

# Readability of Health Sites on the Internet

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## Abstract

### English:

Literacy in the United States is a widespread problem. There are many Americans who do not have the ability to read at a level above the ninth grade. Today's technological advances have resulted in more information being placed on the Internet. Consequently, the same individuals who had a limited capacity to read information from traditional sources will have similar difficulties reading information on the Internet. This study examined three well-known Internet sites for readability. Results of the study indicated that the average reading level for all three sites exceeded the level intended for public consumption of written information. Results of the study indicate that health educators need to be aware of the reading levels of the health information they are placing on the Internet. If the level of health information material is above the comprehension level of the general public, many individuals will be at a disadvantage in comprehending health information required to make personal health decisions.

### Spanish:

El analfabetismo en los Estados Unidos de Norteamérica es un problema amplio. Existen muchos estadounidenses que no tienen la habilidad de leer a un nivel sobre el tercer año de escuela secundaria o bachiller (9° grado). Los avances tecnológicos de hoy en día han resultado en que más información se encuentre disponible en el Internet. Como consecuencia, los mismos individuos que tienen capacidad limitada para leer información de maneras tradicionales tendrán dificultad leyendo la información en el Internet. Este estudio examinó tres páginas web conocidas, en cuanto a su nivel de lectura y entendimiento. Resultados del estudio indican que el nivel de lectura promedio para los tres sitios excede el nivel intencionado de información escrita para el público. Resultados del estudio indican que educadores para la salud necesitan estar conscientes de los niveles de lectura y entendimiento de la información en salud que están presentando en el Internet. Si el nivel de la información en los materiales de salud se encuentra sobre los niveles de entendimiento del público en general, muchos individuos se encontrarán en desventaja de comprensión de información de salud requerida para realizar decisiones.

**Key Words:** health, health education, Internet, readability, readability formulas

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## Introduction

In the United States there are millions of individuals who do not have the ability to read above the ninth grade level. The inability to read and comprehend written forms of communication such as magazines, books, brochures or informational pamphlets, places them at a disadvantage in acquiring important health information. Recently, there have been research studies that focused on specific patient populations to determine their reading abilities. Investigating research on English-speaking diabetic patients found that while 60% could understand information written at the sixth grade level, only 21% could understand information written at the ninth grade level (Berland, et al., 2001). Other studies have found a median reading level of ninth to tenth grade in emergency department patients (Baker, et al., 1996) and a median reading level of seventh to eighth grade in

cancer patients, patients in urban clinics, and parents of pediatric patients at a University Hospital (Berland, et al., 2001).

Today, more health agencies are relying on the Internet to disseminate health information. Although the Internet may provide convenient access to health education materials for some patients, it does add another level of complexity for others. Many patients will first have to overcome the obstacle presented by the technology. Once those patients are able to understand, utilize and access the technology of the Internet, their low level of reading comprehension may still present a barrier.

Many of the Internet sites contain personal testimony and are easier to read and understand than are the more reliable sources such as those of non-profit organizations, health foundations, and government agencies. Consequently, the individuals who have a limited capacity to read information from traditional sources will have similar problems reading

and comprehending reliable health information on digital sources.

When individuals have limited reading abilities or read at the minimum standard for the population (ninth grade level), they will fall short of accessing and interpreting information required to make successful health decisions. With the growth of the Internet, and the development of more sophisticated search tools, the opportunity to obtain health information via this medium has grown tremendously. Rosch (1999) reported that within the population seeking health information on the Internet, 81 percent reported finding the health information to be useful. Most of these individuals were looking for specific information on a particular disease condition, educational services, medications, physical fitness and alternative treatments.

Previous research has been published regarding quality of Internet sites. Tillman (1997) wrote about evaluation criteria of Internet sites in terms of authorship, content, credibility and validity of information. Rippen (2000) specifically explored the standards of evaluative criteria when looking at health information on the Internet. They found reliable health information sites are typically associated with government sources or from organizations/foundations that are closely affiliated with government sources. They also reported that quality of health information on the Internet could affect lives more so than printed media because it is readily available and can reach the health consumer within seconds. Without the ability to fully comprehend written information, an individual may make decisions based on limited knowledge.

Despite the identification of a ninth grade reading level, most health information is written over the population mean (French and Larrabee, 1999). According to Hart (1993), about two in five Americans have completed high school and never went to college, and one in five have never completed high school. The significance of these figures is important with regards to reading ability. Approximately 60 percent of the people in the United States will require maximum effort to comprehend reading material which scores over the 12<sup>th</sup> grade level on a standard readability test. Reading experts report that the majority of the population prefers to read written material three grade levels under their actual education level. Standard publications, regardless of source, would need to be at the ninth grade level for maximum comprehension. Johnson (1992), performed a study, which assessed the readability of health education pamphlets, and booklets, which were distributed among clients at three local health departments in North Carolina. The results of their study indicated that only 15.4 percent

of all materials received from commercial and non-for-profit vendors were at an acceptable reading level. They identified acceptable levels as being between the fifth and seventh grades.

MacColl (1998), reported that most health information located on the Internet is reliable and beneficial to the health consumer. Many sites report the results of clinical trials or experimental research. The content of this type of written material is beneficial to the health consumer looking for information on a specific health condition, disease or dysfunction. However, the typical health consumer cannot comprehend most of these research pieces because they are filled with technical terminology. The problem is then magnified because most readers cannot derive meaning from statistical techniques utilized in reporting research findings.

Readability formulas have been used for years to establish if the intended audience for a particular text can comprehend the message or knowledge intended. A readability formula is a mathematical calculation derived by regression analysis. Readability formulas are commonly used to calculate reading levels. Freimuth (1979), in his investigation of reading formulas, suggests that the selection of reading formula is dependent on intended usage. Reading scales with high predictive validity and intended for general audiences require two variables, a word variable and a sentence variable. The Flesch-Kinkaid and the SMOG Formulas are examples of the two-variable formulas. The McLaughlin SMOG Readability Formula is commonly used because of its ease in calculation and accuracy. It is based 100 percent on reading comprehension. The SMOG Formula consists of counting sentences in a text from the beginning, middle and end of the written material. Words with more than three syllables are counted in each of the ten sentences. The polysyllabic words are then added and the square root is calculated. The last portion of the formula requires the evaluator to add three to obtain the final reading level (French and Larrabee, 1999).

The Flesch-Kinkaid readability formula produces a score equivalent to education grade levels. A score of twelve is equivalent to a twelfth grade reading level. The formula is an objective quantitative tool that measures number of words per sentence, sentences per paragraph, and length of sentences and polysyllabic words.

This study examined whether there was a difference in readability of health information on the Internet by examination of three health web sites that have been identified as offering reliable information: healthline.com, healthfinder.gov, and DrKoop.com. The answers to the following questions were sought: (1) What are the differences between

healthfinder.gov, healthline.com, and DrKoop.com web sites with regard to readability of health information on the Internet using the Flesch-Kincaid Reading Scale? (2) What are the differences between healthfinder.gov, healthline.com, and DrKoop.com web sites with regard to readability of health information on the Internet using the SMOG Reading Formula? (3) What are differences between the SMOG formula and the Flesch-Kincaid reading scale when evaluating health information sites on the Internet?

**Methods**

The sample for this study consisted of readability levels from: healthfinder.gov, healthline.com, and DrKoop.com. Data was collected on two dates one month apart to allow the feature articles to change for healthline.com. and DrKoop.com. For each of these sites the first five feature articles were selected from each month. The sample selection for healthfinder.gov was completed in one collection. Healthfinder.gov does not offer feature articles but has specific hot topic areas. The fifth and tenth hot topic areas were selected. Under each of these topic areas, the first five articles were selected. All articles included in the study from [healthline.com](http://healthline.com), DrKoop.com, and healthfinder.gov were copied from the Internet and put into a word file. A Flesch-Kincaid was performed on each of the 30 articles using the standard software on a Microsoft Word® program to determine reading level. The SMOG formula was manually calculated on each of the 30 articles.

*Analysis of Data*

The following analyses were performed to determine the differences between Internet sites on healthline.com, DrKoop.com, and healthfinder.gov in regards to readability. Measures of central tendency were calculated for each of the Internet sites using the Flesch-Kincaid Reading Scale and the SMOG Reading Formula. ANOVA was used to examine if healthline.com, DrKoop.com, and healthfinder.gov Internet sites differed using the Flesch-Kincaid Reading Scale (Research Question #1). ANOVA was also used to examine if healthline.com, DrKoop.com, and healthfinder.gov Internet sites differed using the SMOG Reading Formula (Research Question #2). T-tests were calculated to determine if the Flesch-Kincaid Reading Scale and the SMOG Reading Formula were equal measures of readability (Research Question #3).

**Results**

This study sought to answer three research questions: 1) Is there a difference between healthfinder.gov, healthline.com, and DrKoop.com Internet sites with regard to readability of health information using the

Flesch-Kincaid Reading Scale? 2) Is there a difference between healthline.com, healthfinder.gov and DrKoop.com Internet sites with regard to readability using the SMOG Reading Formula? 3) Is there a difference between the SMOG formula and the Flesch-Kincaid reading scale when evaluating health information sites on the Internet? An ANOVA was conducted to determine the difference of the Internet sites using the Flesch-Kincaid Reading Scale. The F statistic was significant:  $F=9.17$  ( $F_{cv, .05}=3.35$ ,  $F_{cv, .01}=5.49$ ),  $R^2 =.40$  (Table 1). The results of the F statistic indicate that there was a difference among the three sites regarding readability when using the Flesch-Kincaid Scale (Table 1).

**Table 1. Analysis of Variance for SMOG**

Source	DF	SS	MS	F
Between Group	2	60.88	30.438	9.17
Within Group	27	89.62	3.319	
Total	29	150.49		

Note: Readability of Internet Sites Using the SMOG Formula:  $F_{cv, .05}=3.35$ ,  $F_{cv, .01}=5.49$

An ANOVA was conducted to determine the difference of the Internet sites using the SMOG Formula. The F statistic was significant  $F=5.37$  at the .05 level ( $F_{cv, .05}=3.35$ ), but not significant at the .01 level ( $F_{cv, .01}=5.49$ ),  $R^2 =.28$  (Table 2). The results of the F statistic indicated that there was a difference between the sites using the SMOG formula when tested at the .05 level of significance; however, no significant difference at the .01 level (Table 2).

**Table 2. Analysis of Variance for Flesch-Kincaid Reading Scale**

Source	DF	SS	MS	F
Between Group	2	33.32	16.66	5.37
Within Group	27	83.769	3.10	
Total	29	117.09		

Note: Readability of Internet Sites Using the Flesch-Kincaid Reading Scale:  $F_{cv, .05}=3.35$   $F_{cv, .01}=5.49$

An independent one-tailed t-test was conducted to determine if there was a difference between the Flesch-Kincaid Reading Scale and the SMOG Formula. The t-test was not significant  $t(30)=.54$   $p=.05$ . The results of the t-test indicate there is no difference between the Flesch-Kincaid Reading Scale and the SMOG Formula when evaluating health information on the Internet.

Additional findings through statistical calculations indicated the mean reading levels for sites using the Flesch-Kincaid Reading Scale were

healthline.com, mean = 11.92, healthfinder.gov, mean = 9.53, and DrKoop.com, mean = 11.6. The mean for reading levels using the SMOG Formula were healthline.com, mean = 14.48, healthfinder.gov, mean = 11.46, and DrKoop.com, mean = 12.33.

### **Summary**

The majority of studies regarding health information have dealt with evaluating reliability (Silberg, W. M., Lundberg, G. D., & Musacchio, R. A., 1999; Bower, H., 1996). Fewer studies have been conducted on the readability of health information on the Internet. Although literacy has been a problem in the United States for many years with other forms of written materials, the Internet has received little attention.

The statistical analysis revealed a significant difference in the sites when an ANOVA was applied for each reading instrument. An independent t-test revealed that the two reading scales the Flesch-Kincaid and the SMOG had no significant difference between the scales.

### **Conclusions**

The results of this study revealed a difference among healthline.com, healthfinder.gov, and DrKoop.com when establishing reading level using both the Flesch-Kincaid Reading Scale and SMOG Formula. There was no significant difference in the identification of establishing reading levels of written material on the Internet between the Flesch-Kincaid and SMOG Formula.

### **Discussion**

The American population has struggled with the problem of literacy for many years. A large proportion of the population has only basic literacy skills (Jenner, 1994). The deficit of reading skills will be similar regardless of the medium of written communication. With the growth of the Internet, the American population will see a dramatic shift toward electronic sources of information as opposed to traditional forms in papers, books and magazines. The equipment and operational knowledge required for Internet access, coupled with readability issues, will magnify the existing problem of making health care information accessible and comprehensible.

There was a difference identified among the three sites examined with regards to reading level using the Flesch-Kincaid Reading Scale and the SMOG Formula. Healthfinder.gov had the lowest mean reading level among the three sites evaluated. Healthline.com and DrKoop.com had very similar means. The results of the reading levels for all sites were above the recommended reading level (ninth grade) of written communication recommended for public consumption. This indicates that the health

information on the Internet well exceeds the average readability level of most individuals.

Efforts to ensure that health information sources are both reliable and readable have been limited (Gottlieb & Lingle, 1997; Gorman, 2000). The results of this study revealed that reputable government sources fail to meet the readability standards for the majority of individuals. Therefore, the researchers conclude that reliability and readability of health information does not necessarily occur simultaneously.

### **Recommendations for the Health Educator**

Based on the results of this study several implications for the health educator should be noted. Individuals seeking health information must be able to read and understand the health sites from which they seek health information. If they do not possess the necessary skills for comprehension, they will be at a disadvantage when attempting to make informed choices. Health educators posting information on the Internet need to be aware of the reading level of the message they are trying to convey and target their information to a particular audience. It is also important for health educators to remember that reliable health information typically has a higher reading level, because it is filled with medical terms regarding health, disease, and dysfunction of the human body. A final recommendation would be for further studies to investigate the accessibility of individuals with disabilities to the Internet. If individuals with disabilities are not able to physically access health related materials via Internet technology, they will be at a disadvantage when attempting to make educated health care decisions.

The Internet has become one of the largest suppliers of health information. The fact that over 100 million Americans will go online in search of health-related information, and that more than 70 percent have said that such information has influenced a decision about treatment, demonstrates the power of online applications to influence, and ultimately improve health care (Davis & Farrell, 2001). Health educators need to do their part to insure that the information they provide is not only reliable but also comprehensible.

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