

Readability of Spanish Language Early Intervention Materials for Children who are Deaf or Hard of Hearing

Torri Ann Woodruff-Gautherin, PhD¹

¹University of Connecticut, Storrs, CT

Abstract

This article discusses how accessibility to information may be limited for families and considers why this is of a critical concern for families using Spanish. To look at accessibility of materials online, six search terms were used in the Google search engine. Ninety-one unique websites were included for readability analysis (43 written in English and 48 written in Spanish). Readability was assessed for English materials using Flesh-Kincaid Grade Level (FKGL; $M = 12.83$, $SD = 2.74$) and Flesh-Kincaid Ease of Reading Score (FKERS; $M = 35.60$, $SD = 15.65$). FKGL scores were consistent with prior work (Woodruff & Cienkowski, 2021). For materials written in Spanish, readability was assessed using the Fernandez-Huerta (F-H, $M = 56.16$, $SD = 9.45$). Using the FKERS and F-H allowed for comparisons since both use 100-point scales from easiest (100) to hardest (0) to read. In our sample, the average readability score was consistent with the reading skills needed to attend college ($M = 46.44$, $SD = 16.35$; University of Canterbury, n.d.; Weiss, 2006). A comparison found that English and Spanish materials were challenging to read and scores exceeded recommended guidelines. Further, materials written in English were significantly more difficult to read ($p < .05$) than those in Spanish. The implications of having a large amount of difficult-to-read information is discussed in the context of early intervention access so that readers can identify actionable steps to address this concern.

Keywords: Readability, Parent Education, Deaf, Hard of Hearing

Acronyms: EHDI = early hearing and detection; EI = early intervention; F-H = Fernandez-Huerta; FKERS = Flesh-Kincaid Ease of Reading Score; FKGL = Flesh-Kincaid Grade Level

Acknowledgments: The development of this paper was supported, in part, by funding from the National Institute on Deafness and Other Communication Disorders (R01DC017925). The opinions expressed, however, are those of the author and do not necessarily reflect the official position of the Departments. The author has no relevant financial disclosures related to the content of this manuscript.

Correspondence concerning this article should be addressed to: Torri Ann Woodruff-Gautherin, PhD, 6 Alethia Dr U-1085, Storrs, CT 06269. Phone: 860-341-2667; Email: Tawg@uconn.edu

For children who are identified as Deaf or Hard of Hearing (DHH), early intervention (EI) is a critical service to ensure access to language (Joint Committee on Infant Hearing [JCIH], 2019). Early intervention is a critical step within the process of Early Hearing Detection and Intervention (EHDI) programs. EHDI is a public health program in the United States that aims to screen, diagnose, and provide EI to infants born with hearing loss (JCIH, 2013, 2019). The most common form of EI for children who are identified as DHH is Part C services under the Individuals with Disabilities Education Act of 2004 (CDC, 2024). The services that can be provided to families include audiological management, hearing assistive technology, transportation support, counseling, speech-language pathology services, American Sign Language instruction, and other supports related to the child and family (Individuals with Disabilities Education Act, 2004). However, it is critical to acknowledge that each state can

set specific criteria around what hearing thresholds and characteristics qualify a child for these Part C services (Woodruff-Gautherin & Cienkowski, 2024). Within this system, family choice and decision making are pillars. Families being supported and informed and empowered to make decisions is a critical component of the system.

Health literacy is the ability for an individual to find, understand, and use health information in making decisions (American Speech-Language-Hearing Association, n.d.). Readability is one metric that is commonly referenced to describe how challenging it is to read something and understand the content. One way to measure this is to determine the approximate level of education (grade level) that would be required to read a given material. Generally, it is recommended that materials be written at below a 6th grade reading level (University of Canterbury, n.d.; Weiss, 2006).

The accessibility of written materials also needs to consider the impact of the language that the material is produced in and the population it serves. Spoken Spanish is the most common non-English language in the United States with over 41 million people (13.5% of the population in the United States) using Spanish in the home (Dietrich & Hernandez, 2022b). Specifically, within the realm of EHDI and the Part C EI system, these structures function within a predominantly English-speaking society (Dietrich & Hernandez, 2022a). For families that use another language or mode of communication, the specific access they have to this information also needs to be considered. This is a critical need for those who use spoken Spanish. Previous works about readability in written Spanish have found materials across various medical fields, including those used for children who are DHH, are written at a level above federally recommended guidelines (Coco et al., 2017; Miguéns-Vila et al., 2018; U.S. Department of Health and Human Services, n.d.; Weiss, 2006). It is critical to see if this trend of difficult-to-read information is also present in documentation written in Spanish related to early intervention for children who are DHH.

Within EI for children who are DHH, services are voluntary with parents and families making care decisions for their child as a proxy (Individuals with Disabilities Education Act, 2004). Much of this decision-making requires families to take in new information. Previous works looking at written English have identified that commonly accessible information around EI and children who are DHH tends to be overly complex and written at above what is considered accessible (Sax et al., 2019; Weiss, 2006; Woodruff & Cienkowski, 2021). This may compound family level factors that manifest as access challenges with inaccessible information creating barriers to understanding the beneficial impact of EI for the family. Further, it could create inequity in many other family-level concerns about EI rooted in family culture or experiences (Woodruff-Gautherin & Cienkowski, 2023).

Method

Six search terms were selected for this study. Similar to Woodruff & Cienkowski (2021), terms reflecting early intervention across the range of identities were selected, specifically “deaf” and “hearing” were searched separately. Two search terms were in English “early intervention hearing spanish” and “early intervention deaf spanish.” Four searches were in Spanish with the terms “intervención temprana audición” and “intervención temprana sordos”—one for each term with the accents and one for each term without accents. The Spanish search terms were selected in conjunction with a bilingual research assistant and insight from their community contacts.

For this assessment, Google was used as the search mechanism. Searches were completed in an incognito tab so previous searches did not impact the results due to adaptive search algorithms. The searches of each of the key terms were completed in December 2023. The

process of preparing the identified websites for analysis are described below:

1. The first 50 links from each search term were copied into an Excel sheet. The position of each search term was recorded.
2. All identified sites were combined into one list to identify duplicates.
3. Each website was then opened in a Chrome internet browser and all content was copied from the page (Ctrl+A) and pasted as plain text into a Word document.
4. The plain text copies of the website were then “cleaned” according to the methods laid out by Sax and colleagues (2019) and Woodruff-Gautherin and Cienkowski (2021). The cleaning process removes extraneous content that is generated in the copying of a webpage in calculations, but not reflect the actual readability of the content users would observe. This includes the removal of numbers, semicolons, abbreviations, and the like. (Please see Sax et al. [2019] and Woodruff-Gautherin and Cienkowski [2021] for more discussion on these methods.)
5. The corresponding readability calculation was then selected based on the language of the material and applied to all of the text in the plain text document. English-language websites had Flesh-Kincaid Grade Level (FKGL) and Flesh-Kincaid Ease of Reading Score (FKERS) derived from Microsoft Word or webfx.com. Spanish-language websites had a Fernandez-Huerta (F-H) calculated from <https://www.spanishreadability.com/fernandez-huerta-readability-index>. For analysis across languages, FKGL was excluded.

FKERS is a measure of readability discussed in the public health realm that uses a scale of 0 (*Extremely Difficult to Read*, consistent with the reading skills of a professional university graduate) to 100 (*Easily Read*, consistent with the reading skills for 5th grade education; University of Canterbury, n.d.; Weiss, 2006). Although FKGL is a common metric in this type of work, FKERS was selected to be used in analysis because it uses the same scaling as the F-H (Coco et al., 2017; Miguéns-Vila et al., 2018; U.S. Department of Health and Human Services, n.d.; Weiss, 2006). Descriptive statistics were completed for the English- and Spanish-language websites and then the two populations were compared to each other.

Results

Following the website collection methods, 300 individual weblinks were collected across all the search terms. Of those 300, 130 were removed from the total count since they were duplicates, and another 79 were removed for

not being useable because they were either dead links ($n = 10$), links that were empty ($n = 4$), an item for sale or job posting ($n = 5$), a research journal article either behind a paywall or open access ($n = 38$), behind a secured login page ($n = 2$), could not be copied as plain text in this methodology ($n = 8$), were videos or captions of videos only ($n = 9$), were written concurrently in English and Spanish ($n = 1$), or were deemed to be unrelated to the search terms ($n = 2$). Of the remaining 91 weblinks, 43 were written in English and 48 in Spanish. Each website could be identified in multiple different terms (Table 1).

Table 1
Breakdown of Websites Identified by Search Term and Language

Search term	English	Spanish	Total of row
early intervention hearing spanish	27		27
early intervention deaf spanish	32		32
intervención temprana audición		27	27
intervencion temprana audicion	1	26	27
intervencion temprana sordos	1	23	24
intervención temprana sordos	1	24	25
Total without repetitions	43	48	91

Following cleaning of the content from the included weblinks by a research assistant, 13 (30.2%) randomly selected links written in English were cleaned independently by the author. The agreement between the FKGL scores for these weblinks were then calculated with agreement being very good ($p < .001$). This was used to justify the use of a research assistant in cleaning all websites.

All analyses comparing and combining materials written in English and Spanish were compared on FKRES and F-H (Figure 1). For all collected materials ($n = 91$) the readability score ranged from 1.4 to 73.05 ($M = 46.44$, $SD = 16.35$). Readability was compared by breaking out the language used between English FKRES ($n = 43$, $M = 36.60$, $SD = 15.65$) and Spanish F-H ($n = 48$, $M = 56.16$, $SD = 9.44$) using a one way ANOVA. The comparison indicated materials written in Spanish were statistically significantly easier to read ($p < .05$), but, clinically, both are written at a level that is more difficult to read than is recommended (University of Canterbury, n.d.; Weiss, 2006).

Discussion

In looking for materials for families who use spoken Spanish, the average resource on EI for children who are

DHH is written at a reading level that is more difficult than accessibility recommendations. This is consistent with previous publications (Woodruff & Cienkowski, 2021) on the accessibility of information in English. General recommendations for addressing this and increasing the readability of written materials focus on how something is written linguistically and how it is displayed to the reader (Figure 2). Inaccessible resources may exacerbate root causes of not accessing early intervention. A lack of materials written in the preferred language that is easy to understand may be viewed as conflicting with the family culture or experiences, a known root cause for families not accessing early intervention (Woodruff-Gautherin & Cienkowski, 2023).

Alongside looking at the readability of materials, it is critical to consider how someone would find this information. Looking at the population of care providers, there are only 18,875 ASHA certified professionals (8.4%), including 387 audiologists, who identify as multilingual between English and Spanish (American Speech-Language-Hearing Association, 2024). The clinical care (audiology and speech-language pathology) providers in this country do not reflect the linguistic diversity of the population. Setting aside the disconnect between the population of potential families accessing services and the professional makeup, unless a provider searches for materials with search terms in Spanish, materials found were written in English. If a provider is looking for materials for a family that prefers written Spanish, they will not find resources unless they search using Spanish search terms. This presents a clear problem when there is a lack of bilingual audiologists and speech-language pathologists. For families who use Spanish and seek out educational materials in their native language, it is assumed that the family will have command of the medical terminology related to this topic area. This might not always be the case due to background knowledge or the fact they may be having clinical exposure to key terms in English.

Although the use of various readability measures are common practice and our results are consistent with previous works, it is critical to consider what makes information useable. Metrics like FKGL, FKERS, and F-H, are used in multiple contexts but are limited by their objective features and the measurement of language elements (characters per word, words per sentence, etc.) rather than understanding how people interpret the content and the transition from consuming content to using and understanding it (Spivak, 2022). A major limitation of this type of analysis, and work by extension, is that it does not look at the transition from content that can be consumed easily to content that is useable. Further work should consider not only how accessible the materials are linguistically, but their connection to early intervention choices and perceptions about services (Woodruff-Gautherin & Cienkowski, 2023).

Although this work specifically looked at access to written materials in Spanish and English, it is critical that efforts

Figure 1
Demographic Information for Participants

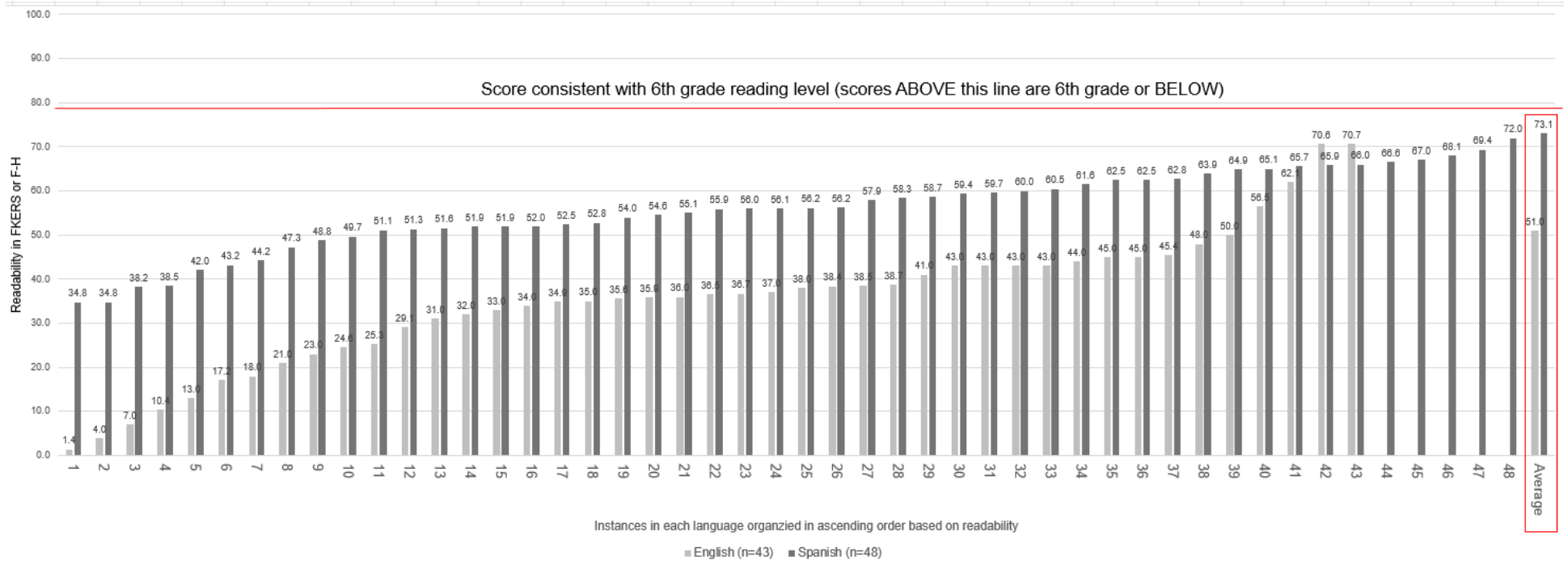
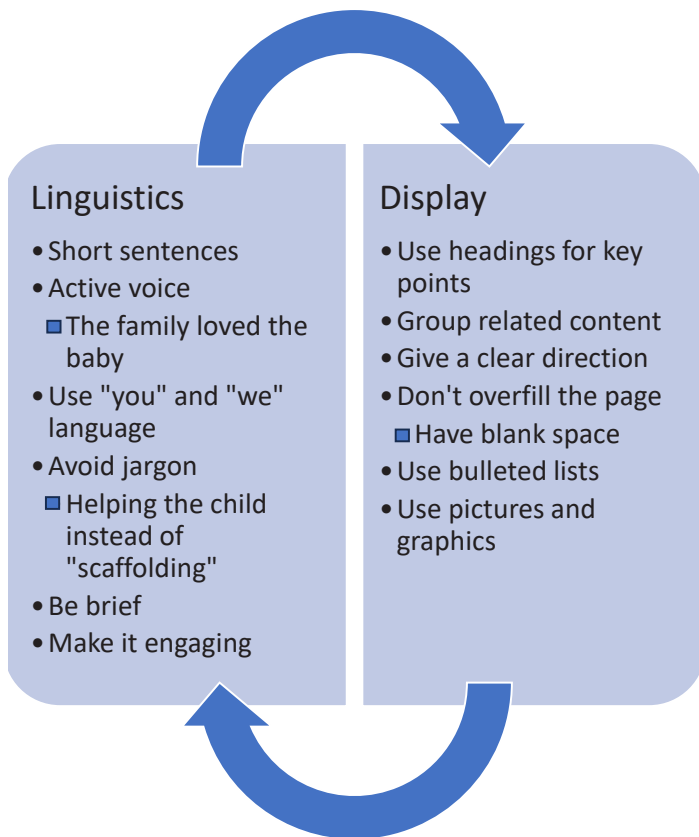


Figure 2

Recommendations for Resource Development



Note. Adapted from the American Speech-Language-Hearing Association (n.d.) and Office of Disease Prevention and Health Promotion (2016).

be made to increase access across all languages and communication modes. However, the act of translating materials itself is insufficient to ensure equitable access to culturally relevant materials. The cultural relevance of the materials identified in this study was not part of the study. However, simply translating accessible written materials is insufficient to answer the call for the creation of more accessible written Spanish materials. There is a co-occurring need for inclusion of stakeholders who use the target language as their native or heritage language, cultural liaisons, and those working within the realm of community engagement.

Conclusion

Access to information that can be used to further understanding for families of children who are DHH is critical. One common measure of accessibility is to evaluate readability using formulas such as grade level equivalency. In this work, it was found that materials written in both English and Spanish about early intervention services may be more difficult to understand than desired. This highlights the need to discover how families understand online information about early intervention and how that understanding can be integrated into decision making for children who are DHH.

References

- American Speech-Language-Hearing Association. (n.d.). *Health literacy*. ASHA. <https://www.asha.org/slp/healthliteracy/-tips>
- American Speech-Language-Hearing Association. (2024). *Profile of ASHA multilingual service providers, Year-end 2023*. ASHA. <https://www.asha.org/siteassets/surveys/2023-profile-of-multilingual-service-providers.pdf>
- Centers for Disease Control and Prevention. (2024, Aug). *2022 Summary of early intervention (EI) among infants identified as deaf or hard of hearing. Data on hearing loss in children*. https://archive.cdc.gov/www_cdc.gov/ncbddd/hearingloss/annual-data-files/2022-Annual-EHDI-Data.pdf
- Coco, L., Colina, S., Atcherson, S. R., & Marrone, N. (2017). Readability level of spanish-language patient-reported outcome measures in audiology and otolaryngology. *American Journal of Audiology*, 26(3), 309–317. https://doi.org/10.1044/2017_aja-17-0018
- Dietrich, S., & Hernandez, E. (2022a). Language use in the United States: 2019. *American Community Survey Reports*. <https://www.census.gov/content/dam/Census/library/publications/2022/acs/acs-50.pdf>
- Dietrich, S., & Hernandez, E. (2022b). *Nearly 68 million people spoke a language other than English at home in 2019*. United State Census Bureau. <https://www.census.gov/library/stories/2022/12/languages-we-speak-in-united-states.html>
- Individuals with Disabilities Education Act, 20 USC. § 1400. (2004).
- Joint Committee on Infant Hearing. (2013). Supplement to the JCIH 2007 position Statement: Principles and guidelines for early intervention after confirmation that a child is deaf or hard of hearing. *Pediatrics*, 131(4), e1324–e1349. <https://doi.org/10.1542/peds.2013-0008>
- Joint Committee on Infant Hearing. (2019). Year 2019 position statement: Principles and guidelines for early hearing detection and intervention programs. *Journal of Early Hearing Detection and Intervention*, 4(2), 1–44. <https://doi.org/10.15142/fptk-b748>
- Miguéns-Vila, R., Ledesma-Ludi, Y., Rodríguez-Lozano, F., Varela-Centelles, P., Seoane-Romero, J. M., & Castelo-Baz, P. (2018). Disparities between English and Spanish in readability of online endodontic information for laypeople. *The Journal of the American Dental Association*, 149(11), 960–966. <https://doi.org/10.1016/j.adaj.2018.07.003>

Office of Disease Prevention and Health Promotion. (2016). *Write actionable content*. Health Literacy Online. <https://odphp.health.gov/healthliteracyonline/write/>

Sax, L., Razak, A., Shetty, K., Cohen, M., & Levi, J. (2019). Readability of online patient education materials for parents after a failed newborn hearing screen. *International Journal of Pediatric Otorhinolaryngology*, 125, 168–174. <https://doi.org/10.1016/j.ijporl.2019.07.009>

Spivak, G. (2022, July 10). *Readability formulas, programs and tools: Do they work for plain language?* Our Languages Blog. Government of Canada. <https://www.noslangues-ourlangues.gc.ca/en/blogue-blog/readability-formulas-eng>

University of Canterbury. (n.d.). *How to write plain English – Flesch formula*. In Writing guide. Archived May 1, 2005. https://web.archive.org/web/20160712094308/http://www.mang.canterbury.ac.nz/writing_guide/writing/flesch.shtml

U.S. Department of Health and Human Services. (n.d.). *Making health communication programs work*.

National Institutes of Health. <https://www.cancer.gov/publications/health-communication/pink-book.pdf>

Weiss, B. D. (2006). *Health literacy: A manual for clinicians: Part of an educational program about health literacy*. American Medical Association. <http://lib.ncfh.org/pdfs/6617.pdf>

Woodruff, T. A., & Cienkowski, K. M. (2021). Readability of online hearing-based early intervention materials. *Journal of Early Hearing Detection and Intervention*, 6(2), 39–44. <https://doi.org/10.26077/2c6d-c243>

Woodruff-Gautherin, T. A., & Cienkowski, K. M. (2023). Modeling lost to intervention in early hearing detection and intervention: A modified eDelphi study. *American Journal of Audiology*, 32(3), 543–559. https://doi.org/10.1044/2023_aja-22-00046

Woodruff-Gautherin, T. A., & Cienkowski, K. M. (2024). State-level variability in Part C early intervention hearing-related eligibility. *Journal of Educational, Pediatrics, & (Re)Habilitative Audiology*, 26, 1–6.

EHDInfo



From communities to classrooms: Hearing care for all children

Act now so no child is left behind due to ear or hearing problems.

Globally, school-age children with hearing loss often remain undiagnosed and without access to needed services. Hearing loss affects around 90 million children and adolescents aged 5-19 years, across all parts of the world. However, it commonly remains undetected, especially in low-resource settings. Left unaddressed, this not only affects a child's ability to hear but significantly impacts speech, language, cognitive and social development, commonly leading to poorer educational outcomes, reduced employment prospects and long-term economic disadvantages.