Readability levels of multiple sclerosis websites in United States, Canada, Australia and New Zealand

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Readability Levels of Multiple Sclerosis Websites in United States, Canada, Australia, and New Zealand

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Abstract

OBJECTIVE. This study explored and compared the readability levels of the Multiple Sclerosis (MS) information websites for the United States, Canada, Australia, and New Zealand.

METHOD. The researcher choose nationally sponsored MS websites from United States, Canada, Australia, and New Zealand and assessed them using the computer based SMOG and the manual based SMOG. The researcher chose two content areas (What is MS/What Causes MS and Symptoms of MS/Treatments of MS) from the four countries websites for analysis. The researcher used descriptive statistics to explore and compare the readability levels of the MS websites.

RESULTS. The researcher found that, on average, the United States’ and Australia’s MS content areas were written at a SMOG grade level of 14. On average, Canada and New Zealand’s MS content areas were written at a SMOG grade level of 13.

CONCLUSION. Results from this study provide evidence that the MS websites from the four countries are written at a literacy level that is too high for approximately half of the population to read and understand. The results from this study can bring awareness to occupational therapists of the literacy levels of the websites that they may use as tools for patient education materials. Occupational therapists can advocate for their patients by collaborating with web designers to create websites that publish content that is at a lower literacy level. The computer based and manual based SMOG resulted in similar grade levels. This finding provides evidence that either SMOG version could be used to accurately assess the reading grade level on selected content areas.
Readability Levels of Multiple Sclerosis Websites in United States, Canada, Australia, and New Zealand

Once a person is diagnosed with a progressive disease, such as Multiple Sclerosis, the battle of living to one’s highest potential despite the disease begins. Knowledge about his/her disease is a critical weapon to use in the battle. This information not only empowers the individual to understand the illness; but enables the individual to adapt to how he/she cares for himself/herself. People learn about ways to cope with their chronic disease, however, learning requires the ability to read and understand the information about the disease that is available. Webster’s Online Dictionary (2001b) defines literacy as the ability to read and write. An individual’s ability to read is affected by his/her literacy level. However, just because a person may be able to read, he/she must also be able to comprehend what is being read in order to gain knowledge. Webster’s Online Dictionary (2001a) defines comprehension as the ability to understand the meaning or importance of something.

Many people around the world have low literacy levels, affecting their ability to learn about their disease. People can fully utilize literature on their disease such as websites, pamphlets, or brochures, only if the readability level of the resource is not too high. People, who are diagnosed with progressive diseases, like Multiple Sclerosis (MS), must deal with life-long treatments and life adaptations. Individuals learn how to manage their chronic disease using important tools such as printed information, including information found on the internet. Therefore, it is important to assess the readability of common patient education websites, such as those about MS.
This study evaluated the readability of MS websites across the United States, Canada, Australia, and New Zealand. This study can help designers of MS websites format websites that are more readable for their viewers. Web designers should be aware that the information on their websites may be written at a level that is too high for the readers to understand. If designers know this, then they can alter their site’s information to better accommodate the needs of the readers. The researcher reviewed the literature for this study and compared literacy levels across the United States, Canada, Australia, and New Zealand. The researcher described the need for and importance of health literacy and patient education in general, as well as for MS patients specifically. The researcher also described the characteristics of readable texts. The purpose of this study was to explore and compare the readability levels of the MS information websites from the four countries. The researcher used the SMOG formula to determine the reading level of the MS websites.

Literacy Levels

The National Institute for Literacy (2009) identifies five reading levels that describe literacy levels of the population in the United States, Canada, Australia, and New Zealand. Level 1 of the five reading levels describes persons with very poor reading skills. Level 2 describes persons who can only deal with written material that is simple and clearly laid out. Persons functioning at a level 2 can read, but test poorly. They may have developed coping skills to manage everyday literacy demands, but their low literacy levels make it difficult for them to cope with novel demands. Level 3 describes persons considered to be at a minimum reading level for coping with demands of everyday life and working in a complex advanced society. These persons are roughly at the skill level required for successful secondary school completion (high school) and college entry. In addition, level 3 requires the ability to integrate several
sources of information to solve more complex problems. Finally, level 4 and level 5 describe persons who demonstrate higher-order information processing skills. The literacy levels are related to grade levels in the education system. Persons who are at a literacy level of 2 or below are most likely to have had 3 years or less of secondary school (high school) education (Tertiary Education Learning Outcomes Policy, 2005b). Persons at level 2 or below may not have graduated high school and have had probably less than 11th grade education. Persons who are at a literacy level of 3 or above usually have tertiary (university) education (2005b), indicating they have graduated from high school and some may have gone on to further their education past high school.

There are different types of literacy; however, this study addressed three of the literacy types that are relevant to webpage analysis. The National Assessment of Adult literacy (2009a), refers to the first literacy type as prose literacy, which is the knowledge and skills needed to search, comprehend and use continuous texts (e.g. brochures or instructional material). National Assessment of Adult Literacy (2009a) labels the second literacy type document literacy, which is the knowledge and skill needed to search, comprehend, and use non-continuous texts (e.g. job applications or drug labels). The Australia Bureau of Statistics (2006) labels the third literacy type, health literacy, which is defined as the knowledge and skills needed to understand and use information relating to health issues. Researchers have associated adequate health literacy with improved self-reported health status and it may be associated with a sense of personal control (Allison, Angner, Miller, Ray, & Saag, 2009). Authors from one study found that self-perception of health, adherence to health screenings, and the ability to manage chronic illness are all affected by health literacy levels. Therefore, low literacy may affect one’s overall health (Francis, Scaife, & Zahnd, 2009). Once can use these five reading levels and three literacy types
to document the scope of the literacy problems in the United States, Canada, Australia, and New Zealand.

Scope of the Literacy Problem

In the United States in 2003, on average, 22% of adults performed at level 1 on the prose and document scale, 27% performed at level 2 on the prose and document scales, and 32% performed at level 3 on the prose and document scales (Jenkins, Jungebalt, Kirsch, & Kolstad, 2003). In Australia in 2003 on average, 47% of adults performed at level 2 or below on the prose and document scales and 60% of adults performed at level 2 or below on the health literacy scale. Approximately 37% performed at level 3 on the prose and document scale, and 35% performed at level 3 on the health literacy scale (Australia Bureau of Statistics, 2006). In Canada in 2003, 40% of adults performed at level 2 or below on the prose scale (ABC Canada Literacy Foundation, 2008). In New Zealand in 1996, 45% of adults performed at level 2 or below on the prose literacy scale and 50% at the same levels on the document scale (Tertiary Education Learning Outcomes Policy, 2005a). In summary, these statistics indicate that large portions of the populations from these four countries have low literacy skills. In the United States and Australia, approximately 50% of adults performed at a level 2 or below on the prose and document scales. In Canada and New Zealand, 43% of adults, on average, performed at a level 2 or below on the prose scales. Finally, in New Zealand, 50% of adults performed at a level 2 or below on the document scale alone. Low literacy levels make it a challenge for a large portion of individuals with a chronic disease, such as Multiple Sclerosis, to understand printed information about their disease.

Readability Recommendations
Authors recommend specific criteria by which to judge literature as more or less readable to its viewers. Health professionals should review important factors such as the length of sentences, number of polysyllabic words, the use of familiar words, and the use of clear and concise content to make literature more readable. In addition, writers should utilize bulleted lists, glossaries for medical terms, and an active voice to help make literature more readable. In order to make a passage more readable, writers should shorten the sentence length to help the reader follow along and better grasp the main idea in each sentence. The sentences should be simple and use the present tense (DuBay, 2004). Authors recommend that within sentences, writers should decrease the number of polysyllabic words to enable more readers at literacy levels 1 and 2 to understand more of the words in the sentence. Writers should use short, simple, and familiar words in order to make the content more readable (DuBay, 2004). Finally, the content writers choose should be clear and concise. Authors should review sentences and if they are not concise or straight to the point, then the authors should remove the sentences from the passage or revise them. Writers should avoid jargon and use culture and gender neutral language. Sentences should have correct grammar, spelling, and punctuation (DuBay, 2004). Using these literacy and readability principles will reduce the reading skills needed to understand written content. Understanding written content is a necessary first step to successfully managing one’s MS.

Multiple Sclerosis

MS is a progressive disease of the central nervous system resulting in nerve damage (Multiple Sclerosis Association of America, 2007). Atchison and Dirette (2007) state that the disease is usually diagnosed between 20-40 years-of-age. MS affects approximately 2.5 million individuals worldwide (Stachowiak, 2008). This neurological disorder can cause cognitive declines; therefore patients should be aware of and prepared for these declines. MS cognitive
declines include memory loss or disturbances and decreased attention span (Atchison & Dirette, 2007). These cognitive deficits will make it more of a challenge for patients with MS to understand patient education materials. Since the internet is now used to provide access to patient education materials, it is important for websites to have a reading level that allows the viewers with lower literacy levels to understand the information. Websites can offer a larger quantity and variety of information than can printed patient education material options. MS also affects patients’ motor control, so traveling to health care professionals offices to get printed materials about the disease, may be less desirable than searching websites from home.

Patient Education

Websters Dictionary defines patient education as the teaching or training of patients concerning their own health needs (Websters Online Dictionary, 2010). Health professionals are responsible for providing information to their patients, which allows patients to gain knowledge about their disease. Through patient education, health professionals provide their patients with information for managing chronic conditions. There are various modes in which to teach patients about living with their chronic disease. Common modes health professions use include verbal discussions, brochures, fact sheets, pamphlets, journal articles, books, and/ or informational websites. This study focused on informational websites.

Occupational therapists frequently teach patients skills and techniques that encourage patients to play an active role in their own health. The occupational therapist works in collaboration with the patient to achieve his/her goals (Griffin, McKenna, & Tooth, 2006). Occupational therapists use teaching and learning methods in many of the models of practice as interventions. Learning compensatory strategies is important for patients with MS because the
disease will affect them for their lifetime. For example, the Role Acquisition Model of Practice (Mosey, 1986) uses role playing as a means for intervention. Through role playing, the occupational therapist teaches the patient compensatory strategies to fulfill new life roles or ways to complete current life roles that are affected by the disease. Occupational therapists use the Human Activity Assistive Technology Model of Practice (Cook & Hussey, 1995) to teach patients how to properly use assistive technology as a compensatory method. Occupational therapists use these models of practice and incorporate teaching learning methods into their strategies for intervention. In addition, occupational therapists incorporate patient education into therapy to empower the patient to be active in his/her own health status, which is beneficial for the individual (Thomas, 1999). Occupational therapists use therapeutic occupations as a means to help their clients become active in their own health (Brownson, Scaffa, & Van Slyke, 2008). When an individual becomes active in his/her well-being, his /her attitude about living with the disease improves and better health status outcomes are associated with this active role (2008).

Historically, occupational therapists have relied on printed materials as a means of patient education; however, internet use for information seeking has grown in popularity. Whether using printed materials or the internet, literacy plays an important role in effective patient education (Thomas, 1999). If a patient has low literacy levels, then the written information given by the therapist will be of little benefit because the patient may be unable to read and comprehend the material. One study revealed that occupational therapists are unaware of the appropriate reading grade level for general audiences and of how to design written materials properly (Griffin, McKenna, & Tooth, 2006). This speaks to the need for assessing the reading level of patient education materials.
Patient education is an important treatment modality to use with someone who has been diagnosed with a progressive disease, such as MS. Through patient education the patient can seek information about MS, learn about his/her diagnosis, learn about follow up-care, and gain knowledge of resources, assistive technology, and coping strategies that are available. In all countries, as people age, there is an increase of older adults seeking services. Since older adults have a higher incidence of chronic diseases, occupational therapists often use self-management as a treatment method. Researchers found that older adults use patient education materials to enhance resourcefulness, feelings of control, and self-efficacy as a means of self-management (Griffin, McKenna, & Tooth, 2006). With the increase in the number of elderly diagnosed with progressive diseases, such as MS, the need to have patient education literature that is appropriately readable is critical. A study reported that patients with low literacy levels found reading leaflets about health information difficult (Good, Semmler, Wagner, & Wardle, 2009). Patients who have low literacy levels are often uncomfortable seeking out information about their disease due to not being able to read and understand the information that they find. Authors need to publish patient education materials at a literacy level that patients with low literacy levels can read and comprehend so patients can benefit from them.

Role of Health Literacy

Where one seeks health information about his/her disease is affected by low literacy levels (Good, Semmler, Wagner, & Wardle, 2009). Patients with low literacy are less likely to seek out or use health education materials than are patients with higher literacy levels (2009). In a study of patients’ interactions with their physicians, researchers found limited health literacy is associated with poor receptive and proactive communication. Results from this study provide evidence that poor receptiveness may be associated with impaired patient understanding and
being less proactive. As a result of this poor receptiveness patients may ask fewer questions about their health status. Patients who are less proactive or unclear ask fewer questions about their health status (Bibbins-Domingo et al., 2009). Patients who are diagnosed with a progressive disease need to feel comfortable building relationships with their health professionals in order to ask questions about their health and managing their chronic disease. Along with asking questions of health professionals, patients need to feel a sense of comfort and confidence in seeking out information via the internet, pamphlets, or other sources of patient education materials. Homer et al found that poor health literacy was linked with poorer understanding of prescriptions and other medical information and less chronic disease knowledge (Homer, Lannon, Mulvaney, Patrick, Rothman, 2009). Patients with progressive diseases, such as MS, will have the disease for the remainder of their lives, thus, they must be able to understand their treatment regimens and gain knowledge on how to live their lives with the disease. Therefore, there is a need for patient education materials, particularly information websites, to be written at a literacy level that the majority of patients can read and understand.

Poor health literacy is associated with unfavorable health outcomes for a number of chronic diseases (Blanch et al., 2009). Physicians and other health care providers often refer patients with MS to occupational therapy for services. A meta-analysis study found that occupational therapy interventions are moderately effective in improving the lives (occupational performance) of persons with MS (Baker & Tickle-Degnen, 2001). Occupational therapy services, as well as other services, are already enhancing knowledge and changing the lives of patients with MS. Occupational therapists enhance and change patient’s lives by creating and promoting electronic and printed educational materials at a reading level that the majority of patients can understand. Addressing health literacy can lead to improved patient knowledge,
behaviors, and outcomes (Homer et al., 2009). MS websites that are readable to viewers with low literacy levels are essential as the patient education content will then be beneficial to patients with a wide spectrum of literacy levels.

There are several studies that evaluated website readability for conditions such as breast, colon, and prostate cancer (Friedman, Hoffman-Goetz, & Arocha, 2004). Researchers evaluated a total of 55 websites for these cancer conditions (2004). Researchers studied forty websites on pain management for children (Oermann, Lowery, & Thornely, 2003). Researchers also assessed 18 websites about breast cancer, depression, obesity, and childhood asthma (Berland et al., 2001). All these websites had reading levels that required at least a 10th grade education and some presented material at a college level (2001). Two studies evaluated general health websites. One study evaluated privacy statements on 54 internet health websites (D’Alessandro, Graber, & Johnson-West, 2002) and the second study assessed 3 general health websites (Gottlieb & Rogers, 2004). Researchers in both studies found that the websites were written higher than an 8th grade reading level. In addition to using the SMOG, these studies used the Flesch-Kincaid and Flesch Reading Ease scales, to determine the reading grade level of the websites. Currently, there are no known studies that report on the reading grade levels of MS websites.

For this study, four official MS websites for the United States, Canada, Australia, and New Zealand were analyzed using the SMOG formula. The United States website is sponsored by the National Multiple Sclerosis Society at www.nationalmssociety.org. Canada’s website is sponsored by Multiple Sclerosis Society of Canada at www.mssociety.ca. Australia’s website is sponsored by Multiple Sclerosis Australia at www.msaustralia.org.au/. New Zealand’s website is sponsored by The Multiple Sclerosis Society of New Zealand at www.msnz.org.nz. The researcher chose these four websites because they are written in English and all four websites
published similar literacy statistics. In addition, the researcher chose websites sponsored by national, reputable, and professional organizations. Knowing the websites’ literacy levels is important so the viewers with low literacy can benefit from the patient education content found on the websites.

In summary, low literacy levels are an international problem affecting many persons ability to read and comprehend patient education materials. Patient education materials, specifically informational websites, are valuable tools that allow patients with chronic diseases to play an active role in management of their conditions. MS is a chronic disease that results in patients having to adapt to new lifestyles due to the effects of the disease. Through patient education materials, patients with MS are able to learn about their disease and ways they can manage their disease. However, most patient education websites addressing chronic conditions, other than MS, are written at a level that is too high for many patients with low literacy levels to understand. The first step in providing appropriate web-based patient education materials is to know the reading levels of current MS websites. The purpose of this study was to explore and compare the readability levels of the MS information websites from the four countries. The research question for this descriptive study was, “what was the readability of selected MS websites in the United States, Canada, Australia, and New Zealand as measured by the SMOG readability measure?” If this study finds that MS websites are written at a level that is too high for those with low literacy to be able to read and understand, an example of how to revise a portion of the website content to reduce its reading level will be provided.

Methods
The researcher selected four MS website content areas including: What is MS, What Causes MS, Symptoms of MS, and Treatments of MS. The author chose these four content areas because they contain the most relevant information that a patient with MS will need to understand about the disease. The researcher selected this content because it is typically covered by occupational therapists when they are educating their patients about MS and how to better manage their lives with the disease. Also, these four content areas were common to all four of the websites analyzed.

Instrument

The Simple Measure of Gobbledygook (SMOG), created by G. McLaughlin (1969), is a readability formula which estimates the years of education a person needs in order to read and understand written passages. The SMOG readability formula is commonly used for evaluation of health information. The SMOG formula is based on reading comprehension (Gottlieb & Rogers, 2004). The SMOG measurement is a conservative measurement, thus 8th grade students would be expected to understand 90-100% of work assessed at an 8th grade level (Vaughan, 1976; Allensworth & Luther, 1986). The SMOG predicts the readability of work within 1.5 grades, 68% of the time (McLaughlin, 1969). The SMOG is available in both a computer based version and a manual based version. The computer based version SMOG was found at www.wordscount.info.

The researcher used the computer based version of the SMOG to analyze the website content for reading grade level. The output of the computer based SMOG provides a reading grade level estimate, number of sentences in the passage, and number of polysyllabic words. To check the consistency between the computer based SMOG and the manual based SMOG, the researcher analyzed the same content areas with both versions of the SMOG. This permitted a comparison between the grade level estimates for the computer and manual versions of the
SMOG. The output of the manual based SMOG includes an estimate of a grade level and number of polysyllabic words in the 30-sentence sample.

Numerous studies have used the SMOG to assess readability levels of printed materials. Studies that assessed written patient education materials using the SMOG included: materials for patients on anticoagulation therapy, materials for women with breast cancer, and information for prevention and care of skin and pressure ulcers (Beaver & Kuker, 1997, Racine, Tekieli, Williams, & Wilson, 2003, & Williams & Wilson, 2003). Another study used the SMOG formula to assess the readability of child safety seat installation instructions for lower priced car seats (Girasek & Wegner, 2003). One study evaluated the readability level of 80 health websites privacy policies using the SMOG formula. However, there are limited studies that have used the SMOG to assess readability levels of health information from the internet (D’Alessandro, Graber, & Johnson-West, 2002).

Procedures

First the researcher cut and pasted each country’s website’s content into its own Microsoft Word documents in July of 2010. The researcher read through each content area and modified the document to ensure that the SMOG analysis would run smoothly and consistently. The researcher found that individually each of the four content areas lacked the minimum 30 sentences required to use the SMOG analysis, so the content areas were combined to make two sections from each country. The What is MS and What Causes MS content areas were combined into one section for each country and the Symptoms of MS and Treatments of MS content areas were combined into one section for each country. This ensured there were more than 30 sentences for each section for each country for the computer based and manual based SMOG analyses.
To ensure that the researcher processed the text consistently she took the following steps to prepare the Word documents:

1. All headings and subheadings were removed (Dessner, 2006)
2. Photographs and diagrams were removed
3. Repetitious information was excluded (e.g. Canada’s second paragraph in the About MS section was excluded because it duplicated information that was already in the What is MS section.)
4. Treatment/management sections that were embedded in the symptom sections were excluded
5. Links to external websites were excluded
6. Treatment updates were excluded
7. Drug descriptions were excluded
8. The SMOG instructions state that sentences must have end punctuation (i.e., period, exclamation point, question mark), however, many patient education materials do not have sentence punctuation when they include lists (Dessner, 2006). Bulleted lists enhance readability; therefore, the researcher took steps to make sure the websites were not penalized in the SMOG analysis for using lists. Lists were handled as follows:
   a. In cases where the list was a series of short items, punctuation was added after each item in the list.
   b. In cases where the lists were composed of full sentences, the researcher deleted the bullets and treated the lists as individual sentences (Dessner, 2006).
9. Hyphens (-) were removed and replaced with a space

10. Slashes between and/or were removed and replaced with a space

11. Spell check was used and cultural variations in spelling were maintained (e.g. fibres)

12. Digital paragraph markers were removed

13. For Canada’s website the following sections were included in the What is MS section: About MS, Did you know, Does MS change over time, Is MS fatal, and How is MS diagnosed.

14. For New Zealand’s website the Who gets MS section was included in the What is MS section.

After the researcher formulated the text of the content areas from the websites, she copied and pasted it into the box provided on the SMOG website. The computer based version calculator analyzed the passage and provided the reading grade level for the specific text. The researcher used the manual based version of the SMOG to compare the results of the computer based version.

Two graduate students who were blind to the purpose of the study and earlier findings of the computer based SMOG completed the manual based SMOG on the same revised website content. The same word document was printed to create hard copies for completing the manual based SMOG. The graduate students followed the manual version instructions (See Appendix A). They randomly selected 30 sentences of content in each section. Of the 30 sentences, the graduate students analyzed 10 consecutive sentences at the beginning, middle, and end of text. They then highlighted words containing three or more syllables (polysyllabic) in the text in the 30 sentence sample. The graduate students counted the number of polysyllabic words for each section for each country. They then totaled the polysyllabic words and located the numbers on
the reading grade level chart (Table 1) to identify the grade level required to read and comprehend the text.

Results

The first content area (What is MS/What causes MS) had 49 sentences for the United States, 31 sentences for Canada, 42 sentences for New Zealand, and 36 sentences for Australia. The second content area (Symptoms of MS/Treatments of MS) had 72 sentences for the United States, 92 sentences for Canada, 46 sentences for New Zealand, and 81 sentences for Australia.

The computer based SMOG assessment computed partial grade levels while the manual based SMOG assessment computed whole grade levels. Table 2 and Table 3 describe for each country the computer and manually calculated SMOG grade levels, total sentence counts, total word count, total polysyllabic words, and the percent of polysyllabic words of total word count for the first content area (What is MS/What Causes MS). Table 2 presents results for the computer based SMOG assessment for the first content area. Table 3 presents results for the manual based SMOG assessment for the first content area.

Table 4 and Table 5 describe for each country the computer and manually calculated SMOG grade levels, total sentence count, total word count, total polysyllabic words, and the percent of polysyllabic words for total word count for the second content area (Symptoms of MS/Treatments of MS). Table 4 presents results from the computer based SMOG assessment for the second content area. Table 5 presents results for the manual based SMOG assessment for the second content area.

Table 6 presents the overall average computer based SMOG grade levels and manual based SMOG grade levels for each country across all content areas. Table 7 presents the overall
average computer based SMOG grade levels and manual based SMOG grade levels for each content area across all countries.

Results from this study show that, on average, the MS websites chosen for the United States and Australia were written at a grade level of 14 and the MS websites chosen for Canada and New Zealand were written at a grade level of 13. In addition, the researcher found that on average the first content area (What is MS/What Causes MS) was written at a grade level of 13 and the second content area (Symptoms of MS/Treatments of MS) was written at a grade level of 14.

Discussion

The purpose of this study was to explore and compare the readability levels of MS information websites from four countries. The research question for this descriptive study was “what is the readability of selected MS websites in the United States, Canada, Australia, and New Zealand as measured by the SMOG readability measure?”

The researcher found the United States and Australia’s MS websites were both written at a grade level of 14. This grade level is at a literacy level that is too high for a portion of the population from these countries to understand. On average, 50% of adults performed at a literacy level 2 or below on the prose and document scales for the United States and Australia. Persons at a literacy level 2 may not have graduated high school and have had probably less than an 11th grade education. Therefore, about half of the population from the United States and Australia would have difficulty reading and understanding the MS website’s information.

In addition, the researcher found Canada’s and New Zealand’s MS websites were written at a grade level of 13. This content is also at a literacy level that is too high for a portion of the
population from these countries to understand. In Canada 43% of adults performed at a literacy level 2 or below on the prose scale and in New Zealand 50% of adults performed at literacy level 2 or below on the document scale. Literacy statistics show that approximately half of the adult population for the four countries performed at a literacy level 2 or below. These persons most likely have not graduated high school or gone further than the 11th grade. These patients and caregivers would have difficulty searching and comprehending the important information on MS that was published on the websites.

The MS websites are a great source of patient education material to which occupational therapists can refer their patients and caregivers. Occupational therapists can use the websites as a tool to enhance patients’ and caregivers’ knowledge about MS, what causes MS, the symptoms and treatments of MS, and gives individuals the basis for improving self management of MS. Occupational therapists who use these MS websites as a tool for patient education materials, may be unsuccessful in fully educating their patients or caregivers because the literacy level of the content on the websites is too high. Only about half of the patients or caregivers could be expected to fully read and comprehend the MS website’s information.

All the studies that appeared in the literature review that used the SMOG assessment found the same results we found with our MS websites. All the prior studies discussed found that the information on their websites was published at too high of a literacy level for a portion of the website readers to understand and comprehend. According to the authors Williams and Wilson (2003), material written at an 8th grade level is acceptable for the general public to understand. Their study found that a website with information for prevention and care of skin and pressure ulcers had at least half of the information written at an 8th grade level (Williams & Wilson,
The websites analyzed for this study far exceed the 8th grade reading level goal Williams and Wilson advocate.

Each country’s computer based and manual based SMOG grade level averages were computed to compare the two SMOG versions. The results show that the average grade levels for the computer based and manual based SMOGs are similar. All grade level differences were less than one grade level. This provides evidence that on average, the computer based and manual based SMOG methods should provide similar results when used to analyze the same written content.

The researcher averaged the same content areas from all the countries for the computer based and manual based SMOG. This provided a comparison of reading grade levels between the two content areas. The results show that the first content area (What is MS/What Causes MS) was published at an average grade level of 14 and the second content area (Symptoms of MS/Treatments of MS) was published at an average grade level of 13. Both content areas are written at too high of reading levels. Patients or caregivers reading the What is MS, What Causes MS, Symptoms of MS, and Treatments of MS content areas would need to read at over a high school grade level to fully understand the information.

The findings from this study have implications for occupational therapists. If occupational therapists are aware that a website’s information is written at a literacy level that is too high, then they can advocate for their patients to have the information revised and written at a lower literacy level. Occupational therapists can do that by collaborating with website designers to encourage them to publish website content at a level that a greater proportion of the audience can read and understand. Occupational therapists can encourage web designers to offer content at
more than one reading grade level. Web designers could embed in the website a link for viewers to use that presents the information in a simplified version to appeal to those with lower reading ability. Occupational therapists can also encourage web designers to include more audio-type content where reading is not required. Web designers could add video links to their websites that would provide the viewers the opportunity to listen to health professionals or other persons with MS discuss topics relevant to living with MS.

In addition, occupational therapists can review all their patient education materials, written or web based, before they recommend the information to their patients. If the occupational therapists find the information is written at a literacy level their patients would not be able to read and understand they can then caution their patients about the information being difficult to understand. The occupational therapists can offer to discuss and walk their patients through the information. This gives patients the opportunity to understand the information and benefit from it. Occupational therapists should recognize that reading abilities of patients and caregivers may not be evident nor tested. If occupational therapists are aware of this, then they can offer a variety of patient education materials with a range of reading levels. This would permit patients and caregivers to self-select the patient education materials that they find most readable.

The researcher used a portion of text from New Zealand’s website as a means of illustrating the difference between a passage written at a 13.66 grade level and one written at less than an 8th grade level. The goal was to revise the content to reduce the passage’s reading level to an 8th grade level. The researcher edited the first 30 sentences from the first content area (What is MS/What Causes MS) for New Zealand to decrease the literacy level of the information. The researcher followed the recommendations of shortening sentence length, decreasing number of
polysyllabic words, using familiar and simple words, and using an active voice to decrease the literacy level required to read and understand the content. Table 8 illustrates examples of how sentences were revised using the recommendations to decrease the literacy level required to read and understand the content. The researcher provided selected content from New Zealand’s website in the full original version and the revised version (See Appendix B). The researcher ran the computer based SMOG and found that the original version was at a grade level of 13.66 and the revised version was at a grade level of 7.96. By following the recommendations to decrease literacy level of content, the researcher was able to reduce the literacy level of a portion of the New Zealand’s website.

**Limitations**

A limitation to this study was that the analysis reviewed the website at one point in time. Website sponsors continuously update and change information and pages on their websites, which will make it difficult to generalize this study. Web designers may update or change the content analyzed for this study, which may change the literacy level of the content.

**Future Research**

For future research, the author suggests that after a content area is selected on a website and analyzed, that periodically thereafter, one should re-run the SMOG on the same content area. This is how one takes into account the changes and updates that are done on websites and obtain an updated and accurate grade level of the websites. We are assuming that persons with low literacy levels are unable to fully benefit from content written at higher literacy levels. Another idea for future research is to test the understanding of patients with varying literacy levels for content written at varying literacy levels. This would test directly how much content written at
higher literacy levels that persons with poor reading skills understand. In addition, future research could analyze different MS websites sponsored by other organizations. Future research could also focus on analyzing websites on different diseases of interest to occupational therapists.

Conclusion

The purpose of this study was to explore the readability levels of selected MS information websites from the United States, Canada, Australia, and New Zealand. The computer based SMOG and manual based SMOG were used to analyze selected content from each country’s MS website. The results showed that the United States and Australia’s websites were written at an average of a 14 grade level and Canada and New Zealand’s websites were written at an average grade level of 13. The first section of content selected (What is MS/What Causes MS) was written on average for the four countries at a grade level of 14. The second section of content selected (Symptoms of MS/Treatments of MS) was written at an average grade level of 13.

The results provide evidence that all the MS websites reviewed were written at a literacy level that is too high for about half the patients and caregivers to fully read and understand. These findings will enable occupational therapists and other health professionals to advocate that web designers publish websites that are at a literacy level that those with low literacy levels as well as those with high literacy levels can read and understand. Informational websites, such as the MS websites, are good tools that occupational therapists can use for patient education materials. Patients have a right to learn about their disease which will in turn help them to play an active role in their health. Playing an active role in one’s health is beneficial to one’s health
status and outcomes (Brownson, Scaffa, & Van Slyke, 2008). For patients and caregivers with lower literacy levels to benefit from the information on the websites, the website content needs to be published at an 8th grade level or below.

In addition, the results indicated that the computer based and manual based SMOG resulted in similar grade levels. This shows that either version of the SMOG could be used to assess the reading grade levels accurately.
Table 1

*SMOG Conversion Table (McLaughlin)*

<table>
<thead>
<tr>
<th>Total Polysyllabic Word Count</th>
<th>Approximate Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>4</td>
</tr>
<tr>
<td>3-6</td>
<td>5</td>
</tr>
<tr>
<td>7-12</td>
<td>6</td>
</tr>
<tr>
<td>13-20</td>
<td>7</td>
</tr>
<tr>
<td>21-30</td>
<td>8</td>
</tr>
<tr>
<td>31-42</td>
<td>9</td>
</tr>
<tr>
<td>43-56</td>
<td>10</td>
</tr>
<tr>
<td>57-72</td>
<td>11</td>
</tr>
<tr>
<td>73-90</td>
<td>12</td>
</tr>
<tr>
<td>91-110</td>
<td>13</td>
</tr>
<tr>
<td>111-132</td>
<td>14</td>
</tr>
<tr>
<td>133-156</td>
<td>15</td>
</tr>
<tr>
<td>157-182</td>
<td>16</td>
</tr>
<tr>
<td>183-210</td>
<td>17</td>
</tr>
<tr>
<td>211-240</td>
<td>18</td>
</tr>
</tbody>
</table>
Table 2

Computer Calculated SMOG Grade Levels, Total Sentence Count, Total Word Count, Total Polysyllabic Words, & Percent of Polysyllabic Words of Total Word Count for Each Country for the What is MS/What Causes MS Content Area

<table>
<thead>
<tr>
<th>Country</th>
<th>SMOG Grade</th>
<th>Total Sentence Count</th>
<th>Total Word Count</th>
<th>Total Polysyllabic Words</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>15.51</td>
<td>49</td>
<td>1,216</td>
<td>230</td>
<td>19.0%</td>
</tr>
<tr>
<td>Canada</td>
<td>13.54</td>
<td>31</td>
<td>493</td>
<td>103</td>
<td>20.9%</td>
</tr>
<tr>
<td>Australia</td>
<td>14.79</td>
<td>36</td>
<td>796</td>
<td>150</td>
<td>18.9%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>13.89</td>
<td>42</td>
<td>830</td>
<td>149</td>
<td>18.0%</td>
</tr>
</tbody>
</table>
Table 3

*Manual Calculated SMOG Grade Levels, Total Sentence Count, Total Word Count, Total Polysyllabic Words, & Percent of Polysyllabic Words of Total Word Count for Each Country for the What is MS/What Causes MS Content Area*

<table>
<thead>
<tr>
<th>Country</th>
<th>SMOG Grade</th>
<th>Total Sentence Count</th>
<th>Total Word Count</th>
<th>Total Polysyllabic Words</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>15</td>
<td>30</td>
<td>793</td>
<td>143</td>
<td>18.0%</td>
</tr>
<tr>
<td>Canada</td>
<td>13</td>
<td>30</td>
<td>493</td>
<td>100</td>
<td>20.3%</td>
</tr>
<tr>
<td>Australia</td>
<td>15</td>
<td>30</td>
<td>708</td>
<td>139</td>
<td>19.6%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>13</td>
<td>30</td>
<td>562</td>
<td>95</td>
<td>16.9%</td>
</tr>
</tbody>
</table>
Table 4

*Computer Calculated SMOG Grade Levels, Total Sentence Count, Total Word Count, Total Polysyllabic Words, & Percent of Polysyllabic Words for Total Word Count for Each Country for the Symptoms of MS/Treatments of Content Area*

<table>
<thead>
<tr>
<th>Symptoms of MS/Treatments of MS</th>
<th>Country</th>
<th>SMOG Grade</th>
<th>Total Sentence Count</th>
<th>Total Word Count</th>
<th>Total Polysyllabic Words</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>United States</td>
<td>12.77</td>
<td>72</td>
<td>902</td>
<td>205</td>
<td>22.7%</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>13.97</td>
<td>92</td>
<td>1,426</td>
<td>331</td>
<td>23.2%</td>
</tr>
<tr>
<td></td>
<td>Australia</td>
<td>13.66</td>
<td>81</td>
<td>1,160</td>
<td>275</td>
<td>23.7%</td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>14.01</td>
<td>46</td>
<td>1,027</td>
<td>167</td>
<td>16.3%</td>
</tr>
</tbody>
</table>
### Table 5

*Manual Calculated SMOG Grade Levels, Total Sentence Count, Total Word Count, Total Polysyllabic Words, & Percent of Polysyllabic Words of Total Word Count for Each Country for the Symptoms of MS/Treatments of MS Content Area*

<table>
<thead>
<tr>
<th>Symptoms of MS/Treatments of MS</th>
<th>Country</th>
<th>SMOG Grade</th>
<th>Total Sentence Count</th>
<th>Total Word Count</th>
<th>Total Polysyllabic Words</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>United States</td>
<td>13</td>
<td>30</td>
<td>404</td>
<td>93</td>
<td>23.0%</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>13</td>
<td>30</td>
<td>440</td>
<td>102</td>
<td>23.2%</td>
</tr>
<tr>
<td></td>
<td>Australia</td>
<td>13</td>
<td>30</td>
<td>424</td>
<td>107</td>
<td>25.2%</td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>14</td>
<td>30</td>
<td>706</td>
<td>126</td>
<td>17.8%</td>
</tr>
</tbody>
</table>
Table 6

*Overall Computer Based SMOG Grade Level and Manual Based SMOG Grade Level Averages for the United States, Canada, Australia, & New Zealand*

<table>
<thead>
<tr>
<th>Country</th>
<th>Computer Based SMOG Grade Level Average</th>
<th>Manual Based SMOG Grade Level Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>14.14</td>
<td>14</td>
</tr>
<tr>
<td>Canada</td>
<td>13.76</td>
<td>13</td>
</tr>
<tr>
<td>Australia</td>
<td>14.23</td>
<td>14</td>
</tr>
<tr>
<td>New Zealand</td>
<td>13.95</td>
<td>13.5</td>
</tr>
</tbody>
</table>
Table 7

*Overall Computer Based SMOG Grade Level and Manual Based SMOG Grade Level Averages for Each Content Area*

<table>
<thead>
<tr>
<th>Content Area</th>
<th>Computer Based SMOG Grade Level Average</th>
<th>Manual Based SMOG Grade Level Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is MS/What Causes MS</td>
<td>14.43</td>
<td>14</td>
</tr>
<tr>
<td>Symptoms of MS/Treatments of MS</td>
<td>13.60</td>
<td>13.25</td>
</tr>
</tbody>
</table>
### Table 8

**Revisions on Sample Text from New Zealand’s MS Website**

<table>
<thead>
<tr>
<th>Revision Recommendations</th>
<th>New Zealand Original Version (SMOG grade level 13.66)</th>
<th>New Zealand Revised Version (SMOG grade level 7.96)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shortening sentence lengths</strong></td>
<td>These scars are the result of healing patches of inflammation that are the basic cause of damage to nerve fibres and of the suddenly appearing symptoms that are referred to as an attack, exacerbation or relapse.</td>
<td>These scars cause damage to nerve fibres and the sudden onset of symptoms. These are referred to as an attack or relapse.</td>
</tr>
<tr>
<td><strong>Decrease number of polysyllabic words</strong></td>
<td>The CNS is responsible for our conscious and unconscious functioning, including movement and the response to sensations such as sight, touch and hearing.</td>
<td>The CNS is in charge of our functions, such as movement and the response to senses such as sight, touch and hearing.</td>
</tr>
<tr>
<td><strong>Use of simple and familiar words</strong></td>
<td>The inflammation causes damage particularly to the insulating myelin sheath covering nerve fibres, but also damages the nerve fibres (axons) themselves.</td>
<td>The swelling harms the nerve coating and the nerve fibers (axons).</td>
</tr>
<tr>
<td><strong>Use of active voice</strong></td>
<td>There is uncertainty how much of this progressive process is due to low grade inflammation and how much to loss of previously damaged nerve fibres.</td>
<td>Researchers do not know how much of this progressive process is due to low grade swelling or from the loss of damaged nerve fibres from before.</td>
</tr>
</tbody>
</table>
Appendix A

The Smog Readability Formula


The SMOG conversion tables were developed by Harold C. McGraw, Office of Educational Research, Baltimore Co. Public Schools, Towson, MD.

The SMOG Readability Formula is a simple method you can use to determine the reading level of your written materials. If a person reads at or above a grade level, they will understand 90-100% of the information. Generally, you need to aim for a reading level of sixth grade or less. In addition, to ensure that the text is clear and readable, read your draft aloud.

How to use the SMOG formula:

1. Count 10 sentences in a row near the beginning of your material. Count 10 sentences in the middle. Count 10 sentences near the end. (30 total sentences)
2. Count every word with three or more syllables in each group of sentences, even if the same word appears more than once.
3. Add the total number of words counted. Use the SMOG Conversion Table I to find the grade level.

Word Counting Rules:

- A sentence is any group of words ending with a period, exclamation point, or question mark.
- Words with hyphens count-as-one-word.
- Proper nouns are counted.
- Read numbers out loud to decide the number of syllables.
- In long sentences with colons or semicolons followed by a list, count each part of the list with the beginning phrase of the sentence as an individual sentence.
- Count abbreviations as the whole word they represent.
Appendix B

**New Zealand: Original Version**

MS is a disorder of the central nervous system (CNS) which includes the brain, spinal cord and optic nerves. The CNS is responsible for our conscious and unconscious functioning, including movement and the response to sensations such as sight, touch and hearing. It directs these functions by sending its instructions in the form of electrical impulses to the appropriate sites along nerve fibres. Nerve fibres are coated in a protective insulating covering called the myelin sheath; this serves a very similar function to the coating around electrical wires. Myelin is important in speeding electrical conduction along nerve fibres and in insulating nerve fibres from one another. The term multiple sclerosis refers to multiple areas of scarring (sclerosis) scattered throughout the brain and spinal cord. These scars are the result of healing patches of inflammation that are the basic cause of damage to nerve fibres and of the suddenly appearing symptoms that are referred to as an attack, exacerbation or relapse. Patches of inflammation heal spontaneously over several weeks or months when symptoms may resolve completely or residual impairment may result, if they do not. The inflammation causes damage particularly to the insulating myelin sheath covering nerve fibres, but also damages the nerve fibres (axons) themselves. In MS, the typical damage is often referred to as “demyelination”. The nature of the symptoms and their severity depends partly on the site of the patch of inflammation (or lesion) and partly on its nature and intensity. The course of MS varies widely from person to person. Some people will only ever experience mild symptoms over their lifetime while others will have relapses followed by incomplete remission when disability may worsen in a stepwise fashion with each relapse experienced. A number of people experience slowly progressive, worsening of disability over many months or years. There is uncertainty how much of this progressive process
is due to low grade inflammation and how much to loss of previously damaged nerve fibres. Using data from similar countries, and some small scale New Zealand studies, we estimate that about one New Zealander in every thousand has MS. Thus, there are approximately 4000 people in New Zealand diagnosed with MS. Symptoms usually appear between the ages of 20 and 50 with a peak in the early 30’s. Diagnosis before 15 is not so common and onset is unusual in those over 50. Women are affected approximately twice as often as men. MS is more prevalent in Caucasians (people with ancestry from Northern Europe), than any other racial group. It is rarely found in Maori and Polynesian people and is uncommon in Asian people. The prevalence in New Zealand is approximately 1 per 1,000 with the annual incidence being 2 to 5 per 100,000. Generally MS becomes more common the further away from the equator you are. Thus the prevalence of MS is much higher in regions such as the South Island of NZ, Scotland and Canada than it is in tropical and sub-tropical areas. Those with a close relative with MS have an increased risk. Having a first-degree relative, (mother, father, sibling) with MS increases the chances of having it from approximately 1 in every 1,000 people to 30 in every 1,000. But it is important to note that the great majority of people with an affected first-degree relative do not develop MS. MS is not contagious or infectious; it is not possible to contract it from close contact with a person with MS.

**New Zealand: Revised Version**

MS is a disorder of the central nervous system (CNS). The CNS is the brain, spinal cord and optic nerves. The CNS is in charge of our functions, such as movement and our senses (sight, touch and hearing). It directs these functions by sending its message to nerve fibres. Nerve fibres are covered with myelin sheaths. This is like the coating around wires. Myelin is in charge of speeding up and protecting nerve fibres from harm. The term MS refers to many spots of
scarring spread in the brain and spinal cord. These scars cause damage to nerve fibres and the sudden onset of symptoms. These are referred to as an attack or relapse. Patches of swelling heal suddenly over several weeks or months when symptoms may stop completely or if not, damage may be left over. The swelling harms the nerve coating and fibers (axons). The type of the symptoms and its effects depends on the amount and spot of swelling (or lesion). The course of MS varies from person to person. Some people will only ever have mild symptoms. Others will have relapses followed by symptoms that may worsen. Some people have slowly progressing MS, where the symptoms get worse over many months or years. Researchers do not know how much of this progressive process is due to low grade swelling or from the loss of damaged nerve fibres from before. About one New Zealander in every thousand has MS. This means that there are about 4000 people in New Zealand with MS. Symptoms usually start between the ages of 20 and 50 with most symptoms starting in the early 30’s. Having MS start before age 15 or after 50 is not common. Women have MS about two times more than men. MS is more common in Caucasians than any other racial group. It is rarely found in Maori and Polynesian people. MS is not common in Asian people. The amount of MS in New Zealand is about 1 per 1,000 people. The yearly rate being 2 to 5 per 100,000 people. MS becomes more common the further away from the equator you are. This means that MS is found more often in regions such as the South Island of NZ, Scotland and Canada. Those with a close family member with MS have an increased risk. Having a family member, (mother, father, sibling) with MS raises the chances of having it from about 1 in every 1,000 people to 30 in every 1,000 people. People with a relative with MS do not always develop MS. MS is not catchable. It is not possible to catch it from close contact with a person with MS.
References


Griffin, J., McKenna, K., & Tooth, L. (2006). Discrepancy between older clients’ ability to read and comprehend and the reading level of written educational materials used by occupational therapists. *American Journal of Occupational Therapy, 60*(1), 70-80.


