A Computer-Based Readability Analysis of Consumer Materials on the American Speech-Language-Hearing Association Website

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ABSTRACT: **Purpose:** The authors of this article examined the readability of audiology- and speech-language pathology-related consumer materials on the website of the American-Speech-Language-Hearing Association (ASHA) and reported their findings relative to the reading grade–level guidelines recommended by health literacy experts.
Method: A search was conducted on the ASHA website to find online audiology- and speech-language pathology-related content for consumers. The website listed consumer resources under a home page link titled "Information For: The Public." The readability of each document resource was determined using a Windows-based software: Readability Calculations version 7.5 (Micro Power and Light, 2008). Two hundred and twenty-five documents were loaded into the software for analysis. The documents were ordered alphabetically with Flesch Reading Ease (FRE; Flesch, 1948) scores and Flesch-Kincaid (FK; Kincaid, Fishburne, Rogers, & Chissom, 1975), Gunning FOG (Gunning, 1952), and FORCAST (Caylor, Sticht, Fox, & Ford, 1975) reading grade levels displayed.
Results: According to 4 different readability formulas, an overwhelming majority (85.4% or more) of the 225 consumer documents exceeded the 5th- to 6th-grade reading levels recommended by health literacy experts.
Conclusion: Many consumer articles on the ASHA website are likely to be of limited value to individuals with low health literacy. As a result, consumers might misinterpret or misapply information contained in the articles, putting themselves or those they care for at risk, or simply fail to seek help.

KEY WORDS: consumer, hearing, Internet, health literacy, readability, speech

The Internet has become an integral part of the everyday lives of most Americans. Although the exact number of U.S. Internet users cannot be directly determined, several converging sources indicate that there is high Internet use. According to the U.S. Census Bureau (2012), as of 2010, more than 292 million Americans ages 3 years and older had access to the Internet, with 75% living in a household with Internet access, 65% accessing (using) the Internet at home, and 38% accessing the Internet outside of home. The U.S. population reached approximately 309 million at the conclusion of 2010, which indicates that some 94% of Americans ages 3 years and older had the means to access and use the Internet. For Internet users ages 15 and older, health care searches were highest, followed by searches for government jobs, searches for nongovernment jobs, and taking a course (U.S. Census Bureau, 2012).

Fox (2006) reported that nearly eight out of 10 American Internet users search for medical information online. The top five reasons why people use the Internet was to find information about a condition, symptoms, and/or treatment, as well as advice about symptoms and/or treatment (Shuyler & Knight, 2003). Fox and Fallows (2003) reported that 93 million American Internet users search for at least one of 16 major health topics.

Medical information on the Internet generally has two audiences: consumers and health/medical professionals. Interestingly, the Health on the Net Foundation (Boyer, Provost, & Baujard, 2002) found that 75% of consumer respondents indicated that they sought health-related information on websites dedicated to medical professionals because they felt that health-related websites intended for consumers were too basic or that they required more complex information to gain a more complete picture. Unfortunately, misunderstanding and confusion often arises when more complex information on professional sites is sought (Boyer et al., 2002).

In terms of socioeconomic status (SES), the highest percentage of Internet users are generally White (non-Hispanic), between the ages of 18 and 29 years, with at least a college education, and making greater than $75,000 a year (Pew Internet & American Life Project, 2012). The lowest percentage of users are Black (non-Hispanic) or Hispanic, age 65 or older, never completed high school, or make less than $30,000 a year. These data are corroborated closely by the U.S. Census Bureau (2012) using somewhat different demographic categories. A point of contention, however, is that statistics on Internet use may be skewed toward certain SES variables.

Health literacy is defined as "the degree to which individuals can obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan & Parker, 2000, p. *v*). The skills needed to function effectively in the health care environment include the ability to (a) read and understand text and to locate and interpret information (print literacy); (b) use quantitative information for tasks, such as interpreting food labels, measuring blood glucose levels, and adhering to medication regimens (numeracy); and (c) speak and listen effectively (oral literacy) (Berkman et al., 2011).

Because of current trends in the need for health information on the Internet and in personal health records, as well as the prevalence of online health information and health information seeking, McCormack et al. (2010) included Internet literacy as a construct in the measurement of individual health literacy skills. Indeed, members of the Calgary Charter on Health Literacy defined health literacy as "that which allows the public and personnel working in all health-related contexts to find, understand, evaluate, communicate, and use information" to make informed decisions (Coleman et al., 2008, p. 1). Based on this definition, both the public (the patient, family member, or caregiver) and health workers are accountable for what is considered health literacy.

There are at least four problems faced by consumers of Internet health-related information who are not health care professionals. First, they may have limited Internet literacy skills, with low ability to use a computer and browser and navigate the Internet. Second, they may not have the skills to judge if the information they find is accurate and reliable. Third, they may not have adequate health literacy skills necessary to use and act on the information, even if it is accurate. Fourth, the literature is mixed on whether paper-based reading and online reading require the same set of skills, but several sources would indicate that reading from a screen is a slower process (Leu et al., 2011; O'Hara & Sellen, 1997).

It is generally well known that there are socioeconomic, racial/ethnicity, and educational attainment disparities in the access and use of computers and the Internet (Hsu et al., 2005; Jackson et al., 2003; Lenhart, Rainie, Fox, Horrigan, & Spooner, 2000). Because these disparities mirror many health disparities, it appears that individuals who need online health information the most experience the most barriers in accessing and using it.

The rates of limited or low health literacy are reportedly higher among elderly, minority, poor, and less educated persons (i.e., those with less than a

high school education; Kutner, Greenberg, Jin, & Paulsen, 2006; Parker, 2000). However, even individuals with an education beyond high school may have limited health literacy (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). The 2003 National Assessment of Adult Literacy revealed that the average reading comprehension level of English-speaking adults in the United States is estimated to be only at the 7th- or 8th-grade level (Kutner et al., 2006). To facilitate health literacy, however, it is recommended that health-related materials targeted to adults be written at the 5th- to 6th-grade reading level (Doak, Doak, & Root, 1996; Safeer & Keenan, 2005; Weiss & Coyne, 1997).

Communication disorder is a term that encompasses disorders of voice, speech, language, and hearing (Ruscello, St. Louis, & Mason, 1991). These disorders are potentially disabling conditions that may affect an individual's social and emotional well-being, cognition, and behavior (McKinnon, McLeod, & Reilly, 2007). Although there are no precise figures as to the overall prevalence of communication disorders, it is estimated that between 5% and 10% of the U.S. population has one (Aithal, 1985; Ruben, 2000). Using conservative prevalence estimates, the cost of communication disorders to the U.S economy is between $154 and $186 billion dollars per year, suggesting that these disorders are a significant economic drain on the economy (Ruben, 2000).

In the last decade or so, research has emerged in communication science and disorders on the health literacy skills of patients and the readability of patient-related materials. For example, Hester and colleagues (Hester, 2009; Hester & McCrary, 2011; Wengryn & Hester, 2011) reported some potentially incorrect assumptions about the health literacy skills of African Americans. For example, although African Americans are frequently reported to have low health literacy skills, Hester and colleagues reported that even when health literacy is adequate, poor health communication (or patient–provider communication) may be the biggest predictor for poor health outcomes in this group.

Recognizing the negative impact of limited health literacy skills among patients, von Wühilsch and Pascoe (2011) explored ways that speech-language pathologists in Cape Town, South Africa can maximize health literacy when working with patients to increase communication, understanding, and compliance. Concerned with the validity and reliability of outcome measures and questionnaires used in communication disorders, several researchers have reported consistently that many measures and questionnaires are written at reading levels that are incongruent with the recommended reading level for health information (Atcherson, Richburg, Zraick, & George, 2013; Atcherson, Zraick, & Brasseux, 2011; Kahn & Pannbacker, 2000; Kelly-Campbell, Atcherson, Zimmerman, & Zraick, 2012; Zraick & Atcherson, 2012; Zraick, Atcherson, & Brown, 2012; Zraick, Atcherson, & Ham, 2011).

To date, the health literacy levels of patients seeking care for hearing and/or speech-language deficits are unknown. Patients likely are using websites as resources to supplement their knowledge, and the information they find can influence their decisions about their health care. At the present time, there is no tool for evaluating the quality (i.e., accuracy or usefulness) of health information on the Internet (Ahmed, Sullivan, Schneders, & McCrory, 2011); however, there are numerous tools and guidelines available to make Internet websites easier to understand.

A major component of health literacy is reading, and a common way to check the potential comprehension of any document is to assess its readability. Several investigators have examined the readability of health consumer websites with congruent and largely disappointing results (Ahmed et al., 2011; Aliu & Chung, 2010; Badarudeen & Sabharwal, 2008; Biru et al., 2004; Elliott, Charyton, & Long, 2007; Graber, Roller, & Kaeble, 1999; Greywoode, Bluman, Spiegel, & Boon, 2009). That is, a majority of consumer health websites have been found to contain information that exceeds the recommended reading level. Moreover, there is a high variability of quality across websites, which can lead to misinformation and confusion.

Readability is defined as "the ease with which a person can read and understand written materials" (Freda, 2005, p. 152) and is "what makes some texts easier to read than others" (DuBay, 2004, p. 3). When the reading material is at a higher level than the reading level of the audience, the intended audience will stop reading the material (DuBay 2004). There are several readability tests that are available, and the most commonly used are the Flesch Reading Ease (FRE; Flesch, 1948) score and the Flesch-Kincaid (F-K; Kincaid, Fishburne, Rogers, & Chissom, 1975) grade level (Sisson, 2007). The FRE score given to a document indicates the ease of reading the document. The FRE score ranges from 0, which is *unreadable*, to 100, which is considered *very easy to read*. The F-K grade level indicates that the person reading the document must have a reading comprehension on a corresponding academic grade in order to be able to read and comprehend the document.

The problem of poor readability for health-related information on the Internet remains pervasive despite the use of readability formulas since the 1920s (Dubay, 2004). The American Speech-Language-

Hearing Association (ASHA, n.d.) holds a vision of "making effective communication a human right, accessible and achievable for all." ASHA further notes that communication disorders experts can be pivotal in providing insight into how to communicate complex messages to individuals who have limited literacy skills or understanding. ASHA encourages professionals to learn more about health literacy, as understanding health information is vital to a person's well-being (ASHA, n.d.).

In 2010, ASHA carried out a makeover of its audiology-related consumer webpages with an improved design and layout and made an attempt to improve the webpages' readability (Farrell, 2011). Farrell, ASHA's Associate Director for Audiology Professional Practices, described an effort to conform all audiology consumer websites to recommendations put forth by the Plain Writing Act (2010) and the National Action Plan to Improve Health Literacy adopted by the U.S. Department of Health and Human Services (2010). One of the most significant changes that was made to the audiology-related consumer webpages was to break up most of the 27 audiology-related articles into 74 smaller, manageable units.

According to Amy Hassellkus (personal communication, July 5, 2011), ASHA's Associate Director of Health Care Services in Speech-Language Pathology, a major revision of the speech-language pathology consumer webpages took place in 2007, with an effort to reduce jargon, break up the text, and present the information more clearly. Both of these efforts are considered positive and deserve praise. When the project to examine the readability of both consumer sections began in 2010, we were not immediately aware of these efforts. However, it presented an opportunity to compare the effectiveness of the makeover for the audiology webpages before and after 2007. Thus, the purpose of this study was to evaluate the readability of audiology- and speech-language-pathology-related consumer content on the ASHA website.

METHOD

Materials and Procedures

We conducted a search on the ASHA website (www.asha.org) over two summers to find audiology-related (from 2010 and its last update in 2011) and speech-language pathology-related (last update was 2007) consumer resources (i.e., documents). The ASHA website had links to all documents under the section "Information For: The Public," which is found on the left-hand side of the ASHA home page (see Figure 1). Our search identified 27 (before 2011) audiology, 74 (after 2011) audiology, and 124 (after 2007) speech-language pathology consumer articles from the public section of the ASHA website. Next, we copied the documents from their original source as shown online, pasted them into a word processor, and then saved them as ASCII text files (.txt). References, navigation links, and advertisements were removed from the text files as they are not considered relevant content. Webpages with only navigation links and no substantive content, description, or explanation were not included in the analysis.

Although there is an abundance of useful information for both consumers and professionals on the ASHA website, some articles written for professionals had links directly from the "Information For: the Public" webpage. These articles were included in our analysis if there was a link to them directly from the "Information For: the Public" webpage. Secondary links within professional articles were not included. Finally, documents linked from the consumer pages of one discipline to the other (audiology to speech-language pathology or vice versa) were analyzed within their principal respective sections in order to avoid duplication. Data analyzed included the audiology-related materials before and after 2011, and the speech-language-pathology-related materials from 2007.

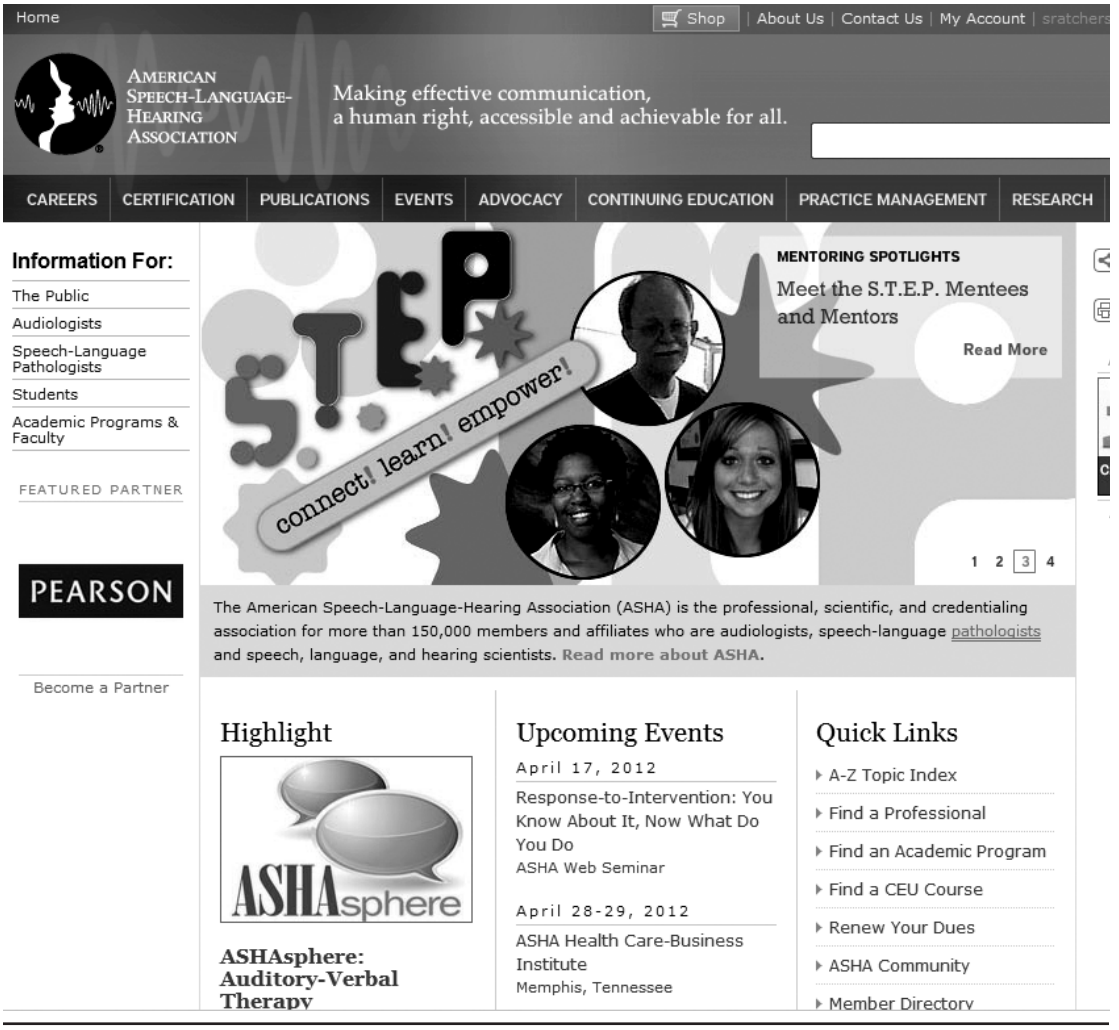
Readability Formulas

Readability of each document was assessed using the Windows-based software program Readability Formulas version 7.4 (Micro Power and Light, 2008). This program assesses the readability of documents using nine different, widely used, popular readability formulas. Although there is no standard of agreement for choosing readability formulas (Breese & Burman, 2005), some formulas have gained popularity over the years, whereas others serve specific purposes. For this study, we chose the FRE, F-K, Gunning FOG (Gunning, 1952), and FORCAST (Caylor, Sticht, Fox, & Ford, 1975) formulas. Further details on the psychometrics of, intended usage for, and correlations between readability formulas have been reported elsewhere (Atcherson et al., 2011; DuBay, 2004; Kelly-Campbell et al., 2012). The use, specific steps, and mathematical calculations applied by these formulas are provided in the Appendix.

Data Analysis

We loaded the articles into the readability analysis software and then printed the 1-page output of statistical results. Next, we imported the readability statistics into a Microsoft Office Excel spreadsheet

Figure 1. Screenshot of the home page of the American Speech-Language-Hearing Association (ASHA) website with information for the public link on the left-hand side navigation bar.



in order to compute descriptive statistics (e.g., mean, median, standard deviation, and range). Pearson product–moment correlations (nondirectional) were computed to assess the general agreement among the readability formulas. The VassarStats website (http://vassarstats.net) was used to compute the statistical significance of the correlation values.

RESULTS

Table 1 presents the mean, median, standard deviation, and range of the FRE scores and the F-K, FOG, and FORCAST reading grade levels for the audiology- and speech-language pathology consumer articles from the public section of the ASHA website. For the audiology-related section prior to 2011, the grand mean across readability formulas was a reading grade level of 11.2, ranging widely from Grade 5 to graduate school. For the audiology-related section after 2011, the grand mean across readability formulas was a reading grade level of 10.5, ranging widely from Grade 5 to graduate school. For the speech-language pathology-related section, the grand mean across readability formulas was a reading grade level of 11.0, ranging widely from Grade 2 to graduate school.

Table 2 illustrates statistically significant Pearson product–moment correlations for all readability formula pairs, with all but two pairs reaching an alpha level less than 0.0001 ($r \geq 0.70$). The correlations for the audiology section before 2011 were –0.65 for FRE–FORCAST ($p = 0.0002$) and 0.63 for FOG–FORCAST ($p = 0.0004$). All correlations suggest strong, positive agreement between the pairs of the different readability formulas.

Table 3 reflects the percentage of consumer articles that exceeded both the recommended health literacy level of fifth to sixth grades and the average

Table 1. Readability statistics for each of the three consumer sections of the ASHA website evaluated.

Website section	*FRE*[a]	*F-K*	*FOG*	*FORCAST*
Audiology-related consumer materials before 2011 (n = 27)				
M	51.0	10.2	12.7	10.7
Mdn	50.0	10.5	12.7	10.9
SD	12.4	2.3	2.4	0.7
Range	27.0–78.0	5.8–13.9	8.6–17.7	8.7–11.8
Audiology-related consumer materials after 2011 (n = 74)				
M	54.2	9.0	11.2	10.8
Mdn	55.0	8.8	11.0	10.9
SD	13.1	2.1	2.5	0.9
Range	3.0–83.0	4.5–15.1	5.7–19.5	9.2–13.4
Speech-language pathology consumer related materials after 2007 (n = 124)				
M	48.2	9.3	11.8	11.5
Mdn	46.5	9.6	12.0	11.7
SD	14.4	2.2	2.6	1.2
Range	20.0–93.0	2.6–14.8	5.3–18.8	7.7–13.7

Note. FRE = Flesch Reading Ease (Flesch, 1948), F-K = Flesch-Kincaid (Kincaid, Fishburne, Rogers, & Chissom, 1975), FOG = Gunning's FOG (Gunning, 1952), FORCAST (Caylor, Sticht, Fox, & Ford, 1975).

[a]Conversion to grade level: 90–100 = 5th grade; 80–90 = 6th grade; 70–80 = 7th grade; 60–70 = 8th and 9th grade; 50–60 = 10th through 12th grades; 30–50 = 13th through 16th grades (college); <30 = 17th through 18th grades (graduate school).

U.S. adult reading grade level of seventh to eighth grades. A high proportion of articles exceeded the most stringent reading level for health information. It is interesting to note that the FRE and F-K readability formulas showed some of the lowest proportion of articles exceeding either criteria compared to the other two readability formulas. In terms of audiology-specific changes before and after 2011, the FRE, F-K, and FOG formulas all demonstrated some improvement in readability. It is also interesting to note that the FORCAST formula showed little to no change using either criteria, which is likely due its formulaic limitation based only on the number of monosyllabic words. Using the audiology-related consumer articles after 2011 as an example, Figure 2 illustrates the rank-ordered distribution of articles using the F-K formula relative to both criteria.

DISCUSSION

An overwhelming majority of the 225 ASHA website consumer articles exceeded the reading level recommended for written health information, regardless of the readability formula applied. Using the seventh to eighth grade average U.S. adult reading grade level as a less stringent level, at least one half of the ASHA website consumer articles would have been considered difficult to read. Across the four readability formulas used, the average reading grade levels of the articles were ninth grade or higher.

ASHA's effort to break up the audiology-related section of the website into more manageable units is illustrated by the expansion of the number of articles from 27 (before 2011) to 74 (after 2011).

Table 2. Pearson product–moment correlations between the readability formulas: FRE, F-K, FOG, and FORCAST.

Consumer section	*FRE–F-K*	*FRE–FOG*	*FRE–FORCAST*	*F-K–FOG*	*F-K–FORCAST*	*FOG–FORCAST*
Audiology (before 2011)	–0.78	–0.79	–0.65**	0.97	0.72	0.63*
Audiology (after 2011)	–0.88	–0.87	–0.88	0.92	0.68	0.64
Speech-language pathology	–0.94	–0.91	–0.86	0.95	0.70	0.64

*p = 0.0004; **p = 0.0002; all others, $p < 0.0001$.

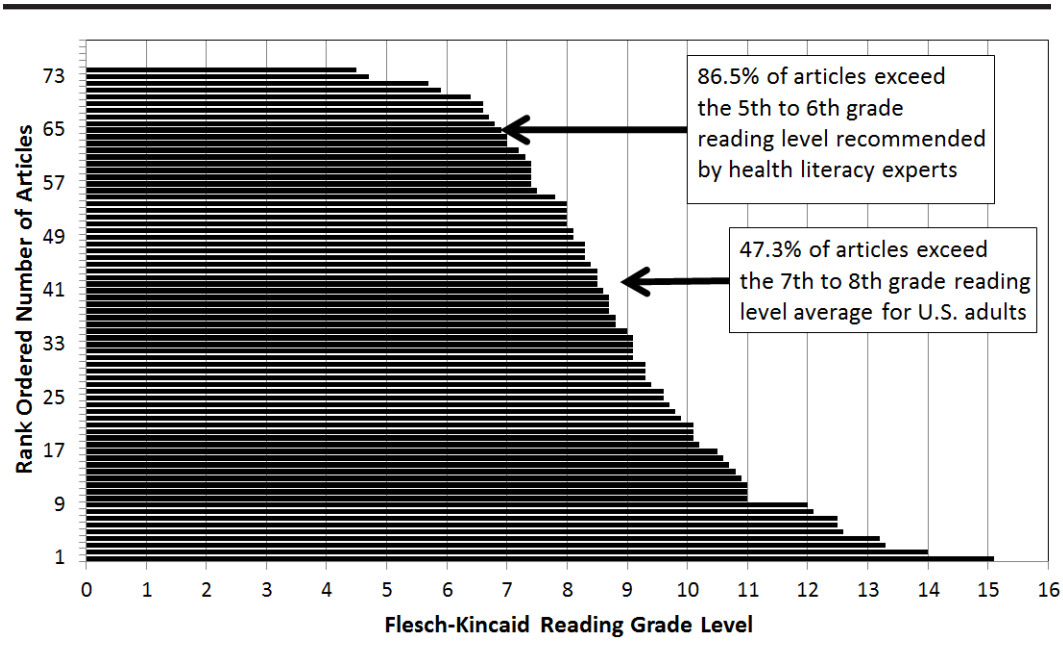
Table 3. Percentage of consumer articles exceeding the recommended health literacy levels and those exceeding the average U.S. adult reading grade level.

Consumer section	*FRE*	*F-K*	*FOG*	*FORCAST*
Exceeds 5th to 6th grade (recommendation)				
Audiology (before 2011)	100.0%	88.9%	100.0%	100.0%
Audiology (after 2011)	98.6%	86.5%	97.3%	100.0%
Speech-language pathology	99.1%	85.4%	95.1%	100.0%
Exceeds 7th to 8th grade (U.S. adult average)				
Audiology (before 2011)	77.8%	70.4%	100.0%	100.0%
Audiology (after 2011)	66.2%	47.3%	85.1%	100.0%
Speech-language pathology	83.1%	66.1%	85.5%	96.0%

However, this chunking strategy did not result in reading-level improvement as measured by common readability formulas. Some of the materials identified as most difficult included "Balance or Vestibular Rehabilitation" and "Auditory Processing Disorders in Children." In the speech-language pathology-related section, some of the most difficult materials were "Welcome to ASHA's Literacy Gateway," "Attention Deficit-Hyperactivity Disorder (ADHD): Benefits of Speech-Language Pathology Services," "Child Speech and Language," and "Preschool Language Disorders: Causes and Number."

In this study, we focused solely on the readability of the online consumer content that is available on the ASHA website. Readability formulas, unfortunately, cannot provide any information about comprehension beyond mathematical calculation of the elements that make up the sentences or phrases in the material (Bruce, Rubin, & Starr, 1981; Klare, 1976). Comprehension of print information not only depends on its readability but also is influenced by one or more human and nonhuman factors (Doak et al., 1996; Meade & Smith, 1991). For example, if the reader has familiarity with the topic or has self-motivation and interest to understand the topic, comprehension of the material will be the desired outcome. Cultural competency, judgments about the attractiveness of the layout, and appropriate use of language may enhance or detract from the reading experience. Sentences that are written in active form, rather than passive, are

Figure 2. Example distribution of ASHA consumer audiology (after 2011) article reading grade levels (n = 74) using two criteria: recommended health literacy level and average U.S. adult reading grade level.



also more likely to be understood. Finally, the organization or design of the material can help to ease its readability by the abundance of white space and use of bulleted lists, tables, graphics, "chunking" strategies, images, and adequate font size. Based on these human and nonhuman factors, websites can be made more readable by ensuring that the content is accurate (Boyer, Selby, & Appel, 1998; Charnock et al., 1999), that the text size and font optimize legibility (Bernard, Liao, & Mills, 2001; Boyarski, Neuwirth, Forlizzi, & Regli, 1998), and that there is an easy-to-follow layout of patient information and action items (Jacobs, Li, Schrier, Bargeron, & Salesin, 2004; Smith, Hetzel, Dalrymple, & Keselman, 2011).

Although not the focus of this study, one approach to evaluate the user friendliness of health materials is to use the well-validated Suitability Assessment of Materials (SAM) tool (Doak et al., 1996). The SAM tool includes ratings for content, literacy demand, graphics, layout and typography, learning stimulation/motivation, and cultural appropriateness, with items to be scored 2 points for *superior*, 1 point for *adequate*, 0 points for *not suitable*, or N/A for *not applicable*. The present study identified the "Auditory Processing Disorders in Children" article within the ASHA consumer resources as one of the most difficult to read. Using the SAM tool, this article would have received a score of 17/32 (53%) possible points, indicating *adequate* suitability of materials. Interestingly, the SAM tool gives an adequate suitability rating even though the article is written at a level that only those with a college degree or higher might actually understand. Using the SAM tool as a point of constructive feedback, this article may benefit not only from improved readability but also by providing some degree of interactivity (to foster learning and motivation), including an illustration or two, and/or making the content relatable to readers.

Conclusion

The readability of a majority (85.4% or more) of the 225 web-based consumer articles from ASHA's website were analyzed as having a reading grade level of ninth grade or higher. This result suggests that consumer content on the ASHA website may need to be rewritten in plain language and with clear writing principles in mind in order to improve its overall readability. This is particularly true for articles that were written principally for professionals but were later added to the public section. Additionally, reorganization of content supplemented with bulleted lists, tables, and/or figures may also support reader comprehension and ease of use. Using adequate font size and providing options to increase font size directly on a webpage would likely be beneficial to many readers. For other considerations for web design accessibility, interested readers are directed to sources listed by the U.S. Department of Justice (2003). Many of these strategies address both human and nonhuman factors that readability formulas are unable to assess. In addition to Internet-based print materials, ASHA may consider alternative web media such as embedded video with audio and open captions using content language that is accessible to the average U.S. adult.

The information provided in this study has a much broader implication for professionals in communication sciences and related disorders. Any and all clinic- or research-related materials, including forms, self-report questionnaires, educational materials, brochures, and practice websites, to be consumed by patients and clients need to be accessible, user friendly, legible, and readable.

The present study did not address the readability of *other* websites on the Internet that disseminate information about communication and related disorders. Laplante-Lévesque, Brännström, Andersson, and Lunner (2012) conducted a readability assessment of online patient education materials from 66 websites with information about hearing impairment and reported that on average, people required at least 11 years of education to read and understand the information in the websites. McKearney and McKearney (2013) conducted a readability assessment of online patient education materials from 84 websites with information about ear tubes and reported that information on only 22 of the sites was written at a grade level that was appropriate for the average adult. Svider et al. (2013) conducted a readability assessment of online patient education materials from 22 academic otolaryngology–head and neck surgery departments and reported that most patient education materials from these programs were written at or above an 11th-grade reading level. Schmitt and Prestigiacomo (2013) conducted a readability assessment of online patient education materials on the website of the American Academy of Neurosurgeons and reported that all 86 articles were written above a sixth-grade reading level. Gill, Gill, Kamath, and Whisnant (2012) conducted a readability assessment of online patient education materials on the topic of traumatic brain injury and concussion on the website of the Centers for Disease Control and reported that all 40 articles required at least an 11th-grade reading level. Clearly, the average adult will be challenged when seeking readable information at both the ASHA website and other websites containing material about communication disorders.

As a professional organization of audiologists and speech-language pathologists, ASHA is committed to

ameliorating communication disorders. In doing so, ASHA is viewed as self-reflective and self-evaluative, with an eye toward accessibility and equality. Efforts made by the staff at ASHA to improve consumer website content to conform with the Plain Writing Act of 2010 and other health literacy principles are to be applauded. The articles are indeed of high quality and accuracy; however, our results suggest that they may not be as readable as was anticipated. Our results are not intended to be punitive but rather raise the issue that health information about communication disorders is oftentimes incongruent with the health literacy skills of the average American.

We believe that the issue of readability in the larger context of health literacy rests squarely on communication professionals. The patients and clients served by these disciplines are populations with compromised hearing, speech, or cognition, and by virtue of these deficits are at increased risk for low health literacy skills. These individuals require additional professional and social support to compensate for these barriers. Framed differently, health professionals and researchers who work with individuals with communication disorders need to be health literate, to communicate effectively in all modalities, and to balance the information demands with the skills of the individual. Our own online health information is an area that needs to be addressed with priority. We are in agreement with Zarcadoolas, Pleasant, and Greer (2006):

> [W]e feel that the barriers and disadvantages of the internet as a source of health information are surmountable through appropriate planning, appropriation of resources, and careful goal setting by health communicators. This will require an application of … principles of health literacy … along with technically competent web design skills. (p. 129)

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APPENDIX. READABILITY FORMULAS

Flesch Reading Ease (FRE)

Reading Ease = 206.835 – (1.015 × ASL) – (84.6 × ASW), where ASL = average sentence length (i.e., the number of words divided by the number of sentences); and ASW = average number of syllables per word (i.e., the number of syllables divided by the number of words). The output is a number ranging from 0 to 100. The higher the number, the easier the text is to read.

Flesch-Kincaid (F-K)

Grade Level = (0.39 x ASL) + (11.8 × ASW) – 15.59.

Gunning's FOG Index (FOG)

Grade Level = 0.4 (ASL + PHW), where PHW = percentage of hard words. Short sentences written in Plain English achieve a better score than long sentences written in complicated language. Requires a minimum of 100 sample words.

FORCAST

Grade Level = 20 – (N/10), where N = number of monosyllabic words in the sample text.