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Online Bruxism-related information: Can people understand what they read? A Cross-Sectional Study

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Abstract

Background: Bruxism patients often access the web to search for information. Unfortunately, the low text readability of online material and the limited medical literacy in the general population may prevent patients' understanding of health information.

Objective(s): We aimed to assess the home page's readability of the top 10 patients-oriented bruxism-related websites and the educational level required to approach them.

Methods: Using the word bruxism in the "no country redirect" extension of Google Chrome browser (www.google.com/ncr), we identified the first 10 patient-oriented English language websites. The readability of the material was determined using six commonly recommended readability tests (1): Gunning Fog Index (GFI), Coleman Liau Index (CLI), Automated Readability Index (ARI) Simple Measure of Gobbledygook (SMOG), Flesch Kincald Grade Level (FKGL), Flesh Reasing Ease (FRE).

Results: The USA National Institutes of Health requirements, which call for websites to be readable at a 6th to 7th-grade level, were not followed by any of the most popular websites.

Conclusion: The average consumer frequently finds the health information on the Internet to be too complex to understand, which can lead to misinterpretation, a delay in diagnosis, and poorer health consequences.

KEYWORDS
bruxism, e-health, readability, temporomandibular disorder, TMD

1 | INTRODUCTION

Tooth grinding is a matter of concern for dentists as it can result in various problems such as dental restoration breaking, tooth damage, and temporomandibular disorders.[1–7] Parafunction refers to the occlusal stress exerted outside the normal function of mastication and swallowing, which includes non-functional oromandibular activities like jaw clenching, bruxism, tooth grinding, and more. Bruxism, which was first referred to as "la bruxomanie," describes gnashing and grinding of the teeth without any functional purpose. It can occur during both wakefulness and sleep, with awake bruxism being associated with stress caused by familial responsibilities or work pressure. Sleep bruxism, on the other hand, is an oromandibular behaviour characterised by tooth grinding and/or clenching during sleep, and it is classified as a sleep-related movement disorder.

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The prevalence rate of awake bruxism and sleep bruxism is around 20% and 8%–16%, respectively, in the adult population. Awake bruxism is more common in females,[8,9] while there is no gender difference for sleep bruxism. The onset of sleep bruxism is around 1 year of age, soon after the eruption of deciduous incisors, and it appears more frequently in younger populations. Children have a prevalence rate of 14%–20%, while only 3% of adults over the age of 60 are aware of frequent grinding. It is negatively correlated with age, with 20% occurring in childhood,[6] 8% in adulthood, and just 3% in old age.[6]

Despite being acknowledged as one of the most prevalent and incapacitating illnesses in the orofacial region, bruxism is nonetheless underdiagnosed, undertreated, and underestimated.[10,11] To get a correct diagnosis of bruxism and differentiate it from other tooth wear forms, a specialist needs to identify the causes and investigate the aetiology.[12–14] A correct diagnosis is essential and often requires a positive self-report, a positive clinical inspection, and an instrumental assessment.[6] The patient's self-report and self-diagnosis, therefore, are critical as they act as an alarm bell. The collection of medical information remotely and in particular through the web is acquiring a pivotal role in several fields.[15]

Patients who suffer from bruxism often turn to the internet to seek information about their condition. As a result, they rely on self-reported information gathered through online resources.[16,17] With the advent of the internet, managing bruxism has taken on a new dimension.[18–21] People are now more aware of health-related issues and can purchase over-the-counter appliances online to manage their bruxism, snoring, and sleep apnea[22] without consulting a dentist or medical professional.[16]

However, the quality of the information available online may not always be reliable. The low readability of online material and the limited medical literacy among the general population may prevent patients from fully understanding health-related information.[23–25] Website readability is determined by several factors, including the content, terminology, syntax, presentation, and typography, such as font size, line height, and line length. The ease with which a reader can comprehend a written text is described as readability.

In this context, the aim of the article was to assess the readability of the top 10 patient-oriented bruxism-related websites and the educational level required to approach them. By analysing the home pages of these websites, the authors sought to determine whether the information presented was easy to understand for the average reader or required a higher level of education to comprehend.

2 | MATERIALS AND METHODS

This study utilised a similar method to previous studies that examined the readability of online health material. The researchers used the Google Chrome browser with the "no country redirect" extension and searched for the term "bruxism" to identify the first 10 patient-oriented English language websites. They then selected websites with at least 500 words and copied and pasted the information content into Microsoft Word. They edited the text to remove any errors or extraneous information that could interfere with their analysis.

To assess the readability of the material, the researchers used six commonly recommended readability tests: the Gunning Fog Index (GFI), Coleman Liau Index (CLI), Automated Readability Index (ARI), Simple Measure of Gobbledygook (SMOG), Flesch Kincald Grade Level (FKGL), and Flesh Reading Ease (FRE). Each test provided scores indicating the ease with which the text could be read. The CLI, SMOG, FKGL, and ARI generated average grade levels needed to understand the text. The GFI estimated the years of formal education needed to understand the text on the first reading. The FRE formula provided a score between 0 and 100, with a higher score indicating easier reading.

The researchers calculated the average grade level required for each website using the scoring output from the indexes. They then calculated the average of the average grade levels for each website to obtain a sole average grade level required to understand the top 10 patient-oriented websites. They also evaluated the normality of the value distribution and the applicability of parametric statistical analyses using the Shapiro–Wilk test.

Overall, this study demonstrates the importance of healthcare providers providing guidance to their patients on how to gather useful medical information from the Internet. It also highlights the need for online health materials to be written at a level that is accessible to a wider range of readers (Figure 1).

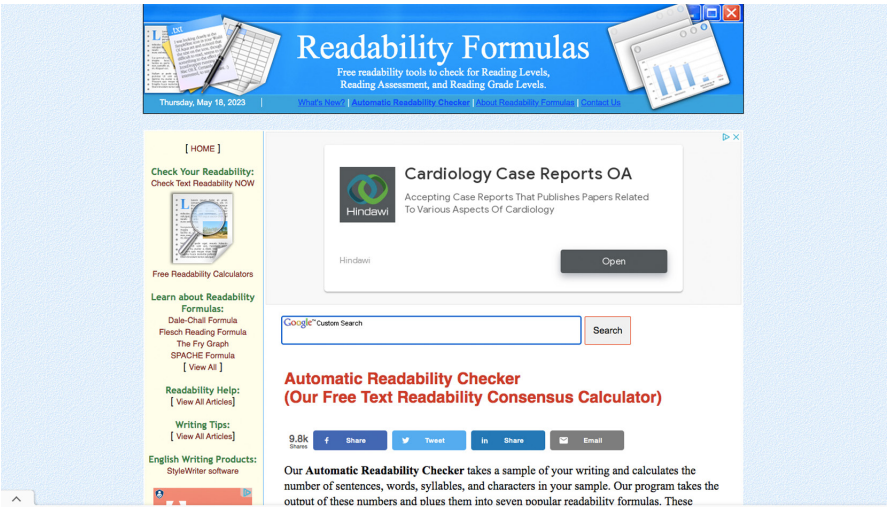

FIGURE 1 Website home page of the tool used for the readability analysis. It consists of the six commonly recommended readability tests: the Gunning Fog Index (GFI), Coleman Liau Index (CLI), Automated Readability Index (ARI), Simple Measure of Gobbledygook (SMOG), Flesch Kincald Grade Level (FKGL), and Flesh Reading Ease (FRE). Each test provided scores indicating the ease with which the text could be read.

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3 | RESULTS

3.1 | Main results

Table 1 provides a comprehensive summary of the research outcomes, including the number of letters and words in the text. The results show that the most frequently viewed websites on bruxism require an average grade level of 11.1, with a standard deviation of 1.58, and an average number of years of formal education of 13.45, with a standard deviation of 2.23, to be easily understood.

The readability of the websites was also assessed using the Flesch Reading Ease index, which measures the ease of understanding a text. The average index score was found to be 51.48, with a standard deviation of 10.74, indicating that the websites were challenging to read.

Moreover, the study found that when considering the most cited index, the average grade level required to comprehend the websites was 10.6, which is consistent with the average grade level output obtained from all four indexes (with a standard deviation of 1.87).

It is important to note that all information related to health should be readable and understandable by the general population, with a minimum requirement of a ninth-grade level of comprehension. However, eight out of the top 10 websites on bruxism, as found by the search term "bruxism," require a minimum of a tenth-grade level of comprehension (i.e., high school level) to be easily understood.

This highlights the need for healthcare providers and website creators to ensure that health-related information is presented in a clear and understandable manner, free from medical jargon and complex language. This is especially important for patients seeking information online to self-manage their bruxism, as they may not have the necessary medical knowledge or understanding to fully comprehend the information presented to them.

4 | DISCUSSION

The study conducted revealed that the top 10 websites related to bruxism, which were found through a Google search, had homepage texts that were difficult to read and comprehend, requiring at least a college level of education. This indicates that the websites did not meet the readability standards set by the USA National Institutes of Health, which suggests that websites should be written at a level that can be understood by individuals with a 6th to 7th-grade education level. The findings also indicate that the amount of material available online about bruxism is much higher than the recommended reading level for the sixth grade.

The lack of adherence to readability standards by patient-oriented bruxism-focused websites implies that the complexity of the language used in the narratives could impede the successful dissemination of medical information to the general public. This is particularly concerning given the prevalence of bruxism and the fact that patients rely heavily on online information for self-education and self-management of their condition. Thus, healthcare providers need to encourage their patients to seek out reliable sources of information and to provide guidance on how to evaluate the quality and reliability of information available on the internet. Bruxism can be defined as a movement disorder characterised by involuntary, unconscious, and excessive grinding and teeth clenching.[26–29] If untreated, teeth grinding can cause headaches, neck pain, disease in the muscles that make up the masticatory system, oral mucosa damage, tooth and periodontal damage, temporomandibular,[30–37] and hearing disorders.[38] Therefore, clinicians should pay more attention to this parafunction to diagnose it at an early stage.

Several recent studies have highlighted the role of psychosocial factors in the development of bruxism.[14] Chronic stressful situations and mental illnesses are considered significant risk factors for developing occlusal parafunction and temporomandibular disorders, although they are not the sole cause. The COVID-19 pandemic has brought about significant changes in daily life and has been a considerable source of stress for the population, which can lead to an increase in bruxism cases.[39] The pandemic's psychological effects may worsen existing cases or contribute to the development of new cases of bruxism.

In this context, the Internet could represent a useful tool for the rapid and wide dissemination and collection of health information, including medical issues. Patients affected by chronic diseases that require lifelong therapy and management, such as bruxism, can benefit from the significant amount of material available on the Web, including free search engines and scientific papers appropriate for healthcare professionals and scientists.

However, the information available online may have both harmful and beneficial effects. On the one hand, it may be an essential source of information for young patients, allowing them to access accurate information about the mechanisms underlying their condition and helping them to seek appropriate medical attention. On the other hand, the unmet readability level of online patient-oriented information may confuse and encourage patients to consult sources of information that are easier to read but less reliable, leading to a delay in diagnosis and appropriate treatment.

It is essential to note that this study's limitations are only related to the readability tests conducted. Additional testing of cohesiveness and comprehensibility is necessary to gain a more comprehensive view of how readers understand the content. Nonetheless, the findings suggest that the average consumer may struggle to understand health information available on the Internet, leading to misunderstandings, delayed diagnoses, and ultimately poorer health outcomes. Thus, healthcare providers need to provide guidance to their patients on how to gather useful medical information on the Internet.[40–44] Our study's findings are consistent with previous studies that have evaluated the readability of patient information materials in various medical and surgical specialties such as neurology, urology, and infectious diseases.[23,45–48] This suggests that the issue of poor readability of patient-oriented health information is not limited to the bruxism-focused websites that we analysed but is prevalent across various medical domains.

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TABLE 1 Readability of the top 10 *bruxism* web sites.

Websites URLs	Number of characters	Number of words	Gunning Fog Index[a]	Coleman Liau Index[b]	Flesh Kincaid Grade Level[b]	Automated Readability Index[b]	Simple measure of Gobledtgook[b]	Average grade level[c]	Flesh reading ease[d]
https://www.mayoclinic.org/diseases-conditions/bruxism/symptoms-causes/syc-20356095	3010	565	14.6	12	11.2	11.8	10.9	12	49
https://www.mayoclinic.org/diseases-conditions/bruxism/diagnosis-treatment/drc-20356100	6154	1187	12.8	11	9.6	9.7	9.5	10	54.2
https://www.webmd.com/oral-health/guide/teeth-grinding-bruxism#1	3651	738	10.2	10	7.9	9.1	7.3	9	67.3
https://en.wikipedia.org/wiki/Bruxism	41993	7415	16.6	12	13.2	12.9	12.3	13	37.1
https://www.medicalnewstoday.com/articles/190180	6156	1214	11.9	11	9.4	9.6	9	10	56.9
https://www.sleepfoundation.org/articles/3-tips-coping-bruxism-or-teeth-grinding	876	181	12.9	10	9.9	10.6	9.5	11	59.8
https://www.sleepfoundation.org/articles/teeth-grinding	2765	527	14.5	12	11.5	12.3	10.9	12	47.9
https://medlineplus.gov/ency/article/001413.htm	4222	813	10.6	11	8.5	9.6	8.2	9	61.3
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3081266/	24788	4409	17.4	13	14.1	13.5	13	14	29.7
https://www.colgate.com/en-us/oral-health/conditions/bruxism/how-to-identify-the-known-bruxism-causes-0615	3167	611	13	12	10.7	11.4	10	11	51.6

[a]Results indicate the number of years of formal education a person requires to easily understand the text on the first reading.

[b]Results correspond to the USA grade level needed to comprehend the text.

[c]Average grade level for every single website (complained as the average of the four (CLI, FKGL, ARI, SMOG) indexes scores outputting the USA grade level needed to comprehend the text).

[d]Results estimate the ease of reading a text, with higher scores indicating material is easier to read.

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Our study highlights the gap between the readability of website materials and the information needs of patients with chronic diseases. Although patient-oriented online information is readily available, it fails to provide patients with a clear understanding of their medical condition, its significance, and its implications for their health. Therefore, the medical team must continue to play a significant role in educating and informing patients with chronic diseases, providing them with reliable and understandable medical information.

However, our study has some limitations. Our analysis only focused on readability tests and did not assess the material's cohesiveness and comprehensibility. Future studies could explore these aspects to obtain a more complete understanding of how readers perceive and comprehend the content. Nonetheless, our findings indicate that the average consumer may find it challenging to comprehend health information available online, leading to misunderstandings, delayed diagnoses, and poorer health outcomes.

In conclusion, our study underscores the need for healthcare providers to be aware of the readability level of the health information they provide to patients and to ensure that it is understandable and accessible to the average consumer. By doing so, healthcare providers can facilitate patients' active participation in their healthcare decision-making, ultimately leading to better health outcomes.

5 | CONCLUSION

The accessibility and abundance of health-related information on the internet have revolutionised the way patients access medical information. However, as highlighted by the study, the readability of online medical information may pose a significant challenge to patients seeking information on their own, particularly those with limited medical literacy. Therefore, it is crucial for healthcare providers to provide guidance and support to their patients on how to gather useful medical information on the internet.

Healthcare providers can play a crucial role in educating patients on how to assess the quality and reliability of online medical information, guiding them on how to navigate online health resources, and providing them with useful tools and resources to make informed decisions about their health. Providers can also help patients identify trustworthy and reliable online sources of information on bruxism, which can help them gain a better understanding of their condition and manage it more effectively.

Furthermore, healthcare providers can also provide patients with educational materials and resources in a clear and understandable format, avoiding complex medical jargon and using language that is easy to comprehend. This will ensure that patients can access reliable information on bruxism that is easy to understand and relevant to their individual needs.

In conclusion, healthcare providers play a crucial role in helping patients access reliable and accurate medical information on bruxism. By providing guidance, support, and educational materials, healthcare providers can empower their patients to make informed decisions about their health and effectively manage their bruxism.

AUTHOR CONTRIBUTIONS

Giuseppe Minervini: Conceptualization, methodology, software, validation, formal analysis, investigation; data curation, writing—original draft preparation, writing—review and editing, supervision. Maria Maddalena Marrapodi: writing—original draft preparation, visualisationMarco Cicciù: writing—review and editing, supervision. All authors have read and agreed to the published version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All data described in the study are presented in the manuscript. The datasets analysed are available from the corresponding author on reasonable request.

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