

## Abstract

**Objective:** To analyze the readability and quality of website materials related to tympanoplasty with mastoidectomy, in both English and Spanish.

**Methods:** “Tympanoplasty with mastoidectomy” was input into four different online search engines and the first 200 websites that resulted were collected. Websites were assessed for readability via the Flesch Reading Ease Score (FRES) for English websites, and via the Fernandez-Huerta Formula (FHF) for Spanish websites. These websites were analyzed for their quality of information through the DISCERN criteria in conjunction with whether the websites were Health on the Net Code of Conduct (HONcode) certified.

**Results:** 26 English and 30 Spanish websites met the inclusion criteria. The English websites were found to be written at a significantly higher reading level as compared to the Spanish websites; the average readability scores all websites correlates to a tenth to twelfth grade reading level. 3 English websites were found to be HONcode certified, while 5 Spanish websites were HONcode certified. There was a statistically significant difference in the means of the HONCode Spanish and HONCode English websites. There was a statistically significant difference in the means of the non-HONCode Spanish and non-HONCode English websites.

**Conclusions:** Websites written in both English and Spanish covering the procedure of tympanoplasty with mastoidectomy were composed at reading levels that greatly exceeded the recommendation set forth by the AMA. Additionally, the assessed websites have significant drawbacks concerning the quality of information being presented.

## Introduction

Health literacy is an important factor in determining a patient’s ability to understand the implications of healthcare options and choices and is an important caveat for medical decision making.<sup>1</sup> Those disproportionately affected by poor health literacy include the elderly, those of lower socioeconomic status, and those with lower English proficiency.<sup>2</sup> To help address these disparities the American Medical Association (AMA) recommends that all patient education materials be written at a sixth-grade reading level or below.<sup>3</sup> Unfortunately, there is high variability in quality and readability among websites conveying health information.

Tympanoplasty with mastoidectomy is a procedure not uncommonly utilized in individuals with chronic otitis media and in some individuals with cholesteatomas. Because of the relatively common utilization of this procedure, it is important that patients understand the details of the procedure and how it relates to them specifically. As a general rule, current online health information is difficult to read and is of poor quality. While the reading level of online information regarding tympanoplasty with or without mastoidectomy is lacking, online information regarding procedures such as tonsillectomy are written at just shy of an eleventh-grade reading level.<sup>4</sup>

Score	Grade Level
90-100	5th grade
90-80	6th grade
80-70	7th grade
70-60	8th and 9th grade
60-50	10th-12th grade
50-30	College
30-10	College graduate
10-0	Professional degree

Table 1. Flesch Reading Score and Fernandez-Huerta Formula Correlation to Reading Grade-Level.

Question number	What is investigated?
1	Are the aims clear?
2	Does it achieve its aims?
3	Is it relevant?
4	Is it clear what sources of information were used to compile the publication (other than the author or producer)?
5	Is it clear when the information used or reported in the publication was produced?
6	Is it balanced and unbiased?
7	Does it provide details of additional sources of support and information?
8	Does it refer to areas of uncertainty?
9	Question 9: Does it describe how each treatment works?
10	Question 10: Does it describe the benefits of each treatment?
11	Does it describe the risks of each treatment?
12	Does it describe what would happen if no treatment is used?
13	Does it describe how the treatment choices affect overall quality of life?
14	Is it clear that there may be more than one possible treatment choice?
15	Does it provide support for shared decision-making?
16	Based on the answers to all of the above questions, rate the overall quality of the publication as a source of information about treatment choices?

Figure 1. DISCERN Criteria.

## Methods and Materials

The first 50 English and Spanish websites were obtained from 4 popular search engines using the term “tympanoplasty with mastoidectomy.” Included websites described the tympanoplasty with mastoidectomy procedure or the care delivered regarding the procedure.

Readability was assessed utilizing the Flesch Reading Ease Score (FRES) in English and the Fernandez Huerta Formula (FHF) in Spanish (Figure 1). Both formulas are score 1-100, with higher numbers signifying easier readability. The scores for each formula are calculated by obtaining the average number of syllables per words and the average number of words per sentence. Quality was assessed utilizing DISCERN criteria in both English and Spanish (Figure 2), alongside the presence of a Health On the Net (HONCode) certification. Results were analyzed using the student’s t-test and Mann-Whitney U test.

## Results

A total of 26 English and 30 Spanish websites were determined to meet inclusion criteria for the study. The composition of the English websites included seven academic websites, fourteen clinical practice websites, one government website, and four health information company websites. The composition of the Spanish websites included six academic websites, thirteen clinical practice websites, one government website, and ten health information company websites.

**Readability:** The average FRES for English websites was 50.72 (SD=10.1), with a minimum score of 34.1 and a maximum score of 77.1. The average FHF for Spanish websites was 59.44 (SD=7.41), with a minimum score of 43.25, and a maximum score of 77.31. English websites were significantly more difficult to read than Spanish websites (p=0.0002). None of the 56 websites analyzed met the AMA recommended sixth-grade reading level. The average scores for readability corresponded to a 10th-12th grade reading level. Figures 3 and 4 show the FRES and FHF with the AMA sixth-grade reading level.

**Quality:** The average DISCERN score for English websites was 38.25 (SD=13.79). The average DISCERN score for Spanish websites was 37.83 (SD=10.8). There was no statistically significant difference between the English and Spanish websites. Figure 5 shows the average DISCERN scores per question for both English and Spanish websites. A total of three English websites were HONCode certified (11.5%), while five of the Spanish websites were HONCode certified (20%). There was a significant difference in the DISCERN scores of the HONCode certified English versus HONCode certified Spanish websites (p=0.015), and between non-HONcode certified English websites vs non-HONCode certified Spanish websites (p=0.0014), signifying that English websites were of significantly higher quality than Spanish websites, independent of HONCode certification status.

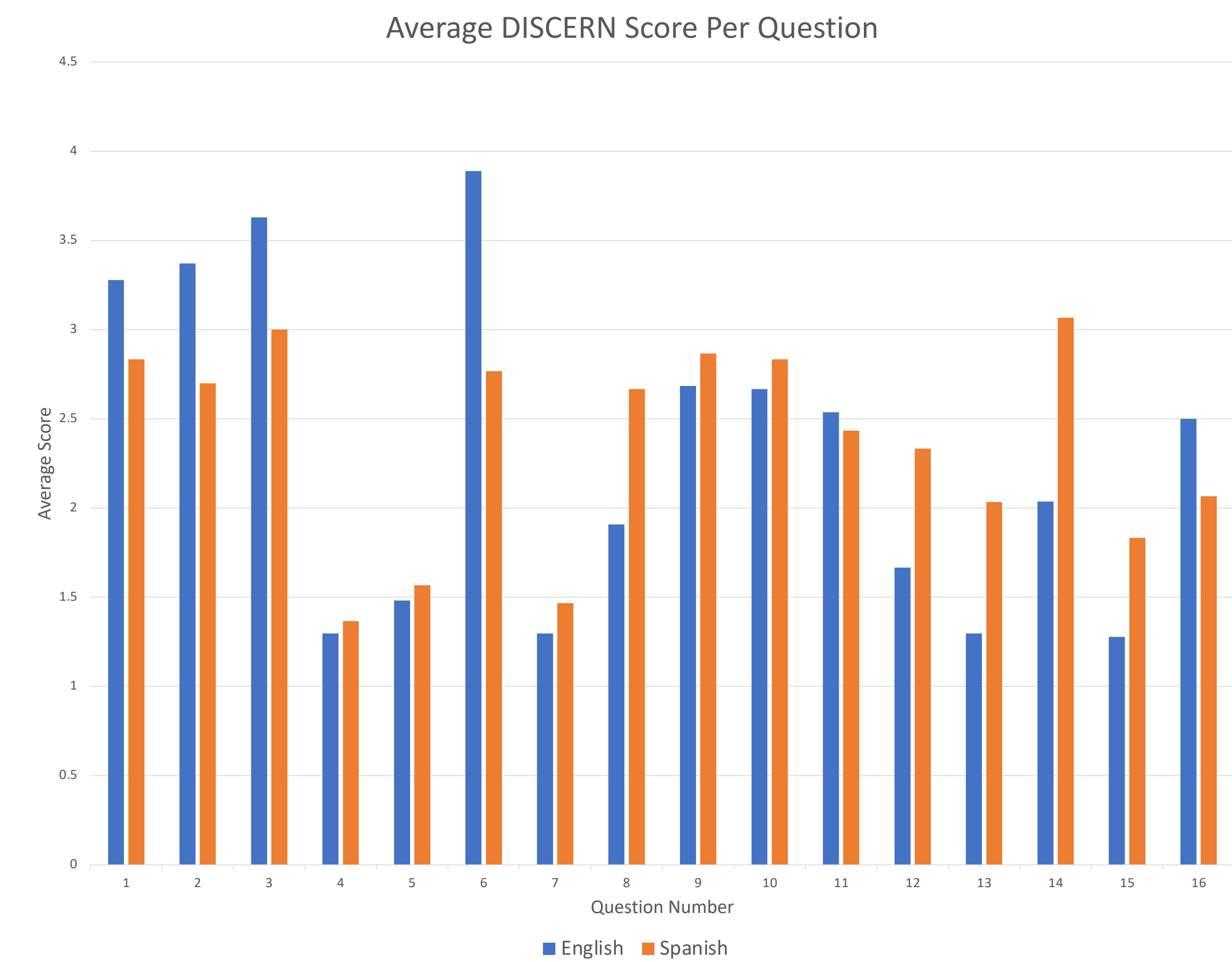


Figure 2. Average DISCERN Score Per Question.

## Discussion

The present study illustrates that English and Spanish websites related to the tympanoplasty with mastoidectomy procedure are written at a level that is much higher than the AMA recommended sixth-grade reading level. None of the 56 websites included met this criteria. This shows the increasing importance of providing high-quality and easy-to-understand healthcare information to patients.

Some limitations are present in the study. This study only utilized online resources and did not consider in-office reading materials presented to patients, or the quality of conversations they may have with their physician. Additionally, the English articles had two DISCERN reviewers, while the Spanish had one DISCERN reviewer, which could introduce some variability.

Overall, this study emphasizes the lack of quality and readability for patient education materials for tympanoplasty/mastoidectomy. This lack of consistency in quality and readability presents significant challenges for patients who seek healthcare information on the internet, which has become the second most common source of information for patients.

## Conclusions

The results of this study highlight the importance of providing patients with reliable, accurate data written at an appropriate level that encompasses all the information that must be included to make informed, and sound health decisions. The lack of adherence to accepted standards for medical information quality and readability is one of the most important conclusions from the present study. There needs to be a conscientious effort to ensure that experts have a place in developing and maintaining patient education materials on the internet. This is especially important for Spanish-speaking patients who are disproportionately affected by lower health literacy and are more likely to suffer long-term sequelae because of their health conditions.<sup>5</sup>

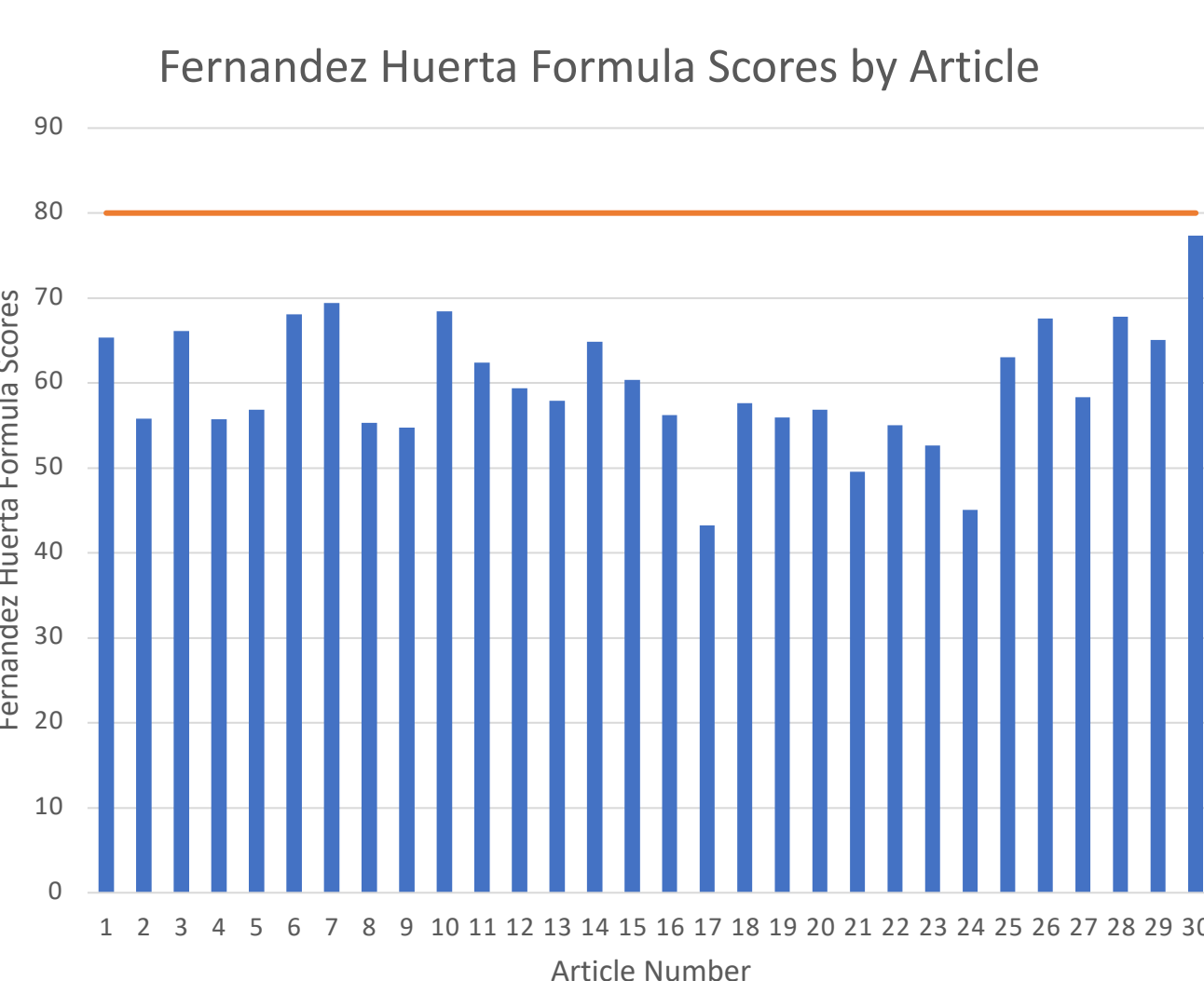


Figure 3. Readability Score by Article for Spanish Websites.

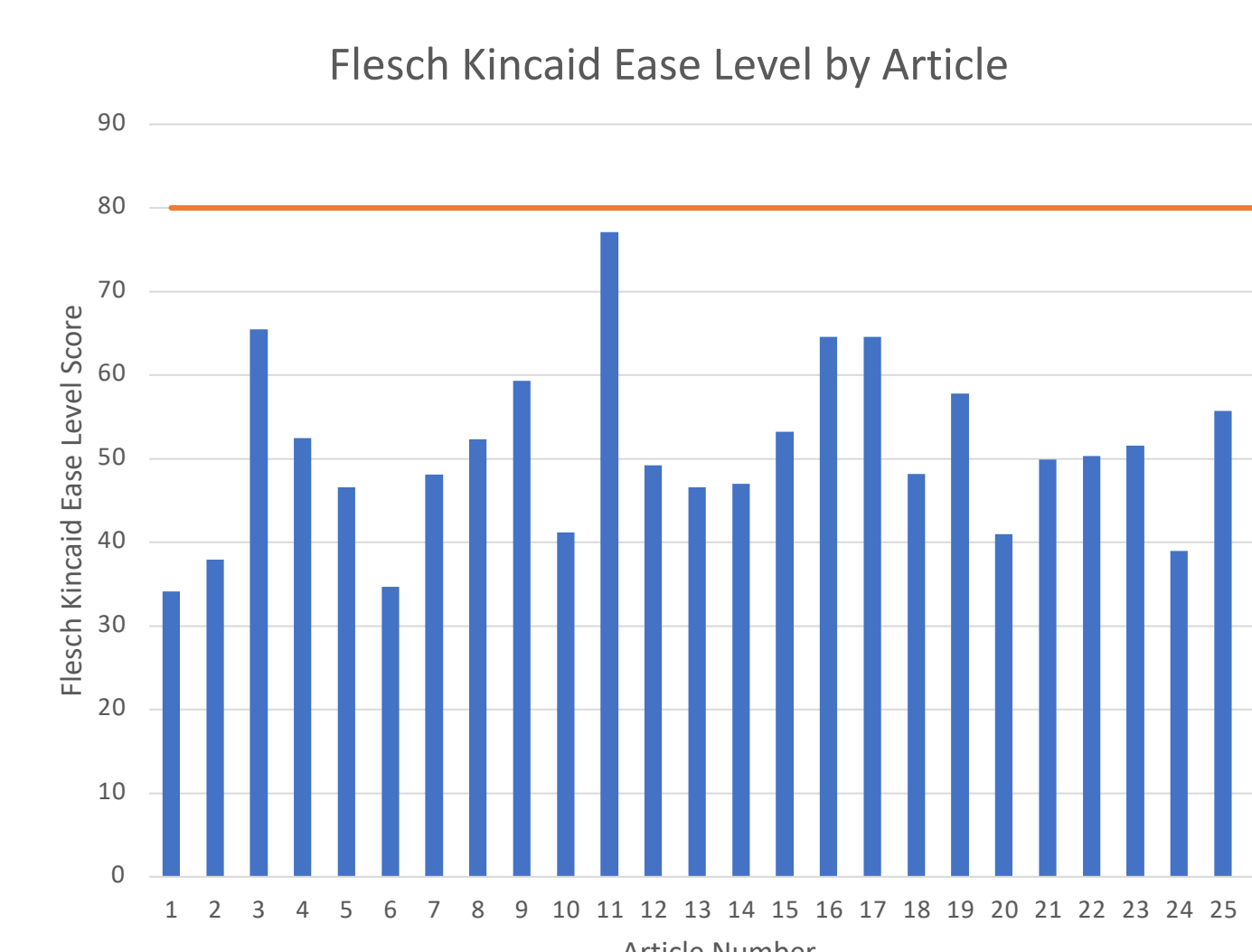


Figure 4. Readability Scores by Article for English Websites.

## Contact

Abbigayle Willgruber-Rawls  
MS4 at the University of Kentucky College of Medicine  
399 US 31W Bypass, Bowling Green, KY 42104  
ajwi240@uky.edu

## Disclosures

None

## References

- Centers for Disease Control and Prevention. (2022, February 2). What is health literacy? Centers for Disease Control and Prevention.
- Center for Health Care Strategies. (2013). What is Health Literacy. Kaiser, CA; Center for Health Care Strategies.
- Eltorai, A. E., Ghanian, S., Adams, C. A., Born, C.T., Daniels, A.H. (2014). Readability of patient education materials on the american association for surgery of trauma website. Archives of trauma research, 3(2), Article e18161.
- Chi E, Jabbar N, Aaronson NL. Quality and readability of websites for patient information on tonsillectomy and sleep apnea. Int J Pediatr Otorhinolaryngol. 2017 Jul;98:1-3. doi: 10.1016/j.ijporl.2017.04.031. Epub 2017 Apr 23. PMID: 28583484.
- Koskan, A., Friedman, D.B., & Hiffinger Messias, D. A. K. (2010). Health Literacy among Hispanics: A systematic research review (1992– 2008). Hispanic Health Care International, 8(2), 65-76.