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Karen M. Austermilller  
*The University of Toledo*

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Readability Levels of Parkinson's Disease Websites in Australia, Canada, New Zealand, and the  
United States.

Karen M. Austermiller

Research Advisor: Julie Jepsen Thomas, Ph.D., OTR/L

Occupational Therapy Doctorate Program

Department of Rehabilitation Sciences

The University of Toledo

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## **Abstract**

### **Purpose**

A significant proportion of the population has poor literacy skills and therefore, may not be able to take full advantage of patient education materials available on the Internet. The purpose of this study is to analyze the readability levels of national websites in the United States, Australia, Canada, and New Zealand that provide patient information about Parkinson's disease.

### **Method**

Parkinson's disease websites were selected from English speaking countries. A protocol was used to select and prepare the data. The data were analyzed using both manual and online versions of the SMOG readability measure. Descriptive statistics were used to present the findings.

### **Results**

A descriptive analysis revealed the readability grade level from all four countries and all four content areas ranged from 11.02 to 14.11. No patterns were noted in readability level for country or content area. However, all of the website content exceeded the readability level range of 5.0-6.9 which literacy experts consider ideal. The grade levels obtained from the manual version of the SMOG were comparable with those obtained by the online method.

### **Conclusions**

Recommendations were made to lower the readability levels of websites created for patients. Referral to websites may not be beneficial for patients with low literacy if the information is difficult to read. Occupational therapists should understand how the readability level of patient education websites can affect therapeutic outcomes.

## Readability Levels of Parkinson's Disease Websites in, Australia, Canada, New Zealand, and the United States.

Occupational therapists are employed worldwide and commonly provide occupational therapy services for individuals diagnosed with Parkinson's disease (PD). Therapists utilize patient education as an important part of practice. The readability of educational materials may have a positive or negative impact on patient outcomes. The popularity of the Internet as a source of patient educational materials is increasing. Prior studies (including those of websites) have shown that most health-related literature is written above the reading ability of a significant proportion of the American population. There are studies that analyze readability of health websites for a variety of diagnoses. However, this was the first study that analyzes the readability of PD websites internationally.

The purpose of this study was to determine the readability of websites that provide patient information regarding PD in select English speaking countries. We selected websites from Australia, Canada, New Zealand, and the United States. We identified common content areas within the four websites. They were evaluated using the SMOG readability measure. We reviewed literature to form a basis for the study. We describe types of literacy and literacy levels. Statistics from all four countries are described in terms of literacy rates. A relationship exists between health literacy and positive therapeutic outcomes. There are implications to clinical practice for occupational therapists. They are defined and characteristics to improve readability are explained. A brief summary of PD is given with emphasis on symptoms that affect reading. We give Internet access statistics and make inferences regarding the use of websites to obtain health information.

### **Review of the Literature**

A review of the literature finds several relevant topics including: international literacy rates, health literacy, readability characteristics, appropriate reading level, implications to occupational therapy, special needs of those with PD, and Internet use to obtain health information. The review suggests occupational therapists consider readability levels and the relationship they have to patient education for health outcomes. Low literacy is an additional risk factor that is correlated with negative outcomes in adults and children with chronic illness. Health institutions are paying more attention to how they give and verify understanding of patient instructions. Health care professionals are posed with legal issues regarding the implications of low literacy skills for patient compliance with follow up instructions. Many hospitals require staff members to complete documentation as to the level of understanding patients have of discharge instructions. Health care professionals may be subject to legal ramifications in the future due to liability regarding the patient's understanding of healthcare instructions (Center for Health Care Strategies, 2010). Ideally, all educational material should be written at a literacy level that can be understood by most people.

### **Literacy Levels and International Statistics**

The National Assessment of Adult Literacy (2009) provides international statistical information for the United States, Canada, Australia, New Zealand and Great Britain. It is organized according to three different literacy types. The three types of literacy are prose, document, and quantitative. This study will focus on prose and document literacy types because of the application they have for patient education material. Prose literacy is the knowledge and skills needed to search, comprehend, and use continuous texts within the same source. Patients use this type of literacy when they read brochures, discharge instructions, medication labels, and nutrition information. Document literacy is the knowledge and skill needed to search,

comprehend, and integrate text from multiple sources. Some examples of document literacy for patients include searching the Internet for information on PD, searching health books for information, looking up community resources, and handling insurance claims. People use prose literacy to read a specific website page and document literacy to navigate the site and take in multiple pages of text.

There are five literacy levels. People at literacy level 1 have very poor literacy skills. They have difficulty reading and understanding basic vocabulary words. People at literacy level 2 have moderate literacy skills. They are able to read short paragraphs but have a limited vocabulary. People at literacy level 3 have the minimum skills necessary to manage as independent members of society in which they obtain employment, function in a household, and have basic problem solving skills. People at literacy level 4 or 5 have advanced vocabulary, comprehension, and problem solving skills (National Association of Adult Literacy, 2009). Those who function at level 3 or below are most at risk for poor understanding of written patient education material found on the Internet.

Literacy statistics from Australia, Canada, New Zealand, and the United States are similar. A significant percentage of people in all four countries have low literacy levels. In Australia, 47% of adults performed at literacy level 1 or 2, while 37% performed at level 3 on the prose and document scales. Additionally, 60% performed at level 1 or 2 and 35% performed at level 3 on the health literacy scale (Australia Bureau of Statistics, 2006). In Canada, 40% of adults are at level 1 or 2 on the prose scale and 48% are at level 2 or below on the document scale (ABC Canada Literacy Foundation, 2008). In New Zealand 45% of adults performed at level 1 or 2 on the prose literacy scale and 50% performed at level 1 or 2 on the document literacy scale. In the United States, 22% of adults performed at level 1 and 26% at level 2 on the

prose and document scales. Only 34% of people in the United States scored at level 3 on the document and prose scales (Jenkins, Jungebalt, Kirsch, & Kolstad, 2003). This places the majority of the population in all four countries at a literacy grade equivalent below 8<sup>th</sup> grade (Tertiary Education Learning Outcomes Policy, 2005). The Internet provides health information to consumers through mainstream outlets. The information should be written below a secondary level of education. This will make Internet-based patient education websites more clearly understood by most people.

Experts in patient education differ in opinion regarding the appropriate readability level of patient education materials. The majority of experts in education urge authors to write at an 8<sup>th</sup> grade reading level or lower (King, Winton, & Adkins, 2003), whereas literacy and health groups suggest a 5<sup>th</sup> grade readability level (Schloman, 2004). The disparity between experts can be explained by several factors. Personal reading level can be lower than the grade level completed (Bass, 2005). Also, medical terminology significantly increases the grade level of patient education brochures (Sand-Jecklen, 2007). A 5<sup>th</sup> grade readability level should be used based on current literacy rates and the cognitive deficits associated with Parkinson's disease. This could minimize the potential negative health outcomes related to low patient literacy levels (Center for Health Care Strategies, 2010).

### **Health Literacy**

The United States National Assessment of Adult Literacy (National Association of Adult Literacy, 2009) defines health literacy as the capacity to obtain, interpret, understand, and use information to promote and maintain health. According to the NAAL, 12% percent of U.S. adults have proficient health literacy and are able to carry out common health tasks. The remaining

88% would have difficulty with common health tasks. This includes tasks such as following the directions on a prescription label, and care instructions.

A concerned group of health care professionals formed a committee and developed a resource entitled, *Health Literacy and the Older Adult*, (Glass & Butler, 2010). They developed this resource to assist other health professionals in writing and improving educational materials for older adults. The committee advocates for patient education material written at a 5<sup>th</sup> grade readability level. They further state that “health literacy in older adults as one of the most important topics in health care today” (2010, p.153). Populations in addition to older adults are at risk due to low health literacy. An article published in *Pediatrics* identifies how low health literacy in parents of children with chronic illnesses is associated with poorer clinical outcomes (Rothman, Yin, Mulvaney, Patrick, Homer, & Lannon, 2009). Blanch, Chibnic, Katz, et al., (2009) found that unfavorable health outcomes in people with chronic disease correlate with low literacy levels.

Alternately, adequate health literacy contributes to an improved sense of wellbeing and personal control (Allison, Angner, Miller, Ray, & Saag, 2009). Francis, Scaife, and Zahnd, (2009) found a positive correlation between health and literacy level. This suggests that a higher level of reading skill is associated with better health practices. The American Academy of Orthopedic Surgeons promotes disseminating patient education materials that suit the readability skills of the patient population (Sabharwal, Badarudeen, & Kunjo, 2008). They suggest material be written below the sixth-grade level. In a study of 426 patient education documents, using the Flesch-Kincaid readability formula, authors found that only 2% were written at the recommended reading level. This means 98% of the documents were written beyond the literacy level of a significant proportion of the general population. Dessner (2006) used the SMOG to



measure the readability level of a publication for patients with PD. She found that content in the handbook was written at a college reading level (Dessner, 2006).

Readability is an issue that has been discussed for many years. In fact, poor readability of patient education material has been a focus of literacy experts for many years. Recently the emphasis on health literacy, which includes improving readability of material, has brought more attention to this important topic. In addition to raising awareness of health literacy, it is important that occupational therapists attend to the readability level of written documents given to patients. A recent editorial in the *American Journal of Occupational Therapy* states “health literacy directly affects client adherence, safety, and satisfaction; intervention cost and time efficiency, and intervention effectiveness” (Smith & Gutman, 2011, p.369). Additional literature in occupational therapy focuses on supporting clients with low health literacy and how patients understanding of written communication can impact their quality of life (Schilloinger et al., 2003). A survey found that over half of occupational therapists provide written materials to patients and that the material that was used was at too high a readability level for most people (Sharry, McKenna, & Tooth, 2002).

The majority of literature we found that discusses readability of patient education materials analyzes material that is given to patients directly by therapists and how understanding health issues leads to better outcomes in patient care. Rudd and Anderson (2006) developed a review tool program for health care professionals to improve care and increase revenue. The tool uses a checklist format to evaluate written materials including print communication. They analyzed print from websites. The results support findings of other studies that note readability levels as a factor in health literacy. Smith et al. (2010) evaluated the ability of care facilities to meet health literacy needs. They used the program review tool and a readability graph to analyze

written material. They found that the material was written at 8<sup>th</sup> and 9<sup>th</sup> grade level. The study also found that written material did not give definitions for medical terms (Smith et al., 2010). Other studies completed by White (2008), and Benson and Forman (2002) analyzed health literacy of adults with college educations. They determined that even when adults have high general literacy they may not have adequate health literacy. Occupational therapists should consider how readability of educational materials is a part of a broader concept of equal access to health care knowledge for everyone and how readability contributes to healthy outcomes (Harden, 2005; Perlow, 2010; Weir, 2006).

### **Role of occupational therapy**

Occupational therapists play an essential role in educating patients diagnosed with a progressive disease such as Parkinson's disease. Occupational therapists often use patient education to facilitate occupation and independence (Griffin, McKenna, & Tooth, 2006). Nelson refers to occupational therapy as "the profession uniquely devoted to helping persons help themselves through their own active efforts" (Nelson, 1997, p.11). This sentiment supports current trends in healthcare encouraging patients' participation in the management of their health. Occupational therapists contribute to positive outcomes in patient care through the education of patients. Providing material with an appropriate readability level is a challenge in patient education. Patients should be given information that they can read and are capable of understanding. In the past, therapists have relied on verbal instruction and printed documents. These methods will continue to be used for patient education. However, due to global advances in technology, Internet websites will play an increasing role in patient education in the future (Thomas, 1999). Literature supports the need to evaluate readability and literacy levels of Internet websites.

There are several models of practice for which patient education is emphasized. For example, PEO, Person Environment Occupation Model, postulates occupation as self-directed and taking place over the lifespan (Brown, 2009). Occupational therapists use websites as a resource to provide patients with information on health issues. Patient education websites support an empowered consciousness for the individual and society. This consciousness has developed over the last century and continues to emphasize individual empowerment (Hammel, Charlton, Jones, Kramer, & Wilson, 2009). Websites can serve family members, caregivers, health professionals, or individual patients. Websites provide health information to those who seek support for themselves or others. A study with people diagnosed with PD demonstrated a positive correlation between health education, improved function, and feelings of self-efficacy (Montgomery et al., 1994). Parkinson's disease websites could correlate with positive outcomes if lowering the readability contributed to health education.

### **Characteristics of Well-Written Text**

Well-written material has characteristics that include minimal use of polysyllabic words and the use of simplistic sentence structure. A simplistic sentence structure includes writing in first person and avoiding unnecessary adjectives or compound phrases. Shorter sentences and writing in an active voice helps lower readability. Authors should add a glossary to define terms that are not commonly used or that refer to medical or technical definitions. Additionally, the font used for text should be widely recognized amongst the population. Websites should be user friendly and easy to navigate. Standard 12 point font or larger should be used for websites. Visibility is increased when there is heavy contrast between the background and text. The layout should have ample white spaces. Authors should avoid using all capital letters for words. The organization of the information should include subheadings, bullet points, and summaries. The

amount of information on a page should be moderate and any use of pictures, charts, or graphs should be explained thoroughly (Griffin et al., 2006).

### **Parkinson's Disease**

Physicians diagnose PD in adults around 60 years of age. It is a progressive neurological disorder. There is generally a slow progression of the disease in which the cells of the substantia-nigra fail to produce enough dopamine to sustain normal physiological function of the body. Symptoms of the disease and side effects of medications impair vision, memory, and the ability to understand written text. Symptoms include tremor, and cognitive, vestibular, optical, sensory and motor functioning deficits. Further symptoms include mood disturbances, neuropathic pain, and disruptive sleep patterns (Braun, 2009). Medication used to treat the disease may cause side effects that include hallucinations, sleep disturbance, and dyskinesias.

Patients with PD commonly experience cognitive dysfunction. Attention, memory, and fluency are affected (Elgh et al., 2009). People with high literacy skill prior to diagnosis may experience a decline in cognitive ability with the progression of the disease. This will affect their ability to comprehend written information. Information (on websites) that is written above the literacy level of the person may be frustrating, confusing, misleading, and lead to negative outcomes (Elgh et al., 2009).

### **Internet Access and Use**

More people are turning to the Internet as a convenient way to obtain information. This includes information about health and disease. The Commonwealth of New Zealand in (2009) published statistical information on adult Internet access in Australia, Canada, New Zealand, and the United States. Data collected in 2006 indicate that 62% of households have Internet access. Canadians ranked the highest with 68% of households having Internet access. The United States

had the lowest percent at 62% of households with Internet access. These statistics indicate that at least some people with low literacy levels are probably using the Internet.

Patient education websites can be a convenient way for patients diagnosed with Parkinson's disease to obtain information if it is written at an appropriate level of readability. The readability of websites is important for occupational therapists to consider so that they can provide the most appropriate educational resources to their clients. A large proportion of the English speaking population is not able to comprehend material written above a 6<sup>th</sup> grade equivalent reading level. Literacy issues can be addressed in a way to promote good and safe health practices (Sabharwal, Badarudeen & Kunjo, 2008). A first step in addressing the problem of appropriate readability for patient education websites is to analyze their current level of readability. We recommend changes to the wording of the passages to provide similar information at a readability level that is more easily understood by most of the population. Therefore, the research question for this study is: What is the readability of Parkinson's disease websites in Australia, Canada, Australia, New Zealand, and the United States as measured by the SMOG readability measure? Analysis of the websites demonstrated that the readability level is higher than recommended. We provide examples that revise passages to reflect lower readability levels, which are appropriate for most people.

## **Method**

### **Websites**

We selected Parkinson's disease websites from Australia, Canada, New Zealand, and the United States by using Google as a search engine for Parkinson's disease. We selected these four countries because they are primarily English speaking and they offered comparable statistics for literacy rates that are easily accessed. We selected websites from each of the four countries with

information about PD. Selections were made by strongest national affiliation if more than one website existed. The websites we used for this study included: Australia: [www.parkinsons.org.au](http://www.parkinsons.org.au), Parkinson's Australia; Canada: [www.parkinson.ca](http://www.parkinson.ca), Parkinson Society Canada; New Zealand: [www.parkinsons.or.nz](http://www.parkinsons.or.nz), Parkinsonism Society of New Zealand; and the United States: [www.parkinson.org](http://www.parkinson.org), National Parkinson's Foundation. The sites were compared for content areas and similar national affiliation for each country.

### **Instruments**

We chose to use the SMOG readability measure based on the expedient and ease of use in research for 40 years. It was created by G. Harry McLaughlin to measure the number of years of education necessary to read and understand written material. Researchers have used the SMOG to evaluate many different types of text including health information. It is the gold standard of readability measures according to *Harvard Health Literacy Projects* (Rudd, 2002). The SMOG formula evaluates the number of polysyllabic words and the number of words in a sentence. When there are fewer syllables and words per sentence, there is a lower readability level. The SMOG measures grade levels from 4 to 18 (13-18 represents college and graduate level) with an accuracy rate measurement within 1.5 grade levels. The estimated readability level indicates that the person is able to read 90-100% of the text at that specific grade level (Rudd, 2002). There are two formats of the SMOG. SMOG readability levels can be calculated by hand or by an online computer based format. We used both formats for this research to provide accurate and consistent measurements of the modified documents.

The manual based SMOG calculates grade levels of education by counting the number of polysyllabic words within a sample of text and the number of words per sentence from a 30 sentence sample. The sample consists of 10 contiguous sentences taken from the beginning,

middle, and end of a passage. The online version of the SMOG analyzes the entire body once it is copied and pasted into the online SMOG calculator.

### **Procedures**

We developed a protocol for compiling the data in word documents that was based on prior research in collecting and analyzing readability data. Initially, we copied and pasted the total content of each website to word documents. We copied the content in the order it appeared on the web page beginning at the upper left tab or section of the main page and selecting each link from the top down when opening a new page. We then copied the material to word documents. We saved the documents by naming the file by the country of origin followed by the date (e.g., Australia 100310). We opened each word document separately to prepare it for analysis. We deleted photos, decorative wording, and borders (Dessner, 2006). We removed headings and subheadings. We changed content that was in a list format into a sentence format (even if it formed a single word sentence). We removed word glossaries when present (Dessner, 2006). We removed paragraph markers. We replaced symbols and numbers with words if they formed polysyllabic words. We left large numerical representations as they appeared in the text (e.g., 42,000). We adjusted the line spacing of the text so that there was a single space between lines and no more than two spaces from the ending of one sentence to the beginning of another.

We identified four themes within the PD website content and separated them into individual documents. Each of the websites had similar content in four themes of patient education. The four themes were: What is Parkinson's disease?; Symptoms; Living with Parkinson's disease; and Treatment. We removed content that was not intended to be read by patients, caregivers, or family members. For example, we removed content that included medical jargon or pharmacological information. We removed content entitled "Fundraising", "Board

Members”, “Careers”, and “For Clinicians”. Finally, we removed content that gave complex and technical information. This included pharmacological, surgical, and technological information. We kept content that was relevant to patient education in occupational therapy and we omitted the content areas that were irrelevant to patient education. We kept the original spelling if there was a discrepancy between the English or British spelling. For example, we kept ageing (British spelling) and aging (English spelling) as they appeared. We identified and labeled the country and content area for each word document. Australia, Canada, New Zealand, and the United States each had one word document. Breaks in content area were made by using a heading and a space between them. The headings that were used were; What is PD?, Symptoms, Treatments, and Living with PD. Although the websites had similar content there were differences in the amount of content each website provided.

We copied and pasted the final modified content from websites into the online version of the SMOG. We completed the online version of the SMOG and recorded the results. We then gave duplicate copies of the content to research assistants who completed the hand version of the SMOG by following a standard protocol. The research assistants were blind to the results of the online version of the SMOG and the research question. We gave the research assistants instructions on how to complete the hand version of the SMOG. The results and documents were returned to the researchers. We completed the hand version of the SMOG a second time.

### **Analysis**

We compared the results of all findings for accuracy. The three sets of data were comparable. We compiled the data for descriptive analysis. We used a conversion table to convert the numbers to a grade level as illustrated in Table 1.



This study is a descriptive analysis of content readability from websites. Results yielded data that were significant to the research question but were not appropriate for additional statistical analyses. We chose to use descriptive analyses to represent the findings. They are described below.

### **Results**

We analyzed the data from the SMOG Readability Measure several ways as illustrated in Tables 2-11. We analyzed the overall readability of the total website content by country (see Table 2). We analyzed the readability of each content area in our sample across all countries (see Table 3). We analyzed the readability of each content area for each country individually (see Tables 4-11). We used percentages to describe the proportion of polysyllabic words in the total number of words in the samples. Additionally, our results support the reliability of the online and manual version of the SMOG Readability Measures (see Tables 2 and 3).

The overall content of the PD websites for each country had readability levels with a range of 11.5 to 13.5 as illustrated in Table 2. This is equivalent to a school grade range of 2.5 years of high school to 0.5 years of college. We found that the four content areas, across countries, had a readability level range of 12.25 to 13.25 as illustrated in Table 3. This is equivalent to 3.25 years of high school and 0.25 years of college within the United States.

We did not find large variations in readability for total website content between each country. Canada had the lowest average grade level for total website content (11.5). Australia (13.5) and New Zealand (13.02) had the highest average grade level for total website content. Refer to Table 2.

We found negligible differences in readability levels between content areas when looking across countries. Both the online and manual SMOG results for each content area were between

readability levels 12.25 and 13.25 across the four counties. Refer to Table 3. The content area Symptoms had the highest readability level. The content area What is PD had the lowest readability level.

New Zealand had the highest grade level for a specific content area, Living with PD, of 14.45 (see Table 7). The United States had the lowest grade level for specific content area, What is PD, of 11.04 (see Table 5). Variation in readability existed between the four countries within the same content areas of 0.3 to 3.0 grade levels as measured by both the online and manual SMOG (see Tables 4-11).

We used percentages to represent the proportion of polysyllabic words found in the sample. We found the largest percentage of polysyllabic words (32%) used in content area Treatment on the Australian website with 674 polysyllabic words in a 2093 word passage. This is illustrated in Table 4. We found the smallest percentage polysyllabic words (14%) used in the Treatment content area for the Canadian and the United States websites as illustrated in Table 4. The Canadian website had 116 polysyllabic words out of 853 total words. The United States website had 304 polysyllabic words with a total word count of 2126. The New Zealand website had a percentage of 24% polysyllabic words used in the content area Treatment with 185 polysyllabic words identified in a 781 word sample.

We compared the manual and online versions of the SMOG readability methods for differences in results. We found the manual and online version of the SMOG Readability measure to be comparable. The range of differences in readability levels between the manual and online versions of the SMOG were from 0.01 to 0.65 readability levels, or less than one school year. Please refer to Tables 2 and 3.

## **Discussion**

The purpose of this study was to measure the readability level of Parkinson's disease websites in Australia, Canada, New Zealand, and the United States. We found all of the content represents readability levels that are too high for many people to read. The results of this study show readability levels that range from grade 11 to grade 14 or second year of college. This is much higher than the ideal readability level for patient education material. The recommended readability level for written documents for patients is 5<sup>th</sup> grade (Schloman, 2004). The readability level of the websites requires a minimum of three years of high school and beyond two years of college to fully understand the website content.

Research completed by Sabharwal et al. (2008) also found online patient education materials to be written far beyond the readability level of most people. They found only 2% of the 426 online patient education materials they analyzed to be written at a 6<sup>th</sup> grade level. This means that 98% of the online patient education materials were considerably more difficult to read than the level at which a large proportion of English speaking people read (NAAL, 2009). The findings are similar to Dessner (2006), Sharry et al. (2002), and Smith et al. (2010). We conclude that written information designed for patient use including web-based PD information has readability levels above recommended levels. The PD websites present information that is meant to benefit patients, family members, and caregivers. The information on the websites could potentially be more beneficial to a broader spectrum of patients if it was written at a lower readability level.

The authors of websites could improve readability by making changes to the format and design of their websites. The changes should include use of large, common fonts, use of color contrast, addition of pictures or symbols, and use of bulleted lists. These are all ways to improve readability (Griffin et al., 2006). Readability is improved when text is written in an active voice.

Grammatically, the subject should be the doer to achieve an active voice. Also, authors should use plain language and fewer words per sentence (Rudd, 2002). For example: The Symptoms of PD content area of the Australian PD website uses the sentence: “it also takes time and ongoing education to learn the multiple symptoms of PD and somewhat complicated medication regimes that offer the most symptom relief and improve quality of life.” One could change the sentence to reflect a lower readability level and still maintains the basic meaning by revising it as follows: “in time, your doctor will find a medication treatment plan to help control many of your symptoms.” The changes made to the sentence include; use of active voice, reduced use of polysyllabic words, less complex sentence structure, and informal use of terminology. Table 12 provides further examples of changes that can be made to lower the readability level of the information on the websites.

Organizations that prefer to maintain a higher level of readability on their websites could provide definitions for the medical terms that are used or use simpler language in areas of the site that covers basic information. Designers may consider developing multiple sites or sections of webpages that are geared towards different populations. For example, a site or webpages could be designed specifically for patients and their families. A different site or webpages could be designed for health professionals and students in the health care field. We can also use strategies to increase accessibility for those with low literacy such as using audio or video clips to augment written content on websites. Therapists can use multimedia approaches that include demonstration, video, or voice-overs to further support patients in obtaining information that is most easily understood.

Implications of this study for occupational therapy are significant. Occupational therapists frequently use education as a treatment modality. Occupational therapists may refer

patients to websites to encourage independence, active participation, and occupational engagement (Griffin et al., 2006). We predict that websites will be used more frequently in the future in occupational therapy practice due to the increasing number of households with Internet access. We think occupational therapists should be proactive in seeking out sites and contributing to the development of websites that are most likely to benefit their patients.

Occupational therapists have skill sets to develop appropriate treatments for their patients. Therefore, occupational therapists are uniquely qualified to contribute to the development of patient education materials that are at the appropriate reading level. This includes screening websites to verify that they are written at a level of readability that will contribute to understanding, and comprehension. The SMOG readability measure in both the manual and online methods is efficient and easy to use for screening websites and other written patient educational materials.

Occupational therapists should be aware of how the ability to understand health information can increase a person's sense of well-being and lead to improved health outcomes (Allison et al., 2009; Francis et al., 2009). Offering alternative formats to patients and advocating for websites which include topical information written at multiple grade levels will better meet the needs of both the proficient reader and the reader who struggles with printed material. Lowering the readability level of patient education websites and developing other multimedia approaches are additional things therapists can do to help their patients access health information that they can use.

We found slight differences between the grade levels produced by the hand and online versions of the SMOG. This could be attributed to the random sampling selection process that is part of the manual SMOG procedure. Sections of text could vary slightly within content areas.

However, both methods yielded comparable results that varied by less than one grade level. Occupational therapists should feel confident that they will get similar results whether they use the manual version of the SMOG or the online version of the SMOG. This research contributes to the reliability and validity of the SMOG.

### **Limitations**

Limitations for this study include temporal aspects of websites, which are subject to change over time. The data that were prepared and analyzed represents the information provided on a website at a given point in time. The content of websites change and are often updated. Therefore the results of this study may not accurately represent the readability levels of the current websites. Another limitation includes the possibility of human error in data collection, organization, and preparation of the website content for analysis.

### **Future Research**

The ease with which information can be found through the Internet highlights the necessity for further study of readability of patient websites. When no formal readability information exists for a specific website, occupational therapists should evaluate the site independently prior to referring patients to such a site. Other areas of research related to this topic include the development of quantitative and qualitative measures for comprehension and retention of website information. Research to study how lowering the readability levels of websites benefits patients is also needed. Research that furthers the understanding of the disparity between general literacy and health literacy would also be helpful. Future studies that specifically measure the influence lower readability of patient education materials has on patient outcomes is necessary. Although, we have focused on the needs of those with low literacy and PD, similar investigations should be conducted for those who have other impairments or

conditions that may affect their ability to benefit from standard websites such as those with heart disease or the visually impaired.

### **Conclusion**

The purpose of this study was to measure the readability level of PD websites in Australia, Canada, New Zealand, and the United States with the SMOG readability measure. We found all of the sites had readability levels that far exceeded recommended levels. We also found that the results of this study are consistent with the findings of other researchers as presented in the literature review. Furthermore, our research verified consistency between results of the manual and online versions of the SMOG Readability Measure.

Occupational therapists are uniquely qualified to contribute to awareness of the importance of readability levels of patient materials and also to contribute to the development of future patient education websites. Additionally, occupational therapists may write, publish, and provide written information to patients. Occupational therapists have a responsibility to address the issue of readability for the safety of patients and to promote positive clinical outcomes. Resources for this topic are numerous and are available through publications, professional consultation, and online. Changes that lower the readability level of websites are easy to implement and may contribute to better outcomes for patients. Therapists have the opportunity to be creative in the way they approach the use of multimedia to enhance retention and understanding during the therapeutic process. Further research on how readability influences health literacy could lead to the development of different or additional recommendations and ultimately improve quality of life for those who use occupational therapy services.

Table 1

*SMOG Conversion Table (McLaughlin)*

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

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Table 2

*Overall Average SMOG Readability Measures Completed Online and Manually for Australia, Canada, New Zealand, and the United States*

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Country	Manual SMOG	Online SMOG	Difference
Australia	13.50	12.86	0.64
Canada	11.50	11.85	0.35
New Zealand	12.75	13.02	0.27
United States	12.50	12.64	0.14

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Table 3

*Online and Manual SMOG Readability Level Averages by Content Area*

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Content Area	Manual	Online	Difference
What is PD	12.25	12.26	0.01
Symptoms	12.25	12.86	0.61
Living With PD	12.25	12.74	0.49
Treatment	13.25	12.60	0.65

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Table 4

*Online Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Treatment*

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Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Words	% of Total
Australia	12.32	170	2093	674	32
Canada	11.56	72	853	116	14
New Zealand	12.42	45	781	185	24
United States	14.11	119	2126	304	14

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Table 5

*Online Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: What is PD?*

Country	SMOG	Sentence Count	Total Word Count	Polysyllabic Words	% of Total
Australia	13.60	39	625	131	21
Canada	11.22	40	375	84	22
New Zealand	13.19	32	408	100	25
United States	11.04	46	522	112	21

Table 6

*Online Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Symptoms*

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Country	SMOG	Sentence Count	Total Word Count	Polysyllabic Words	% of Total
Australia	13.12	65	992	228	23
Canada	12.71	57	702	158	23
United States	12.40	128	2059	444	21
New Zealand	13.12	35	427	104	24

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Table 7

*Online Analysis of SMOG Grade Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Living With PD*

Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Words	% of Total
Australia	12.38	200	2905	780	27
Canada	11.92	77	1043	164	16
New Zealand	14.45	43	798	124	16
United States	12.19	434	6660	1229	18

Table 8

*Manual Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: What is PD?*

Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Words	% of Total
Australia	13	30	480	101	21
Canada	11	30	281	63	22
New Zealand	13	30	396	93	23
United States	12	30	341	73	21

Table 9

*Manual Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Symptoms*

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Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Word Count	% of Total
Australia	13	30	450	105	23
Canada	12	30	360	80	22
New Zealand	12	30	360	89	25
United States	13	30	480	104	22

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Table 10

*Manual Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Living with PD*

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Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Word Count	% of Total
Australia	14	30	436	111	25
Canada	11	30	407	64	16
New Zealand	12	30	527	87	17
United States	12	30	461	85	18

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Table 11

*Manual Analysis of SMOG Readability Levels, Sentence Counts, Total Polysyllabic Words, Total Word Count, and Percentage of Polysyllabic Words for Australia, Canada, New Zealand, and United States in Content Area: Treatment*

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Country	SMOG	Sentence Count	Word Total Count	Polysyllabic Word Count	% of Total
Australia	14	30	369	119	32
Canada	12	30	356	76	22
New Zealand	14	30	520	123	24
United States	13	30	510	110	22

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Table 12

*Examples of Revisions to Original Passages Taken from Australia’s Website Content Area: What is PD? with Grade Equivalents from the Online Version of the SMOG.*

Recommendations	Original: 13.6	Revision: 4.71
Shortening sentence lengths	Predominantly those in the middle to later years such as 50-75 are affected, though up to 20% of people are diagnosed between the ages of 30 and 50. (1 sentence)	People have symptoms of PD most often after age 50.
Decrease number of polysyllabic words	It is difficult to diagnose Parkinson’s disease as there are no pathological tests or identifying markers to confirm a diagnosis.	There are no tests to confirm PD. PD is hard to label.
Use of simple and familiar words	Functional mobility and the ability to perform all activities of daily living independently becomes more difficult.	Often people are not able to walk or function on their own. Living alone gets harder.
Use of active voice	It is not considered to be genetic though 10% of cases have a familial incidence.	PD is only passed down through genes 10% of the time.

## Appendix A

### Instructions for the Manual SMOG

Adapted from McLaughlin, G. (1969), SMOG grading: A new readability formula. Journal of Reading, 12 (8) 639-646.

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

### Instructions for the online version of the SMOG

#### *Tests Document Readability*

#### *Readability Calculator*

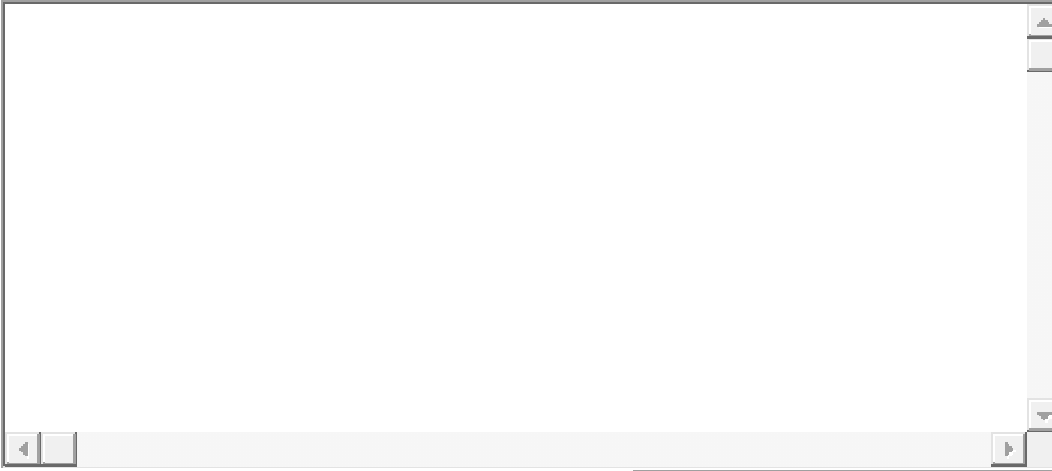
This free online software tool calculates readability : Coleman Liau index, Flesch Kincaid Grade Level, ARI (Automated Readability Index), SMOG. The measure of readability used here is the indication of number of years of education that a person needs to be able to understand the text easily on the first reading. Comprehension tests and skills training.

This tool is made primarily for English texts but might work also for some other languages. In general, these tests penalize writers for polysyllabic words and long, complex sentences. Your writing will score better when you: use simpler diction, write short sentences.

It also displays complicated sentences (with many words and syllables) with suggestions for what you might do to improve its readability.

Basic text statistics are also displayed, including number of characters, words, sentences, and average number of characters per word, syllables per word, and words per sentence.

Enter text (copy and paste is fine) here:



or read it from a website (only plain text .TXT) :

Process text

[http://www.harrymclaughlin.com/SMOG Readability Formula G. Harry McLaughlin %281969%29pdf](http://www.harrymclaughlin.com/SMOG%20Readability%20Formula%20G.%20Harry%20McLaughlin%20%281969%29.pdf)

## Appendix C

### Completed Modifications to Text

#### **Australia: Original (13.6 Readability Level)**

Predominantly those in the middle to later years such as 50-75 are affected, though up to 20% of people are diagnosed between the ages of 30 and 50. It is difficult to diagnose Parkinson's disease as there are no pathological tests or identifying markers to confirm a diagnosis. Functional mobility and the ability to perform all activities of daily living independently becomes more difficult. When approximately 70% of the dopamine-producing cells are damaged, the symptoms of Parkinson's disease appear. What causes Parkinson's disease? We understand that the cells in a particular part of the brain die off, causing a reduction in the level of the brain chemical dopamine. This primarily affects movement and coordination. However we do not have a clear idea of what triggers this process and why some people are affected and others are not. Parkinson's occurs when certain nerve cells (neurons) in a part of the brain called the substantia nigra die or become impaired. Normally, these cells produce a vital chemical known as dopamine. Dopamine allows smooth, coordinated function of the body's muscles and movement. When approximately 70% of the dopamine-producing cells are damaged, the symptoms of Parkinson's disease appear when about 70% of dopamine producing cells cease to function normally. Parkinson's disease is a progressively degenerative neurological disorder which affects the control of body movements. Symptoms develop slowly and gradually progress over years, but are greatly helped by drug treatment. Symptoms result from the progressive degeneration of neuronal cells located in the substantia nigra. This causes a deficiency in the availability of dopamine; a chemical neurotransmitter (messenger) necessary for the production of smooth controlled movements. At present there is no known cause and therefore the illness is termed; "idiopathic". It is not considered to be genetic though 10% of cases have a familial

incidence. Predominantly those in the middle to later years such as 50-75 are affected, though up to 20% of people are diagnosed between the ages of 30 and 50. Ten per cent of people are diagnosed before the age of 45 years of age. Approximately 20,000 people are diagnosed with Parkinson's disease in Victoria. Approximately 1,000 new cases are diagnosed in Victoria per annum, or an average of 19 every week of the year. It is difficult to diagnose Parkinson's disease as there are no pathological tests or identifying markers to confirm a diagnosis. Diagnosis is based on a progressive history of deterioration in function and clinical impression. Each person is affected differently and therefore the rate of progression varies greatly between individuals. The illness progresses at a very slow rate and longevity of life is not shortened. Treatment alleviates symptoms though does not halt or slow the progression of the illness. Parkinson's disease will affect the individual for the remainder of their life with increasing severity as the illness progresses. Functional mobility and the ability to perform all activities of daily living independently becomes more difficult.

**Australia: Modifications for lower readability (4.71 Readability)**

About 19 people find out they have PD every week. There are one thousand new cases every year. There are about twenty thousand people with PD in the state. We are not sure what triggers the onset of PD. It occurs when brain cells die or do not function well. This affects the way a person moves. PD is only passed down through genes 10% of the time. PD does not shorten lifespan. Most people start to have symptoms of PD after age 50. Each person can have unique symptoms. This means symptoms are not always the same from person to person. Symptoms include tremor and lack of control of movement. Sometimes people with PD are depressed, or do not seem like themselves. These symptoms often get worse over time. A person may have mental decline and not be able to see as well. Often people are not able to walk or

function on their own. Living alone gets harder. Later stages of the disease disrupt function in daily life. People may need to rely on others for daily care. PD is hard to label. There are no tests to confirm PD. Doctors use a lot of tools to see if someone has PD. They look at symptoms and changes over time that disrupt function. They also look at the type of symptoms. There is no cure. Drugs are used for treatment. Treatment helps symptoms but does not stop the disease.



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