> <li>• <b>Do score</b> if the acronym appears by itself. Example: PTSD</li> </ul>
Proper names of diseases or pathogens	English or Latin designations of illnesses or the pathogens that cause them	Methicillin Resistant Staphylococcus	Score as one unit (i.e., as one noun)

*Continued on next page*

**Other Scoring Guidelines (continued)**

<b>Item</b>	<b>Description</b>	<b>Example(s)</b>	<b>How to Score</b>
Compound Adjectives	Two adjectives that modify a noun. They are always hyphenated.	<b>Red-hot</b> coals	Score as one unit (i.e., as one adjective)
Cardinal Numbers	Numeric ranges and multiple-word numbers that are spelled out	<ul style="list-style-type: none"> <li>• 2.3 million</li> <li>• 24-48</li> </ul>	Score both a range of numbers and multiple word numbers that are spelled out as one unit (i.e., as one adjective or noun)
Latin Abbreviations	Abbreviations that indicate an example or clarify something	<ul style="list-style-type: none"> <li>• e.g. (for example)</li> <li>• i.e. (that is)</li> </ul>	<b>Do not score.</b>
Numeric or Currency Symbols	Symbols such as those for indicating temperature or currency	<ul style="list-style-type: none"> <li>• F, Fahrenheit</li> <li>• \$, dollar</li> </ul>	Score as nouns whether displayed in symbolic form or spelled out
Punctuation	Periods, dashes, question marks	<ul style="list-style-type: none"> <li>• . ? / "</li> </ul>	<b>Do not score.</b>
Formatting Symbols	Symbols for items in a bulleted list	<ul style="list-style-type: none"> <li>• * - ♦ ●</li> </ul>	<b>Do not score.</b>
Geographic Areas	Names of countries or geographic areas composed of more than one word	<ul style="list-style-type: none"> <li>• United States, The Czech Republic</li> </ul>	Score as one unit (i.e., as one noun)

### Scoring Rubric

Speech Part	Function	Examples	Usage
Noun	A person, thing, place, or idea	Apple, boy, concept, beauty	Poached <b>salmon</b> is my favorite <b>food</b> .
Verb	A word that describes an action or state of being	Walk, study, talk, be, enjoy	He <b>thought</b> he <b>was</b> prepared, but he <b>wasn't</b> .
Pronoun	A word that replaces a noun	I, you, me, my, they, their, your, nobody, who, which, her, him, we, ourselves, he, she	<b>They</b> walked <b>her</b> to the front gate. <b>Nobody</b> knew whether <b>he</b> or <b>she</b> committed the crime.
Adjective	A word that describes a noun or pronoun	Every, white, fat, intelligent, rough, silky	The river was <b>clear</b> and <b>cold</b> on that chilly <b>fall</b> day.
Article	A kind of adjective that is always used with a noun and further explains or delimits it	a, an, the	<b>A</b> man was attempting to cross <b>the</b> river with <b>an</b> old boat.
Adverb	A word that modifies an adjective or that describes how, when, or where an action was performed. Can be a verb, adjective, or adverb. If a word ends in <b>ly</b> it is usually an adverb.	Lovely, too, rarely, never, sometimes, very, carefully, neither	The doctor <b>carefully</b> removed the splinter. Uncle Jim was <b>very</b> concerned about his nephew. <b>Sometimes</b> he ran, but most of the time he walked briskly.

*Continued on next page*

### Scoring Rubric (continued)

Speech Part	Function	Examples	Usage
Preposition	A word used before nouns or pronouns to indicate a spatial, temporal, or other relationship	As, At, by, About, of, before, between, for, from, after, into, during, under, over, beyond, in, on, until, from, across, toward, with, without, since, to	Look <b>on</b> the shelf before you look <b>under</b> the cabinets. It was neither here <b>nor</b> there.
Conjunction	Joins words, clauses, or sentences	And, but, or, nor, while, since, although, because, neither	<b>While</b> he was able to finish his Math homework, he couldn't start his History assignment.
Interjection	A brief exclamation	Ow! Say! Stop!	<b>Run! Don't move!</b>

The parts of speech for the manual deconstruction were identified with a color-coding scheme using the following legend:

**Parts of Speech:**

Nouns

Verbs

Pronouns

Adjectives

Articles

Adverbs

Prepositions

Conjunctions

Interjections

## Appendix D – Manual Deconstruction of Baseline Texts

### Manual Deconstruction Results (Researcher)

#### Mayo Clinic (<http://www.mayoclinic.com/>)

Dengue fever is a disease—ranging from mild to severe—caused by four related viruses spread by a particular species of mosquito. Mild dengue fever causes high fever, rash, and muscle and joint pain. More severe forms of the disease—dengue hemorrhagic fever and dengue shock syndrome—can additionally cause severe bleeding, a sudden drop in blood pressure (shock) and death.

No specific treatment for dengue fever exists, and most people recover. But if you have a severe form of the disease, you need hospital care.

Millions of cases of dengue infection occur worldwide each year. Most often, dengue fever occurs in urban areas of tropical and subtropical regions. A few cases have been reported in the United States — particularly in Texas, along the border with Mexico, and in Hawaii.

Signs and symptoms of dengue fever vary, depending on the form and severity of the disease.

With a mild form of the disease, you may experience some or all of these signs and symptoms:

- High fever, up to 105 F (40.6 C)
- Rash over most of your body, which may subside after a couple of days and then reappear
- Severe headache, backache or both
- Pain behind your eyes

- Severe joint and muscle pain
- Signs and symptoms usually begin about four to seven days after being bitten by a mosquito carrying the dengue virus. Mild dengue fever rarely causes death, and your symptoms will usually subside within a week after starting.

Parts of Speech	Total
Nouns	66
Verbs	27
Pronouns	8
Adjectives	39
Articles	18
Adverbs	10
Prepositions	37
Conjunctions	N/A
Interjections	0
Total Words	205

#### Explicitness Level Formula

*F = (noun frequency + adjective frequency + preposition frequency + article frequency – pronoun frequency – verb frequency – adverb frequency – interjection frequency + 100)/2*

$$F = (32.1+19+18+8.7-3.9-13.1-4.8-0+100)/2$$

**Explicitness Level = 78**

WebMD (<http://www.Webmd.com/>)

Dengue fever is a painful, debilitating mosquito-borne disease caused by any one of four close-related dengue viruses. These viruses are related to the viruses that cause West Nile infection and yellow fever.

Each year, an estimated 100 million cases of dengue fever occur worldwide. Most of these are in tropical areas of the world, with the greatest risk occurring in

- The Indian subcontinent
- Southeast Asia
- Southern China
- Taiwan
- The Pacific Islands
- The Caribbean (except Cuba and the Cayman Islands)
- Mexico
- Africa
- Central and South America (except Chile, Paraguay, and Argentina)

Most cases in the United States occur in people who contracted the infection while traveling abroad. But the risk is increasing for people living along the Texas-Mexico border and in other parts of the southern United States. In 2009, an outbreak of dengue fever was identified in Key West, Florida.

Dengue fever is transmitted by the bite of the Aedes mosquito infected with the dengue virus. The mosquito becomes infected when it bites a person with dengue virus in their blood. It can't be spread directly from one person to another person.

Symptoms, which usually begin four to six days after infection and last for up to 10 days, may include

- a sudden, high fever

- Severe headaches
- Pain behind the eyes
- Severe joint and muscle pain
- Nausea
- Vomiting
- Skin rash, which appears three to four days after the onset of fever, mild bleeding (such as nose bleed, bleeding gums, or easy bruising)

Parts of Speech	Total
Nouns	73
Verbs	22
Pronouns	5
Adjectives	41
Articles	23
Adverbs	6
Prepositions	36
Conjunctions	N/A
Interjections	0
Total Words	206

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

$$F = (35.4 + 19.9 + 17.4 + 11.1 - 2.4 - 10.6 - 2.9 - 0 + 100)/2$$

**Explicitness Level = 83.9**

## National Institutes of Health (<http://www.nih.gov/>)

Dengue fever is an infectious disease carried by mosquitoes and caused by any of four related dengue viruses. This disease used to be called "break-bone" fever because it sometimes causes severe joint and muscle pain that feels like bones are breaking, hence the name. Health experts have known about dengue fever for more than 200 years.

Dengue fever is found mostly during and shortly after the rainy season in tropical and subtropical areas of

- Africa
- Southeast Asia and China
- India
- Middle East
- Caribbean and Central and South America
- Australia and the South and Central Pacific

An epidemic in Hawaii in 2001 is a reminder that many locations in the United States are susceptible to dengue epidemics because they harbor the particular types of mosquitoes that transmit dengue virus.

Worldwide, 50 to 100 million cases of dengue infection occur each year. This includes 100 to 200 cases in the United States, mostly in people who have recently traveled abroad. Many more cases go unreported because some healthcare providers do not recognize the disease.

During the last part of the 20th century, many tropical regions of the world saw an increase in dengue cases. Epidemics have occurred more recently and with more severity. In addition to typical dengue, dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) have increased in many parts of the world. Globally, there are an estimated several hundred thousand cases of DHF per year.

Parts of Speech	Total
Nouns	64
Verbs	23
Pronouns	4
Adjectives	40
Articles	15
Adverbs	16
Prepositions	30
Conjunctions	N/A
Interjections	0
Total Words	192

### Explicitness Level Formula

*F = (noun frequency + adjective frequency + preposition frequency + article frequency – pronoun frequency – verb frequency – adverb frequency – interjection frequency + 100)/2*

$$F = (33.3 + 20.8 + 15.6 + 7.8 - 2 - 11.9 - 8.3 - 0 + 100) / 2$$

**Explicitness Level = 77.6**

### Virtual Hospital (<http://www.uihealthcare.com/vh/>)

Dengue fever, also known as breakbone fever, is a viral illness caused by the bite of a mosquito. Dengue fever is found worldwide, but is more frequently seen in Caribbean countries, central and South America, Mexico, the Pacific and tropical countries of Asia, and parts of tropical Africa.

Most of the cases in the United States are seen in people who have traveled to a tropical region. However, with the decrease in mosquito control programs, the numbers of cases of dengue fever have been rising.

The incubation period may range from three to 15 days, however symptoms usually begin 5 to 8 days after being bitten by an infected mosquito. Most dengue fever results in a relatively mild illness.

Symptoms include:

- Sudden onset of high fever
- Severe headache
- Rash
- Swollen glands
- Severe muscle and joint pain
- Nausea and vomiting
- Flushing of the face and
- Pain behind the eyes or with movement of the eyes

The three symptoms are known as the "Dengue Triad." Dengue fever should be considered in any patient with these symptoms who has a history of traveling to tropical climates throughout the world. If dengue fever is suspected, your healthcare provider will order a blood test to confirm the diagnosis.

The treatment for dengue fever is supportive care with bed rest advised during the period of high fever. Acetaminophen is the preferred treatment for fever and headache

because of its blood thinning properties of aspirin. Acetaminophen should not be taken by anyone with known liver or kidney disease.

Parts of Speech	Total
Nouns	74
Verbs	23
Pronouns	3
Adjectives	40
Articles	25
Adverbs	9
Prepositions	38
Conjunctions	N/A
Interjections	0
Total Words	212

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

$$F = (34.9 + 18.8 + 17.9 + 11.7 - 1.4 - 10.8 - 4.2 - 0 + 100)/2$$

**Explicitness Level = 83.4**

Wrongdiagnosis.com (<http://www.wrongdiagnosis.com/>)

Dengue fever, also called dengue, is a potentially serious disease caused by a virus. There are four types of dengue virus that can cause illness in humans. Dengue viruses are transmitted between humans by the bite of an infected Aedes mosquito.

Dengue is rare in the U.S., but is common and a serious public health threat in warm sub-tropical and tropical areas of the world. These include areas of Central and South America, Africa, Southeast Asia, China, India, the Middle East, Australia, the Caribbean and the South and Central Pacific. Dengue fever is most common in urban areas and outbreaks occur commonly during the rainy season when mosquitoes breed heavily in standing water. The incidence of dengue fever is on the rise worldwide, and in some areas of Asia, complications of the disease are a leading cause of serious illness and death in children.

Mosquitoes pick up a dengue virus when they bite a human who is already infected with the virus. The mosquito then carries it in its own blood and spreads it when it bites other humans.

After a dengue virus enters the human bloodstream, it spreads throughout the body. Symptoms appear in about eight to ten days after a bite from an infected mosquito. Symptoms are flu-like and can include high fever, nausea, vomiting, body aches, and headache.

Most people can recover from dengue fever, but some cases can progress into a life-threatening complication called dengue hemorrhagic fever. Symptoms of this disease include severe, uncontrolled hemorrhage and shock.

Parts of Speech	Total
Nouns	75
Verbs	30
Pronouns	9
Adjectives	38
Articles	24
Adverbs	5
Prepositions	33
Conjunctions	N/A
Interjections	0
Total Words	214

### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

$$F = (35+17.7+15.4+11.2-4.2-14.0-2.3-0+100)/2$$

**Explicitness Level = 79.4**

## Manual Deconstruction Results (Second Coder)

### Mayo Clinic (<http://www.mayoclinic.com/>)

Dengue fever is a disease — ranging from mild to severe — caused by four related viruses spread by a particular species of mosquito. Mild dengue fever causes high fever, rash, and muscle and joint pain. More severe forms of the disease — dengue hemorrhagic fever and dengue shock syndrome — can additionally cause severe bleeding, a sudden drop in blood pressure (shock) and death.

No specific treatment for dengue fever exists, and most people recover. But if you have a severe form of the disease, you need hospital care.

Millions of cases of dengue infection occur worldwide each year. Most often, dengue fever occurs in urban areas of tropical and subtropical regions. A few cases have been reported in the United States — particularly in Texas, along the border with Mexico, and in Hawaii.

Signs and symptoms of dengue fever vary, depending on the form and severity of the disease.

With the mild form of the disease, you may experience some or all of these signs and symptoms:

- High fever, up to 105 F (40.6 C)

• Rash over most of your body, which may subside after a couple of days and then reappear

• Severe headache, backache or both

- Pain behind your eyes

- Severe joint and muscle pain
- Signs and symptoms usually begin about four to seven days after being bitten by mosquito carrying dengue virus. Mild dengue fever rarely causes death, and your symptoms will usually subside within a week after starting.

Parts of Speech	Total
Nouns	79
Verbs	30
Pronouns	5
Adjectives	35
Articles	21
Adverbs	6
Prepositions	37
Conjunctions	N/A
Interjections	0
Total Words	213

#### Explicitness Level Formula

$$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$$

$$F = (37+16.4+17.3+9.8-2.3-14-2.8-0+100)/2$$

$$\text{Explicitness Level} = 80.7$$

## WebMD (<http://www.Webmd.com/>)

Dengue fever is a painful, debilitating mosquito-borne disease caused by any one of four closely related dengue viruses. These viruses are related to the viruses that cause West Nile infection and yellow fever.

Each year, an estimated 100 million cases of dengue fever occur worldwide. Most of these are in tropical areas of the world, with the greatest risk occurring in

- The Indian subcontinent
- Southeast Asia
- Southern China
- Taiwan
- The Pacific Islands
- The Caribbean (except Cuba and the Cayman Islands)
- Mexico
- Africa
- Central and South America (except Chile, Paraguay, and Argentina)

Most cases in the United States occur in people who contracted the infection while traveling overseas. But the risk is increasing for people living along the Texas-Mexico border and in other parts of the southern United States. In 2009, an outbreak of dengue fever was identified in Key West, Florida.

Dengue fever is transmitted by the bite of an Aedes mosquito infected with the dengue virus. The mosquito becomes infected when it bites a person with dengue virus in their blood. It can't be spread directly from one person to another person.

Symptoms, which usually begin four to six days after infection and last for up to 10 days, may include

- a sudden, high fever

- Severe headaches
- Pain behind the eyes
- Severe joint and muscle pain
- Nausea
- Vomiting
- Skin rash, which appears three to four days after the onset of fever mild bleeding (such as nose bleed, bleeding gums, or easy bruising)

Parts of Speech	Total
Nouns	90
Verbs	27
Pronouns	5
Adjectives	28
Articles	19
Adverbs	5
Prepositions	37
Conjunctions	N/A
Interjections	0
Total Words	211

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

$$F = (42.6 + 13.2 + 17.5 + 9 - 2.3 - 12.7 - 2.3 - 0 + 100)/2 =$$

**Explicitness Level = 82.5**

## National Institutes of Health (<http://www.nih.gov/>)

Dengue fever is an infectious disease carried by mosquitoes and caused by any of four related dengue viruses. This disease used to be called "break-bone" fever because it sometimes causes severe joint and muscle pain that feels like bones are breaking, hence the name. Health experts have known about dengue fever for more than 200 years.

Dengue fever is found mostly during and shortly after the rainy season in tropical and subtropical areas of

- Africa
- Southeast Asia and China
- India
- Middle East
- Caribbean and Central and South America
- Australia and the South and Central Pacific

The epidemic in Hawaii in 2001 is a reminder that many locations in the United States are susceptible to dengue epidemics because they harbor the particular types of mosquitoes that transmit dengue virus.

Worldwide, 50 to 100 million cases of dengue infection occur each year. This includes 100 to 200 cases in the United States, mostly in people who have recently traveled abroad. Many more cases go unreported because some healthcare providers do not recognize the disease.

During the last part of the 20th century, many tropical regions of the world saw an increase in dengue cases. Epidemics also occurred more frequently and with more severity. In addition to typical dengue, dengue hemorrhagic fever (DHF) and dengue shock syndrome also have increased in many parts of the world. Clearly, there are an estimated several hundred thousand cases of DHF per year.

Parts of Speech	Total
Nouns	76
Verbs	37
Pronouns	9
Adjectives	33
Articles	16
Adverbs	12
Prepositions	20
Conjunctions	N/A
Interjections	0
Total Words	203

### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

$\text{Explicitness Level} = (37.4 + 16.2 + 9.8 + 7.8 - 4.4 - 18.2 - 5.9 - 0 + 100)/2$

$F = 71.3$

## Virtual Hospital (<http://www.uihealthcare.com/vh/>)

Dengue fever, also known as breakbone fever, is a viral illness caused by the bite of a mosquito. Dengue fever is found worldwide, but more frequently seen in Caribbean countries, central and South America, Mexico, the Pacific and tropical countries of Asia, and parts of tropical Africa.

Most of the cases in the United States are seen in people who have traveled to a tropical region. However, with the decrease in mosquito control programs, the numbers of cases of dengue fever have been rising.

The incubation period may range from three to 15 days, however symptoms usually begin 5 to 8 days after being bitten by an infected mosquito. Most dengue fever results in a relatively mild illness.

### Symptoms include:

- Sudden onset of high fever
- Severe headache
- Rash
- Swollen glands
- Severe muscle and joint pain
- Nausea and vomiting
- Flushing of the face
- Pain behind the eyes or with movement of the eyes

The first three symptoms are known as the "Dengue Triad." Dengue fever should be considered in any patient with these symptoms who has a history of traveling to tropical climates throughout the world. If dengue fever is suspected, your healthcare provider will order a blood test to confirm the diagnosis.

The treatment for dengue fever is supportive care with bed rest advised during the period of high fever. Acetaminophen is the preferred treatment for fever and headache

because of its blood thinning properties of aspirin. Acetaminophen should not be taken by anyone with known liver or kidney disease.

Parts of Speech	Total
Nouns	84
Verbs	41
Pronouns	2
Adjectives	27
Articles	29
Adverbs	8
Prepositions	36
Conjunctions	N/A
Interjections	0
Total Words	227

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

**Explicitness Level =  $(37+11.8+15.8+12.7-.8-18-3.5-0+100)/2 = 77.2$**

## Wrong diagnosis.com (<http://www.wrongdiagnosis.com/>)

Dengue fever, also called dengue, is a potentially serious disease caused by a virus. There are four types of dengue virus that can cause illness in humans. Dengue viruses are transmitted between humans by the bite of an infected Aedes mosquito.

Dengue is rare in the U.S., but is common and a serious public health threat in warm sub-tropical and tropical areas of the world. These include areas of Central and South America, Africa, Southeast Asia, China, India, the Middle East, Australia, the Caribbean and the South and Central Pacific. Dengue fever is most common in urban areas and outbreaks occur commonly during the rainy season when mosquitoes breed heavily in standing water. The incidence of dengue fever is on the rise worldwide, and in some areas of Asia, complications of the disease are a leading cause of serious illness and death in children.

Mosquitoes pick up a dengue virus when they bite a human who is already infected with the virus. The mosquito then carries it in its own blood and spreads it to other humans.

After a dengue virus enters the human bloodstream, it spreads throughout the body. Symptoms appear in about eight to ten days after a bite from an infected mosquito. Symptoms are mild and can include fever, nausea, vomiting, body aches, and headache.

Most people can recover from dengue fever, but some cases can progress into a life-threatening complication called dengue hemorrhagic fever. Symptoms of this disease include severe, uncontrolled hemorrhage and shock.

Parts of Speech	Total
Nouns	77
Verbs	40
Pronouns	9
Adjectives	40
Articles	25
Adverbs	11
Prepositions	27
Conjunctions	N/A
Interjections	0
Total Words	229

### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

**Explicitness Level =  $(33.6 + 17.4 + 11.7 + 10.9 - 3.9 - 17.4 - 4.8 - 0 + 100)/2 = 73.7$**

## Appendix E – Modified Penn Treebank Set

Tag	Corresponding Part of Speech	Example
CC	Coordinating conjunction	and, but, or
CD	Cardinal number	two, fourth, 127, mid-1900
DT	Determiner (article)	a, an, the, each, either
EX	Existential there	<i>there are</i>
FW	Foreign Word	<i>raison d'etre</i>
IN	Preposition or coordinating conjunction	for, in, above, under
JJ	Adjective	brown, beautiful, solar-powered
JJR	Adjective, comparative	better, smaller, harder
JJS	Adjective, superlative	best, smallest, hardest
LS	List item marker	1), a, first, A
MD	Modal auxiliary (helping verb)	Should, would, might, shall
NN	Noun, singular or mass	bird, human, car
NNS	Noun, plural	birds, humans, cars
NNP	Proper noun, singular	Rick, Mom, Africa
NNPS	Proper noun, plural	Smiths, Phillipines
PDT	Predeterminer	both, half, many, such, quite
POS	Possessive ending	Billy's, Mama's
PRP	Personal pronoun	She, he, it
PRPS	Possessive pronoun	hers, his, theirs, my
RB	Adverb	quickly, very, specifically
RBR	Adverb, comparative	However, larger, lonelier
RBS	Adverb, superlative	Best, skinniest, nearest
RP	Particle	Just, ever, more, open, out, over, aboard, across
SYM	Symbol	% ! @ U.S. =
TO	To as preposition or infinitive	<i>to eat, to her</i>
UH	Interjection	Wow! Gee!
VB	Verb, base form	run, eat, fly
VBD	Verb, past tense	Slipped, cleaned, studied
VBG	Verb, gerund or present participle	Climbing, stitching, hurting
VBN	Verb, past participle	used, flourished, chaired

*Continued on next page*

## Appendix E – Modified Penn Treebank Set (continued)

VBP	Verb, non-third person singular present	Love, paint, get
VBZ	Verb, third person singular present	Gets, monopolizes, exercises
WDT	Wh-determiner	That, what, whatever, which, who
WP	Wh-pronoun	That, whatsoever, which, whom
WP\$	Possessive wh-pronoun	Whose
WRB	Wh-adverb	How, however, whenever, why

### SOURCES:

Atwell, E. The University of Pennsylvania (Penn) Treebank Tagset. Retrieved May 18, 2010, from <http://www.comp.leeds.ac.uk/amalgam/tagsets/upenn.html>

Marcus, M. P., Santorini, B., & Marcinkiewicz, M. A. (1993). Building a Large Annotated Corpus of English: The Penn Treebank. *Association for Computational Linguistics*, 19(2), 313-330.

## Appendix F – Infogistics Natural Language Processor Results for Baseline Texts

**Mayo Clinic (<http://www.mayoclinic.com/>)**

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ :>

([ a\_DT disease\_NN ]) —\_: ranging\_VBG from\_IN ([ mild\_NN ]) to\_TO severe\_JJ —\_:  
caused\_VBN by\_IN ([ four\_CD related\_JJ viruses\_NNS ]) spread\_VBN by\_IN ([ a\_DT  
particular\_JJ species\_NNS ]) of\_IN ([ mosquito\_NN ]),\_.

([ Mild\_JJ dengue\_NN fever\_NN ])

<: causes\_VBZ :>

([ high\_JJ fever\_NN ]),\_, rash\_JJ ,\_, and\_CC ([ muscle\_NN ]) and\_CC ([ joint\_NN  
pain\_NN ]),\_.

([ More\_RBR severe\_JJ forms\_NNS ]) of\_IN ([ the\_DT disease\_NN ]) —\_: dengue\_FW ([  
hemorrhagic\_JJ fever\_NN ]) and\_CC ([ dengue\_NN shock\_NN syndrome\_NN ]) —\_:

<: can\_MD additionally\_RB cause\_VB :>

([ severe\_JJ bleeding\_NN ]),\_, ([ a\_DT sudden\_JJ drop\_NN ]) in\_IN ([ blood\_NN  
pressure\_NN ]) ( ([ shock\_NN ] :>  
\_) and\_CC ([ death\_NN ]),\_.

([ No\_DT specific\_JJ treatment\_NN ]) for\_IN ([ dengue\_NN fever\_NN ])

<: exists\_VBZ :>

,\_, and\_CC ([ most\_JJS people\_NNS ])

<: recover\_VBP :>

.\_.

But\_CC if\_IN ([ you\_PRP ])

<: have\_VBP :>

([ a\_DT severe\_JJ form\_NN ]) of\_IN ([ the\_DT disease\_NN ]),\_, ([ you\_PRP ]) need\_MD

([ hospital\_NN care\_NN ]).\_.

([ Millions\_NNS ]) of\_IN ([ cases\_NNS ]) of\_IN ([ dengue\_NN infection\_NN ])

<: occur\_VBP :>

worldwide\_RB ([ each\_DT year\_NN ]).\_.

Most\_RBS often\_RB ,\_, dengue\_VBG ([ fever\_NN ])

<: occurs\_VBZ :>

in\_IN ([ urban\_JJ areas\_NNS ]) of\_IN ([ tropical\_JJ and\_CC subtropical\_JJ regions\_NNS  
]).\_.

([ A\_DT few\_JJ cases\_NNS ])

<: have\_VBP been\_VBN reported\_VBN :>

in\_IN ([ the\_DT United\_NNP States\_NNPS ]) —\_: particularly\_RB in\_IN ([ Texas\_NNP

]),\_, along\_IN ([ the\_DT border\_NN ]) with\_IN ([ Mexico\_NNP ]),\_, and\_CC in\_IN ([

Hawaii\_NNP ]).\_.

([ Signs\_NNS ]) and\_CC ([ symptoms\_NNS ]) of\_IN ([ dengue\_NN fever\_NN ])

<: vary\_VBP :>

, depending\_VBG on\_IN ([ the\_DT form\_NN ]) and\_CC ([ severity\_NN ]) of\_IN ([ the\_DT disease\_NN ]).

With\_IN ([ the\_DT mild\_JJ form\_NN ]) of\_IN ([ the\_DT disease\_NN ]), ([ you\_PRP ])

<: may\_MD experience\_VB :>

([ some\_DT ]) or\_CC ([ all\_DT ]) of\_IN ([ these\_DT signs\_NNS ]) and\_CC ([ symptoms\_NNS ]):

•: ([ High\_JJ fever\_NN ]), up\_RB to\_TO ([ 105\_CD F\_NN ]) ( ([ 40.6\_CD C\_NN ] :> )

•: ([ A\_DT rash\_NN ]) over\_IN ([ most\_JJS of\_IN your\_PRPS body\_NN ]), ([ which\_WDT ])

<: may\_MD subside\_VB :>

after\_IN ([ a\_DT couple\_NN ]) of\_IN ([ days\_NNS ]) and\_CC then\_RB

<: reappear\_VB :>

•: ([ Severe\_JJ headache\_NN ]), ([ backache\_NN ]) or\_CC ([ both\_DT ])

•:

<: Pain\_VB :>

behind\_IN ([ your\_PRPS eyes\_NNS ])

•: ([ Severe\_JJ joint\_NN ]) and\_CC ([ muscle\_NN pain\_NN ])

•: ([ Signs\_NNS ]) and\_CC ([ symptoms\_NNS ])

<: usually\_RB begin\_VBP :>

about\_IN four\_CD to\_TO ([ seven\_CD days\_NNS ]) after\_IN ([ being\_VBG ]) bitten\_VBN  
by\_IN ([ a\_DT mosquito\_NN ]) carrying\_VBG ([ a\_DT dengue\_NN virus\_NN ]).\_.

([ Mild\_JJ dengue\_NN fever\_NN ])

<: rarely\_RB causes\_VBZ :>

([ death\_NN ]),\_, and\_CC ([ your\_PRPS symptoms\_NNS ])

<: will\_MD usually\_RB subside\_VB :>

within\_IN ([ a\_DT week\_NN ]) after\_IN ([ starting\_NN ]).\_.

Parts of Speech	Total
Nouns	77
Verbs	25
Pronouns	5
Adjectives	28
Articles	23
Adverbs	14
Prepositions	37
Conjunctions	-
Interjections	-
Total Words	209

#### Explicitness Level Formula

$$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100) / 2$$

$$\text{Explicitness Level} = 36.8 + 13.3 + 17.7 + 11.0 - 2.3 - 11.9 - 6.6 - 0 + 100 / 2 = 79.$$

**WebMD (<http://www.Webmd.com/>)**

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ :>

([ a\_DT painful\_JJ ,\_, debilitating\_JJ mosquito-borne\_NN disease\_NN ])

<: caused\_VBD :>

by\_IN ([ any\_DT one\_NN of\_IN four\_CD closely\_RB related\_VBN dengue\_NN  
viruses\_NNS ]),\_.

([ These\_DT viruses\_NNS ])

<: are\_VBP related\_VBN :>

to\_TO ([ the\_DT viruses\_NNS ]) ([ that\_WDT ])

<: cause\_VBP :>

([ West\_NNP Nile\_NNP infection\_NN ]) and\_CC ([ yellow\_NN fever\_NN ]),\_.

([ Each\_DT year\_NN ]),\_ ([ an\_DT estimated\_JJ 100\_CD million\_CD cases\_NNS ]) of\_IN

([ dengue\_NN fever\_NN ])

<: occur\_VBP worldwide\_RB :>

:\_.

Most\_JJS of\_IN ([ these\_DT ])

<: are\_VBP :>

in\_IN ([ tropical\_JJ areas\_NNS ]) of\_IN ([ the\_DT world\_NN ]),\_ with\_IN ([ the\_DT  
greatest\_JJS risk\_NN ]) occurring\_VBG in\_IN

•\_: ([ The\_DT Indian\_NNP subcontinent\_NN ])

•\_: ([ Southeast\_JJ Asia\_NNP ])

•\_: ([ Southern\_JJ China\_NNP ])

•\_: ([ Taiwan\_NNP ])

•\_: ([ The\_DT Pacific\_NNP Islands\_NNPS ])

•\_: ([ The\_DT Caribbean\_NNP ]) \_(\_ except\_IN ([ Cuba\_NNP ]) and\_CC ([ the\_DT  
Cayman\_NNP Islands\_NNP ] :>

\_)

•\_: ([ Mexico\_NNP ])

•\_: ([ Africa\_NNP ])

•\_: ([ Central\_NNP ]) and\_CC ([ South\_NNP America\_NNP ]) \_(\_ except\_IN ([ Chile\_NNP  
]),\_, ([ Paraguay\_NNP ]),\_, and\_CC ([ Argentina\_NNP ] :>

\_) ([ Most\_JJS cases\_NNS ]) in\_IN ([ the\_DT United\_NNP States\_NNPS ])

<: occur\_VBP :>

in\_IN ([ people\_NNS ]) who\_WP

<: contracted\_VBD :>

([ the\_DT infection\_NN ]) while\_IN ([ traveling\_VBG ]) abroad\_RB .\_.

But\_CC ([ the\_DT risk\_NN ])

<: is\_VBZ increasing\_VBG :>

for\_IN ([ people\_NNS ]) living\_VBG along\_IN ([ the\_DT Texas-Mexico\_NNP border\_NN

] and **\_CC** in **\_IN** ([ other **\_JJ** parts **\_NNS** ]) of **\_IN** ([ the **\_DT** southern **\_JJ** United **\_NNP** States **\_NNPS** ]).

In **\_IN** ([ 2009 **\_CD** ]), ([ an **\_DT** outbreak **\_NN** ]) of **\_IN** ([ dengue **\_NN** fever **\_NN** ])

<: was **\_VBD** identified **\_VBN** :>

in **\_IN** ([ Key **\_NNP** West **\_NNP** ]), ([ Florida **\_NNP** ]).

([ Dengue **\_JJ** fever **\_NN** ])

<: is **\_VBZ** transmitted **\_VBN** :>

by **\_IN** ([ the **\_DT** bite **\_NN** ]) of **\_IN** ([ an **\_DT** Aedes **\_NNP** mosquito **\_NN** ])

<: infected **\_VBD** :>

with **\_IN** ([ a **\_DT** dengue **\_NN** virus **\_NN** ]).

([ The **\_DT** mosquito **\_NN** ])

<: becomes **\_VBZ** :>

infected **\_JJ** when **\_WRB** ([ it **\_PRP** ])

<: bites **\_VBZ** :>

([ a **\_DT** person **\_NN** ]) with **\_IN** ([ dengue **\_NN** virus **\_NN** ]) in **\_IN** ([ their **\_PRPS** blood **\_NN** ]).

([ It **\_PRP** ])

<: can **\_MD** 't **\_RB** be **\_VB** spread **\_VBN** directly **\_RB** :>

from **\_IN** ([ one **\_CD** person **\_NN** ]) to **\_TO** ([ another **\_DT** person **\_NN** ]).

([ Symptoms **\_NNP** ]), ([ which **\_WDT** ])

<: usually **\_RB** begin **\_VBP** :>

four\_CD to\_TO ([ six\_CD days\_NNS ]) after\_IN ([ infection\_NN ]) and\_CC ([ last\_NN ]) for\_IN ([ up\_NN ]) to\_TO ([ 10\_CD days\_NNS ]),\_ ,

<: may\_MD include\_VB :>

•\_: ([ A\_DT sudden\_JJ ,\_, high\_JJ fever\_NN ])

•\_: ([ Severe\_JJ headaches\_NNS ])

•\_:

<: Pain\_VB :>

behind\_IN ([ the\_DT eyes\_NNS ])

•\_: ([ Severe\_JJ joint\_NN ]) and\_CC ([ muscle\_NN pain\_NN ])

•\_: ([ Nausea\_NN ])

•\_: Vomiting\_VBG

•\_:

<: Skin\_VB :>

([ rash\_NN ]),\_ , ([ which\_WDT ])

<: appears\_VBZ :>

three\_CD to\_TO ([ four\_CD days\_NNS ]) after\_IN ([ the\_DT onset\_NN ]) of\_IN ([ fever\_NN ]),\_ , ([ mild\_JJ bleeding\_NN ]) (\_ ( such\_JJ as\_IN ([ nose\_NN ])

<: bleed\_VBP :>

,\_ , bleeding\_VBG ([ gums\_NNS ]),\_ , or\_CC easy\_RB bruising\_JJ )\_ )

Parts of Speech	Total
Nouns	77
Verbs	26
Pronouns	4
Adjectives	29
Articles	28
Adverbs	8
Prepositions	37
Conjunctions	-
Interjections	-
Total Words	209

#### Explicitness Level Formula

$$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$$

$$\text{Explicitness Level} = 36.8 + 13.8 + 17.7 + 13.3 - 1.9 - 12.4 - 3.8 - 0 + 100 / 2 = 81.7$$

**National Institutes of Health (<http://www.nih.gov/>)**

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ :>

([ an\_DT infectious\_JJ disease\_NN ]) carried\_VBN by\_IN ([ mosquitoes\_NNS ]) and\_CC

<: caused\_VBD :>

by\_IN ([ any\_DT ]) of\_IN ([ four\_CD related\_JJ dengue\_NN viruses\_NNS ]).

([ This\_DT disease\_NN ])

<: used\_VBD :>

<: to\_TO be\_VB called\_VBN :>

" `` ([ break-bone\_JJ " `` fever\_NN ]) because\_IN ([ it\_PRP ])

<: sometimes\_RB causes\_VBZ :>

([ severe\_JJ joint\_NN ]) and\_CC ([ muscle\_NN pain\_NN ]) ([ that\_WDT ])

<: feels\_VBZ :>

like\_IN ([ bones\_NNS ])

<: are\_VBP breaking\_VBG :>

,\_ hence\_RB ([ the\_DT name\_NN ])\_.

([ Health\_NN experts\_NNS ])

<: have\_VBP known\_VBN :>

about\_IN ([ dengue\_JJ fever\_NN ]) for\_IN ([ more\_RBR than\_IN 200\_CD years\_NNS ])\_.

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ found\_VBN mostly\_RB :>

during\_IN and\_CC shortly\_RB after\_IN ([ the\_DT rainy\_JJ season\_NN ]) in\_IN ([  
tropical\_JJ and\_CC subtropical\_JJ areas\_NNS ]) of\_IN

•\_: ([ Africa\_NNP ])

•\_: ([ Southeast\_NNP Asia\_NNP ]) and\_CC ([ China\_NNP ])

•\_: ([ India\_NNP ])

•\_:

<: Middle\_VB :>

East\_JJ

•\_: ([ Caribbean\_NNP ]) and\_CC ([ Central\_NNP ]) and\_CC ([ South\_NNP America\_NNP  
])

•\_: ([ Australia\_NNP ]) and\_CC ([ the\_DT South\_NNP ]) and\_CC ([ the\_DT Central\_NNP  
Pacific\_NNP An\_NNP epidemic\_NN ]) in\_IN ([ Hawaii\_NNP ]) in\_IN ([ 2001\_CD ])

<: is\_VBZ :>

([ a\_DT reminder\_NN ]) that\_IN ([ many\_JJ locations\_NNS ]) in\_IN ([ the\_DT  
United\_NNP States\_NNPS ])

<: are\_VBP :>

susceptible\_JJ

<: to\_TO dengue\_VB :>

([ epidemics\_NNS ]) because\_IN ([ they\_PRP ])

<: harbor\_VBP :>

([ the\_DT particular\_JJ types\_NNS ]) of\_IN ([ mosquitoes\_NNS ]) ([ that\_WDT ])

<: transmit\_VBP :>

([ dengue\_NN virus\_NN ]),\_.

Worldwide\_RB ,\_, ([ 50\_CD ]) to\_TO ([ 100\_CD million\_CD cases\_NNS ]) of\_IN ([  
dengue\_NN infection\_NN ])

<: occur\_VBP :>

([ each\_DT year\_NN ]),\_.

([ This\_DT ])

<: includes\_VBZ :>

([ 100\_CD ]) to\_TO ([ 200\_CD cases\_NNS ]) in\_IN ([ the\_DT United\_NNP States\_NNPS  
]),\_ , mostly\_RB in\_IN ([ people\_NNS ]) who\_WP

<: have\_VBP recently\_RB traveled\_VBN abroad\_RB :>

.\_.

([ Many\_JJ more\_JJR cases\_NNS ])

<: likely\_RB go\_VBP :>

unreported\_VBN because\_IN ([ some\_DT healthcare\_JJ providers\_NNS ])

<: do\_VBP not\_RB recognize\_VB :>

([ the\_DT disease\_NN ]).\_.

During\_IN ([ the\_DT last\_JJ part\_NN ]) of\_IN ([ the\_DT 20th\_JJ century\_NN ]),\_ ([ many\_JJ tropical\_JJ regions\_NNS ]) of\_IN ([ the\_DT world\_NN ])

<: saw\_VBD :>

([ an\_DT increase\_NN ]) in\_IN ([ dengue\_NN cases\_NNS ]).\_.

([ Epidemics\_NNS ])

<: also\_RB occurred\_VBD :>

more\_RBR frequently\_RB and\_CC with\_IN ([ more\_JJR severity\_NN ]).\_.

In\_IN ([ addition\_NN ]) to\_TO ([ typical\_JJ dengue\_NN ]),\_ ([ dengue\_RB hemorrhagic\_JJ fever\_NN ]) (\_ ([ DHF\_NNP ] :>

\_ ) and\_CC ([ dengue\_NN shock\_NN syndrome\_NN ])

<: also\_RB have\_VB increased\_VBN :>

in\_IN ([ many\_JJ parts\_NNS ]) of\_IN ([ the\_DT world\_NN ]).\_.

Globally\_RB ,\_ there\_EX

<: are\_VBP :>

an\_DT estimated\_VBN several\_JJ ([ hundred\_CD thousand\_CD cases\_NNS ]) of\_IN ([  
DHF\_NNP ]) per\_IN ([ year\_NN ]).\_.

Parts of Speech	Total
Nouns	69
Verbs	26
Pronouns	4
Adjectives	28
Articles	20
Adverbs	17
Prepositions	34
Conjunctions	
Interjections	
Total Words	198

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$

**Explicitness Level =  $(34.8 + 14.1 + 17.1 + 10.1 - 2.0 - 13.1 - 8.5 - 0 + 100)/2 = 76.2$**

**Virtual Hospital (<http://www.uihealthcare.com/vh/>)**

([ Dengue\_JJ fever\_NN ]),\_, also\_RB known\_VBN as\_IN ([ breakbone\_NN fever\_NN ]),\_,

<: is\_VBZ :>

([ a\_DT viral\_JJ illness\_NN ])

<: caused\_VBD :>

by\_IN ([ the\_DT bite\_NN ]) of\_IN ([ a\_DT mosquito\_NN ]),\_.

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ found\_VBN worldwide\_RB :>

,\_, but\_CC more\_RBR frequently\_RB seen\_VBN in\_IN ([ Caribbean\_NNP countries\_NNS ]),\_, central\_JJ and\_CC ([ South\_NNP America\_NNP ]),\_, ([ Mexico\_NNP ]),\_, ([ the\_DT Pacific\_JJP and\_CC tropical\_JJ countries\_NNS ]) of\_IN ([ Asia\_NNP ]),\_, and\_CC ([ parts\_NNS ]) of\_IN ([ tropical\_JJ Africa\_NNP ]),\_.

([ Most\_JJS of\_IN the\_DT cases\_NNS ]) in\_IN ([ the\_DT United\_NNP States\_NNPS ])

<: are\_VBP seen\_VBN :>

in\_IN ([ people\_NNS ]) who\_WP

<: have\_VBP traveled\_VBN :>

to\_TO ([ a\_DT tropical\_JJ region\_NN ]),\_.

However\_RB ,\_, with\_IN ([ the\_DT decrease\_NN ]) in\_IN ([ mosquito\_NN control\_NN programs\_NNS ]),\_, ([ the\_DT numbers\_NNS ]) of\_IN ([ cases\_NNS ]) of\_IN ([ dengue\_NN fever\_NN ])

<: have\_VBP been\_VBN rising\_VBG :>

..

([ The\_DT incubation\_NN period\_NN ])

<: may\_MD range\_VB :>

from\_IN three\_CD to\_TO ([ 15\_CD days\_NNS ]),\_, however\_WRB ([ symptoms\_NNS ])

<: usually\_RB begin\_VBP :>

([ 5\_CD ]) to\_TO ([ 8\_CD days\_NNS ]) after\_IN ([ being\_VBG ]) bitten\_VBN by\_IN ([ an\_DT infected\_JJ mosquito\_NN ]).\_.

([ Most\_JJS dengue\_NN fever\_NN results\_NNS ]) in\_IN ([ a\_DT relatively\_RB mild\_JJ illness\_NN ]).\_.

([ Symptoms\_NNS ])

<: include\_VBP :>

:\_:

•\_: ([ Sudden\_JJ onset\_NN ]) of\_IN ([ high\_JJ fever\_NN ])

•\_: ([ Severe\_JJ headache\_NN ])

•\_: ([ Rash\_NN ])

•\_: Swollen\_VBN ([ glands\_NNS ])

•\_: ([ Severe\_JJ muscle\_NN ]) and\_CC ([ joint\_NN pain\_NN ])

•\_: ([ Nausea\_NNP ]) and\_CC vomiting\_VBG

•\_: Flushing\_VBG of\_IN ([ the\_DT face\_NN ]) and\_CC

•\_:

<: Pain\_VB :>

behind\_IN ([ the\_DT eyes\_NNS ]) or\_CC with\_IN ([ movement\_NN ]) of\_IN ([ the\_DT eyes\_NNS ]) ([ The\_DT first\_JJ three\_CD symptoms\_NNS ])

<: are\_VBP known\_VBN :>

as\_IN the\_DT " `` Dengue\_UH ([ Triad\_NNP ]),\_ " ``

([ Dengue\_JJ fever\_NN ])

<: should\_MD be\_VB considered\_VBN :>

in\_IN ([ any\_DT patient\_NN ]) with\_IN ([ these\_DT symptoms\_NNS ]) who\_WP

<: has\_VBZ :>

([ a\_DT history\_NN ]) of\_IN ([ traveling\_VBG ]) to\_TO ([ tropical\_JJ climates\_NNS ])

throughout\_IN ([ the\_DT world\_NN ]),\_.

If\_IN ([ dengue\_NN fever\_NN ])

<: is\_VBZ suspected\_VBN :>

,\_ ([ your\_PRPS healthcare\_JJ provider\_NN ])

<: will\_MD order\_VB :>

([ a\_DT blood\_NN test\_NN ])

<: to\_TO confirm\_VB :>

([ the\_DT diagnosis\_NN ]),\_.

([ The\_DT treatment\_NN ]) for\_IN ([ dengue\_NN fever\_NN ])

<: is\_VBZ :>

([ supportive\_JJ care\_NN ]) with\_IN ([ bed\_NN rest\_NN ])

<: advised\_VBD :>

during\_IN ([ the\_DT period\_NN ]) of\_IN ([ high\_JJ fever\_NN ])\_.

([ Acetaminophen\_NNP ])

<: is\_VBZ :>

([ the\_DT preferred\_JJ treatment\_NN ]) for\_IN ([ fever\_NN ]) and\_CC ([ headache\_NN ])

because\_IN of\_IN ([ the\_DT blood\_NN ]) thinning\_VBG ([ properties\_NNS ]) of\_IN ([ aspirin\_NNS ])\_.

([ Acetaminophen\_NNP ])

<: should\_MD not\_RB be\_VB taken\_VBN :>

by\_IN ([ anyone\_NN ]) with\_IN ([ known\_VBN liver\_NN ]) or\_CC ([ kidney\_NN disease\_NN ])\_.

Parts of Speech	Total
Nouns	80
Verbs	33
Pronouns	3
Adjectives	25
Articles	27
Adverbs	8
Prepositions	40
Conjunctions	-
Interjections	-
Total Words	216

#### Explicitness Level Formula

*F = (noun frequency + adjective frequency + preposition frequency + article frequency – pronoun frequency – verb frequency – adverb frequency – interjection frequency + 100)/2*

**Explicitness Level = 37.0+11.5+18.5+12.5-1.3-15.2-3.7-0+100)/2=79.6**

**Wrong diagnosis.com (<http://www.wrongdiagnosis.com/>)**

([ Dengue\_JJ fever\_NN ]),, also\_RB called\_VBN ([ dengue\_NN ]),,

<: is\_VBZ :>

([ a\_DT potentially\_RB serious\_JJ disease\_NN ])

<: caused\_VBD :>

by\_IN ([ a\_DT virus\_NN ]),.

There\_EX

<: are\_VBP :>

([ four\_CD types\_NNS ]) of\_IN ([ dengue\_NN virus\_NN ]) ([ that\_WDT ])

<: can\_MD cause\_VB :>

([ illness\_NN ]) in\_IN ([ humans\_NNS ]),.

([ Dengue\_JJ viruses\_NNS ])

<: are\_VBP transmitted\_VBN :>

between\_IN ([ humans\_NNS ]) by\_IN ([ the\_DT bite\_NN ]) of\_IN ([ an\_DT infected\_JJ

Aedes\_NNP mosquito\_NN ]),.

([ Dengue\_NN ])

<: is\_VBZ :>

rare\_JJ in\_IN ([ the\_DT U.S.\_NNP ]),, but\_CC

<: is\_VBZ :>

common\_JJ and\_CC ([ a\_DT serious\_JJ public\_JJ health\_NN threat\_NN ]) in\_IN ([

warm\_JJ sub-tropical\_JJ and\_CC tropical\_JJ areas\_NNS ]) of\_IN ([ the\_DT world\_NN

]).

([ These\_DT ])

<: include\_VBP :>

([ areas\_NNS ]) of\_IN ([ Central\_NNP ] and\_CC ([ South\_NNP America\_NNP ]),\_, ([ Africa\_NNP ]),\_, ([ Southeast\_NNP Asia\_NNP ]),\_, ([ China\_NNP ]),\_, ([ India\_NNP ]),\_, ([ the\_DT Middle\_NNP East\_NNP ]),\_, ([ Australia\_NNP ]),\_, ([ the\_DT Caribbean\_NNP ]) and\_CC ([ the\_DT South\_NNP ]) and\_CC ([ Central\_NNP Pacific\_NNP ]),\_.

([ Dengue\_JJ fever\_NN ])

<: is\_VBZ :>

most\_RBS common\_JJ in\_IN ([ urban\_JJ areas\_NNS ]) and\_CC ([ outbreaks\_NNS ])

<: occur\_VBP commonly\_RB :>

during\_IN ([ the\_DT rainy\_JJ season\_NN ]) when\_WRB ([ mosquitoes\_NNS ])

<: breed\_VBP heavily\_RB :>

in\_IN ([ standing\_VBG water\_NN ]),\_.

([ The\_DT incidence\_NN ]) of\_IN ([ dengue\_NN fever\_NN ])

<: is\_VBZ :>

on\_IN ([ the\_DT rise\_NN ]) worldwide\_RB ,\_, and\_CC in\_IN ([ some\_DT areas\_NNS ])

of\_IN ([ Asia\_NNP ]),\_, ([ complications\_NNS ]) of\_IN ([ the\_DT disease\_NN ])

<: are\_VBP :>

([ a\_DT leading\_JJ cause\_NN ]) of\_IN ([ serious\_JJ illness\_NN ]) and\_CC ([ death\_NN ])

in\_IN ([ children\_NNS ]),\_.

([ Mosquitoes\_NNS ])

<: pick\_VBP :>

up\_IN ([ a\_DT dengue\_NN virus\_NN ]) when\_WRB ([ they\_PRP ])

<: bite\_VBP :>

([ a\_DT human\_NN ]) who\_WP

<: is\_VBZ already\_RB infected\_VBN :>

with\_IN ([ the\_DT virus\_NN ]),\_.

([ The\_DT mosquito\_NN ]) then\_RB

<: carries\_VBZ :>

([ it\_PRP ]) in\_IN ([ its\_PRPS own\_JJ blood\_NN ]) and\_CC

<: spreads\_VBZ :>

([ it\_PRP ]) when\_WRB ([ it\_PRP ])

<: bites\_VBZ :>

([ other\_JJ humans\_NNS ]),\_.

After\_IN ([ a\_DT dengue\_NN virus\_NN ])

<: enters\_VBZ :>

([ the\_DT human\_JJ bloodstream\_NN ]),\_, ([ it\_PRP ])

<: spreads\_VBZ :>

throughout\_IN ([ the\_DT body\_NN ]),\_.

([ Symptoms\_NNS ])

<: appear\_VBP :>

in\_IN about\_IN eight\_CD to\_TO ([ ten\_CD days\_NNS ]) after\_IN ([ a\_DT bite\_NN ])

from\_IN ([ an\_DT infected\_JJ mosquito\_NN ]),\_.

([ Symptoms\_NNS ])

<: are\_VBP :>

flu-like\_JJ and\_CC

<: can\_MD include\_VB :>

([ high\_JJ fever\_NN ]),\_, ([ nausea\_NN ]),\_, vomiting\_VBG ,\_, ([ body\_NN aches\_NNS ]),\_, and\_CC ([ headache\_NN ]).\_.

([ Most\_JJS people\_NNS ])

<: can\_MD recover\_VB :>

from\_IN ([ dengue\_NN fever\_NN ]),\_, but\_CC ([ some\_DT cases\_NNS ])

<: can\_MD progress\_VB :>

into\_IN ([ a\_DT life-threatening\_JJ complication\_NN ])

<: called\_VBD :>

([ dengue\_NN ])([ hemorrhagic\_JJ fever\_NN ]).\_.

([ Symptoms\_NNS ]) of\_IN ([ this\_DT disease\_NN ])

<: include\_VBP :>

([ severe\_JJ ,\_, uncontrolled\_JJ hemorrhage\_NN ]) and\_CC ([ shock\_NN ]).\_.

Parts of Speech	Total
Nouns	80
Verbs	35
Pronouns	8
Adjectives	29
Articles	28
Adverbs	11
Prepositions	31
Conjunctions	-
Interjections	-
Total Words	222

### Explicitness Level Formula

$$F = (\textit{noun frequency} + \textit{adjective frequency} + \textit{preposition frequency} + \textit{article frequency} - \textit{pronoun frequency} - \textit{verb frequency} - \textit{adverb frequency} - \textit{interjection frequency} + 100) / 2$$

$$\textit{Explicitness Level} = 36.0 + 13.0 + 13.9 + 12.6 - 3.6 - 15.7 - 13.0 - 0 + 100) / 2 = 71.6$$

## **Appendix G – Experimental Texts**

### **Credibility Perceptions Article (Explicit Version)**

#### **Incidence of Dengue Fever**

With more than one-third of the world's population living in areas at risk for transmission, Dengue infection is a leading cause of illness and death in the tropics and subtropics. As many as 100 million people are infected yearly. Dengue is caused by any one of four related viruses transmitted by mosquitoes. Currently, there are no vaccines to prevent infection with Dengue virus (DENV) and the most effective protective measures are those that avoid mosquito bites. When a human becomes infected, early recognition and prompt supportive treatment by medical professionals can substantially lower the risk of developing severe disease.

Dengue has emerged as a worldwide problem only since the 1950s. Although Dengue rarely occurs in the continental United States, it is endemic (occurs yearly) in Puerto Rico and in many popular tourist destinations in Latin America and Southeast Asia; periodic outbreaks occur in Samoa and Guam.

## **Dengue Fever Origin**

The four Dengue viruses originated in monkeys and independently jumped to humans in Africa or Southeast Asia between 100 and 800 years ago. Dengue remained a relatively minor, geographically-restricted disease until the middle of the 20th century. The second world war—in particular the unintended transport of *Aedes* mosquitoes around the world in cargo—is thought to have played a crucial role in the dissemination of the viruses. Dengue Hemorrhagic Fever (DHF), the most severe form of Dengue Fever, was first documented only in the 1950s during epidemics in the Philippines and Thailand. It was not until 1981 that large numbers of DHF cases began to appear in the Caribbean and Latin America, where highly effective *Aedes* control programs had been in place until the early 1970s.

Today about 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of Dengue transmission. Dengue is endemic (occurring yearly) in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. The World Health Organization (WHO) estimates that 50 to 100 million infections occur yearly, including 500,000 DHF cases and 22,000 deaths, mostly among children.

## **Transmission of the Dengue Virus**

Dengue is transmitted between people by the *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are found throughout the world. Insects that transmit disease are called *vectors*. Symptoms of infection usually begin 4-7 days after the mosquito bite and typically last 3-10 days. In order for transmission to occur the mosquito must feed on a person during a five-day period when large amounts of virus are in that person's blood; this period usually begins a little before the person become symptomatic. Some people never have significant symptoms but can still infect mosquitoes. After entering the mosquito from the ingested blood, the virus will require an additional 8-12 days of incubation before it can then be

transmitted to another human. The mosquito remains infected for the remainder of its life, which might be days or a few weeks.

In rare cases, Dengue can be transmitted in organ transplants or blood transfusions from infected donors, and there is evidence of transmission from an infected pregnant mother to her fetus. But in the vast majority of infections, a mosquito bite is responsible.

In many parts of the tropics and subtropics, Dengue occurs every year, usually during a season when *Aedes* mosquito populations are high and often when rainfall is optimal for breeding. These areas are, however, additionally at periodic risk for epidemic Dengue when large numbers of people become infected during a short period. Dengue epidemics require a coincidence of large numbers of vector mosquitoes, large numbers of people with no immunity to one of the four virus types (DENV 1, DENV 2, DENV 3, DENV 4), and the opportunity for contact between the two. Although *Aedes* mosquitoes are common in the southern United States (U.S.), Dengue is endemic in northern Mexico and the U.S. population has no immunity. The lack of Dengue transmission in the continental U.S. is primarily because contact between people and the vectors is too infrequent to sustain transmission.

## Symptoms of Dengue Fever

The principal symptoms of Dengue are:

- High fever and at least two of the following symptoms:
  - Severe headache
  - Severe eye pain (behind the eyes)
  - Joint pain
  - Muscle and/or bone pain
  - Rash
  - Mild bleeding manifestation (e.g., nose or gum bleed, tiny hemorrhages in the skin or mucous membranes, or easy bruising)
  - Low white cell count

Generally, younger children and those with their first Dengue infection have a milder illness than older children and adults.

Warning signs may appear as temperature declines 3-7 days after symptoms begin.

The appearance of any of the following symptoms requires an immediate visit to the emergency room or health care provider:

- Severe abdominal pain or persistent vomiting
- Red spots or patches on the skin
- Bleeding from nose or gums
- Vomiting of blood
- Black, tarry stools (feces, excrement)
- Drowsiness or irritability
- Pale, cold, or clammy skin

- Difficulty breathing

The most serious form of the disease is Dengue hemorrhagic fever (DHF), which is characterized by a fever that lasts from two to seven days with general signs and symptoms similar to Dengue fever. When the fever declines, warning signs may develop. This marks the beginning of a 24-48 hour period when the smallest blood vessels (capillaries) become excessively permeable ("leaky"), allowing the fluid component to escape from the blood vessels into the membrane lining the abdominal cavity (causing the accumulation of excess fluid which may cause abdominal distension) and the membranes between the lungs and chest wall (creating excess fluid which may impair breathing). This may lead to failure of the circulatory system and shock, and possibly death without prompt, appropriate treatment. In addition, the patient with DHF has a low platelet count and hemorrhagic manifestations, tendency to bruise easily or have other types of skin hemorrhages, bleeding nose or gums, and possibly internal bleeding.

### **Treatment**

There is no specific medication for treatment of a Dengue infection. Persons who think they have Dengue should use analgesics (pain relievers) with acetaminophen and avoid those containing ibuprofen, Naproxen, aspirin, or aspirin-containing drugs. They should also rest, drink plenty of fluids to prevent dehydration, avoid mosquito bites while feverish, and consult a physician.

As with Dengue, there is no specific medication for DHF. If a clinical diagnosis is made early, a health care provider can effectively treat DHF using fluid replacement therapy. Adequate management of DHF generally requires hospitalization.

## **Reducing the Risk of Contracting Dengue**

There is no vaccine available against Dengue and there are no specific medications to treat a Dengue infection. This makes prevention the most important step, and prevention means avoiding mosquito bites if people live in or travel to an endemic area.

The best way to reduce mosquitoes is to eliminate the places where the female mosquito lays her eggs such as artificial containers that hold water in and around the home. Outdoors, water containers like pet and animal watering containers or flower planter dishes should be cleaned and water storage barrels should be covered. Containers with standing water indoors such as vases with fresh flowers should be cleaned at least once a week.

Adult mosquitoes will bite inside as well as outside homes, during the day and even at night when the lights are on. People in affected areas should protect themselves by using insect repellent on their skin while indoors or outside, wearing long sleeves and pants when possible, sleeping under mosquito bed nets, and ensuring that windows and door screens are secure and without holes. If available, air-conditioning should be used.

If someone in a household is ill with Dengue, extra precautions should be taken to prevent mosquitoes from biting the patient and infecting others in the household.

## Credibility Perceptions Article (Implicit Version)

### Incidence

Over one-third of the world risks getting Dengue, which sickens and kills people. Mosquitoes that transmit viruses infect people yearly. Currently, there are no vaccines preventing it and measures that most effectively protect people are those that avoid bites. When someone becomes infected, recognizing it and treating it quickly can substantially lower the risk of developing it.

It has been problematic only since the 1950s. It rarely occurs in the United States but occurs yearly in Puerto Rico, Latin America, and Southeast Asia. Samoa and Guam also have it periodically.

### Origin

Monkeys began Dengue, which independently jumped to humans in Africa or Southeast Asia 100-800 years ago. It remained relatively minor until the 1950s. World War II—in particular, the transportation of mosquitoes unintentionally—is thought to have helped disseminate it. Dengue Hemorrhagic Fever (DHF), its severest form, was documented in the 1950s in Thailand and the Philippines. Cases appeared in the Caribbean and Latin America where programs had existed until the 1970s.

Forty percent of the world currently lives where there is risk. It occurs yearly in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. The World Health Organization (WHO) estimates that 50-100 million get infected yearly. 500,000 are DHF cases; 22,000 die, mostly children.

## **Transmission**

Mosquitoes, found everywhere, transmit Dengue. Insects that transmit disease are called vectors. Symptoms usually begin after biting and typically last days. Mosquitoes must feed when viruses are in their blood, which usually begins slightly before people become symptomatic. Some never have symptoms but can still infect mosquitoes. After entering, viruses require days to be transmitted. Mosquitoes remain infected for their lives, which might be days or weeks.

Rarely, transplants or transfusions can transmit Dengue, and evidently those who are pregnant can transmit it to fetuses, but mosquitoes are largely responsible.

In the tropics and subtropics, it occurs yearly when mosquitoes abound and rainfall optimizes breeding. These areas are, however, additionally risky when people become infected quickly. Epidemics require that mosquitoes coincide with people who have no immunity as well as contact opportunities. Although mosquitoes commonly live in the United States (U.S.), Dengue occurs yearly in Mexico and the U.S. has no immunity. Transmission in the U.S. is lacking primarily because infrequent contact does not sustain transmission.

## **Symptoms**

Symptoms are mainly fever and at least two of these:

- Headache
- Eye pain (behind eyes)
- Joint pain
- Muscle or bone pain
- Rash
- Bleeding (e.g., bleeds, hemorrhages, or bruising that occurs easily)
- Low white cell count

Generally, children and those with their first infection have milder illnesses than those who are older.

Signs may appear as temperature declines and symptoms begin. Victims must visit the emergency room or health provider immediately when they:

- Vomit persistently or have pain
- Display spots or patches
- Bleed from nose or gums
- Vomit blood
- Pass black stools
- Show drowsiness or irritability
- Have pale, cold, or clammy skin
- Breathe with difficulty

The most serious is Dengue hemorrhagic fever (DHF), which is characterized by fever that lasts days. Its symptoms are generally similar to Dengue. When the fever declines, warnings may develop. When capillaries become excessively permeable (“leaky”), allowing fluid to escape into the abdominal membrane (accumulating fluid excessively, which may cause distension) and lung and chest membranes (creating fluid, which may impair breathing). This may lead to failure and shock, and possibly death if treatment is not promptly and appropriately given. Those with it have low platelets, bruise easily, or have hemorrhages, bleeding noses or gums, and possibly internal bleeding.

### **Treatment**

Nothing specifically treats Dengue. Those who think they have it should use acetaminophen analgesics (pain relievers) and avoid ibuprofen, Naproxen, aspirin, or

aspirin-containing drugs. They should also rest, drink to prevent dehydration, avoid bites, and consult a physician.

Nothing specifically treats DHF. If health providers diagnose it early, they can effectively treat it using hydration. Managing it adequately generally requires hospitalization.

### **Reducing Risk**

There is no vaccine and nothing specifically treats it. Preventing it is most important and that means avoiding mosquitoes if people live or travel where it occurs yearly.

Reducing mosquitoes involves eliminating where they lay their eggs like containers that hold water. Containers or planters should be cleaned and barrels should be covered. Containers should be cleaned weekly.

Biting occurs inside and outside, during the day and at night. Those in affected areas should use repellent, wear sleeves and pants when possible, sleep under nets, and secure windows and screens and ensure that they don't have holes. If available, air-conditioning should be used. If someone is ill, precautions should be taken to prevent mosquitoes from biting and infecting others.

## Appendix H – Manual Deconstruction of Experimental Texts

### Manual Deconstruction (Explicit Version)

#### Incidence of Dengue Fever

With more than one-third of the world's population living in areas at risk for transmission, Dengue infection is a leading cause of illness and death in the tropics and subtropics. As many as 100 million people are infected yearly. Dengue is caused by any one of four related viruses transmitted by mosquitoes. Currently, there are no vaccines to prevent infection with Dengue virus (DENV) and the most effective protective measures are those that avoid mosquito bites. When a human becomes infected, early recognition and prompt supportive treatment by medical professionals can substantially lower the risk of developing severe disease.

Dengue has emerged as a worldwide problem only since the 1950s. Although Dengue rarely occurs in the continental United States, it is endemic (occurs yearly) in Puerto Rico and in many popular tourist destinations in Latin America and Southeast Asia; periodic outbreaks occur in Samoa and Guam.

#### Dengue Fever Origin

Our Dengue viruses originated in monkeys and were first introduced to humans in Africa or Southeast Asia between 100 and 300 years ago. Dengue remained a relatively minor, geographically-restricted disease until the middle of the 20th century. The second world war—in particular the unintended transport of *Aedes* mosquitoes around the world in cargo—is thought to have played a crucial role in the dissemination of the viruses. Dengue Hemorrhagic Fever (DHF), the most severe form of Dengue Fever, was first documented only in the 1950s during epidemics in the Philippines and Thailand. It was not until 1981 that

large numbers of DHF cases began to appear in the Caribbean and Latin America, where highly effective *Aedes* control programs had been in place until the early 1970s.

Today about 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of Dengue transmission. Dengue is endemic (occurring yearly) in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. The World Health Organization (WHO) estimates that 50 to 100 million infections occur yearly, including 500,000 DHF cases and 22,000 deaths, mostly among children.

### Transmission of the Dengue Virus

Dengue is transmitted between people by the *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are found throughout the world. Insects that transmit disease are called vectors. Symptoms of infection usually begin 4-7 days after the mosquito bite and typically last 3-10 days. In order for transmission to occur the mosquito must feed on a person during a 5-day period when large amounts of virus are in that person's blood; this period usually begins a little before the person becomes symptomatic. Some people never have significant symptoms but can still infect mosquitoes. After entering the mosquito from the ingested blood, the virus will require an additional 8-12 days of incubation before it can then be transmitted to another human. The mosquito remains infected for the remainder of its life, which might be days or a few weeks.

In rare cases, Dengue can be transmitted in organ transplants or blood transfusions from infected donors, and there is evidence of transmission from an infected pregnant mother to her fetus. But in the vast majority of infections, a mosquito bite is responsible.

In many parts of the tropics and subtropics, Dengue occurs every year, usually during a season when *Aedes* mosquito populations are high and after when rainfall is optimal for breeding. These areas are, however, additionally at periodic risk for epidemic Dengue when large numbers of people become infected during a short period. Dengue epidemics require

The coincidence of large numbers of vector mosquitoes, large numbers of people with no immunity to one of the four virus types (DENV 1, DENV 2, DENV 3, DENV 4), and the opportunity for contact between the two. Although *Aedes* mosquitoes are common in the southern United States, Dengue is endemic in northern Mexico and the United States population has no immunity. The lack of Dengue transmission in the continental United States is primarily because contact between people and the vectors is too infrequent to sustain transmission.

### Symptoms of Dengue Fever

The principal symptoms of Dengue are:

High fever and at least two of the following symptoms:

Severe headache

Severe eye pain (behind the eyes)

Joint pain

Muscle or bone pain

Rash

The bleeding manifestation (e.g., nose or gum bleed, tiny hemorrhages in the skin or mucous membranes, or easy bruising)

Low white cell count

Generally, younger children and those with their first Dengue infection have a milder illness than older children and adults.

Warning signs may appear as temperature declines 3-7 days after symptoms begin.

The appearance of any of the following symptoms requires an immediate visit to an emergency room or health care provider:

Severe abdominal pain or persistent vomiting

Red spots or patches on the skin

Bleeding from nose or gums

Vomiting of blood

Black, tarry stools (feces, excrement)

Drowsiness or irritability

Pale, cold, or clammy skin

Difficulty breathing

The most serious form of the disease is Dengue Hemorrhagic Fever (DHF), which is characterized by a fever that lasts from two to seven days with general signs and symptoms similar to Dengue fever. When the fever declines, warning signs may develop. This marks the beginning of a 24-48 hour period when the smallest blood vessels (capillaries) become excessively permeable ("leaky"), allowing the fluid component to escape from the blood vessels into the membrane lining the abdominal cavity (causing the accumulation of excess fluid, which may cause abdominal distension) and the membranes between the lungs and chest wall (creating excess fluid, which may impair breathing). This may lead to failure of the circulatory system and shock, and possibly death without prompt, appropriate treatment. In addition, the patient with DHF has a low platelet count and hemorrhagic manifestations, tendency to bruise easily or have other types of skin hemorrhages, bleeding nose or gums, and possibly internal bleeding.

### Treatment

There is no specific medication for treatment of Dengue infection. Persons who think they have Dengue should use analgesics (pain relievers) with acetaminophen and avoid those containing ibuprofen, Naproxen, aspirin, or aspirin-containing drugs. They should get rest, drink plenty of fluids to prevent dehydration, avoid mosquito bites while febrile, and consult a physician.

As with Dengue, there is no specific medication for DHF. If a clinical diagnosis is made early, a health care provider can effectively treat DHF using fluid replacement therapy. Adequate management of DHF generally requires hospitalization.

### Reducing the Risk of Contracting Dengue

There is no vaccine available against Dengue and there are no specific medications to treat a Dengue infection. This makes prevention the most important step, and prevention means avoiding mosquito bites if people live in or travel to an endemic area.

The best way to reduce mosquitoes is to eliminate the places where a female mosquito lays her eggs such as artificial containers that hold water in and around the home. Outdoors, water containers like pots and animal watering containers or flower planter dishes should be cleaned and water storage barrels should be covered. Containers with standing water indoors such as vases with fresh flowers should be cleaned at least once a week.

Adult mosquitoes will bite inside as well as outside homes, during the day and even at night when the lights are on. People in affected areas should protect themselves by using insect repellent on their skin while indoors or outside, wearing long sleeves and pants when possible, sleeping under mosquito bed nets, and ensuring that windows and door screens are secure and without holes. If available, air-conditioning should be used.

If someone in a household is ill with Dengue, extra precautions should be taken to prevent mosquitoes from biting the patient and infecting others in the household.

Parts of Speech	Total
Nouns	362
Verbs	117
Pronouns	38
Adjectives	222
Articles	104
Adverbs	72
Prepositions	159
Conjunctions	N/A
Interjections	0
Total Words	1,074

### Explicitness Level (F)

*F = (noun frequency + adjective frequency + preposition frequency + article frequency – pronoun frequency – verb frequency – adverb frequency – interjection frequency + 100/2*

$$F = 33.7 + 20.7 + 14.8 + 9.7 - 3.5 - 10.9 - 6.7 + 100/2$$

**Explicitness Level = 78.9**

## Manual Deconstruction (Contextual Version)

### Incidence

Over one-third of the world risks getting Dengue, which sickens and kills people. Mosquitoes who transmit viruses infect people yearly. Currently, there are no vaccines preventing it and measures that most effectively protect people are those that avoid bites. When someone becomes infected, recognizing it and treating it quickly can substantially lower the risk of developing it.

It has been problematic only since the 1950s. It rarely occurs in the United States but occurs yearly in Puerto Rico, Latin America, and Southeast Asia. Samoa and Guam also have it periodically.

### Origin

Monkeys began Dengue, which independently jumped to humans in Africa or Southeast Asia 100-300 years ago. It remained relatively minor until the 1950s. World War II—in particular, transporting mosquitoes unintentionally—is thought to have helped disseminate it. Dengue Hemorrhagic Fever (DHF), its severest form, was documented in 1950s Thailand and the Philippines. Cases appeared in the Caribbean and Latin America where programs had existed until the 1970s.

Forty percent of the world currently lives where there is risk. It occurs yearly in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. The World Health Organization (WHO) estimates that 50-100 million get infected yearly. 500,000 are DHF cases; 22,000 die, mostly children.

### Transmission

Mosquitoes, found everywhere, transmit Dengue. Insects that transmit disease are called vectors. Symptoms usually begin after biting and usually last days. Mosquitoes must

feed when viruses are in their blood, which usually begins slightly before people become symptomatic. Some never have symptoms but can still infect mosquitoes. After entering, viruses require days to be transmitted. Mosquitoes remain infected for their lives, which might be days or weeks.

Rarely, transplants or transfusions can transmit Dengue, and evidently those who are pregnant can transmit it to fetuses, but mosquitoes are largely responsible.

In the tropics and subtropics, it occurs yearly when mosquitoes abound and rainfall optimizes breeding. These areas are, however, additionally risky when people become infected quickly. Epidemics require that mosquitoes coincide with people who have no immunity as well as contact opportunities. Although mosquitoes commonly live in the United States, Dengue occurs yearly in Mexico and the United States. has no immunity. Transmission in the United States is lacking primarily because infrequent contact does not sustain transmission.

## Symptoms

Symptoms are many fever and at least two of these:

Headache

Eye pain (behind eyes)

Joint pain

Muscle or bone pain

Rash

Bleeding (e.g., bleeds, hemorrhages, or bruising that occurs easily)

Low white cell count

Generally, children and those with prior Dengue infection have milder illnesses than those who are older.

Signs may appear as temperature declines and symptoms begin. Victims must visit the emergency room or provider immediately when they:

Vomit persistently or have pain

Display spots or patches

Bleed from nose or gums

Vomit blood

Pass black stools

Show drowsiness or irritability

Have pale, cold, or clammy skin

Breathe with difficulty

The most serious is Dengue Hemorrhagic Fever (DHF), which is characterized by fever that lasts days. Its symptoms are generally similar to Dengue. When the fever declines, warnings may develop. This is when capillaries become excessively permeable ("leaky"), allowing fluid to escape into the abdominal membrane (accumulating fluid excessively, which may cause distension) and lung and chest membranes (creating fluid, which may impair breathing). This may lead to failure and shock, and possibly death if treatment is not promptly and appropriately given. Those with it have low platelets, bruise easily, or have hemorrhages, bleeding noses or gums, and possibly internal bleeding.

### Treatment

Nothing specifically treats Dengue. Those who think they have it should use analgesics (pain relievers) and avoid Ibuprofen, Naproxen, aspirin, or aspirin-containing drugs. They should rest, drink to avoid dehydration, avoid bites, and consult a physician.

Nothing specifically treats DHF. If providers diagnose it early, they can effectively treat it using hydration. Managing it severely requires hospitalization.

## Reducing Risk

There is no vaccine and nothing specifically treats it. Preventing it is most important and that means avoiding mosquitoes if people live or travel where it occurs yearly.

Reducing mosquitoes involves eliminating where they lay their eggs, like containers that hold water. Containers or planters should be cleaned and barrels should be covered. Containers should be cleaned weekly.

Biting occurs everywhere and always. Those in affected areas should use repellent, wear sleeves and pants when possible, sleep under nets, and secure windows and screens and ensure that they don't have holes. If available, air-conditioning should be used. If someone is ill, precautions should be taken to prevent mosquitoes from biting and infecting others.

Parts of Speech	Total
Nouns	213
Verbs	132
Pronouns	67
Adjectives	66
Adverbs	22
Adverbs	71
Prepositions	42
Conjunctions	N/A
Interjections	0
Total Words	613

### Explicitness Level (F)

$$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100)/2$$

$$F = 34.7 + 10.8 + 6.8 + 3.6 - 11.0 - 21.5 - 11.6 + 100)/2$$

$$\text{Explicitness Level} = 55.9$$

## Appendix I - Infogistics Natural Language Processor Results for Experimental Texts

### Explicit Version

([ Incidence\_NN ] of\_IN ([ Dengue\_NNP Fever\_NNP ])

With\_IN ([ more\_RBR than\_IN one-third\_CD of\_IN the\_DT world\_NN ])?\_.

([ s\_NN population\_NN ]) living\_VBG in\_IN ([ areas\_NNS ]) at\_IN ([ risk\_NN ])

for\_IN ([ transmission\_NN ]),\_ ([ Dengue\_NNP infection\_NN ])

<: is\_VBZ :>

([ a\_DT leading\_JJ cause\_NN ]) of\_IN ([ illness\_NN ]) and\_CC ([ death\_NN ]) in\_IN ([ the\_DT tropics\_NNS ]) and\_CC ([ subtropics\_NNS ]),\_.

As\_RB many\_JJ as\_IN ([ 100\_CD million\_CD people\_NNS ])

<: are\_VBP infected\_VBN yearly\_RB :>

..

([ Dengue\_NNP ])

<: is\_VBZ caused\_VBN :>

by\_IN ([ any\_DT one\_NN of\_IN four\_CD related\_JJ viruses\_NNS ]) transmitted\_VBN

by\_IN ([ mosquitoes\_NNS ]),\_.

Currently\_RB ,\_ there\_EX

<: are\_VBP :>

([ no\_DT vaccines\_NNS ])

<: to\_TO prevent\_VB :>

([ infection\_NN ]) with\_IN ([ Dengue\_NNP virus\_NN ]) \_([ DENV\_NNP ] :>  
\_) and\_CC ([ the\_DT most\_RBS effective\_JJ protective\_JJ measures\_NNS ])

<: are\_VBP :>

([ those\_DT ]) that\_WP

<: avoid\_VBP :>

([ mosquito\_NN bites\_NNS ])\_.

When\_WRB ([ a\_DT human\_NN ])

<: becomes\_VBZ :>

([ infected\_JJ ,\_ , early\_JJ recognition\_NN ]) and\_CC ([ prompt\_JJ supportive\_JJ  
treatment\_NN ]) by\_IN ([ medical\_JJ professionals\_NNS ])

<: can\_MD substantially\_RB lower\_VB :>

([ the\_DT risk\_NN ]) of\_IN developing\_VBG ([ severe\_JJ disease\_NN ])\_.

([ Dengue\_NNP ])

<: has\_VBZ emerged\_VBN :>

as\_IN ([ a\_DT worldwide\_JJ problem\_NN ]) only\_RB since\_IN ([ the\_DT 1950s\_CD ])\_.

Although\_IN ([ Dengue\_NNP ])

<: rarely\_RB occurs\_VBZ :>

in\_IN ([ the\_DT continental\_JJ United\_NNP States\_NNPS ]),\_ ([ it\_PRP ])

<: is\_VBZ :>

endemic\_JJ \_([

<: occurs\_VBZ yearly\_RB :>

)\_) in\_IN ([ Puerto\_NNP Rico\_NNP ]) and\_CC in\_IN ([ many\_JJ popular\_JJ tourist\_NN destinations\_NNS ]) in\_IN ([ Latin\_NNP America\_NNP ]) and\_CC ([ Southeast\_NNP Asia\_NNP ]);\_: ([ periodic\_JJ outbreaks\_NNS ])

<: occur\_VBP :>

in\_IN ([ Samoa\_NNP ]) and\_CC ([ Guam\_NNP ])\_.

([ Dengue\_NNP Fever\_NNP Origin\_NN ])

([ The\_DT four\_CD Dengue\_NNP viruses\_NNS ])

<: originated\_VBD :>

in\_IN ([ monkeys\_NNS ]) and\_CC independently\_RB jumped\_VBN to\_TO ([ humans\_NNS ]) in\_IN ([ Africa\_NNP ]) or\_CC ([ Southeast\_NNP Asia\_NNP ]) between\_IN ([ 100\_CD and\_CC 800\_CD years\_NNS ]) ago\_RB . .

([ Dengue\_NNP ])

<: remained\_VBD :>

([ a\_DT relatively\_RB minor\_JJ , , geographically-restricted\_JJ disease\_NN ]) until\_IN ([ the\_DT middle\_NN ]) of\_IN ([ the\_DT 20th\_JJ century\_NN ])\_ . ?\_ .

([ The\_DT second\_JJ world\_NN war\_NN ])?\_ .

in\_IN particular\_JJ ([ the\_DT unintended\_JJ transport\_NN ]) of\_IN ([ Aedes\_NNP mosquitoes\_NNS ]) around\_IN ([ the\_DT world\_NN ]) in\_IN ([ cargo\_NN ])?\_ .

<: is\_VBZ thought\_VBN :>

<: to\_TO have\_VB :>

played\_VBN ([ a\_DT crucial\_JJ role\_NN ]) in\_IN ([ the\_DT dissemination\_NN ]) of\_IN ([ the\_DT viruses\_NNS ]).

([ Dengue\_NNP Hemorrhagic\_NNP Fever\_NNP ]) ( ([ DHF\_NNP ] :> ) , , ([ the\_DT most\_RBS severe\_JJ form\_NN ]) of\_IN ([ Dengue\_NNP Fever\_NNP ]), ,

<: was\_VBD first\_RB documented\_VBN only\_RB :>

in\_IN ([ the\_DT 1950s\_CD ]) during\_IN ([ epidemics\_NNS ]) in\_IN ([ the\_DT Philippines\_NNP ]) and\_CC ([ Thailand\_NNP ]).

([ It\_PRP ])

<: was\_VBD not\_RB :>

until\_IN ([ 1981\_CD ]) that\_IN ([ large\_JJ numbers\_NNS ]) of\_IN ([ DHF\_NNP cases\_NNS ])

<: began\_VBD :>

<: to\_TO appear\_VB :>

in\_IN ([ the\_DT Caribbean\_NNP ]) and\_CC ([ Latin\_NNP America\_NNP ]), ,

where\_WRB ([ highly\_RB effective\_JJ Aedes\_NNP control\_NN programs\_NNS ])

<: had\_VBD been\_VBN :>

in\_IN ([ place\_NN ]) until\_IN the\_DT early\_JJ 1970s\_SYM .

([ Today\_NN ]) about\_IN ([ 2.5\_CD billion\_CD people\_NNS ]), , or\_CC ([ 40\_CD ])%\_SYM of\_IN ([ the\_DT world\_NN ])?

([ s\_NN population\_NN ]),\_, live\_JJ in\_IN ([ areas\_NNS ]) where\_WRB there\_EX

<: is\_VBZ :>

([ a\_DT risk\_NN ]) of\_IN ([ Dengue\_NNP transmission\_NN ]).\_.

([ Dengue\_NNP ])

<: is\_VBZ :>

endemic\_JJ ( ( occurring\_VBG yearly\_RB ) ) in\_IN at\_IN ([ least\_JJS 100\_CD  
countries\_NNS ]) in\_IN ([ Asia\_NNP ]),\_, ([ the\_DT Pacific\_NNP ]),\_, ([ the\_DT  
Americas\_NNP ]),\_, ([ Africa\_NNP ]),\_, and\_CC ([ the\_DT Caribbean\_NNP ]).\_.

([ The\_DT World\_NNP Health\_NNP Organization\_NNP ]) ( ([ WHO\_NNP ] :>

)

<: estimates\_VBZ :>

that\_IN ([ 50\_CD ]) to\_TO ([ 100\_CD million\_CD infections\_NNS ])

<: occur\_VBP yearly\_RB :>

,\_, including\_VBG ([ 500,000\_CD DHF\_NNP cases\_NNS ]) and\_CC ([ 22,000\_CD  
deaths\_NNS ]),\_, mostly\_RB among\_IN ([ children\_NNS ]).\_.

([ Transmission\_NN ]) of\_IN ([ the\_DT Dengue\_NNP Virus\_NNP ])

([ Dengue\_NNP ])

<: is\_VBZ transmitted\_VBN :>

between\_IN ([ people\_NNS ]) by\_IN ([ the\_DT Aedes\_NNP aegypti\_NN ]) and\_CC ([  
Aedes\_NNP albopictus\_NN mosquitoes\_NNS ]),\_, ([ which\_WDT ])

<: are\_VBP found\_VBN :>

throughout\_IN ([ the\_DT world\_NN ])\_.

([ Insects\_NNS ]) ([ that\_WDT ])

<: transmit\_VBP :>

([ disease\_NN ])

<: are\_VBP called\_VBN :>

([ vectors\_NNS ])\_.

([ Symptoms\_NNS ]) of\_IN ([ infection\_NN ])

<: usually\_RB begin\_VB :>

([ 4-7\_CD days\_NNS ]) after\_IN ([ the\_DT mosquito\_NN bite\_NN ]) and\_CC ([ typically\_RB last\_JJ 3-10\_CD days\_NNS ])\_.

In\_IN ([ order\_NN ]) for\_IN ([ transmission\_NN ])

<: to\_TO occur\_VB :>

([ the\_DT mosquito\_NN ])

<: must\_MD feed\_VB :>

on\_IN ([ a\_DT person\_NN ]) during\_IN ([ a\_DT five-day\_JJ period\_NN ]) when\_WRB ([ large\_JJ amounts\_NNS ]) of\_IN ([ virus\_NN ])

<: are\_VBP :>

in\_IN ([ that\_DT person\_NN ])?\_.

([ s\_NN blood\_NN ]);\_: ([ this\_DT period\_NN ])

<: usually\_RB begins\_VBZ :>

([ a\_DT little\_NN ]) before\_IN ([ the\_DT person\_NN ])

<: become\_VB :>

symptomatic\_JJ .\_.

([ Some\_DT people\_NNS ])

<: never\_RB have\_VBP :>

([ significant\_JJ symptoms\_NNS ]) but\_CC

<: can\_MD still\_RB infect\_VB :>

([ mosquitoes\_NNS ]).\_.

After\_IN entering\_VBG ([ the\_DT mosquito\_NN ]) from\_IN ([ the\_DT ingested\_JJ

blood\_NN ]),\_ ([ the\_DT virus\_NN ])

<: will\_MD require\_VB :>

([ an\_DT additional\_JJ 8-12\_CD days\_NNS ]) of\_IN ([ incubation\_NN ]) before\_IN ([ it\_PRP ])

<: can\_MD then\_RB be\_VB transmitted\_VBN :>

to\_TO ([ another\_DT human\_NN ]).\_.

([ The\_DT mosquito\_NN remains\_NNS ])

<: infected\_VBD :>

for\_IN ([ the\_DT remainder\_NN ]) of\_IN ([ its\_PRPS life\_NN ]),\_ ([ which\_WDT ])

<: might\_MD be\_VB :>

([ days\_NNS ]) or\_CC ([ a\_DT few\_JJ weeks\_NNS ]).\_.

In **IN** ([ rare **JJ** cases **NNS** ]),\_, ([ Dengue **NNP** ])

<: can **MD** be **VB** transmitted **VBN** :>

in **IN** ([ organ **NN** transplants **NNS** ]) or **CC** ([ blood **NN** transfusions **NNS** ]) from **IN** ([ infected **JJ** donors **NNS** ]),\_, and **CC** there **EX**

<: is **VBZ** :>

([ evidence **NN** ]) of **IN** ([ transmission **NN** ]) from **IN** ([ an **DT** infected **JJ** pregnant **JJ** mother **NN** ]) to **TO** ([ her **PRP\$** fetus **NN** ]),\_.

But **CC** in **IN** ([ the **DT** vast **JJ** majority **NN** ]) of **IN** ([ infections **NNS** ]),\_, ([ a **DT** mosquito **NN** bite **NN** ])

<: is **VBZ** :>

responsible **JJ** ,\_.

In **IN** ([ many **JJ** parts **NNS** ]) of **IN** ([ the **DT** tropics **NNS** ]) and **CC** ([ subtropics **NNS** ]),\_, ([ Dengue **NNP** ])

<: occurs **VBZ** :>

([ every **DT** ]) year **JJ** ,\_, usually **RB** during **IN** ([ a **DT** season **NN** ]) when **WRB** ([ Aedes **NNP** mosquito **NN** populations **NNS** ])

<: are **VBP** :>

high **JJ** and **CC** often **RB** when **WRB** ([ rainfall **NN** ])

<: is **VBZ** :>

optimal **JJ** for **IN** ([ breeding **VBG** ]),\_.

([ These **DT** areas **NNS** ])

<: are **VBP** :>

,\_, however\_RB ,\_, additionally\_RB at\_IN ([ periodic\_JJ risk\_NN ]) for\_IN ([ epidemic\_JJ Dengue\_NNP ]) when\_WRB ([ large\_JJ numbers\_NNS ]) of\_IN ([ people\_NNS ])

<: become\_VBP :>

infected\_VBN during\_IN ([ a\_DT short\_JJ period\_NN ]).\_.?\_.

([ Dengue\_NNP epidemics\_NNS ])

<: require\_VBP :>

([ a\_DT coincidence\_NN ]) of\_IN ([ large\_JJ numbers\_NNS ]) of\_IN ([ vector\_NN mosquitoes\_NNS ]),\_, ([ large\_JJ numbers\_NNS ]) of\_IN ([ people\_NNS ]) with\_IN ([ no\_DT immunity\_NN ]) to\_TO ([ one\_CD of\_IN the\_DT four\_CD virus\_NN types\_NNS ])

( ([ DENV\_NNP 1\_CD ]),\_, ([ DENV\_NNP 2\_CD ]),\_, ([ DENV\_NNP 3\_CD ]),\_, ([ DENV\_NNP 4\_CD ] ) :>

) ,\_, and\_CC ([ the\_DT opportunity\_NN ]) for\_IN ([ contact\_NN ]) between\_IN the\_DT two\_CD .\_.

Although\_IN ([ Aedes\_NNP mosquitoes\_NNS ])

<: are\_VBP :>

common\_JJ in\_IN ([ the\_DT southern\_JJ United\_NNP States\_NNPS ]) ( ([ U.S.\_NNP ]

:>

) ,\_, ([ Dengue\_NNP ])

<: is\_VBZ :>

endemic\_JJ in\_IN ([ northern\_JJ Mexico\_NNP ]) and\_CC ([ the\_DT U.S.\_NNP population\_NN ])

<: has\_VBZ :>

([ no\_DT immunity\_NN ]).\_.

([ The\_DT lack\_NN ]) of\_IN ([ Dengue\_NNP transmission\_NN ]) in\_IN ([ the\_DT continental\_JJ U.S.\_NNP ])

<: is\_VBZ primarily\_RB :>

because\_IN ([ contact\_NN ]) between\_IN ([ people\_NNS ]) and\_CC ([ the\_DT vectors\_NNS ])

<: is\_VBZ :>

too\_RB infrequent\_JJ

<: to\_TO sustain\_VB :>

([ transmission\_NN ]).\_.

([ Symptoms\_NNS ]) of\_IN ([ Dengue\_NNP Fever\_NNP ])

([ The\_DT principal\_JJ symptoms\_NNS ]) of\_IN ([ Dengue\_NNP ])

<: are\_VBP :>

:\_:

([ High\_JJ fever\_NN ]) and\_CC at\_IN least\_JJS ([ two\_CD of\_IN the\_DT following\_VBG symptoms\_NNS ]):\_:

o\_IN ([ Severe\_JJP headache\_NN ]) o\_IN ([ Severe\_JJP eye\_NN pain\_NN ]) (\_( behind\_IN ([ the\_DT eyes\_NNS ] :>

\_) o\_IN ([ Joint\_NNP pain\_NN ]) o\_IN ([ Muscle\_NNP ]) and\_CC /\_CC or\_CC ([ bone\_NN pain\_NN ]) o\_IN ([ Rash\_NNP ]) o\_IN ([ Mild\_NNP bleeding\_NN

manifestation\_NN ] ( ( [ e.g.\_NN ] ), ( [ nose\_NN ] ) or\_CC ( [ gum\_NN ] )

<: bleed\_VBP :>

, ( [ tiny\_JJ hemorrhages\_NNS ] ) in\_IN ( [ the\_DT skin\_NN ] ) or\_CC ( [ mucous\_JJ membranes\_NNS ] ), or\_CC easy\_RB bruising\_JJ ) o\_IN ( [ Low\_NNP ] ) ( [ white\_JJ cell\_NN count\_NN ] )

Generally\_RB , ( [ younger\_JJR children\_NNS ] ) and\_CC ( [ those\_DT ] ) with\_IN ( [ their\_PRPS first\_JJ Dengue\_NNP infection\_NN ] )

<: have\_VBP :>

( [ a\_DT milder\_JJR illness\_NN ] ) than\_IN ( [ older\_JJR children\_NNS ] ) and\_CC ( [ adults\_NNS ] ).

Warning\_VBG ( [ signs\_NNS ] )

<: may\_MD appear\_VB :>

as\_IN ( [ temperature\_NN declines\_NNS 3-7\_CD days\_NNS ] ) after\_IN ( [ symptoms\_NNS ] )

<: begin\_VBP :>

..

( [ The\_DT appearance\_NN ] ) of\_IN ( [ any\_DT ] ) of\_IN ( [ the\_DT following\_VBG symptoms\_NNS ] )

<: requires\_VBZ :>

( [ an\_DT immediate\_JJ visit\_NN ] ) to\_TO ( [ the\_DT emergency\_NN room\_NN ] ) or\_CC ( [ health\_NN care\_NN provider\_NN ] )::

\*\_SYM ([ Severe\_JJ abdominal\_JJ pain\_NN ]) or\_CC persistent\_JJ vomiting\_VBG

\*\_SYM ([ Red\_JJ spots\_NNS ]) or\_CC ([ patches\_NNS ]) on\_IN ([ the\_DT skin\_NN ])

\*\_SYM Bleeding\_VBG from\_IN ([ nose\_NN ]) or\_CC ([ gums\_NNS ])

\*\_SYM Vomiting\_VBG of\_IN ([ blood\_NN ])

\*\_SYM ([ Black\_JJ ,\_, tarry\_JJ stools\_NNS ]) \_([ feces\_NNS ]),\_, ([ excrement\_NN ] :>  
\_)

\*\_SYM ([ Drowsiness\_NN ]) or\_CC ([ irritability\_NN ])

\*\_SYM Pale\_JJ ,\_, cold\_JJ ,\_, or\_CC ([ clammy\_JJ skin\_NN ])

\*\_SYM ([ Difficulty\_NNP breathing\_NN ])

([ The\_DT most\_RBS serious\_JJ form\_NN ]) of\_IN ([ the\_DT disease\_NN ])

<: is\_VBZ :>

([ Dengue\_NNP hemorrhagic\_NN fever\_NN ]) \_([ DHF\_NNP ] :>  
\_) ,\_, ([ which\_WDT ])

<: is\_VBZ characterized\_VBN :>

by\_IN ([ a\_DT fever\_NN ]) that\_IN ([ lasts\_NNS ]) from\_IN two\_CD to\_TO ([ seven\_CD  
days\_NNS ]) with\_IN ([ general\_JJ signs\_NNS ]) and\_CC ([ symptoms\_NNS ]) similar\_JJ  
to\_TO ([ Dengue\_NNP fever\_NN ]).

When\_WRB ([ the\_DT fever\_NN declines\_NNS ]),\_, warning\_VBG ([ signs\_NNS ])

<: may\_MD develop\_VB :>

.\_.

([ This\_DT ])

<: marks\_VBZ :>

([ the\_DT beginning\_NN ] of\_IN ([ a\_DT 24-48\_CD hour\_NN period\_NN ]) when\_WRB

([ the\_DT smallest\_JJS blood\_NN vessels\_NNS ]) \_([ capillaries\_NNS ] :>

)

<: become\_VBP :>

excessively\_RB permeable\_JJ \_([ ?\_.

leaky\_JJ ?\_.)\_) ,\_, allowing\_VBG ([ the\_DT fluid\_JJ component\_NN ])

<: to\_TO escape\_VB :>

from\_IN ([ the\_DT blood\_NN vessels\_NNS ]) into\_IN ([ the\_DT membrane\_NN ])

lining\_VBG ([ the\_DT abdominal\_JJ cavity\_NN ]) \_([ causing\_VBG ([ the\_DT

accumulation\_NN ]) of\_IN ([ excess\_JJ fluid\_NN ]) ([ which\_WDT ])

<: may\_MD cause\_VB :>

([ abdominal\_JJ distension\_NN ] :>

) and\_CC ([ the\_DT membranes\_NNS ]) between\_IN ([ the\_DT lungs\_NNS ]) and\_CC ([

chest\_NN wall\_NN ]) \_([ creating\_VBG ([ excess\_JJ fluid\_NN ]) ([ which\_WDT ])

<: may\_MD impair\_VB :>

([ breathing\_NN ] :>

) . . .

([ This\_DT ])

<: may\_MD lead\_VB :>

to\_TO ([ failure\_NN ]) of\_IN ([ the\_DT circulatory\_JJ system\_NN ]) and\_CC ([ shock\_NN ]),\_ and\_CC possibly\_RB ([ death\_NN ]) without\_IN ([ prompt\_JJ ],\_ appropriate\_JJ treatment\_NN ])\_.

In\_IN ([ addition\_NN ]),\_ ([ the\_DT patient\_NN ]) with\_IN ([ DHF\_NNP ])

<: has\_VBZ :>

([ a\_DT low\_JJ platelet\_NN count\_NN ]) and\_CC ([ hemorrhagic\_JJ manifestations\_NNS ]),\_ ([ tendency\_NN ])

<: to\_TO bruise\_VB easily\_RB :>

or\_CC

<: have\_VB :>

([ other\_JJ types\_NNS ]) of\_IN ([ skin\_NN hemorrhages\_NNS ]),\_ bleeding\_VBG ([ nose\_NN ]) or\_CC ([ gums\_NNS ]),\_ and\_CC ([ possibly\_RB internal\_JJ bleeding\_NN ])\_.

Treatment

There\_EX

<: is\_VBZ :>

([ no\_DT specific\_JJ medication\_NN ]) for\_IN ([ treatment\_NN ]) of\_IN ([ a\_DT Dengue\_NNP infection\_NN ])\_.

([ Persons\_NNS ]) who\_WP

<: think\_VBP :>

([ they\_PRP ])

<: have\_VB :>

([ Dengue\_NNP ])

<: should\_MD use\_VB :>

([ analgesics\_NNS ]) ( ([ pain\_NN relievers\_NNS ] :>

) with\_IN ([ acetaminophen\_NN ]) and\_CC

<: avoid\_VB :>

([ those\_DT containing\_VBG ibuprofen\_NN ]),\_, ([ Naproxen\_NNP ]),\_, ([ aspirin\_NNS

]),\_, or\_CC ([ aspirin-containing\_JJ drugs\_NNS ]),\_.

([ They\_PRP ])

<: should\_MD also\_RB rest\_VB :>

,\_.

<: drink\_VB :>

plenty\_JJ of\_IN ([ fluids\_NNS ])

<: to\_TO prevent\_VB :>

([ dehydration\_NN ]),\_,

<: avoid\_VBP :>

([ mosquito\_NN bites\_NNS ]) while\_IN feverish\_JJ ,\_, and\_CC

<: consult\_VB :>

([ a\_DT physician\_NN ]),\_.

As\_IN with\_IN ([ Dengue\_NNP ]),\_, there\_EX

<: is\_VBZ :>

([ no\_DT specific\_JJ medication\_NN ]) for\_IN ([ DHF\_NNP ]),\_.

If\_IN ([ a\_DT clinical\_JJ diagnosis\_NN ])

<: is\_VBZ made\_VBN early\_RB :>

,\_, ([ a\_DT health\_NN care\_NN provider\_NN ])

<: can\_MD effectively\_RB treat\_VB :>

([ DHF\_NNP ]) using\_VBG ([ fluid\_JJ replacement\_NN therapy\_NN ]),\_.

([ Adequate\_JJ management\_NN ]) of\_IN ([ DHF\_NNP ])

<: generally\_RB requires\_VBZ :>

([ hospitalization\_NN ]),\_.

Reducing\_VBG ([ the\_DT Risk\_NNP ]) of\_IN ([ Contracting\_NNP Dengue\_NNP ])

There\_EX

<: is\_VBZ :>

([ no\_DT vaccine\_NN ]) available\_JJ against\_IN ([ Dengue\_NNP ]) and\_CC there\_EX

<: are\_VBP :>

([ no\_DT specific\_JJ medications\_NNS ])

<: to\_TO treat\_VB :>

([ a\_DT Dengue\_NNP infection\_NN ]),\_.

([ This\_DT ])

<: makes\_VBZ :>

([ prevention\_NN ]) ([ the\_DT most\_RBS important\_JJ step\_NN ]), and\_CC ([ prevention\_NN means\_NNS ]) avoiding\_VBG ([ mosquito\_NN bites\_NNS ]) if\_IN ([ people\_NNS ])

<: live\_VBP :>

in\_IN or\_CC

<: travel\_VB :>

to\_TO ([ an\_DT endemic\_JJ area\_NN ]).

([ The\_DT best\_JJS way\_NN ])

<: to\_TO reduce\_VB :>

([ mosquitoes\_NNS ])

<: is\_VBZ to\_TO eliminate\_VB :>

([ the\_DT places\_NNS ]) where\_WRB ([ the\_DT female\_JJ mosquito\_NN ])

<: lays\_VBZ :>

([ her\_PRPS\$ eggs\_NNS ]) such\_JJ as\_IN ([ artificial\_JJ containers\_NNS ]) that\_IN ([ hold\_NN water\_NN ]) in\_IN and\_CC around\_IN ([ the\_DT home\_NN ]).

Outdoors\_RB , ([ water\_NN containers\_NNS ]) like\_IN ([ pet\_NN ]) and\_CC ([ animal\_NN ]) watering\_VBG ([ containers\_NNS ]) or\_CC ([ flower\_NN planter\_NN dishes\_NNS ])

<: should\_MD be\_VB cleaned\_VBN :>

and\_CC ([ water\_NN storage\_NN barrels\_NNS ])

<: should\_MD be\_VB covered\_VBN :>

..

([ Containers\_NNS ]) with\_IN ([ standing\_VBG water\_NN ]) indoors\_RB such\_JJ as\_IN ([ vases\_NNS ]) with\_IN ([ fresh\_JJ flowers\_NNS ])

<: should\_MD be\_VB cleaned\_VBN :>

at\_IN least\_JJS once\_IN ([ a\_DT week\_NN ]).

([ Adult\_JJ mosquitoes\_NNS ])

<: will\_MD bite\_VB :>

inside\_IN as\_RB well\_RB as\_IN ([ outside\_JJ homes\_NNS ]), during\_IN ([ the\_DT day\_NN ]) and\_CC ([ even\_NN ]) at\_IN ([ night\_NN ]) when\_WRB ([ the\_DT lights\_NNS ])

<: are\_VBP on\_RB :>

.

([ People\_NNS ]) in\_IN ([ affected\_JJ areas\_NNS ])

<: should\_MD protect\_VB :>

([ themselves\_PRP ]) by\_IN ([ using\_VBG insect\_NN ]) repellent\_JJ on\_IN ([ their\_PRPS skin\_NN ]) while\_IN ([ indoors\_NN ]) or\_CC ([ outside\_NN ]), wearing\_VBG ([ long\_JJ sleeves\_NNS ]) and\_CC ([ pants\_NNS ]) when\_WRB possible\_JJ , sleeping\_VBG under\_IN ([ mosquito\_NN bed\_NN nets\_NNS ]), and\_CC ensuring\_VBG that\_IN ([ windows\_NNS ]) and\_CC ([ door\_NN screens\_NNS ])

<: are\_VBP :>

secure\_JJ and\_CC without\_IN ([ holes\_NNS ]).

If **IN** available **JJ** ,\_ , ([ air-conditioning **NN** ])

<: should **MD** be **VB** used **VBN** :>

.\_.

If **IN** ([ someone **NN** ]) in **IN** ([ a **DT** household **NN** ])

<: is **VBZ** :>

ill **JJ** with **IN** ([ Dengue **NNP** ]),\_ , ([ extra **JJ** precautions **NNS** ])

<: should **MD** be **VB** taken **VBN** :>

<: to **TO** prevent **VB** :>

([ mosquitoes **NNS** ]) from **IN** biting **VBG** ([ the **DT** patient **JJ** and **CC** infecting **JJ** others **NNS** ]) in **IN** ([ the **DT** household **NN** ]).\_.

Parts of Speech	Total
Nouns	426
Verbs	143
Pronouns	20
Adjectives	165
Articles	125
Adverbs	59
Prepositions	191
Conjunctions	-
Interjections	-
Total Words	1,129

#### Explicitness Level Formula

$F = (\text{noun frequency} + \text{adjective frequency} + \text{preposition frequency} + \text{article frequency} - \text{pronoun frequency} - \text{verb frequency} - \text{adverb frequency} - \text{interjection frequency} + 100) / 2$

**Explicitness Level =  $(37.7 + 14.6 + 16.9 + 11.0 - 1.7 - 12.6 - 5.2 - 0 + 100) / 2 = 80.35$**

## Implicit Version

([ Incidence\_NNP ])

Over\_IN ([ one-third\_NN ]) of\_IN ([ the\_DT world\_NN risks\_NNS ]) getting\_VBG ([  
Dengue\_NNP ]),\_, ([ which\_WDT ])

<: sickens\_VBZ and\_CC kills\_VBZ :>

([ people\_NNS ]),\_.

([ Mosquitoes\_NNS ]) ([ that\_WDT ])

<: transmit\_VBP :>

([ viruses\_NNS ])

<: infect\_VBP :>

([ people\_NNS ]) yearly\_RB .\_.

Currently\_RB ,\_, there\_EX

<: are\_VBP :>

([ no\_DT vaccines\_NNS ]) preventing\_VBG ([ it\_PRP ]) and\_CC

<: measures\_VBZ :>

that\_IN most\_JJS

<: effectively\_RB protect\_VB :>

([ people\_NNS ])

<: are\_VBP :>

([ those\_DT ]) that\_WP

<: avoid\_VBP :>

([ bites\_NNS ]),\_.

When\_ **WRB** ([ someone\_ **NN** ])

<: becomes\_ **VBZ** :>

infected\_ **VCN** ,\_, recognizing\_ **VBG** ([ it\_ **PRP** ]) and\_ **CC** treating\_ **VBG** ([ it\_ **PRP** ])

<: quickly\_ **RB** can\_ **MD** substantially\_ **RB** lower\_ **VB** :>

([ the\_ **DT** risk\_ **NN** ]) of\_ **IN** ([ developing\_ **VBG** ]) ([ it\_ **PRP** ])\_.

([ It\_ **PRP** ])

<: has\_ **VBZ** been\_ **VCN** :>

problematic\_ **JJ** only\_ **RB** since\_ **IN** ([ the\_ **DT** 1950s\_ **CD** ])\_.

([ It\_ **PRP** ])

<: rarely\_ **RB** occurs\_ **VBZ** :>

in\_ **IN** ([ the\_ **DT** United\_ **NNP** States\_ **NNPS** ]) but\_ **CC**

<: occurs\_ **VBZ** :>

yearly\_ **JJ** in\_ **IN** ([ Puerto\_ **NNP** Rico\_ **NNP** ]),\_, ([ Latin\_ **NNP** America\_ **NNP** ]),\_, and\_ **CC**

([ Southeast\_ **NNP** Asia\_ **NNP** ])\_.

([ Samoa\_ **NNP** ]) and\_ **CC** ([ Guam\_ **NNP** ])

<: also\_ **RB** have\_ **VB** :>

([ it\_ **PRP** ]) periodically\_ **RB** . .

Origin

([ Monkeys\_ **NNS** ])

<: began\_ **VBD** :>

([ Dengue\_ **NNP** ]),\_, ([ which\_ **WDT** ])

<: independently\_**RB** jumped\_**VBD** :>

to\_**TO** ([ humans\_**NNS** ]) in\_**IN** ([ Africa\_**NNP** ]) or\_**CC** ([ Southeast\_**NNP** Asia\_**NNP**  
100-800\_**CD** years\_**NNS** ]) ago\_**RB** .\_.

([ It\_**PRP** ])

<: remained\_**VBD** :>

relatively\_**RB** minor\_**JJ** until\_**IN** ([ the\_**DT** 1950s\_**CD** ])\_.

([ World\_**NNP** War\_**NNP** II\_**NNP** ])\_—\_: in\_**IN** ([ particular\_**NN** ]),\_, ([ the\_**DT**  
transportation\_**NN** ]) of\_**IN** ([ mosquitoes\_**NNS** ]) unintentionally\_**RB** —\_:

<: is\_**VBZ** thought\_**VBN** :>

<: to\_**TO** have\_**VB** :>

helped\_**VBN**

<: disseminate\_**VB** :>

([ it\_**PRP** ])\_.

([ Dengue\_**NNP** Hemorrhagic\_**NNP** Fever\_**NNP** ]) ( ( ([ DHF\_**NNP** ] :>  
\_) ,\_, ([ its\_**PRPS** severest\_**JJS** form\_**NN** ]),\_,

<: was\_**VBD** documented\_**VBN** :>

in\_**IN** ([ the\_**DT** 1950s\_**CD** ]) in\_**IN** ([ Thailand\_**NNP** ]) and\_**CC** ([ the\_**DT**  
Philippines\_**NNP** ])\_.

([ Cases\_**NNS** ])

<: appeared\_**VBD** :>

in\_**IN** ([ the\_**DT** Caribbean\_**NNP** ]) and\_**CC** ([ Latin\_**NNP** America\_**NNP** ]) where\_**WRB**

([ programs\_NNS ])

<: had\_VBD existed\_VBN :>

until\_IN the\_DT 1970s\_SYM .\_.

([ Forty\_CD percent\_NN ]) of\_IN ([ the\_DT world\_NN ])

<: currently\_RB lives\_VBZ :>

where\_WRB there\_EX

<: is\_VBZ :>

([ risk\_NN ]).\_.

([ It\_PRP ])

<: occurs\_VBZ :>

yearly\_JJ in\_IN at\_IN ([ least\_JJS 100\_CD countries\_NNS ]) in\_IN ([ Asia\_NNP ]),\_ ([ the\_DT Pacific\_NNP ]),\_ ([ the\_DT Americas\_NNP ]),\_ ([ Africa\_NNP ]),\_ and\_CC ([ the\_DT Caribbean\_NNP ]).\_.

([ The\_DT World\_NNP Health\_NNP Organization\_NNP ]) ( ([ WHO\_NNP ] :>

)

<: estimates\_VBZ :>

that\_IN ([ 50-100\_CD ]) million\_CD

<: get\_VBP infected\_VBN yearly\_RB :>

:-

([ 500,000\_CD ])

<: are\_VBP :>

([ DHF\_NNP ])

<: cases\_VBZ :>

;\_: ([ 22,000\_CD die\_NN ]),\_, mostly\_RB ([ children\_NNS ]),\_.

Transmission

([ Mosquitoes\_NNS ]),\_,

<: found\_VBD everywhere\_RB :>

,\_

<: transmit\_VB :>

([ Dengue\_NNP ]),\_.

([ Insects\_NNS ]) ([ that\_WDT ])

<: transmit\_VBP :>

([ disease\_NN ])

<: are\_VBP called\_VBN :>

([ vectors\_NNS ]),\_.

([ Symptoms\_NNS ])

<: usually\_RB begin\_VBP :>

after\_IN ([ biting\_VBG ]) and\_CC ([ typically\_RB last\_JJ days\_NNS ]),\_.

([ Mosquitoes\_NNS ])

<: must\_MD feed\_VB :>

when\_WRB ([ viruses\_NNS ])

<: are\_VBP :>

in\_IN ([ their\_PRPS blood\_NN ]),\_, ([ which\_WDT ])

<: usually\_RB begins\_VBZ slightly\_RB :>

before\_IN ([ people\_NNS ])

<: become\_VBP :>

symptomatic\_JJ .\_.

([ Some\_DT ])

<: never\_RB have\_VBP :>

([ symptoms\_NNS ]) but\_CC

<: can\_MD still\_RB infect\_VB :>

([ mosquitoes\_NNS ]).\_.

After\_IN ([ entering\_VBG ]),\_, ([ viruses\_NNS ])

<: require\_VBP :>

([ days\_NNS ])

<: to\_TO be\_VB transmitted\_VBN :>

.\_.

([ Mosquitoes\_NNS ])

<: remain\_VBP :>

infected\_VBN for\_IN ([ their\_PRPS lives\_NNS ]),\_, ([ which\_WDT ])

<: might\_MD be\_VB :>

([ days\_NNS ]) or\_CC ([ weeks\_NNS ]).\_.

Rarely **RB** , , ([ transplants **NNS** ]) or **CC** ([ transfusions **NNS** ])

<: can **MD** transmit **VB** :>

([ Dengue **NNP** ]), , and **CC** evidently **RB** ([ those **DT** ]) who **WP**

<: are **VBP** :>

pregnant **JJ**

<: can **MD** transmit **VB** :>

([ it **PRP** ]) to **TO** ([ fetuses **NNS** ]), , but **CC** ([ mosquitoes **NNS** ])

<: are **VBP** :>

largely **RB** responsible **JJ** . .

In **IN** ([ the **DT** tropics **NNS** ]) and **CC** ([ subtropics **NNS** ]), , ([ it **PRP** ])

<: occurs **VBZ** :>

yearly **JJ** when **WRB** ([ mosquitoes **NNS** ])

<: abound **VBP** :>

and **CC** ([ rainfall **NN** optimizes **NNS** ]) breeding **VBG** . .

([ These **DT** areas **NNS** ])

<: are **VBP** :>

, , however **RB** , , additionally **RB** risky **JJ** when **WRB** ([ people **NNS** ])

<: become **VBP** :>

infected **VCN** quickly **RB** . .

([ Epidemics **NNS** ])

<: require **VBP** :>

([ that **DT** mosquitoes **NNS** ])

<: coincide\_VBP :>

with\_IN ([ people\_NNS ]) who\_WP

<: have\_VBP :>

([ no\_DT immunity\_NN ]) as\_IN well\_RB as\_IN ([ contact\_JJ opportunities\_NNS ]).\_.

Although\_IN ([ mosquitoes\_NNS ]) commonly\_RB live\_JJ in\_IN ([ the\_DT United\_NNP

States\_NNPS ]) (\_ ([ U.S.\_NNP ] :>

\_),\_, ([ Dengue\_NNP ])

<: occurs\_VBZ :>

yearly\_JJ in\_IN ([ Mexico\_NNP ]) and\_CC ([ the\_DT U.S.\_NNP ])

<: has\_VBZ :>

([ no\_DT immunity\_NN ]).\_.

([ Transmission\_NN ]) in\_IN ([ the\_DT U.S.\_NNP ])

<: is\_VBZ lacking\_VBG primarily\_RB :>

because\_IN ([ infrequent\_JJ contact\_NN ])

<: does\_VBZ not\_RB sustain\_VB :>

([ transmission\_NN ]).\_.

Symptoms

([ Symptoms\_NNS ])

<: are\_VBP :>

mainly\_RB ([ fever\_NN ]) and\_CC at\_IN least\_JJS two\_CD of\_IN ([ these\_DT ]):\_.

\*\_SYM ([ Headache\_NN ])

\*\_SYM ([ Eye\_NN pain\_NN ]) ( ( behind\_IN ([ eyes\_NNS ] :>  
 )

\*\_SYM ([ Joint\_JJ pain\_NN ])

\*\_SYM ([ Muscle\_NN ]) or\_CC ([ bone\_NN pain\_NN ])

\*\_SYM ([ Rash\_NN ])

\*\_SYM ([ Bleeding\_NN ]) ( ( e.g.\_FW , ,

<: bleeds\_VBZ :>

, , ([ hemorrhages\_NNS ] ) , , or\_CC bruising\_VBG that\_WP

<: occurs\_VBZ easily\_RB :>

) )

\*\_SYM ([ Low\_RB white\_JJ cell\_NN count\_NN ])

Generally\_RB , , ([ children\_NNS ]) and\_CC ([ those\_DT ]) with\_IN ([ their\_PRPS  
 first\_JJ infection\_NN ])

<: have\_VBP :>

([ milder\_JJR illnesses\_NNS ]) than\_IN ([ those\_DT ]) who\_WP

<: are\_VBP :>

older\_JJR . .

([ Signs\_NNS ])

<: may\_MD appear\_VB :>

as\_IN ([ temperature\_NN declines\_NNS ]) and\_CC ([ symptoms\_NNS ])

<: begin\_VBP :>

‘.

([ Victims\_NNS ])

<: must\_MD visit\_VB :>

([ the\_DT emergency\_NN room\_NN ]) or\_CC ([ health\_NN provider\_NN ])

immediately\_RB when\_WRB ([ they\_PRP ]):\_:

\*\_SYM

<: Vomit\_VB persistently\_RB :>

or\_CC

<: have\_VB :>

([ pain\_NN ])

\*\_SYM ([ Display\_NN spots\_NNS ]) or\_CC ([ patches\_NNS ])

\*\_SYM

<: Bleed\_VB :>

from\_IN ([ nose\_NN ]) or\_CC ([ gums\_NNS ])

\*\_SYM

<: Vomit\_VB :>

([ blood\_NN ])

\* **\_SYM**

<: Pass\_ **VB** :>

([ black\_ **JJ** stools\_ **NNS** ])

\* **\_SYM** ([ Show\_ **NN** drowsiness\_ **NN** ]) or\_ **CC** ([ irritability\_ **NN** ])

\* **\_SYM**

<: Have\_ **VBP** :>

([ pale\_ **NN** ],\_, cold\_ **JJ** ,\_, or\_ **CC** ([ clammy\_ **JJ** skin\_ **NN** ])

\* **\_SYM**

<: Breathe\_ **VB** :>

with\_ **IN** ([ difficulty\_ **NN** ])

The\_ **DT** most\_ **RBS** serious\_ **JJ**

<: is\_ **VBZ** :>

([ Dengue\_ **NNP** hemorrhagic\_ **NN** fever\_ **NN** ]) ( ( [ DHF\_ **NNP** ] :>

) ,\_, ([ which\_ **WDT** ])

<: is\_ **VBZ** characterized\_ **VBN** :>

by\_ **IN** ([ fever\_ **NN** ]) ([ that\_ **WDT** ])

<: lasts\_ **VBZ** :>

([ days\_ **NNS** ]).\_.

([ Its\_ **PRPS** symptoms\_ **NNS** ])

<: are\_ **VBP** :>

generally\_ **RB** similar\_ **JJ** to\_ **TO** ([ Dengue\_ **NNP** ]).\_.

When\_WRB ([ the\_DT fever\_NN declines\_NNS ]),\_, ([ warnings\_NNS ])

<: may\_MD develop\_VB :>

.\_.

When\_WRB ([ capillaries\_NNS ])

<: become\_VBP :>

excessively\_RB permeable\_JJ ( ( “ `` leaky\_JJ ” ” ) ) ,\_, allowing\_VBG fluid\_JJ

<: to\_TO escape\_VB :>

into\_IN ([ the\_DT abdominal\_JJ membrane\_NN ] ) ( ( accumulating\_VBG ([ fluid\_NN ] )

excessively\_RB ,\_, ([ which\_WDT ])

<: may\_MD cause\_VB :>

( [ distension\_NN ] :>

) and\_CC ([ lung\_NN ] ) and\_CC ([ chest\_NN membranes\_NNS ] ) ( ( creating\_VBG ([

fluid\_NN ]),\_, ([ which\_WDT ])

<: may\_MD impair\_VB :>

( [ breathing\_NN ] :>

) . \_ .

( [ This\_DT ])

<: may\_MD lead\_VB :>

to\_TO ([ failure\_NN ] ) and\_CC ([ shock\_NN ]),\_, and\_CC possibly\_RB ([ death\_NN ])

if\_IN ([ treatment\_NN ])

<: is\_VBZ not\_RB promptly\_RB :>

and\_CC appropriately\_RB given\_VBN . \_ .

([ Those\_DT ] with\_IN ([ it\_PRP ])

<: have\_VBP :>

([ low\_JJ platelets\_NNS ],\_,

<: bruise\_VBP easily\_RB :>

,\_, or\_CC

<: have\_VB :>

([ hemorrhages\_NNS ],\_, bleeding\_VBG ([ noses\_NNS ]) or\_CC ([ gums\_NNS ],\_,

and\_CC ([ possibly\_RB internal\_JJ bleeding\_NN ]),\_.

Treatment

([ Nothing\_NN ])

<: specifically\_RB treats\_VBZ :>

([ Dengue\_NNP ]),\_.

([ Those\_DT ] who\_WP

<: think\_VBP :>

([ they\_PRP ])

<: have\_VB :>

([ it\_PRP ])

<: should\_MD use\_VB :>

([ acetaminophen\_JJ analgesics\_NNS ]) \_ ( ([ pain\_NN relievers\_NNS ] :>

) and\_CC

<: avoid\_VBP :>

([ ibuprofen\_NN ]),\_, ([ Naproxen\_NNP ]),\_, ([ aspirin\_NNS ]),\_, or\_CC ([ aspirin-containing\_JJ drugs\_NNS ])\_.

([ They\_PRP ])

<: should\_MD also\_RB rest\_VB :>

,\_

<: drink\_VB :>

<: to\_TO prevent\_VB :>

([ dehydration\_NN ]),\_,

<: avoid\_VBP :>

([ bites\_NNS ]),\_, and\_CC

<: consult\_VB :>

([ a\_DT physician\_NN ])\_.

([ Nothing\_NN ])

<: specifically\_RB treats\_VBZ :>

([ DHF\_NNP ])\_.

If\_IN ([ health\_NN providers\_NNS ])

<: diagnose\_VBP :>

([ it\_PRP ]) early\_RB ,\_, ([ they\_PRP ])

<: can\_MD effectively\_RB treat\_VB :>

([ it\_PRP ]) using\_VBG ([ hydration\_NN ])\_.

Managing\_VBG ([ it\_PRP ])

<: adequately\_RB generally\_RB requires\_VBZ :>

([ hospitalization\_NN ]).\_.

Reducing\_VBG ([ Risk\_NN ])

There\_EX

<: is\_VBZ :>

([ no\_DT vaccine\_NN ] and\_CC ([ nothing\_NN ])

<: specifically\_RB treats\_VBZ :>

([ it\_PRP ]).\_.

Preventing\_VBG ([ it\_PRP ])

<: is\_VBZ :>

most\_RBS important\_JJ and\_CC that\_IN ([ means\_NNS ]) avoiding\_VBG ([  
mosquitoes\_NNS ]) if\_IN ([ people\_NNS ])

<: live\_VB or\_CC travel\_VB :>

where\_WRB ([ it\_PRP ])

<: occurs\_VBZ yearly\_RB :>

..

Reducing\_VBG ([ mosquitoes\_NNS ])

<: involves\_VBZ :>

eliminating\_VBG where\_WRB ([ they\_PRP ])

<: lay\_VBD :>

([ their\_PRPS eggs\_NNS ]) like\_IN ([ containers\_NNS ]) that\_IN ([ hold\_NN water\_NN ]).

([ Containers\_NNS ]) or\_CC ([ planters\_NNS ])

<: should\_MD be\_VB cleaned\_VBN :>

and\_CC ([ barrels\_NNS ])

<: should\_MD be\_VB covered\_VBN :>

..

([ Containers\_NNS ])

<: should\_MD be\_VB cleaned\_VBN weekly\_RB :>

..

Biting\_VBG

<: occurs\_VBZ :>

inside\_JJ and\_CC outside\_RB ,\_, during\_IN ([ the\_DT day\_NN ]) and\_CC at\_IN ([ night\_NN ]).

([ Those\_DT ]) in\_IN ([ affected\_JJ areas\_NNS ])

<: should\_MD use\_VB :>

([ repellent\_NN ]),\_, ([ wear\_NN sleeves\_NNS ]) and\_CC ([ pants\_NNS ]) when\_WRB ([ possible\_NN ]),\_, ([ sleep\_NN ]) under\_IN ([ nets\_NNS ]),\_, and\_CC ([ secure\_JJ windows\_NNS ]) and\_CC ([ screens\_NNS ]) and\_CC

<: ensure\_VB :>

that\_IN ([ they\_PRP ])

<: do\_VBP n't\_RB have\_VB :>

([ holes\_NNS ])\_.\_.

If\_IN available\_JJ ,\_ , ([ air-conditioning\_NN ])

<: should\_MD be\_VB used\_VBN :>

.\_.

If\_IN ([ someone\_NN ])

<: is\_VBZ :>

ill\_JJ ,\_ , ([ precautions\_NNS ])

<: should\_MD be\_VB taken\_VBN :>

<: to\_TO prevent\_VB :>

([ mosquitoes\_NNS ]) from\_IN ([ biting\_VBG])

Parts of Speech	Total
Nouns	218
Verbs	147
Pronouns	39
Adjectives	62
Articles	36
Adverbs	73
Prepositions	59
Conjunctions	-
Interjections	-
Total Words	634

#### Explicitness Level Formula

*F = (noun frequency + adjective frequency + preposition frequency + article frequency – pronoun frequency – verb frequency – adverb frequency – interjection frequency + 100)/2*

**Explicitness Level =  $(34.3+9.7+9.3+5.6-6.1-23.1-11.5-0+100)/2=59.1$**

## Appendix J – Survey Questionnaires

### Demographic Survey

#### Question 1.

In general, how comfortable do you feel using **computers**?

- Very uncomfortable
- Somewhat uncomfortable
- Neutral
- Somewhat comfortable
- Very comfortable

#### Question 2.

In general, how comfortable do you feel using the **World Wide Web** (the Web)?

- Very uncomfortable
- Somewhat uncomfortable
- Neutral
- Somewhat comfortable
- Very comfortable

#### Question 3.

How many years have you used the Web?

- 1-3
- 4-6
- 7-9
- More than 10

**Question 4.**

How often do you use the Web to look up **general** information?

- Never
- A few times a month
- About once a month
- About once a week
- More than once a week

**Question 5.**

How often do you use the Web to look up **medical** information?

- Never
- A few times a month
- About once a month
- About once a week
- More than once a week

**Question 6.**

What is the highest level of **general** education you have completed in Japan?

- Junior high school
- Senior high school
- Vocation/technical school
- Several years of college or university (no degree)
- Junior college
- Graduate school
- Other:

**Question 7.**

How many years of **general** education have you completed in the United States at the following levels? (Answer all that apply)

	<b>1 year</b>	<b>2 years</b>	<b>3 years</b>	<b>4 years</b>	<b>5 years</b>	<b>6 years</b>
Elementary School	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Middle School	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High School	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vocation/Technical School	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Several years of college (no degree)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Junior College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Graduate School	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 8.**

If you completed a college program in the United States, did you major in English at the **Bachelor's level**?

- Yes  
 No

**Question 9.**

If you completed a college program in the United States, did you major in English at the **graduate** school level?

- Yes  
 No

**Question 10.**

What is your gender?

- Male  
 Female

**Question 11.**

What is your age?

- Under 18
- 18-25
- 26-35
- 36-45
- 46-55
- Over 56

**Question 12.**

Are you a medical professional?

- Yes
- No

**Question 13.**

If you have worked in a medical setting, what job have you held?

- Physician
- Nurse
- Paramedic
- Administration
- Research Scientist
- Other (Please specify) : \_\_\_\_\_

**Question 14.**

Are you a native English speaker?

- Yes
- No

**Question 15.**

How would you rate your English **reading** ability?

- Very low
- Low
- Medium
- High
- Very High

**Question 16.**

If you are not a native English speaker, how many years of **English language** education do you have?

Enter an integer (without commas).Limit response to two characters.

**Question 17.**

Have you taken the Test of English for International Communication (TOEIC)?

- Yes
- No

**Question 18.**

If you answered YES to question 15, what was your score?

Enter an integer (without commas).Limit response to three characters.

### Credibility Perceptions Survey

#### Question 19.

Please indicate your level of agreement or disagreement with the following statements:

	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly agree</b>
The information in this article is correct.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article is objective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can believe the information in the article.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article seems like it has been written by someone who is an authority on this topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is well-organized.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is clearly written.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is of high quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article seems up-to-date.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article seems to be similar to what other authorities say about this topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can trust the information in this article.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article's author seems to have the patient's best interests in mind.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The amount of information about this topic seems to be complete.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The meaning of this article is confusing to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The words used in this article provide enough detail to understand the topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article does not favor only one type of viewpoint.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Question 20.**

- |  | Yes                   | No                    |
|--|-----------------------|-----------------------|
| If you knew SOMEONE who had or was at risk of getting [MEDICAL CONDITION], would you recommend that he or she read this article?                             | <input type="radio"/> | <input type="radio"/> |
| If YOU had or were at risk of getting [MEDICAL CONDITION], would you be willing to use information in this article to make decisions about your health care? | <input type="radio"/> | <input type="radio"/> |

**Question 21.**

How **interesting** was the information?

- Very uninteresting
- Uninteresting
- Neutral
- Interesting
- Very interesting

**Question 22.**

How **difficult** was the article?

- Very difficult
- Difficult
- Neutral
- Easy
- Very easy

**Question 23.**

How **familiar** were you with the information in this article?

- Very unfamiliar
- Unfamiliar
- Neutral
- Familiar
- Very familiar

**Question 24.**

What characteristics of a Web site would most influence your decision to use the health information you read on it? (Rank the importance by marking 1, 2, 3, 4, with 1 being the most important).

- Credentials of the author(s)
- Contact information (for example, street address, e-mail, or phone number)
- The information itself
- The name of the institution sponsoring the information
- Other: \_\_\_\_\_

**Question 25.**

- |   | Yes                   | No                    |
|---|-----------------------|-----------------------|
| Do YOU have [MEDICAL CONDITION]?                              | <input type="radio"/> | <input type="radio"/> |
| Do you have a FRIEND or RELATIVE who has [MEDICAL CONDITION]? |                       |                       |

**English Language Comprehension Survey****Question 26.**

Which area is typically **not** affected by rheumatoid arthritis?

- The low back.
- The neck.
- The shoulders.

**Question 27.**

Which statement is **most** true of rheumatoid arthritis?

- It goes into spontaneous remission.
- Joints affected tend to be in a symmetrical pattern.
- Rheumatoid arthritis is most common in the elderly.

**Question 28.**

Which of the following might increase joint pain in rheumatoid arthritis?

- Decreased muscle mass.
- Excess joint fluid.
- Thinning of the synovium.

**Question 29.**

Which of the following is most likely to occur in people with rheumatoid arthritis?

- Glaucoma.
- Inflamed lymph nodes.
- Inflamed tear ducts.

**Question 30.**

Which condition would **most** likely be caused by another form of arthritis rather than rheumatoid arthritis?

- Hip arthritis.
- Low back arthritis.
- Neck arthritis.

**Question 31.**

A common condition related to rheumatoid arthritis might require the use of:

- Cough expectorants.
- Eye lubricants.
- Laxatives.

## Appendix K – Catalyst Survey

The following screen captures show each screen participants were asked to read and/or complete.

### Welcome

## Perceptions of Online Medical Information

Page 1 of 10

**Welcome!**

Thank you for your help with this research study. This study is being conducted by a graduate student in the Department of Human Centered Design & Engineering at the University of Washington.

The study investigates factors that affect the perceptions of online medical information for users who are nonnative English speakers. Your participation will help develop guidelines that improve English-language medical web sites for these users.

The study will take approximately [X] minutes to complete, depending on your reading speed. **Please take your time to carefully read the study article and answer the survey questions; this is not a test of reading speed.** To participate in the study you will:

1. Read two short articles about medical information.
2. Take some short surveys.
3. **If you wish, enter a drawing to win one of three Amazon.com gift certificates (\$15, \$25, \$50).** This step is optional.

**Your name will not be associated with any of the study data.** If you enter the drawing at the end of the survey, your e-mail address will be kept confidential and separate from your answers. You can skip any question you do not wish to answer or you can leave the study at any time by closing your browser. Participating in this study should cause you no more discomfort than reading other information on the Web and answering questions about it.

By clicking on the "Next" Link, you are agreeing to participate in this study and are affirming that you are at least 18 years old. Please feel free to print a copy of this consent form for your records.

[Next >>](#)

**Study Instructions****Perceptions of Online Medical Information**

Page 2 of 10

**Study Instructions**

- Please maximize your browser window for better viewing of the study Web pages.
- Complete a brief survey about your use of the Web.
- Read two short medical articles and answer survey questions afterward.
- Enter your e-mail address if you wish to enter the drawing for one of the Amazon.com gift certificates.

**Please Note:**

In order for your study data to count

- Please maximize your browser window for better viewing of the study Web pages
- Do not open multiple windows or tabs for the study site
- Do not return to the articles after you have entered the surveys following them

To begin your participation in the study, please click the "Next" link below. Thank you for participating.

[<< Previous](#)    [Next >>](#)

## Demographic Survey

### Perceptions of Online Medical Information

Page 3 of 10

**Question 1.**

In general, how comfortable do you feel using **computers**?

- Very uncomfortable
- Somewhat uncomfortable
- Neutral
- Somewhat comfortable
- Very comfortable

**Question 2.**

In general, how comfortable do you feel using the **World Wide Web** (the Web)?

- Very uncomfortable
- Somewhat uncomfortable
- Neutral
- Somewhat comfortable
- Very comfortable

**Question 3.**

How many years have you used the Web?

- 1-3
- 4-6
- 7-9
- More than 10

**Note:** Appendix J contains the complete demographic survey.

## Instructions for First Medical Article

### Perceptions of Online Medical Information

Page 4 of 10

**Please read the the following medical article. When reading it, imagine...**

You or a loved one has [medical condition] and you want to find out about its symptoms and treatment options. You want to learn as much as you can about this condition so you decide to read an article about it on the Web.

After you read the article, please respond to the survey questions. Please **do not revisit the medical article after you start the survey.**

[<< Previous](#)    [Next >>](#)

**First Medical Article****Perceptions of Online Medical Information**

Page 5 of 10

[MEDICAL ARTICLE]

<< [Previous](#)   [Next](#) >>**Note:** Appendix G contains the complete text of the first medical article**Credibility Perceptions Survey****Perceptions of Online Medical Information**

Page 6 of 10

**Question 19.**

Please indicate your level of agreement or disagreement with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The information in this article is correct.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article is objective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can believe the information in the article.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The article seems like it has been written by someone who is an authority on this topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is well-organized.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is clearly written.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article is of high quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information in this article seems up-to-date.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Note:** Appendix J contains the complete credibility perceptions survey.

## Instructions for English Language Comprehension Article

### Perceptions of Online Medical Information

Page 7 of 10

Now you will read one final short medical article and answer a few more questions on it. Please do not revisit the medical article after you start the survey.

[<< Previous](#)   [Next >>](#)

## English Language Comprehension Article

### Perceptions of Online Medical Information

Page 8 of 10

#### Rheumatoid Arthritis

##### What are the early signs of rheumatoid arthritis?

Initial symptoms of rheumatoid arthritis (RA) are generally pain and stiffness in the morning and a few *symptoms with activity*

The pain and swelling will usually progress on to obvious joint swelling and the level of stiffness in the morning increases. Other symptoms include fatigue and difficulty sleeping due to joint stiffness.

##### What are common symptoms of rheumatoid arthritis?

Rheumatoid arthritis can be distinguished from other forms of arthritis by the location and number of joints involved. The areas affected include the neck, shoulders, elbows, wrists, and hands, especially the joints at the base and middle of the fingers but not the joints at the end of the fingers. In the lower extremities, RA can affect the hips, knees, ankles, and the joints at the base of the toes. RA tends to spare the low back. The joints affected tend to be involved in a symmetrical pattern. That is, if knuckles on the right hand are inflamed, it is likely that knuckles on the left hand will be inflamed as well. This symmetry is not found as often in most other types of arthritis.

Fatigue in RA is due to many factors. It can be due to the inflammation which produces chemicals called cytokines that commonly cause fatigue. People with RA might have a mild anemia that also might contribute to fatigue and the sleep disturbance from night time pain may also be a factor. Finally, people with RA tend to decrease their exercise and thus lose stamina and strength and this might also play a role in their fatigue.

**Note:** Appendix L contains the complete text of the English language comprehension article

## English Language Comprehension Survey

## Perceptions of Online Medical Information

Page 9 of 10

**Question 26.**

Which area is typically **not** affected by rheumatoid arthritis?

- The low back.
- The neck.
- The shoulders

**Question 27.**

Which statement is **most** true of rheumatoid arthritis?

- It goes into spontaneous remission.
- Joints affected tend to be in a symmetrical pattern.
- Rheumatoid arthritis is most common in the elderly.

**Question 28.**

Which of the following might increase joint pain in rheumatoid arthritis?

- Decreased muscle mass.*
- Excess joint fluid.
- Thinning of the synovium.

**Question 29.**

Which of the following is most likely to occur in people with rheumatoid arthritis?

- Glaucoma.
- Inflamed lymph nodes.
- Inflamed tear ducts.

**Note:** Appendix J contains the complete English language comprehension survey.

**Participant Thank You and Opportunity to Enter Raffle****Perceptions of Online Medical Information**

Page 10 of 10

**Thank you for participating in this study!**

If you would like to enter a drawing for one of three Amazon.com gift certificates (\$15, \$25, \$50), please enter your e-mail address in the space below. **Your e-mail information will be kept in a separate and confidential database and will not be connected in any way at all to your survey responses.** Winners of the gift certificates will be notified by [DATE].

After entering your e-mail address, click the SUBMIT RESPONSES button at the bottom of the screen.

If you do not wish to enter the drawing, leave the e-mail field blank and click the SUBMIT RESPONSES button.

**Question 32.**

E-mail address:

---

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## **Appendix L – English Language Comprehension Article**

### **Rheumatoid Arthritis**

#### **What are the early signs of rheumatoid arthritis?**

Initial symptoms of rheumatoid arthritis (RA) are generally pain and stiffness in the morning and a few symptoms with activity.

The pain and swelling will usually progress on to obvious joint swelling and the level of stiffness in the morning increases. Other symptoms include fatigue and difficulty sleeping due to joint stiffness.

#### **What are common symptoms of rheumatoid arthritis?**

Rheumatoid arthritis can be distinguished from other forms of arthritis by the location and number of joints involved. The areas affected include the neck, shoulders, elbows, wrists, and hands, especially the joints at the base and middle of the fingers but not the joints at the end of the fingers. In the lower extremities, RA can affect the hips, knees, ankles, and the joints at the base of the toes. RA tends to spare the low back. The joints affected tend to be involved in a symmetrical pattern. That is, if knuckles on the right hand are inflamed, it is likely that knuckles on the left hand will be inflamed as well. This symmetry is not found as often in most other types of arthritis.

Fatigue in RA is due to many factors. It can be due to the inflammation which produces chemicals called cytokines that commonly cause fatigue. People with RA might have a mild anemia that also might contribute to fatigue and the sleep disturbance from night time pain may also be a factor. Finally, people with RA tend to decrease their exercise and thus lose stamina and strength and this might also play a role in their fatigue.

**How do the symptoms of rheumatoid arthritis change over time?**

About one in 10 people with RA will have a single episode of disease activity (or joint inflammation) and a spontaneous long-lasting remission. However, in almost all people with RA, inflammation of the joints will persist for a long period of time. The way RA acts will vary from person to person. In some people the disease will be mild with periods of activity (worsening joint inflammation) called "flares." In other cases the disease will be continuously active and appear to get worse, or progress, over time.

Inflamed joints will be warm, swollen, tender, often red, and painful or difficult to move. These physical signs of arthritis are due to inflammation of the lining of joints and tendons in a layer of tissue that is called synovium. The cells of the immune system within the synovium appear active and capable of causing tissue damage. If this inflammation persists or does not respond well to treatment, destruction of nearby cartilage, bone, tendons, and ligaments can follow. This may lead to deformity and disability that can be permanent. However, many patients with rheumatoid arthritis are able to get improved function and pain relief from surgical reconstruction of the damaged joints, such as total hip arthroplasty, total knee arthroplasty, and total shoulder arthroplasty.

**Rheumatoid nodules**

About one-fifth of people with RA also develop the rheumatoid nodules, which are lumps of tissue that form under the skin, often over bony areas. These occur most often around the elbow but can be found elsewhere on the body and even in internal organs. Occasionally, people with RA will develop inflammation of the membranes that surround the heart (pericarditis) and lung (pleuritis). RA can also cause an emphysema-like condition called rheumatoid lung that can affect a person's ability to breathe comfortably. People with RA often develop dry eyes and a dry mouth due to inflammation of tear glands and salivary glands (called sicca syndrome). Occasionally, a low white blood cell count may occur

because of the rheumatoid arthritis. Rarely, people with RA develop vasculitis inflammation of blood vessels that can cause illness affecting the skin, nerves and other organs or tissues. An unusual condition called Felty's syndrome is rheumatoid arthritis, low white blood cell counts, and enlargement of the spleen. All of the above conditions are rare with the exception of rheumatoid nodules. The nodules tend to occur in people with more serious forms of RA.

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**VITA**

Alexandra L. Bartell was born on an island in the southwest Pacific Ocean near the eastern coast of Australia. As the daughter of a Foreign Service Officer, she lived the first 18 years of her life in New Caledonia, the Dominican Republic, Nicaragua, and Morocco. She graduated from high school knowing how to hunt iguanas and ride camels but not how to cross a busy roadway in America.

After returning to live in the United States, she continued her education by earning a Bachelor's degree in Psychology from Hollins University; an MBA from Monmouth University; a Master of Science in Technical Communication from the University of Washington; and three certificates from the University of Washington in Technical Writing and Editing, Digital Production in Graphic Design, and User Centered Design. Alexandra is also an accomplished skydiver and scuba diver. In her spare time, she enjoys fishing, camping, and mushroom hunting with friends in the Washington state forests.

She currently resides in Seattle, Washington where she has worked at the Boeing Company for 22 years as a technical communicator.