Readability and Quality of Online Hearing-Related Information in Spanish

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ABSTRACT

Purpose: Previous research has demonstrated that online hearing-related information in English and health information in Spanish is too difficult to read and is of variable quality. This thesis investigated the readability and quality of online hearing-related information in Spanish.

Method: Websites were selected by entering 4 search terms, identified by native Spanish speakers and Google trends, into 22 Google ccTLDS. The first 10 webpages produced by each search that matched the inclusion criteria were selected, providing 44 webpages after removing duplicates. The location and type of the website, the webpage word counts, and whether the websites had HON certification were recorded. In part 1 of the study, readability of the websites was assessed using the Crawford and SOL readability formulas. For part 2, the DISCERN tool was used to rate the quality of the webpages.

Results: Readability measures provided a mean RGL of 8.31, suggesting that over 8 years of education would be required to read and understand this material. The quality of the webpages was variable, with DISCERN scores ranging from 1.5 to 4. The mean DISCERN score was 2.64, corresponding to fair quality. Only 6 webpages had HON certification. Webpages from governmental and non-profit organisation scored significantly higher on the DISCERN than those form commercial origin. A significant positive correlation was found between the DISCERN scores of webpages from commercial and governmental origins and their word counts.

Conclusion: These findings suggest that people searching the internet for hearing-related information in Spanish are likely to find information that is too difficult to read or is of insufficient quality to support understanding regarding their hearing.

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LIST OF ABBREVIATIONS

ANOVA- Analysis of Variance
ccTLD- country-coded Top-Level Domain
GNI- Gross National Income
GPMG- Gilliam-Peña-Mountain Graph readability formula
HA- Hearing Aid
HL- Hearing Loss
HON- Health On the Net
ICC- Intra-class Correlation Coefficient
PCC- Patient Centred Care
RGL- Reading Grade Level
SAM- Suitability Assessment of Materials
SDM- Shared Decision Making
SMOG- Simple Measure Of Gobbledygook readability formula
WHO- World Health Organisation

CHAPTER 1. INTRODUCTION

1.1. Overview

Hearing loss (HL) is a common health issue (World Health Organisation; WHO, 2012) that can cause difficulties in everyday life (Newman, Hug, Jacobson, & Sandridge, 1997). HL can make communication more difficult (Scarinci, Worrall, & Hickson, 2008), increase stress and anxiety (Hétu, Riverin, Lalande, Getty, & St-Cyr, 1988), and impact on quality of life (Dalton et al., 2003; Mulrow et al., 1990; Scarinci et al., 2008). Treatment choice is a personal decision that will depend on many factors (Laplante-Lévesque, Hickson, & Worrall, 2010a); therefore, people with HL and their families need high-quality information that they can read and understand to help them to learn about their HL and treatment options.

The internet is a common source of health information (Prestin, Vieux, & Chou, 2015) that is often influential on health decisions (Fox & Jones, 2009; Fox & Rainie, 2002; Sillence, Briggs, Harris, & Fishwick, 2007). The internet provides many benefits for sharing health information, including the ability to reach a wider population (Bessell, Silagy, Anderson, Hiller, & Sansom, 2002; Gibbons et al., 2011), but the quality of the available information will contribute towards its potential usefulness to readers.

Past research has highlighted a disparity between the reading difficulty of health materials and the reading abilities of their intended audiences (Cheng & Dunn, 2015; Cooley et al., 1995; Hoffmann & McKenna, 2006; Hosey, Freeman, Stracqualursi, & Gohdes, 1990; Jolly, Scott, Feied, & Sanford, 1993). The quality of online health information has also been shown to be highly variable (Eysenbach, Powell, Kuss, & Sa, 2002). These deficiencies in quality and readability have been demonstrated for English-language information specific to hearing (Laplante-Lévesque, Brännström, Andersson, & Lunner, 2012) and for health

information published in Spanish (Berland et al., 2001; Cardelle & Rodriguez, 2005; Mayer, Leis, & Sanz, 2009), but similar research has not yet been published for Spanish-language information specific to HL. This literature review will elaborate on HL and its impacts, discuss the importance of information in patient-centred care (PCC) and shared decision making (SDM), and review some of the existing studies on the quality and readability of online heath information.

1.2. Hearing loss

Hearing is an important sensory input that is central to communication. HL is a reduction in the ability to hear. It can affect one or both ears and range in severity from slight to profound. According to the World Health Organisation (WHO), a disabling HL (defined as reduction in hearing thresholds of over 40 dB HL in the better ear) affects over 5% of the world's population and around a third of those who are over 65 years of age (WHO, 2012). The prevalence of HL is positively associated with age (Stevens et al., 2011), meaning that these numbers are likely to increase as the world's population and life expectancies rise (Duthey, 2013; Stevens et al., 2011). It is difficult to find data specifically describing the prevalence of HL in Spanish-speaking communities, but Spanish is the second most commonly spoken language by number of speakers and is the native language for over 400 million people (Simons & Fennig, 2018). Worldwide, disparities are seen between high- and low-income regions, with areas of lower income having higher overall rates of HL (Stevens et al., 2011).

1.2.1. Impact

WHO estimated, that after depression, the burden of adult-onset HL is the greatest of all diseases globally (Mathers, Smith, & Concha, 2000). The impact of HL on individuals cannot be predicted by hearing thresholds alone (Hallberg, Hallberg, & Kramer, 2008; Newman et al., 1997); even mild losses, however, can cause difficulties in everyday life

(Newman et al., 1997). HL has been associated with increased physical, social, and mental health problems (Strawbridge, Wallhagen, Shema, & Kaplan, 2000); it can lead to depression (Strawbridge et al., 2000) and feelings of stress and anxiety (Hétu et al., 1988); and can ultimately reduce overall quality of life (Dalton et al., 2003; Mulrow et al., 1990; Scarinci et al., 2008). HL can even become a safety issue (Morata et al., 2005) if environmental sounds such as fire alarms are not audible (Bruck, 2001).

HL usually leads to decreased speech perception, especially in noisy environments (Crandell, 2006; Dubno, Dirks, & Morgan, 1984; Festen & Plomp, 1990). This increases the listening effort required to follow conversation (Hornsby, 2013), making social interactions more demanding. People with HL may begin to talk less, experience feelings of isolation in groups (Hétu et al., 1988; Strawbridge et al., 2000), or withdraw from the situations in which they have difficulties communicating (Hétu et al., 1988; Kochkin & Rogin, 2000). The increased listening effort required to process a degraded signal (such as with HL or when in unfavourable listening environments) can lead to fatigue (Hornsby, 2013) and has been suggested as a contributor to poorer speech understanding and auditory processing by occupying the processing resources that would otherwise be applied to deciphering meaning (McCoy et al., 2005).

HL also impacts on the families and frequent communication partners of people with HL (Hétu et al., 1988; Scarinci et al., 2008; Scarinci, Worrall, & Hickson, 2012; Wallhagen, Strawbridge, Shema, & Kaplan, 2004). HL can add strain to conversations, and frequent repetitions and misunderstandings can make conversations more difficult (Scarinci et al., 2008). The reduction in the ease and efficacy of communication can have significant impacts on families and friends, as well as on the individual with HL (Hétu et al., 1988; Scarinci et al., 2008, 2012; Wallhagen et al., 2004). However, support from significant others may encourage seeking help and/or adopting hearing aids (HAs; Meyer & Hickson, 2012), and

early identification and treatment of HL has been suggested as having an important role in improving the wellbeing of both individuals with HL and their spouses (Wallhagen et al., 2004).

For children, HL is a common contributor to speech and language delays (Psarommatis et al., 2001), and this increases with greater severity of HL (Wiggin, Sedey, Awad, Bogle, & Yoshinaga-Itano, 2013). Children with HL may also experience additional difficulties at school, perceived behavioural problems (Lieu, 2004), and delayed social-emotional development (Yoshinaga-Itano, 2003). Early intervention, however, can also improve outcomes for children with HL (Yoshinaga-Itano, 2003).

1.2.2. Treatment

Treatment choice will depend on many personal factors (Laplante-Lévesque et al., 2010a), as well as the type and degree of HL (Sprinzl & Riechelmann, 2010), availability and affordability of options, convenience, and the individual's perception of their HL (Laplante-Lévesque et al., 2010a). While there are some types and causes of HL that can be treated medically or surgically (Fisher & McManus, 1994; Holt, 2003; Lous et al., 2005), this is usually not the case, and treatment therefore generally means some form of intervention aiming to alleviate the everyday difficulties experienced. This may consist of improving audibility of sounds through amplification (using devices such as HAs, middle ear implants, or cochlear implants (Sprinzl & Riechelmann, 2010)), improving listening environments, and learning communication strategies (Hawkins, 2005).

Early identification and treatment of HL in children is associated with better language development (Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998), speech intelligibility (Markides, 1986), and social-emotional development (Yoshinaga-Itano, 2003). Fulcher, Baker, Purcell, and Munro (2014) found that children with severe to profound HL who received HAs or cochlear implants prior to 6 months of age showed normal consonant cluster

development by 3 to 4 years of age. Similarly, Moeller (2000) found that 5 year old children who were enrolled early (before 11 months of age) in a comprehensive intervention programme (providing communication programmes and family-centred support for identifying needs and making decisions regarding treatment options) showed vocabulary and verbal reasoning scores similar to those of children their age without HL. Family involvement explained the most variance in these scores after controlling for other factors, highlighting the importance of this.

For adults, early identification and treatment of HL is linked to improvements in speech perception (Sprinzl & Riechelmann, 2010) and quality of life (Chisolm et al., 2007; Mulrow et al., 1990; Sprinzl & Riechelmann, 2010). HAs can improve communication for many people with HL (Mulrow et al., 1990), and benefits from amplification can be seen even for people with only slight losses (Bennett, 1989). While satisfaction with HAs depends on many factors such as aspects of personality (Gatehouse, 1994), type and degree of HL, age of treatment, and hours of HA use per day (Korkmaz et al., 2016), greater motivation is associated with increased HA use, benefit, and satisfaction, and participation in decision making is related to improved health outcomes (Brody, Miller, Lerman, Smith, & Caputo, 1989).

Although previous research has demonstrated the benefits of treatment to a wide range of individuals and their families, many people with HL do not receive treatment (Yueh, Shapiro, MacLean, & Shekelle, 2003). For example, HA use varies around the world from less than 1% to 10–40% of people who have a HL (Mathers et al., 2000). Much of this is likely due to inaccessibility of treatment (Fagan & Jacobs, 2009; Goulios & Patuzzi, 2008) or a personal decision to not use HAs (Kochkin, 2007), but lack of awareness of treatment options and their possible benefits has also been suggested as an factor (Sprinzl & Riechelmann, 2010). In a 2007 study by Kochkin (2007), nearly half of the respondents (HA

candidates who did not use HAs for a range of reasons) cited lack of knowledge either on their HL or on where or how to find HAs. Providing sufficient information, supporting client choices, and using SDM are practices suggested by Poost-Foroosh, Jennings, Shaw, Meston, and Cheesman (2011) as ways of increasing HA uptake through empowering clients. Improved communication between patients and medical professionals (including increased information sharing, patients dominating more of the conversation, and greater sharing of emotions) has also been associated with better health outcomes (Kaplan, Greenfield, & Ware Jr, 1989).

1.3. Patient-centred care and shared decision making

PCC is an approach to health care that is focussed around individuals' personal needs, values, and preferences with these guiding all clinical decisions (Institute of Medicine, 2001) and interpersonal interactions (Tresolini & Pew-Fetzer Task Force, 1994). The Institute of Medicine (2001) recommend that a patient-centred approach is used to ensure that patients fully understand all of their treatment options. Ford, Schofield, and Hope (2003) added that PCC provides the opportunity for patients to make evidence-based health decisions. Central to PCC is the sharing of clinical decision making (Geirteis, Edgman-Levitan, Daley, & Delbanco, 1993). People with HL report wanting audiologists to tailor recommendations based on their individual preferences and experiences, and often feel that frequent communication partners, as well as their audiologists, have a role in the decision-making process (Laplante-Lévesque, Hickson, & Worrall, 2010b).

The SDM process is described by Charles, Gafni, and Whelan (1997) as requiring the following: both the medical professional/team and the patient are involved in the SDM process, they share information, express their treatment preferences, and jointly make treatment decisions. Sharing goes both ways: the patient and health professional need to both be willing to participate in the decision process by exchanging information and expressing

ideas and preferences (Charles et al., 1997; Charles, Gafni, & Whelan, 1999). Medical professionals, however, must at least provide patients with all information relevant to the clinical decision (Charles et al., 1999). This may include information on the health condition; benefits, risks, and side effects of treatment options; and potential impacts on wellbeing and quality of life. Evidence must be shared and clinical uncertainties acknowledged to enable joint decisions (Coulter, 1997).

Different patients will have individual preferences around how involved they want to be in decision making, and these preferences might change over time or between situations (Allshouse, 1993); there are many benefits, however, to patients having the opportunity to participate actively in their health care. Greater patient participation has been suggested as leading to improved health outcomes (Brody et al., 1989; Stevenson, Cox, Britten, & Dundar, 2004) and increased levels of hope (Cassileth, Zupkis, Sutton-Smith, & March, 1980; Kaplan et al., 1989). In addition, Fallowfield, Hall, Maguire, and Baum (1990) found that participants less often experienced anxiety and depression when they were offered treatment choices. According to Hibbard, Peters, Dixon, and Tusler (2007), taking an active role in health-care decision making can increase the motivation to make good choices, and can help individuals to understand the consequences of their decisions; alternatively, lack of participation can lead to misunderstandings (Britten, Stevenson, Barry, Barber, & Bradley, 2000). Although some people choose not to take an active part in decision making (Deber, Kraetschmer, Urowitz, & Sharpe, 2007), according to Allshouse (1993), almost all patients want to receive information that is accurate, honest, and complete**.**

1.4. The role of information

Information is necessary to allow people to make informed choices (Griffin, McKenna, & Tooth, 2003). According to Charles et al. (1999), information is a basic building block to allow SDM. As with participation in decision making, individual preferences in the

amount and type of information that patients want to receive about treatment options vary (Cassileth et al., 1980; Richards et al., 1995), but the majority of patients want comprehensive information, including details on possible side effects, how treatments work (Cassileth et al., 1980), and HL treatment options (Laplante-Lévesque et al., 2010b). When making decisions regarding treating HL, people feel that everyone involved in the decision making process should have a good understanding of their HL (Laplante-Lévesque et al., 2010b).

Authors have discussed the role of information in supporting independence and self-care (Geirteis et al., 1993) and in improving health literacy and overall health outcomes (Nutbeam, 2008). Patients who prefer to have more information have been shown to have higher levels of hope (Cassileth et al., 1980), and more information given by physicians at initial appointments has been related to improved health status at follow-up visits (Kaplan et al., 1989). Additionally, people who feel better informed also feel more satisfied (Martin, Martin, Stumbo, & Morrill, 2011), and access to high-quality information can increase self-efficacy (Lee, Hwang, Hawkins, & Pingree, 2008).

There are various treatment options available for HL (Sprinzl & Riechelmann, 2010; Yueh et al., 2003); therefore, people with HL need information that can help them learn about these options. Seeking help for a HL often begins with a visit to a family doctor (Laplante-Lévesque, Knudsen, et al., 2012); however, HL can be a barrier to effective communication with health professionals (Iezzoni, O'Day, Killeen, & Harker, 2004), and these visits do not always lead to referrals for hearing testing (Yueh et al., 2003). Moreover, many patients have poor understanding and recall of information verbally conveyed during appointments with health professionals, especially if they are older or have poor health literacy (McCarthy et al., 2012). This makes it even more essential that written information can effectively inform readers of the available options and support their decision making.

If written health materials are to be beneficial, they must be in a form that is useful to patients (Coulter, Entwistle, & Gilbert, 1999): patients must be able to read, understand, and remember them (Hoffmann & Worrall, 2004). To take an active part in health care decisions, people must have information that is relevant (Coulter et al., 1999), high quality, and evidence based (Shepperd, Charnock, & Gann, 1999). Griffin et al. (2003) recommended that in addition to the content and design of the information, consideration be given to the reading level of the intended audience and their information needs. Raising the quality of health information is essential to support proper understanding and also has a role in increasing health literacy (Sørensen et al., 2012).

1.5. Health literacy

Misunderstanding health information can have significant consequences (Britten et al., 2000), yet is very common (M. V. Williams et al., 1995). Along with numeracy, health literacy has been found as one of the two strongest predictors of comprehension of health information and whether information is influential on health choices (Hibbard et al., 2007). WHO defines health literacy as "The cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (Nutbeam, 1998, p. 29). According to Sørensen et al. (2012), health literacy equips people to use health information to overcome barriers to good health. Paasche-Orlow, Schillinger, Greene, and Wagner (2006) add that it is important to consider both the skills of the consumer and the complexity of the tasks required.

Research consistently shows the association between low health literacy and poor health outcomes (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011; DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004). A systematic review by Berkman et al. (2011) concluded that low health literacy is associated with increased hospitalisations, higher use of emergency

services, and limited ability to understand medicine labels. In an earlier systematic review, DeWalt et al. (2004) found that patients with low literacy were more likely to have lower health knowledge, use health resources less, and have poorer general health. They found a link between reading ability and understanding of health materials and reported that people who read at lower levels were 1.5 to 3 times more likely to have an adverse health outcome than those with better reading ability (DeWalt et al., 2004). In addition, health literacy has been described as a major barrier to educating patients on their health conditions (M. V. Williams, Baker, Parker, & Nurss, 1998). Along with a need to support health literacy, this highlights the importance of ensuring that health materials are highly readable to as many readers as possible.

Limited health literacy appears to be a widespread issue (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005; M. V. Williams et al., 1995); it is difficult, however, to make prevalence estimates that are representative of populations. This is demonstrated by a systematic review by Paasche-Orlow et al. (2005) which aimed to synthesise results from studies of U.S. health literacy levels and found that prevalence rates of low health literacy varied from 0% to 68% between studies. Pooled data from this study, however, revealed a 26% incidence of low health literacy. Another study by Kutner, Greenburg, Jin, and Paulsen (2006) reported that 36% of American adults had below basic or basic health literacy, and that adults who spoke only English before starting school had higher health literacy than those who spoke other languages. M. V. Williams et al. (1995) found that only 58.2% of patients whose first language was Spanish were able to understand instructions on taking medication on an empty stomach, and 31.2% were able to understand an appointment slip informing them of their next appointment time. This study was conducted in a hospital in Los Angeles, so the data are unlikely to be directly transferrable to the other Spanish speaking populations; however, limited health literacy is a prevalent issue that is consistently associated with age, education, and ethnicity (Paasche-Orlow et al., 2005).

Improving health literacy has been suggested as a method for increasing autonomy within the health care system and ultimately quality of life by enabling people to effectively use health information (Sørensen et al., 2012). Sørensen et al. (2012) discuss a life-long learning process of developing health literacy: in moving through the steps to building health literacy, people develop the skills and knowledge to effectively apply their health-literacy skills to health information. Thus, health literacy can be seen as "an asset for improving people's empowerment within the domains of healthcare, disease prevention and health promotion." (Sørensen et al., 2012, p. 10). The process of accessing, understanding, appraising, and applying health information is contributed to by intrinsic motivation, competence, and knowledge, but will depend on the quality of information available (Sørensen et al., 2012).

Health information has a key role in supporting health literacy. Nutbeam (2008)'s conceptualisation of health literacy as an asset shows tailored information contributing to increased knowledge and skills, which in turn leads to improved health literacy and better health outcomes. The U.S. Department of Health and Human Services (2010) created a plan to improve health literacy recommending that health information should be delivered in a format that is understandable and beneficial to health and wellbeing. There are also other benefits to creating understandable health information: Hibbard and Peters (2003) suggest that reducing the cognitive effort required to understand health information can support decision making by increasing motivation, comprehension, and the use of information. Additionally, matching health information materials to the skills of consumers has been demonstrated to lead to improved health outcomes (Jacobson et al., 1999).

1.6. The internet as a source of health information

Health information can come from a variety of sources such as newspapers, magazines, and the internet (Dutta-Bergman, 2004); and through family and friends (Dutta-

Bergman, 2004) or health professionals (Hoffmann & McKenna, 2006). The internet is a common source of health information (Fox & Jones, 2009; Instituto Nacional de Estadística, 2018) that people may access with or without also consulting a medical professional (Akerkar, Kanitkar, & Bichile, 2005; Bessell et al., 2002; Charnock & Shepperd, 2004; Fox & Rainie, 2002; Sillence et al., 2007).

Consumers are using the internet as a source of health information more and more (Prestin et al., 2015) as global internet access increases (WHO, 2011). Andreassen et al. (2007) reported that 71% of European internet users had looked for health information on the internet. In Spain, 2010 data from the national Institute of Statistics showed that 52.5% of adults between 16 and 74 years of age had used the internet to search for health information in the previous 3 months (Instituto Nacional de Estadística, 2018). For many, this is the first source of health information (Prestin et al., 2015); some then discuss the information they found with a health professional (Akerkar et al., 2005; Bessell et al., 2002; Fox & Rainie, 2002; Sillence et al., 2007).

Among those looking for health information on the internet are people with HL (Peddie & Kelly-Campbell, 2017), parents of children diagnosed with HL (Porter & Edirippulige, 2007), and people looking for information on assistive technology (Martin et al., 2011). People with serious health needs and those who experience barriers in accessing health care through traditional routes are more likely to search for health information on the internet (Bundorf, Wagner, Singer, & Baker, 2006), and people who have HL may use the internet more than people who do not (Barak & Sadovsky, 2008). Health professionals also sometimes direct their patients to appropriate websites (P. Williams, Nicholas, & Huntington, 2003).

Among other reasons, people report using the internet to search for advice or information about conditions, treatments or symptoms (Shuyler & Knight, 2003); look for a

second opinion (Bessell et al., 2002); or decide whether to see a doctor or follow up on appointments (Andreassen et al., 2007). Many people report that the information found online influences their health decisions (Fox & Jones, 2009; Fox & Rainie, 2002; Sillence et al., 2007); Couper et al. (2010) found that the internet was the second most influential source of information for medical decisions after health professionals.

1.6.1. Global internet access

Global internet access is increasing (WHO, 2011). Internet World Stats (2018a) estimate that over 4 million people or 54.4% of the world had internet access in December 2017, a growth of over 1000% since the year 2000. Spanish speakers make up 8% of the world's internet users with 58.4% of Spanish speakers having internet access (Internet World Stats, 2018a). This number has grown 1,758.5% since the year 2000, compared to a 647.9% growth in English speaking users (Internet World Stats, 2018b).

While internet access is rising, it is not universal. Around the world, internet penetration rates range from 32.5% in Africa to 95% in North America (Internet World Stats, 2018b). Disparities are seen between countries with higher incomes and those with lower incomes: 81.7% of the population use the internet in countries with high gross national income (GNI) compared to 13.5% in countries with low GNI (The World Bank, 2017). In the U.S., inequalities in internet access have been found based on age, income, and race (Brodie et al., 2000), and people of Hispanic origin are more likely to have access to and use the internet if they speak, read, and write English fluently (Fox & Livingston, 2007). Table 1 shows 2016 estimates of the percentage of the population who have internet access (internet penetration rates) for Spanish speaking localities.

Table 1. Internet penetration rate estimates for Spanish speaking localities (Internet World Stats, 2018a)

COUNTRIES	Population (2016 Estimate)	Internet Users (30 June 2016)	Internet Penetration (% of Population)
Argentina	43,833,328	34,785,206	79.40%
Bolivia	10,969,649	4,600,000	41.90%
Chile	17,650,114	14,108,392	79.90%
Colombia	48,593,405	28,475,560	58.60%
Costa Rica	4,872,543	4,236,443	86.90%
Cuba	11,014,425	3,696,765	33.60%
Dominican Republic	10,606,865	6,054,013	57.10%
Ecuador	16,080,778	13,471,736	83.80%
El Salvador	6,156,670	3,100,000	50.40%
Equatorial Guinea	759,451	181,657	23.90%
Guatemala	15,189,958	5,300,000	34.90%
Honduras	8,893,259	2,700,000	30.40%
Mexico	123,166,749	69,000,000	56.00%
Nicaragua	5,966,798	1,900,000	31.80%
Panama	3,705,246	2,799,892	75.60%
Paraguay	6,862,812	3,149,519	45.90%
Peru	30,741,062	18,000,000	58.60%
Puerto Rico	3,578,056	3,047,311	85.20%
Spain	48,563,476	37,865,104	78.00%
United States (Hispanic population)	46,655,356	13,222,304	28.30%
Uruguay	3,351,016	2,400,000	71.60%
Venezuela	29,680,303	18,254,349	61.50%
TOTAL	496,891,319	290,348,251	58.40%

Part of PPC is that patients must have access to information in a language they understand (Institute of Medicine, 2001), yet previous research into the quality and readability of online heath information has focussed on information published in English. On top of this, McDaid and Park (2011) suggested that the high cost of health care may increase the reliance on online health information in countries with lower incomes. According to WHO (2011), however, much of the health information in developing nations is inadequate and unreliable. Cardelle and Rodriguez (2005) found that Spanish-language websites based in Spanish-speaking countries were more difficult to use and scored lower on important quality criteria than those produced in the US. Furthermore, the health webpages that appear among

the top results on Google are commonly based in the US and written in English: Castillo-Ortiz et al. (2017), when searching for information on rheumatoid arthritis in Spanish, found that 65% of the resulting Spanish-language webpages from medical institutions were from the U.S., and that these appeared higher in Google search results than those from Spanish speaking countries; Mayer et al. (2009) searched Google Spain for information on vaccines (using search terms in both English and Spanish without selecting the option to only show results in Spanish) and reported that only 4 of the first 20 links were written in Spanish, 7 in English, and 9 in both languages. This disadvantages those who do not speak English or are more comfortable accessing health information in other languages.

1.6.2. Benefits and drawbacks of the internet as a source of health information

The internet has many benefits as a source of health information. For example, the internet has been suggested as a method of getting information to a wider population (Bessell et al., 2002), addressing disparities in the quality and access of health care (Gibbons et al., 2011), and allowing consumers to evaluate the evidence base of health professionals (Eysenbach & Jadad, 2001). In the rehabilitation of adults with HL, the internet has been suggested as a tool for informing and guiding readers in areas such as communication strategies and how to use HAs (Thorén, Öberg, Wänström, Andersson, & Lunner, 2013). A study by Fox and Rainie (2002) found that 61% of people who searched for health information online said that the internet improved the way they take care of their health.

Internet users report that the information makes them feel empowered to make treatment decisions, and people who use the internet to search for health information have higher perceived self-efficacy than those who do not (Fleisher, Bass, Ruzek, & McKeown-Conn, 2002). Internet users report that they feel their online research improves conversations with physicians (Fleisher et al., 2002; Sillence et al., 2007; P. Williams et al., 2003), and helps them to maintain independence in looking after their health (Fleisher et al., 2002). The

internet can also be a source of support (Lorig et al., 2002), which may help people to become more involved in decision making and participate more actively in their health care (Shuyler & Knight, 2003). Barak and Sadovsky (2008) found that adolescents with HL who used the internet intensively had higher levels of self-esteem and reported feeling less lonely than those who did not. The authors suggest that the ease of access to large amounts of information in a convenient, anonymous, and non-auditory form may contribute to increased wellbeing and empowerment.

While the internet has great potential to increase access to health information (Bessell et al., 2002), there may still be barriers to its beneficial use. The lack of monitoring of what is published online is a frequently discussed issue (Eysenbach et al., 1998; Jadad & Gagliardi, 1998; Morahan-Martin, 2004; Pereira & Bruera, 1998), and it can be difficult to find information that is both high quality and understandable (Ritchie, Tornari, Patel, & Lakhani, 2016). As discussed by Eysenbach and Jadad (2001), the internet allows consumers to directly access a vast amount of health information, bypassing the health professional who would traditionally act as a filter by suppling patients with relevant information. This means that consumers are required to decide for themselves which information sources to trust— a task that can be overwhelming (Fleisher et al., 2002; Skinner, Biscope, Poland, & Goldberg, 2003).

Consumers also may not always have the skills required to judge the quality of information. Fox and Rainie (2000) found that while 86% of people using the internet to access health information reported that the reliability of information sources is important to them, only 58% check who produced information. Additionally, Bates, Romina, Ahmed, and Hopson (2006) found that details about the credibility of information sources did not affect consumers' evaluations of the quality of health materials. Consumers also appear to rate the reliability and quality of information higher than researchers. In a study by Fox and Rainie

(2000), 52% of people reported believing that most or almost all of the health information they find on the internet is credible. Likewise, Akerkar et al. (2005) found that 95% of participants (patients at a private clinic) thought that health information available on the internet was reliable, and the majority were satisfied with the quality of the information. Similarly, 69% of respondents in Fox and Rainie (2002) said that they had not found misleading or incorrect information online. This is a different evaluation to that of many researchers who have described the quality of the health information on the internet as highly variable or poor (Cardelle & Rodriguez, 2005; Eysenbach et al., 2002; Impicciatore, Pandolfini, Casella, & Bonati, 1997; Lambert, Mullan, Mansfield, Koukomous, & Mesiti, 2017; Mayer et al., 2009; Ritchie et al., 2016; Seymour, Lakhani, Hartley, Cochrane, & Jephson, 2015).

On top of this, people may be less likely to visit a health professional if they can access information from home (P. Williams et al., 2003), creating a risk if the information accessed on the internet is not reliable. Eighteen percent of participants in a study by Fox and Rainie (2002) reported having used the internet to diagnose or treat a medical condition without seeing a medical professional. This highlights the importance of both improving the standard of the information online and enabling consumers to easily assess the quality of the information they encounter. Laplante-Lévesque, Brännström, et al. (2012, p. 626) concluded that "a concerted effort is required for people with hearing impairment and their significant others to be informed—rather than misinformed—by the internet.".

Eysenbach (2000) outlined four methods for managing the quality of information that consumers access on the internet: (1) educating consumers and supporting them to judge the quality of the information they find, (2) encouraging information providers to self-regulate with organisations such as Health on the Net (HON) that provide certification to signify that the website meets a set of quality criteria, (3) using third-party evaluation and certification

with websites being labelled with information on their quality that users will see when they open the webpage, and (4) enforcing re-evaluation or removal of webpages providing potentially harmful information.

It is important to review the quality of health information to highlight issues for improvement. Although what constitutes quality will depend on the needs of the reader (Eysenbach et al., 1998), common criteria for judging quality have been based on aspects such as accessibility and appropriateness (Doak, Doak, Miller, & Wilder, 1994), literacy demand (Doak et al., 1994), and transparency of information sources (Boyer, Baujard, & Geissbühler, 2011; Charnock, Shepperd, Needham, & Gann, 1999).

1.7. Readability

Readability is measure used to describe how easy a text is to read. It is "what makes some texts easier to read than others" (DuBay, 2004, p. 3). The readability of a text can be expressed as a reading grade level (RGL) based on the U.S. year of schooling that this corresponds to (an average reader of that grade should be able to read and understand the material). Due to the importance of proper understanding and the potential consequences of misunderstanding health information (Britten et al., 2000), it is essential that health materials are easy to understand for a wide range of readers. Research also suggests that people generally prefer easier-to-read health materials (Davis et al., 1996; Klare, Mabry, & Gustafson, 1955) regardless of their reading ability (Davis et al., 1998). A systematic literature review by Hoffmann and Worrall (2004) concluded that the consensus among studies is that written health materials should be written as simply as possible, at the lowest RGL possible, while accurately conveying the necessary information. To this end, the American Medical Association recommend a maximum 6th RGL for consumer health information (Weiss, 2003).

Many studies, however, have demonstrated that health materials are generally written at well above this recommended level (Azios, Bellon-Harn, Dockens, & Manchaiah, 2017; Barak & Sadovsky, 2008; Berland et al., 2001; Cardelle & Rodriguez, 2005; Cheng & Dunn, 2015; Cooley et al., 1995; Doval, Riba, Tran, Rudd, & Lee, 2018; Gottlieb & Rogers, 2004; Greywoode, Bluman, Spiegel, & Boon, 2009; Hosey et al., 1990; Jolly et al., 1993; Laplante-Lévesque & Thorén, 2015; Manchaiah et al., 2018; Mcinnes & Haglund, 2011; Wallace, Turner, Ballard, Keenum, & Weiss, 2005; Walsh & Volsko, 2008). For instance, Berland et al. (2001) found that the mean RGL required to understand internet health information was 13.2 for English and 9.9 for Spanish. Similarly, Cardelle and Rodriguez (2005) reported that the majority of Spanish-language health information found through an internet search for 10 different health topics was written at or above the 12th RGL. In a study of information published in Spanish on breast reconstruction, Doval et al. (2018) reported mean RGLs from 9.1 to 10.8 depending on the readability formula used and the type of website analysed. Castillo-Ortiz et al. (2017) found that only 31% of webpages on rheumatoid arthritis resulting from Google searches in Mexico, Colombia, and Spain were easy or very easy to read and concluded that less than half of the webpages would be understandable to the average Mexican. Internet information specific to hearing has also been studied for English-language information: a systematic review by Laplante-Lévesque and Thorén (2015) found that internet information on hearing requires at least 9 to 12 years of education to understand. Such information may not succeed in conveying the critical information it is designed to communicate.

1.7.1. Readability formulas

Readability formulas are usually equations generated using regression analyses that represent the relationship between a text's reading difficulty and linguistic factors of the text such as sentence or word lengths (Mc Laughlin, 1969), or the proportion of common words (Ley & Florio, 1996). These equations can then be used to assess the readability of texts,

usually reported in RGL. Some of the readability formulas available for use with texts written in Spanish include SOL (meaning "sun" in Spanish), the Gilliam-Peña-Mountain Graph (GPMG), and Crawford. All three of these formulas estimate readability based on word length (measured in number of syllables) and sentence length (in number of words).

The SOL formula (Contreras, Garcia-Alonso, Echenique, & Daye-Contreras, 1999) allows the Simple Measure of Gobbledygook (SMOG; Mc Laughlin, 1969) English-language readability formula to be applied to Spanish texts by applying an equation to convert SMOG between the languages. SMOG uses the rationale that longer words and sentences make a text harder to read; accordingly, a SMOG score (the reading grade required to fully understand the text) is calculated from the number of polysyllabic words (words containing 3 or more syllables) found in 30 sentences from the beginning, middle, and end of a text, (Mc Laughlin, 1969). The idea behind this method is that tallying polysyllabic words within a set number of sentences allows sentence length as well as word length to contribute to the score, as the longer the sentences are, the more polysyllabic words should be found in the sample (Mc Laughlin, 1969). The RGLs used to develop SMOG correspond to the mean grade levels of students who could correctly answer all questions on a comprehension test. SMOG is recommended by L. W. Wang, Miller, Schmitt, and Wen (2013) for health-care uses because it produces consistent RGL estimates that are similar to those produced by other formulas, and because its estimates are based on 100% comprehension.

The Crawford and GPMG formulas are both based on the Fry graph. The Fry graph was created in by Fry (1968) for assessing texts used in schools in the U.S.. Like the SMOG, the Fry formula's RGL estimations are based on sentence and word lengths. The number of syllables found in a 100 word sample are plotted on a graph against the number of sentences in that sample, with corresponding points on the graph representing the text's estimated RGL (Fry, 1968). The RGL estimates provided by the Fry graph were created based on the grade

levels that publishers assigned to their books (Fry, 1968). The Crawford formula was developed using the same method as the Fry graph but was created specifically for use with Spanish texts, using books published in Spanish (Crawford, 1984). The GPMG, on the other hand, simply provides a separate graph, called the GPMG, which essentially applies correction factors to allow the Fry formula to be used with Spanish texts. Gilliam, Peña, and Mountain (1980) applied the Fry formula to books written in Spanish for primary school children, and then calculated the correction needed to arrive at the book's known grade level (either a publisher recommended grade level or the grade levels of the book's English translation which could be calculated using the already existing Fry formula (Gilliam et al., 1980)). The authors pointed out the issues with assuming that texts remain at the same RGL in when translated between languages but decided that the method was an acceptable starting point (Gilliam et al., 1980).

1.8. Quality of online health information

In view of the increasing number of consumers turning to the internet as a source of health information (Prestin et al., 2015), and the influence that this information has on health decisions (Fox & Jones, 2009; Fox & Rainie, 2002; Sillence et al., 2007), the standard of the information accessed on the internet is worthy of attention. Past research on internet health information on a range of health topics has highlighted its variable quality (Cardelle & Rodriguez, 2005; Eysenbach et al., 2002; Impicciatore et al., 1997; Lambert et al., 2017; Manchaiah et al., 2018; Meredith, Emberton, Wood, & Smith, 1995; Ritchie et al., 2016; Seymour et al., 2015). A systematic review of studies performed by Eysenbach et al. (2002) found that 70% of the studies reviewed (focusing on any language but English appeared the most frequently) concluded that health information found on the internet is of insufficient quality, with issues such as lack of completeness and accuracy, and the difficulty of finding high-quality websites.

Hearing-specific information in English has also been studied and shows a similar trend (Laplante-Lévesque, Brännström, et al., 2012; Manchaiah et al., 2018; Ritchie et al., 2016; Seymour et al., 2015), as does online health information published in Spanish (Berland et al., 2001; Doval et al., 2018; Fuentes, Ontoso, & Morante, 2011; Mayer et al., 2009; San Norberto et al., 2011). A 2001 study by Berland et al. focussed on webpages in Spanish or English and concluded that it is difficult to find complete and accurate information on health problems via the internet. This study may be somewhat dated as it was conducted early in the history of the internet; however, its findings are supported by more recent studies by Cardelle and Rodriguez (2005) and Mayer et al. (2009). Cardelle and Rodriguez (2005) concluded that the majority of Spanish-language health websites were of average to poor quality, with significant variation between sites. Similarly, Mayer et al. (2009) searched for health information on vaccines through Google and Yahoo! Spain and found that 15–25% of webpages contained inaccurate information, and a large number of the pages were not useful, often including irrelevant information or content that was too complicated or specialised. Mayer et al. (2009) detected no significant difference in quality scores between publications in English and those in Spanish, suggesting that the findings of the multiple studies into the quality of hearing-related information in English may also apply to information published in Spanish.

1.8.1. The DISCERN tool

The DISCERN (discern.org.uk) is a tool used to rate the quality of health information on treatment choices. Charnock et al. (1999) designed the tool to enable patients to make evidence-based treatment decisions by guiding them to judge the quality of treatment-related health information. The authors suggest that DISCERN can be used to improve the quality of the information that is available to patients. They recommend that health providers use DISCERN to screen information that they are considering giving out in clinic, and publishers or authors can use the tool to guide the production of patient information. The designers of

the DISCERN tool (Charnock et al., 1999) have demonstrated that after training, raters reliably discriminate high- from low-quality publications, although questions requiring subjective judgements showed weaker agreement between groups. Ratings are also fairly consistent among groups of people who are unfamiliar with the content they are rating, affirming that the instrument can be useful to untrained patients (Charnock et al., 1999).

discern.org.uk (1997) details the use of the DISCERN tool. The tool has two sections, comprising 16 questions (called items) to be rated from 1 to 5 to represent how well the rater feels that the publication achieved each item. The website's instructions explain that rating of 1 is given if the answer to an item is "no", 2–4 are given if the answer is "partially", and 5 is given if the answer is "yes". Section 1 (items 1–8) is concerned with the reliability of the publication and is designed to help decide how trustworthy the publication is. Section 2 (items 9–15) addresses more specific details of the information on treatment choices, and item 16 is a is an overall summary of the quality of the publication as an information source on treatment choices based on the rater's subjective judgement after rating the previous items. The DISCERN website explains that a high rating for item 16 indicates that the publication is of good quality with minimal limitations and is an appropriate source of useful treatment information, where a low rating indicates that the publication is of poor quality and is not likely to be useful as an information source.

Researchers have applied DISCERN to online information on a range of health topics, generally concluding that this information is of low quality (Azios et al., 2017; Hargrave, Hargrave, & Bouffet, 2006; Kaicker, Debono, Dang, Buckley, & Thabane, 2010; Wallace et al., 2005). DISCERN also been applied to hearing information: Laplante-Lévesque, Brännström, et al. (2012) used the DISCERN tool to rate English-language hearing information and found a mean score of 2.04 with scores ranging from 1.13 to 3.93. This means that the rated websites only partially met the DISCERN quality criteria and suggests

that the quality of hearing-related internet information is highly variable. DISCERN has been applied to online information in Spanish. Castillo-Ortiz et al. (2017) used DISCERN to rate Spanish information on rheumatoid arthritis and concluded that 25% of the webpages meet the DISCERN criteria, 42% partially met the criteria, and 33% did not meet the criteria.

1.8.2. HONcode

Another way of addressing the problem of quality on the internet suggested by Eysenbach (2000) is for web developers to comply with a set of third-party ethical guidelines. Website authors can voluntarily adhere to quality standards as a way of ensuring the quality of their information at the same time as signaling to consumers that their publications are at a certain standard. Examples of such a standards include the HONcode (Team HON, 2018), the e-Health Code of Ethics (Rippen & Risk, 2000), Web Médica Acreditada (Mayer, Leis, Sarrias, & Ruíz, 2005), and the American Medical Association's Code of Medical Ethics (Riddick Jr, 2003).

The HON Foundation is a non-governmental organisation that provides a certification aimed at helping to standardise the reliability of medical and health information on the internet while identifying websites that are reliable and maintained by qualified people (Boyer, Selby, Scherrer, & Appel, 1998). It is a code of ethics that demonstrates websites' intent to publish information that is high quality, objective, and transparent (Team HON, 2018). Health information from HON certified webpages has been found to be of higher quality than information from webpages without certification (Bompastore, Cisu, & Holoch, 2018). Web developers can apply for HON certification if they meet the code's 8 principles outlined on the HON website (Team HON, 2018) and listed in Table 2.

The HON Foundation reports that HON has been translated into 35 languages (Boyer et al., 2011) and currently certifies over 8000 websites (Team HON, 2018). Fifty five percent of the websites with HON certification are written in English, followed by French at 15%,

and then Spanish with 12% (Boyer & Geissbuhler, 2005). In a study of hearing-related websites in English, Laplante-Lévesque, Brännström, et al. (2012) found that 14% had HON certification. Differences in the rate of certification were seen between Websites of different origins, with websites of government origin more likely to have HON certification than non-profit or commercial websites (Laplante-Lévesque, Brännström, et al., 2012). For Spanish-language information, Mayer et al. (2009) found that 30% of webpages on vaccines found through Google and Yahoo! Spain displayed the HON certification. Some of these pages also displayed a Web Médica Acreditada (WMA) seal. Mayer et al. (2009) point out that while only 30% of webpages found in their search showed HON certification, this percentage seems much more encouraging when considering the number of webpages that exist on the internet compared to the number of pages that HON currently certify (Team HON, 2018). This suggests that pages with HON certification are appearing higher on search results than those without.

Table 2. HONcode 8 principles (Team HON, 2018)

1. Authority	All medical health advice on the website must be given by qualified medical professionals unless accompanied by a clear statement explaining otherwise.
2. Complementarity	The information on the website is designed to support rather than replace the readers' relationships with their medical professionals.
3. Privacy policy	Visitors' personal information is confidential. The website hosts must abide by the medical information privacy laws in their country.
4. Attribution and date	Information sources are clearly mentioned and links to original sources are provided where possible. The date of the last content update must be provided on each webpage.
5. Justifiability	Any claims to benefits or performance of treatments, products, or services must be accompanied by appropriate, balanced evidence, referenced according to principle 4.
6. Transparency	Information must be provided in a format that is as accessible as possible and provide contact information for readers to seek further information or support. An email address must be clearly displayed.
7. Financial disclosure	Funding sources of the site must be clearly identified.
8. Advertising policy	Advertising as a source of funding must be clearly indicated. A brief description of the advertising policy must be included on the website. Advertising material must be clearly distinguishable from the content provided by the website hosts.

1.9. Rationale

As previously discussed, HL is a prevalent health condition with significant impacts on communication and quality of life. It is essential that people with HL and their families have access to information that can help them to understand their HL and treatment options. The internet is increasingly popular as a source of health information (Prestin et al., 2015) that has been shown to be influential on health decisions (Fox & Jones, 2009; Fox & Rainie, 2002; Sillence et al., 2007). To be useful to its readers, health information must be high quality (Shepperd et al., 1999) and readable (Griffin et al., 2003; Hibbard, Slovic, & Jewett, 1997).

The 6th RGL has been suggested as a maximum for health materials (Weiss, 2003), yet past studies have found that health information is generally written at well above this level (Barak & Sadovsky, 2008; Berland et al., 2001; Cheng & Dunn, 2015; Cooley et al., 1995; Gottlieb & Rogers, 2004; Greywoode et al., 2009; Hosey et al., 1990; Jolly et al., 1993; Laplante-Lévesque & Thorén, 2015; Wallace et al., 2005; Walsh & Volsko, 2008). The quality of online health information has also been shown to be lacking (Eysenbach et al., 2002; Impicciatore et al., 1997; Lambert et al., 2017; Meredith et al., 1995; Ritchie et al., 2016; Seymour et al., 2015). Previous research focussing on information published in English have demonstrated that this trend is no different for internet information specific to hearing (Laplante-Lévesque, Brännström, et al., 2012; Laplante-Lévesque & Thorén, 2015; Ritchie et al., 2016; Seymour et al., 2015). Likewise, studies on information about other health topics written in Spanish have found similar issues (Berland et al., 2001; Fuentes et al., 2011; San Norberto et al., 2011).

Spanish is the second most commonly spoken native language (Simons & Fennig, 2018); however, the readability and quality of the hearing-related online information in Spanish has yet to be published. Assessing the readability and quality of online hearing

information in Spanish will address this gap in the literature and highlight shortfalls in the current information available to people searching for information related to hearing on the internet. This knowledge is made more important again for HL because of its prevalence (WHO, 2012), the impact on quality of life (Dalton et al., 2003; Mulrow et al., 1990; Scarinci et al., 2008), the possible consequences of misunderstanding health information (Britten et al., 2000), and the potential for HL to be barrier to effective communication with health professionals (Iezzoni et al., 2004).

This research is clinically relevant because of the key role information plays in health care. As discussed above, information is necessary to allow for understanding of health conditions and treatment options, and therefore is essential in PCC and SDM. Clinicians need to know what sort of information their clients are likely to be accessing or bringing to the clinic to discuss and should be able to point them to suitable high-quality information. While there are tools available for consumers to judge the quality of information for themselves, most consumers are not aware of any quality standards available for health information (Akerkar et al., 2005). This thesis will analyse the readability and quality of online hearing-related information in Spanish using two different readability formulas, the DISCERN tool, and HONcode.

1.10. Aims and Hypotheses

The purpose of this study is to investigate the readability and quality of the hearing-related information that Spanish speakers are likely to find if they search the internet for hearing information. This study has two parts. Part 1 focusses on the readability of this information and part 2 looks at its quality.

Hypotheses and expected findings

Internet search

1. There is an even distribution in the locality of the webpages (the Americas, Europe, and World) found using the search criteria. This hypothesis is expected to be supported.
2. There is an even distribution in the type of website host organisation (government, non-profit, and commercial) found using the search criteria. This hypothesis is expected to be supported.
3. There is an even distribution of type of website host organisation by host locality. This hypothesis is expected to be supported.

Part 1: Readability

4. There is no significant relationship between the RGLs derived from each formula. This hypothesis is expected to be not supported. It is expected that a significant positive correlation will be found between the RGLs derived from each formula.
5. Webpages found using the search criteria do not have a mean RGL significantly different from 6. This hypothesis is expected to be not supported. It is expected that the mean RGL will be greater than 6.
6. There is no significant difference in mean RGL between webpages based on locality. This hypothesis is expected to be supported.
7. There is no significant difference in mean RGL between webpages based on type of organisation. This hypothesis is expected to be supported.

Part 2: Quality

8. There is no significant difference in DISCERN scores based on locality. This hypothesis is expected to be supported.
9. There is no significant difference in DISCERN scores based on type of organisation. This hypothesis is expected to be not supported. Consistent with the findings of Laplante-Lévesque, Brännström, et al. (2012) for English-language hearing information, it is expected that non-profit websites could score more highly than governmental and commercial websites.
10. There is an even distribution of HON certification by locality. This hypothesis is expected to be supported.
11. There is an even distribution of HON certification by type of organisation. This hypothesis is expected to be not supported. It is expected that more non-profit webpages will have HON certification as this is the result found by Laplante-Lévesque, Brännström, et al. (2012).
12. There is no significant difference in DISCERN scores based on presence/absence of HONcode certification. This hypothesis is expected to be not supported. It is expected that webpages with HON certification will score more highly on DISCERN than those without.

Relationship between dependant variables

13. There is no significant relationship between DISCERN scores and RGL. There are no specific expectations for this hypothesis. It is possible to assume that the higher-quality webpages will be easier to read, as websites that are mindful of the suitability of their information may have considered both of these factors. It is also possible to expect that webpages that are high quality will also be difficult to read, as websites that are written for medical professionals or a scientific audience (for example) may

score more highly on DISCERN by being comprehensive, unbiased, and well referenced, yet be written at a high RGL.

14. There is no significant relationship between webpage word count and RGL. This hypothesis is expected to be supported.
15. There is no significant relationship between webpage word count and DISCERN scores. This hypothesis is expected to be not supported. It is expected that longer webpages will score more highly on DISCERN as they are likely to be more comprehensive and therefore cover more of the DISCERN criteria.

CHAPTER 2. METHOD

This study investigated the readability and quality of online hearing-related information in Spanish using a methodology based on that used by Laplante-Lévesque, Brännström, et al. (2012). Websites were identified by taking the top 10 search results from Google searches conducted in 22 Google country-coded Top-Level Domains (ccTLDs) using search terms that native Spanish speakers indicated they would use to look for information related to HL. Part 1 of this study assessed the readability of the webpages using the Crawford and SOL (Spanish version of the SMOG) readability formulas. Part 2 focussed on the quality of the webpages using the DISCERN tool and HONcode to indicate quality.

2.1. Finding webpages

2.1.1. Identifying search terms

Search terms were initially identified by native Spanish speakers, and then entered into Google.com/trends for information on where these search terms are popular. A group of 12 informants who speak, read, and write Spanish as one of their native languages were asked to identify Spanish terms (and their English equivalents) that they thought people interested in learning about HL might use to search the internet. The terms were then entered into Google.com/trends to obtain information on the geographic locations where they are commonly used. Google Trends provides information on how frequently search terms have been entered into Google in different geographical locations in set time periods. Table 3 shows the search terms and locations obtained.

Table 3. Search terms and locations of common use

Terms identified by informants	Equivalent English terms	Geographic location
pérdida de la audición	hearing loss, hearing impairment	United States, Mexico
la discapacidad auditiva	hearing loss, hearing impairment	Mexico
audición/la audición	hearing	Spain, Colombia, Chile, Mexico, Argentina
auditiva	hearing	Guatemala, Panama, Colombia, Ecuador, Chile

2.1.2. Identifying ccTLDs

The 4 search terms were then used to search in 22 Google country-coded Top-Level Domains (ccTLDs) on the 14th of September 2017. Worldwide, Google is the most commonly used search engine with over 90% of the global market share (statcounter, 2018), and was therefore selected as the search engine for this study. A ccTLD is a two-character part of website domain names that is specific to each country. The ccTLDs used in this study were identified are those that met the criteria: (1) that at least 5% of the population of the locality spoke Spanish, and (2) the locality had a ccTLD. Table 4 shows these localities their ccTLDs.

Table 4. Country-coded Top-Level Domains (ccTLDs) in Spanish speaking localities

Country	ccTLD
Argentina	google.com.ar
Belize	google.com.bz
Chile	google.cl
Colombia	google.com.co
Costa Rica	google.co.cr
Cuba	google.com.cu
Dominican Republic	google.com.do
Gibraltar	google.com.gi
Guatemala	google.com.gt
Honduras	google.hn
Mexico	google.com.mx
Nicaragua	google.com.ni
Panama	google.com.pa
Paraguay	google.com.py
Peru	google.com.pe
Puerto Rico	google.com.pr
Spain	google.es
Trinidad and Tobago	google.tt
US	google.us*
Uruguay	google.com.uy
Venezuela	google.co.ve
Virgin Islands	google.co.vi

* redirects to Google.com

2.1.3. Inclusion and exclusion criteria

The first 10 webpages from each search were used for the study if they met the following criteria: (1) primarily written in Spanish, (2) contain information relating to hearing or HL, (3) freely available to the public, (4) contain information about the organisation hosting the website. Webpages were excluded if they were: (1) a Google-identified advertisement, (2) a video, (3) a directory listing, or (4) less than 100 words in length.

2.1.4. Internet search

Internet users generally only look at the top results when searching for health information (Eysenbach & Köhler, 2002); therefore, the first 10 webpages resulting from

each ccTLD were used in this study. An Excel spreadsheet was used to record webpage information and results. For each webpage, the URL, information on the location of the website host and type of organisation, whether or not the website had HON certification, and the word count of the main text were recorded. The type of hosting organisation was classed as "non-profit" if the website was hosted by an organisation that could be verified as being non-profit. The type of hosting organisation was classed as "governmental" if it was associated with a government agency. All other websites were classed as "commercial". The information about host type was either found on the website or discovered through further internet searching. The location of the website's hosting organisation was either determined from the URL or found on the website. Locations were recorded and then grouped into the categories: Europe, Americas, or World (if it did not fit either of these categories). Organisations aimed at a global audience (e.g., Wikipedia) were coded as World. A total of 44 webpages were found after removing duplicates. The webpages directly accessed from the search results were used in the study: links embedded in the webpage (whether linking externally or to other pages within the same website) were not examined. The content of the webpages was saved for analysis by copying and pasting into individual Word documents or downloading as PDFs when possible. The word counts were those given by Microsoft Word and included the main text of the webpage but did not include any references or other information on the webpage such as menu bars or links to contact information.

2.2. Part 1: Readability analysis

Part 1 of this study aimed to evaluate the readability of the 44 webpages identified through internet search. The Oleander Readability Studio software (Oreander Software, 2015) was used to assess readability according to the following readability formulas: Crawford, Gilliam-Peña-Mountain Graph (GPMG), and SOL (Spanish version of the SMOG). Readabilities were calculated in the software and recorded in the Excel document.

2.3. Part 2: Quality

Part 2 of this study focusses on the quality of the webpages. The DISCERN tool and the presence or absence of HONcode certification were used to judge quality.

2.3.1. DISCERN

Two Spanish readers used the DISCERN tool to rate the quality of the 44 webpages. The readers (two audiology students: the author and another classmate) were trained by our supervisor who has had training and experience with the DISCERN tool. Spanish is a second language for both raters, both having studied Spanish at university before living and working in Spain. We independently rated 2 hearing-related webpages in the English language and met to discuss our ratings and any discrepancies. The DISCERN handbook (Charnock, 1997) and other information provided on discern.org.uk, including notes for each item of the tool, were used to help refine our rating criteria and improve reliability. The tool is designed to be used in its entirety rather than by selecting items to apply; therefore, unless entirely inapplicable, all items were rated for every webpage, and their relative relevance was considered while judging item 16 (the overall quality rating). We then independently rated 2 webpages on health topics written in Spanish and met again to discuss our ratings. After checking that we were rating consistently, we rated the test material. I rated all of the 44 webpages and the second reader rated 10 randomly-selected webpages (using the random number function in Excel) to verify reliability. The ratings for item 16 (the overall DISCERN total) for each webpage were added to the Excel spreadsheet for later analysis.

2.3.2. HONcode

HONcode presence or absence was determined by using the HONsearch function on the HON website (https://www.hon.ch/HONsearch/Patients/index.html). HONsearch is a search engine that only produces search results that are HON certified. Website names were

entered into HONsearch and recorded as having HON certification if they appeared in the results.

2.4. Statistical Analyses

IBM SPSS statistics software version 25 was used for statistical analysis. Inter-rater reliability of the DISCERN scores for the study webpages was evaluated via intra-class correlation coefficient (ICC) and Cronbach's Alpha. The single measures ICC for the DISCERN scores of the webpages rated by both raters was ICC(3,1) = .67 (f(9,9) = 5.07, p = .02). According to Fleiss (1981), this indicates fair agreement beyond chance. A two-way mixed model was selected because the DISCERN scores were derived from the same two raters for each webpage. The single measures result was used because the reliability analysis was performed on the mean DISCERN scores for each webpage, rather than for each DISCERN item. Cronbach's Alpha was also used to assess reliability. Cronbach's Alpha can be used to evaluate the extent to which scores measure a single construct (in this case, DISCERN score). The alpha can range from 0 to + 1, with higher values indicating greater internal consistency. The Cronbach's Alpha for the DISCERN scores rated by both raters was .80. Once reliability was established, only the first rater's scores were used for subsequent analysis.

Descriptive statistics were used to obtain minimum and maximum scores, means, and information on skewness and kurtosis for RGL, DISCERN, and word-count data. Box plots were utilised to check for significant outliers in the RGLs, DISCERN ratings, and word counts. Levene's tests were used to test the homogeneity of variances in the DISCERN, RGL, and word-count results. The distributions in the locations and types of webpage host organisations found using the search criteria were evaluated via Chi Square tests. Descriptive statistics were used to discover whether any of the webpages had an RGL higher than 6 and a t-test was used to discover whether the mean RGL of the webpages was significantly greater

than 6. Two-way Univariate Analysis of Variance (ANOVA) were used to test for significant differences in the RGLs and DISCERN scores based on the location and type of hosting organisations. One-tailed Pearson correlations were used to evaluate the relationship between the RGLs derived from each formula and the relationship between DISCERN scores and RGL. A Mann-Whitney test was used (due to the low number of websites with HON certification) to determine if there were any significant differences in DISCERN scores based on presence/absence of HONcode certification. The word count of the webpages was compared with the mean RGL and DISCERN scores via Spearman's correlations to assess whether there were any significant relationships.

CHAPTER 3. RESULTS

The purpose of this chapter is to present the results from the readability and quality analysis. The RGLs provided by two of the readability formulas, the DISCERN scores from rater 1, and whether the websites had HON certification were analysed.

3.1. Origin of webpages

The internet search resulted in 44 webpages after removing duplicates (URLs available in the appendix). Table 5 shows the number of webpages found for each type, in each locality. Hypothesis 1, *There is an even distribution in the locality of the webpages found using the search criteria*, was supported. A Chi-Square test revealed that the distribution was not significantly uneven (χ^2 (2, N = 44) = 2.23, p = .36). A Chi-Square test also supported hypothesis 2: *There is an even distribution in the type of organisation found using the search criteria* (χ^2 (2, N = 44) = 0.86, p = .68). The third study hypothesis: *There is an even distribution of type of organisation by locality* could not be tested as there were too few websites from each location for the cross-tabulation.

Table 5. Number of webpages from each organisation type

Locality	Type	N
Europe	Government	3
	Non-profit	4
	Commercial	4
	Total	11
Americas	Government	9
	Non-profit	6
	Commercial	4
	Total	19
World	Government	0
	Non-profit	7
	Commercial	7
	Total	14
Total		44

3.2. Part 1: Readability

Readability was analysed using all three formulas: SOL, Crawford, and GPMG. A full list of the individual webpages and their RGLs can be found in the appendix. Descriptive statistics were used to test for normality and outliers in the RGL scores. There were no significant outliers, skewness, or kurtosis and a Levene's test showed that the assumption of homogeneity of variance was not violated ($p = .06$). One-tailed Pearson correlations were used to assess hypothesis 4: *There is no significant relationship between the RGLs derived from each formula*. This hypothesis was not supported by the data. All three formulas produced RGLs that were significantly positively correlated ($p < .001$): SOL and GPMG ($r = .76$), SOL and Crawford ($r = .64$), Crawford and GPMG ($r = .83$). The GPMP produced many results corresponding to scores beyond the limits of the graph; therefore, the mean of the SOL and Crawford results were used for subsequent analysis. Mean RGLs produced by SOL and Crawford formulas can be seen in Table 6.

Descriptive statistics and a one-sample t-test were used to address the fifth hypothesis: *Webpages found using these criteria will not have a mean RGL (Crawford and SOL) significantly different from 6.* This hypothesis was not supported. Table 6 shows the range of RGLs. No webpage had a mean RGL below 6, and a one-sample t-test reviled that the mean RGL is significantly greater than 6, $t(43) = 14.51$, $p < .001$.

Table 6. Descriptive statistics in RGL from Crawford and SOL formulas

Formula	Minimum	Maximum	Mean	Standard Deviation
Crawford	3.9	7.2	5.89	0.7
SOL	8.6	16.2	10.74	1.6
Mean	6.65	11.7	8.31	1.06

A two-way ANOVA was used to assess hypotheses 6 and 7. Both of these hypotheses were supported.

- Hypothesis 6: *There is no significant difference in mean RGL between webpages based on locality,* [$F(2, 36) = .17$, $p = .85$, $\eta^2 = .01$].
- Hypothesis 7: *There is no significant difference in mean RGL between webpages based on type of organisation*, [$F(2,36) = .13$, $p = .88$, $\eta^2 = .01$].
- No significant interaction between locality and type was found ($p = .80$).

Figure 1 shows the mean RGLs for webpages of each origin and type.

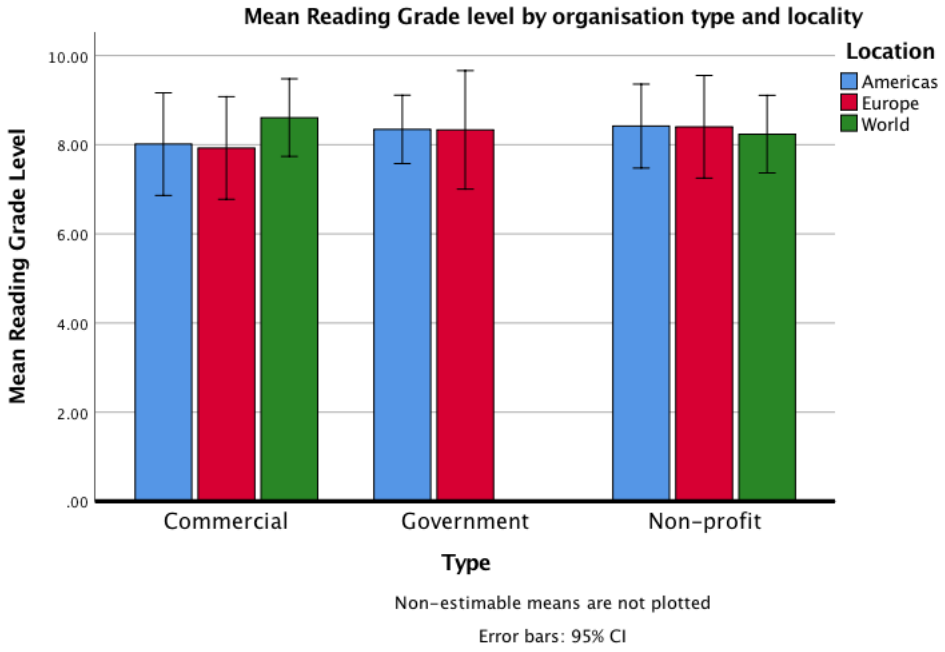

Figure 1. Mean Reading Grade Levels (RGLs) for each locality and type

Note. Error bars represent the 95% confidence interval.

3.3. Part 2: Quality

The quality of the 44 webpages was estimated through DISCERN scores and HON certification. There were no significant outliers, skewness, or kurtosis in the DISCERN data and a Levene's test shows that the assumption of homogeneity of variance was not violated ($p = .83$). Six webpages were HON certified (URLs available in the appendix) and DISCERN scores ranged from 1.5 to 4, with a mean score of 2.64 ($SD = 0.61$). Table 7 shows the mean ratings for each item of the DISCERN and Figure 2 shows the spread of scores in series of box plots. Item 16 is the overall DISCERN score and will be used for further analysis.

Table 7. Mean DISCERN scores for each item in descending order

Item	Mean rating (SD)
3. Relevance	3.36 (0.80)
2. Aims achieved	3.23 (0.87)
14. Clarity of other treatment options	3.15 (1.13)
6. Balance and bias	3.05 (0.74)
1. Clarity of aims	2.82 (0.86)
7. Additional support and information	2.8 (1.18)
16. Overall rating	2.64 (0.61)
5. Clarity of production date of information	2.44 (1.01)
9. Description of how treatments work	2.11 (1.08)
4. Clarity of information sources	2.05 (1.27)
10. Description of treatment benefits	2.05 (1.10)
12. No treatment option discussion	1.94 (1.08)
8. Mention of areas of uncertainty	1.84 (0.98)
13. Discussion on effects of treatment on quality of life	1.39 (0.61)
15. Support for shared decision making	1.26 (0.71)
11. Description of treatment risks	1.22 (0.49)

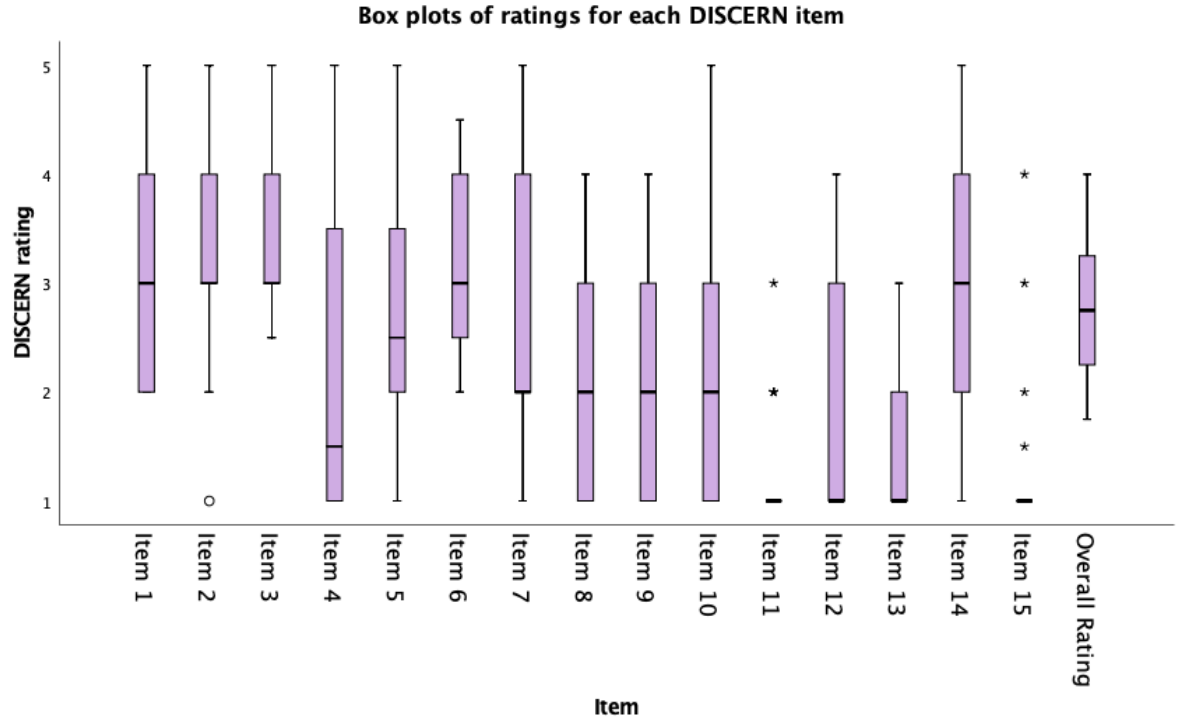

Figure 2. Box plots of ratings for each DISCERN item

Note. Thick horizontal lines represent median ratings, purple boxes represent the interquartile range, and vertical bars represent the range of scores excluding outliers. Outliers are shown as circles if non-significant or asterisks if significant.

Hypotheses 8 and 9 were assessed by a two-way ANOVA. Hypothesis 8, *There is no significant difference in DISCERN scores based on host locality,* was supported. No significant differences in DISCERN scores were detected based on locality, $F(2, 36) = .77$, $p = .47$, $\eta^2 = .04$. Figure 3 shows the mean DISCERN scores for each locality.

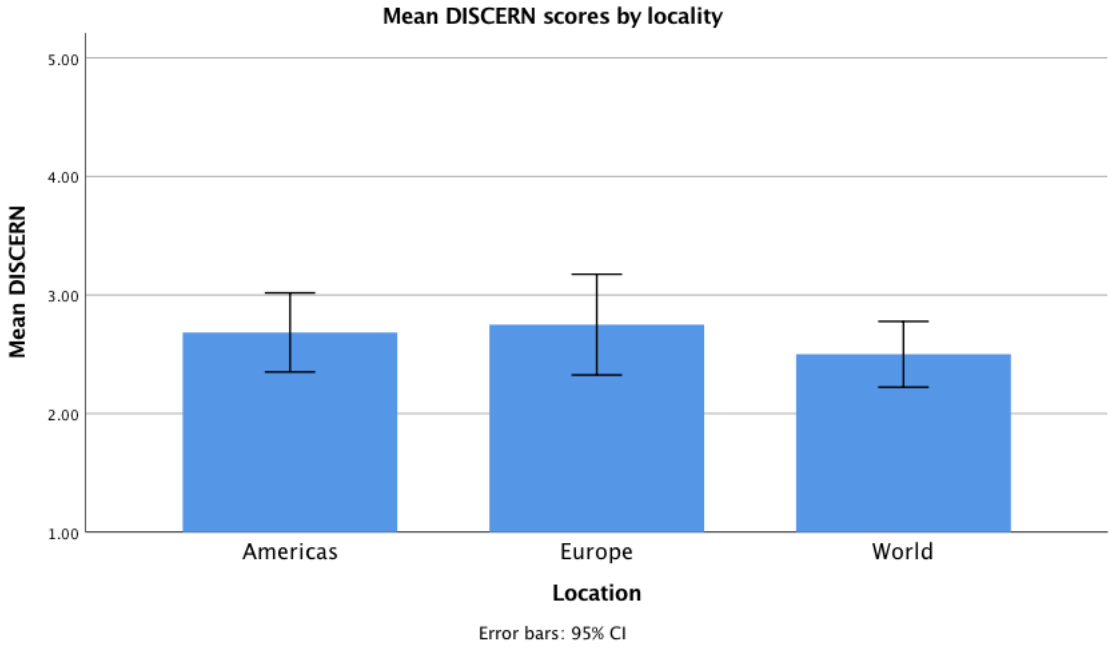

Figure 3. Mean DISCERN scores by locality

Note. Error bars represent the 95% confidence interval.

Hypothesis 9, *There is no significant difference in DISCERN scores based on type of organisation,* was not supported. There were significant differences in DISCERN scores based on type of organisation, $F(2, 36) = 10.14$, $p < .001$, $\eta^2 = .36$. Post hoc analyses using an LSD correction indicated that scores from governmental organisations, ($M = 3.06$, $SD = 0.53$) were significantly higher than scores from webpages of commercial origin, ($M = 2.18$, $SD = 0.45$), $p < .001$, $d = 1.78$. Scores from non-profit organisations, ($M = 2.75$, $SD = 0.54$) were also significantly higher than scores from webpages of commercial origin, ($M = 2.18$, $SD = 0.45$), $p = .01$, $d = 1.15$. Scores from governmental organisations, ($M = 3.06$, $SD = 0.53$) were not significantly different from scores from non-profit organisations, ($M = 2.75$, $SD = 0.54$), $p = .37$, $d = 0.58$. Figure 4 depicts this. There was no significant interaction between locality and type, $p = .78$.

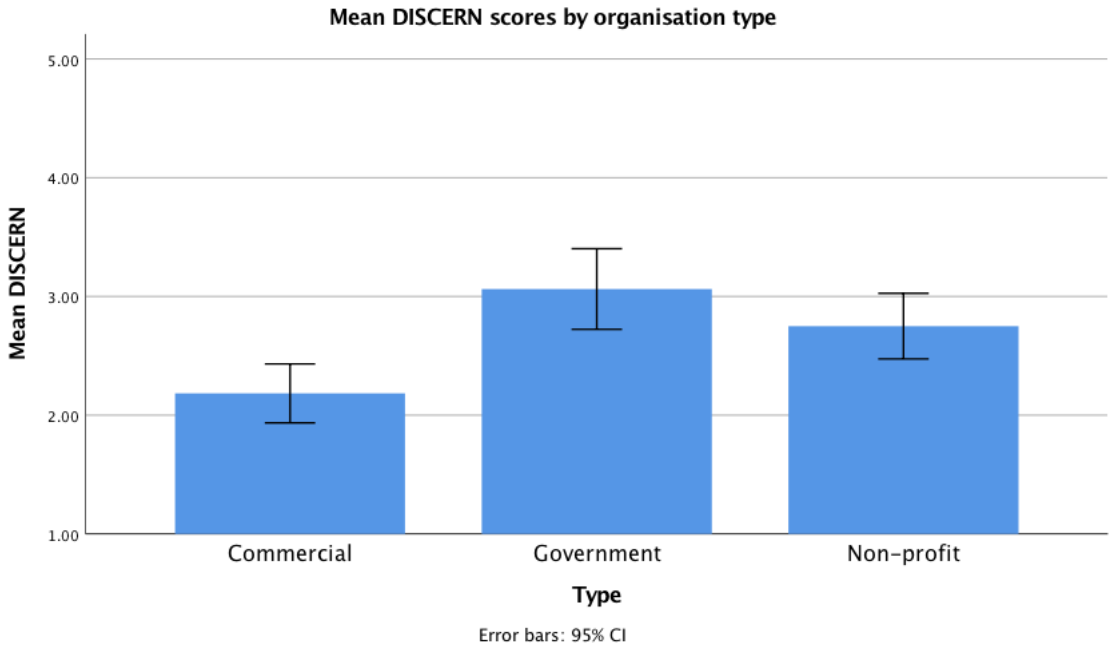

Figure 4. Mean DISCERN scores by organisation type

Note. Error bars represent the 95% confidence interval.

Six of the 44 webpages had HON certification. Two of these webpages originated from the Americas and four were coded as World. Hypothesis 10: *There is an even distribution of HON certification by locality* could not be tested because there were not enough webpages with HON certification for the cross-tabulation. Hypothesis 11: *There is an even distribution of HON certification by type of organisation* could not be tested for the same reason; however, of the six webpages that had HON certification, one was of governmental origin, one commercial, and four non-profit.

Due to a small sample size of webpages with HON certification, a two-tailed Mann-Whitney test was used to assess hypothesis 12, *There is no significant difference in DISCERN scores based on presence/absence of HONcode certification.* This hypothesis was supported. DISCERN scores of webpages with HON certification (*Mdn* = 2.75) were not significantly different from the DISCERN scores of webpages without HON certification (*Mdn* = 2.5),

$n_{HON} = 6$, $n_{noHON} = 38$, $U = 112.00$, $z = 0.07$, $p = .95$. The median DISCERN scores for webpages with and without HON certification is shown in figure 5.

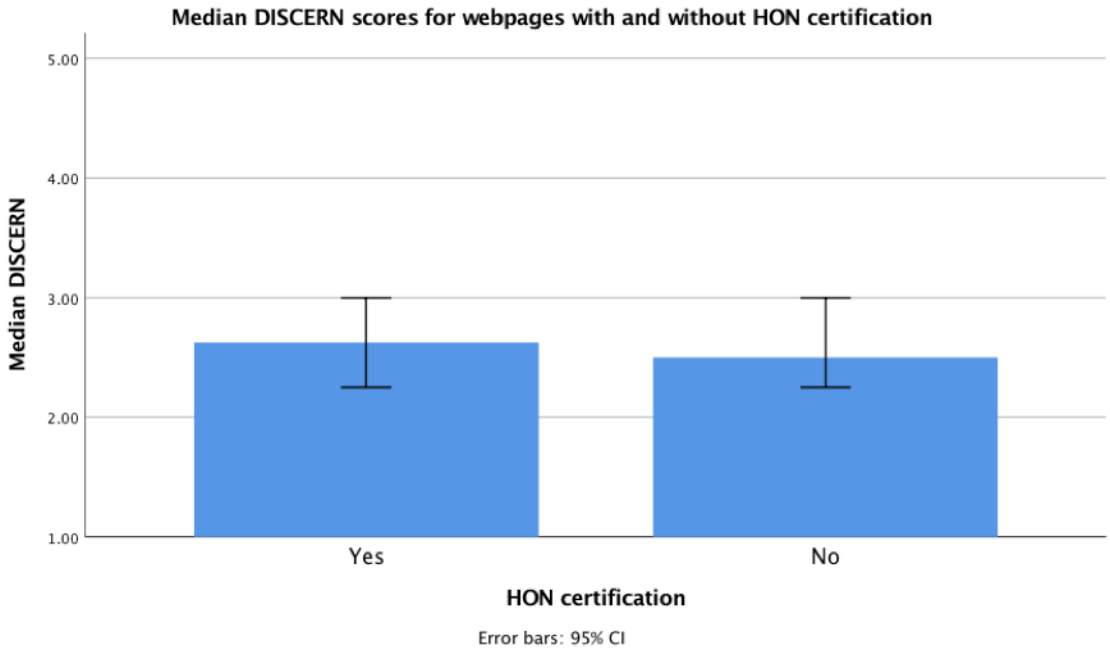

Figure 5. Median DISCERN scores for webpages with and without Health on the Net (HON) certification

Note. Error bars represent the 95% confidence interval.

3.4. Relationship between readability and quality measures

A one-tailed Pearson correlation was used to assess the hypothesis: *There is no significant relationship between DISCERN scores and RGL.* This hypothesis was supported by the data ($(p = .07)$: $r(44) = .23)$); no significant correlation between DISCERN scores and RGL was detected. This is depicted by figure 6.

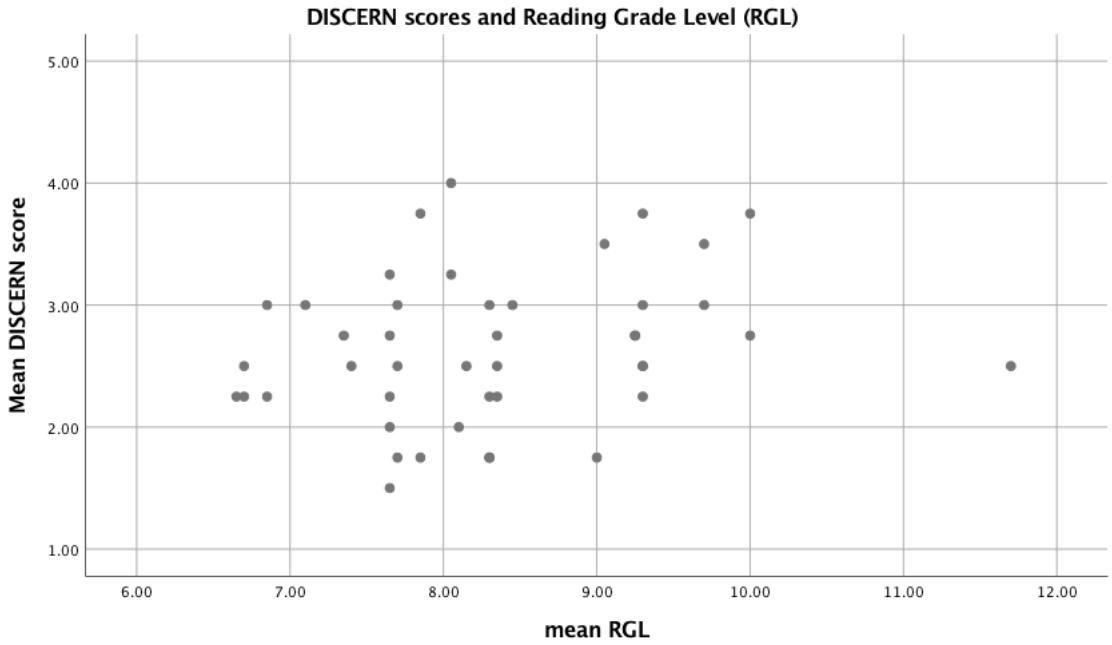

Figure 6. Relationship between DISCERN scores and Reading Grade Level (RGL)

The webpages ranged in length from 148 to 19976 words, with a median word count of 804.5 words. There were significant skewness, kurtosis, and outliers in the word count data; therefore, a Spearman's correlation was used to assess whether there was a relationship between word count and RGL or DISCERN scores. Hypothesis 14, *There is no significant relationship between webpage word count and RGL*, was supported. No significant correlation was detected between RGL and word count (($p = .19$): r_s (44) = .20): $r_s^2 = .04$).

Hypothesis 15, *There is no significant relationship between webpage word count and DISCERN scores*, was not supported. DISCERN scores and word count were significantly positively correlated for websites of commercial origin (($p = .01$): $r_s(15) = .59$): $r_s^2 = .35$), and for websites of governmental origin (($p < .001$): $r_s(12) = .91$: $r_s^2 = .82$), but not for non-profit (($p = .07$): $r_s(17) = .38$: $r_s^2 = .14$). Figures 7–9 show these findings.

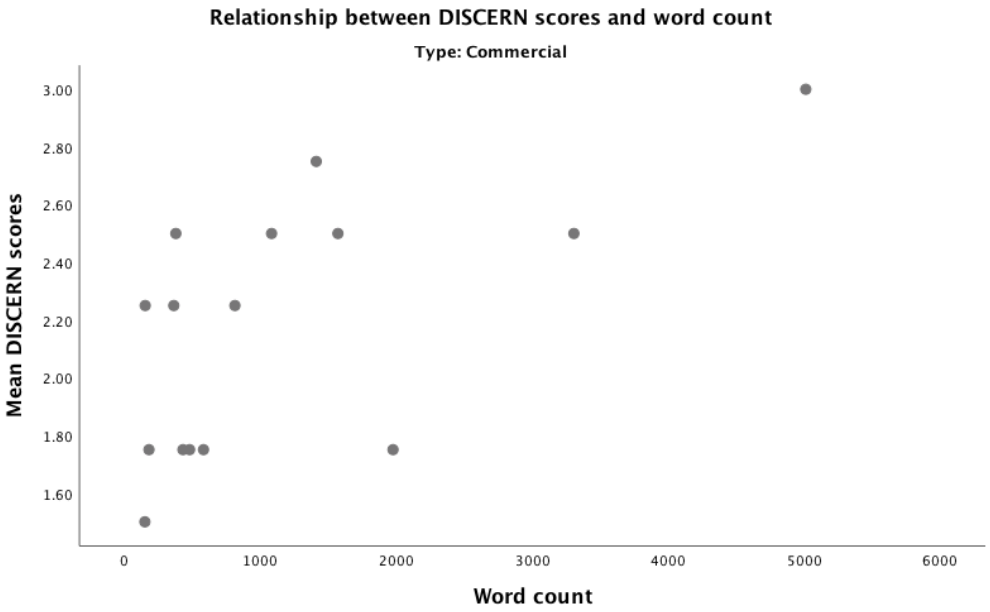

Figure 7. Relationship between word count and DISCERN scores for commercial webpages

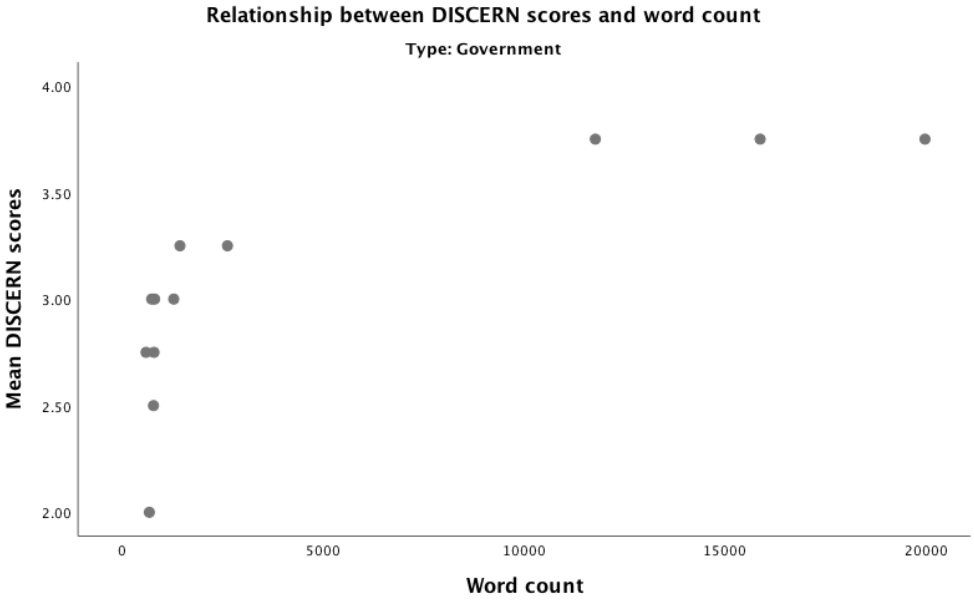

Figure 8. Relationship between word count and DISCERN scores for governmental webpages

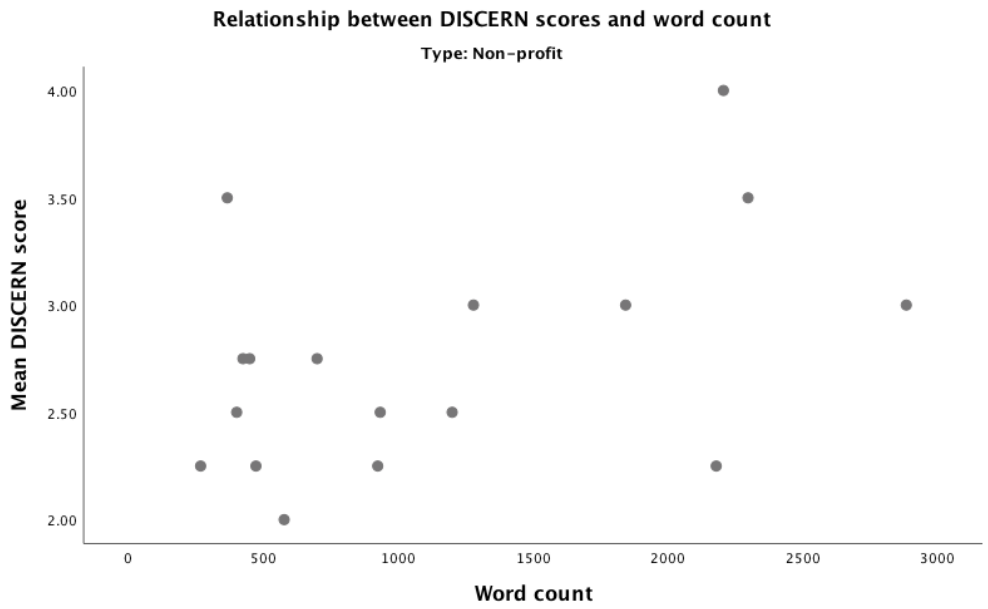

Figure 9. Relationship between word count and DISCERN scores for non-profit webpages

3.5. Summary of results

The analysis of the data demonstrated that the mean RGL of 8.31 is significantly above the recommended 6th RGL. No significant differences were found in readability based on the locality or type of hosting origination. DISCERN scores ranged from 1.5 to 4, with a mean score of 2.64 (*SD* = 0.61), and only 6 webpages had HON certification. No significant differences in DISCERN scores were detected between localities; however, webpages of governmental and non-profit organisations scored significantly higher than those from commercial origin. No significant relationship was detected between the DISCERN scores and either RGL or presence of HON certification. Similarly, no significant correlation was found between RGL and word-count data; however, DISCERN scores from websites of commercial and government origins were found to be significantly positively correlated with the word counts of the webpages.

CHAPTER 4. DISCUSSION

This study assessed the readability and quality of 44 webpages found through a Google search of 22 ccTLDs for hearing-related information in Spanish. This chapter will discuss the results presented in chapter 3 and compare these with the previous research introduced in chapter 1.

4.1. Part 1: Readability

Part 1 of this study aimed to estimate the readability of online hearing information in Spanish by calculating the RGL of the webpages found using the search criteria. The mean RGL of the webpages provided by the SOL and Crawford readability formulas was 8.31 (*SD* = 1.06). This is significantly higher than the recommended 6th grade level (Weiss, 2003), and suggests that, on average, readers would need over eight years of education to read and understand the material. The lowest mean RGL found was 6.65, suggesting that even the easiest-to-read webpage was written at above the recommended difficulty.

The mean RGL found in this study is lower than that reported in other studies of hearing-related information in English: in a systematic review, Laplante-Lévesque and Thorén (2015) found mean RGLs from 9 to 14. The RGL found in this thesis appears to be closer to (although still lower than) RGLs reported for Spanish-language health information. For example, Doval et al. (2018) used the SOL and GPMG formulas to assess internet information on breast reconstructions published in Spanish and found mean RGLs of 9.1 to 10.8 (depending on the webpage type and readability formula used). Similarly, in a study of non-hearing health information, Berland et al. (2001) found a mean RGL of 9.9 (*SD* = 2.5) for Spanish-language information using the GPMG (compared to 13.2 [*SD* = 2.1] for English-language websites using the Fry Graph). Conversely, Cardelle and Rodriguez (2005) used the Flesch formula, which accounts for the proportion of commonly used words, and found that the majority of Spanish-language health information was written at the 12th RGL

or higher. It appears that on the whole, studies on Spanish-language health information have reported lower RGLs than those focussing on English information. The difference in results found between the languages could suggest that the information available in Spanish is generally more readable than English, although it could also be related to differences in the formulas used. In any case, the results of this study suggest that, along with other health information, there is a discrepancy between the RGLs of Spanish-language online hearing information and the recommended 6th RGL for consumer health materials.

RGL was not found to be significantly associated with the webpage type (governmental, non-profit, or commercial). This is similar to the results of Laplante-Lévesque, Brännström, et al. (2012) who reviewed hearing-related internet information (in English) and reported no significant association between RGL and webpage type. Likewise, Doval et al. (2018) found no significant differences in RGL between academic/institutional websites and media/private Spanish-language websites on breast reconstruction. The current study also found no significant difference in RGL based on webpage word count, suggesting that the webpage lengths were not related to their readability. No significant difference in DISCERN scores was detected based on the location of the website host organisation. Website locations were grouped into Americas, Europe, or World (other) as there were not enough webpages found from each country to analyse countries separately; this study, therefore, cannot confirm whether an effect of location could be detected in a larger study analysing countries separately. Cardelle and Rodriguez (2005) also found no significant differences in RGL when comparing Spanish-language websites from within the US with international websites.

Interestingly, the two readability formulas used in this study provided notably different results (Crawford: $M = 5.89$, $SD = 0.7$; SOL: $M = 10.74$, $SD = 1.6$). Although the mean RGL when using both formulas was significantly greater than six, the mean RGL given

by the Crawford formula alone was below six. The Crawford was designed based on the Fry graph, which has been shown to produce irregular results when compared to other popular formulas (L. W. Wang et al., 2013). L. W. Wang et al. (2013) reported that the Fry formula produced results that were more variable (both higher and lower) than the outputs of other formulas, while the SMOG (origin of SOL) was the most consistent formula they assessed. Gallego Andrés (2017) also analysed different readability formulas for assessing health information and reported results suggesting that the Crawford formula tends to produce much lower RGL estimates than other formulas: materials that were subjectively judged as difficult to read (from experts in the health fields) were graded between the 5th and 7th RGL by the Crawford formula while other formulas rated the same materials as normal to very difficult to read, or between general-press and scientific/university levels.

The RGL estimates developed for the Crawford and Fry formulas are based on the grade levels that publishers assigned to their books (Crawford, 1984; Fry, 1968), which L. W. Wang et al. (2013) argued could be more subjective than a comprehension test, and also does not allow for a clear expected level of comprehension at each grade level. In comparison, the SMOG formula (origin of the SOL formula) was validated against 100% understanding in comprehension tests (Mc Laughlin, 1969) and therefore may be more conservative (L. W. Wang et al., 2013). Given the importance of proper understanding of health information, it may be more appropriate to use a more conservative readability estimation; however, the discrepancy between the results from the two formulas also highlights the importance of using more than one formula. In this study, the mean of the results from the two formulas was used for analyses as although the RGLs provided by the formulas were different, they were significantly positively correlated, suggesting that they are measuring aspects of the same thing.

4.2. Part 2: Quality

Part 2 of this study aimed to estimate the quality of the information found using the search criteria by applying the DISCERN tool and by the frequency of HON certification.

4.2.1. DISCERN

The DISCERN analysis provided a mean score of 2.64 (*SD* = 0.61), with scores ranging from 1.5 to 4. DISCERN scores are on a scale from 1 to 5, with a rating of 3 corresponding to a moderate score, and indicating fair quality (Charnock, 1997). According to the DISCERN scoring, this suggests that overall, the content of the webpages is a useful information source but has some limitations (Charnock, 1997). For comparison, a DISCERN score of 1 indicates a publication that is of poor quality with serious shortcomings— a publication that receives a score of 1 is unlikely to be beneficial as a source of information on treatment choices and should not be used (Charnock, 1997). By contrast, a score above 4 suggests a good-quality publication that is an appropriate and useful information source. This study found a mean DISCERN score of 2.64 (*SD* = 0.61), or just under 3. By DISCERN quality criteria, this score indicates that the information is of below-moderate quality and has some shortcomings that would require that the publications be supplemented with additional information or support.

The mean DISCERN score is similar to that found by Laplante-Lévesque, Brännström, et al. (2012), who used the DISCERN tool to rate hearing information in English and reported a mean rating of 2.04 (*SD* = 0.65). Similarly, Castillo-Ortiz et al. (2017) reported that 33% of Spanish-language webpages on rheumatoid arthritis had a low DISCERN score (score of 1), 42% moderate (score of 2 to 3), and 25% high (score of 4 or above). The range of DISCERN scores found in the current study was also highly variable (1.5 to 4). This is comparable to the range of scores reported by Laplante-Lévesque,

Brännström, et al. (2012; 1.13 to 3.93), and suggests that the quality of hearing information available on the internet is highly variable in both languages.

Significant differences in DISCERN scores were seen based on the type of website hosting organisation. The mean DISCERN scores for webpages of governmental (3.06, *SD* = 0.53) and non-profit (2.75, *SD* = 0.54) origins were significantly higher than those of commercial origin (2.18, *SD* = 0.45). Scores from webpages of non-profit and governmental origins were not significantly different. This is the same trend as that reported by Dueppen, Bellon-Harn, Radhakrishnan, and Manchaiah (2017) for English-language websites on voice disorders who also rated governmental and non-profit websites as significantly higher in quality than commercial websites. For hearing-specific information in English, Laplante-Lévesque, Brännström, et al. (2012) found that non-profit websites scored better on DISCERN than commercial and governmental websites, however reported no significant difference in DISCERN scores between governmental and commercial webpages. This trend appears to highlight commercial websites as a specific area of concern.

The DISCERN scores were significantly positively correlated with the webpages' word counts when looking at webpages of governmental or commercial origins, conveying that, in general, the longer webpages scored more highly by the DISCERN criteria. This could be because the longer publications were covering more information and had more opportunities to address some of the DISCERN criteria that require more depth.

Interestingly, the webpages' DISCERN scores were not significantly correlated with their RGLs, suggesting that websites that are highly readable may not also be of high quality, and vice versa. This was also found by Guo et al. (2018) for English-language information on failed back surgeries. The relevance to consumers is that it may be difficult to find information that is both high quality and easy to read, compounding the problems of poor readability or quality alone. Azios et al. (2017), however, found a positive correlation

between DISCERN scores and RGL for English-language information on aphasia, suggesting that the higher-quality webpages are more difficult to read. This pattern would also increase the barrier to accessing high-quality information.

4.2.2. Identifying problem areas

When analysing DISCERN items separately, mean scores varied from 1.22 (item 11: description of treatment risks) to 3.36 (item 3: relevance). This range of scores suggests that while all areas of the DISCERN criteria could be improved, some items highlight specific areas of concern. Some of the lowest mean scores (displayed in table 7, chapter 3) were seen for items 11: *Describing the risks of each treatment*, 13: *Discussion on the effects of treatment on quality of life*, and 15: *Support for shared decision making*. Laplante-Lévesque, Brännström, et al. (2012) also reported mean scores below 2.5 for these three items for English-language hearing information. The items that scored the lowest in the present study seem to be criteria that require more depth of discussion and completeness of information. A lack of completeness was also noted by Eysenbach et al. (2002) in a systematic review of studies on the quality of health information on the internet.

Interestingly, the mean DISCERN scores were notably better for discussing the benefits of treatments (item 10) than the risks (item 11), a trend also seen in English-language hearing information (Laplante-Lévesque, Brännström, et al., 2012). This could be related to the topic area, as most publications were not discussing high-risk surgeries or medications, however a discussion on pros and cons or possible expectations could be useful to people looking at hearing management options. Another area of concern discussed in other studies is the inclusion of sources of additional support or information (addressed by item 7). Cardelle and Rodriguez (2005) found that less than half of Spanish-language health webpages included links to further information, and Castillo-Ortiz et al. (2017) reported that only 36% of Spanish-language webpages on Rheumatoid arthritis provided sources of additional

information or support. This item received a mean score of 2.8 (*SD* = 1.18) in the current study, suggesting that, on average, the information partially fulfilled this criterion.

The referencing of information sources is also worth noting. Items 4 (*M* = 2.05, *SD* = 1.27) and 5 (*M* = 2.44, *SD* = 1.01) evaluate the referencing of the evidence behind claims regarding treatment choices. Although these were not some of the lowest scoring DISCERN items, their mean scores imply that, overall, the referencing among these webpages is less than optimal. Castillo-Ortiz et al. (2017) also found that over half of Spanish-language webpages on Rheumatoid arthritis failed to identify information sources, and referencing has also been identified as a specific area of concern for English-language information on aphasia (Azios et al., 2017) and failed back surgeries (Guo et al., 2018). Improving referencing would be an easy way of providing readers with information to confirm the trustworthiness of online information.

Some of the items that received comparatively high DISCERN scores include items 2: *aims achieved*, 3: *relevance*, 6: *balance and bias*, and 14: *clarity of whether other treatment options exist.* It is important to note, however, that the highest mean score (item 3: *M* = 3.36, *SD* = 0.80) still only corresponds to a partial score by the DISCERN criteria. Consistent with the current study, Laplante-Lévesque, Brännström, et al. (2012) reported items 3 and 14 as the highest scoring items (for English-language hearing information); however, unlike the current study, Laplante-Lévesque, Brännström, et al. (2012) identified items one and two as the two lowest scoring items. Castillo-Ortiz et al. (2017) also highlighted item 2 as a problem area for Spanish-language information on Rheumatoid arthritis, reporting that only 48% of webpages fulfilled their aims. This could suggest that the webpages assessed in the current study achieve their aims better than those analysed in previous research. However, item 2 was a particularly difficult item to rate: if publications only partially outlined their aims (item 1), it was difficult to make judgements on how well the aims were achieved.

To keep readability of health materials high, it is recommended to limit content to the essential information and not provide too much at once to avoid overloading the reader (Weiss, 2003). The current study, however, showed that longer webpages tended to score more highly by the DISCERN criteria. It is possible that improving the quality of health webpages may require increasing their length to improve completeness and avoid omitting essential information such as the effects of treatments on quality of life. Improving DISCERN item 1 (clarity of aims) may help to improve readability and avoid information overload: a clear table of contents and headings throughout the webpage would allow readers to more easily determine which sections are relevant to them. Improving DISCERN item 7 (including sources of additional support or information) could also address issues of completeness: providing clear links (with descriptions of what they cover) to other sources of information and support would allow the reader to easily find more detailed, specific information that is relevant to them, without introducing problems with information overload.

4.2.3. HON

Six of the 44 webpages (13.64%) found using the search criteria had HON certification. This rate of certification is similar to that reported in other studies of English-language webpages on aphasia (Azios et al., 2017), tinnitus (Manchaiah et al., 2018), and hearing (Laplante-Lévesque, Brännström, et al., 2012), but is lower than reported by Mayer et al. (2009) for Spanish-language health webpages (30%). Laplante-Lévesque, Brännström, et al. (2012) found differences in the rate of certification between websites of different origins, with websites of governmental origin showing higher rates of HON certification than non-profit or commercial websites. This difference was not detected in the current study as too few websites had HON certification to analyse their distribution; however, 4 of the 6 webpages with HON certification were from non-profit organisations, 1 was governmental, and 1 commercial. As HON is a voluntary certification, the low number of certified webpages does not necessarily mean that the webpages did not meet the criteria for

certification: it may reflect the popularity of HON in addition to the quality of the information.

While trust marks such as HON are designed to signal to consumers that a website meets a set of quality criteria, as McDaid and Park (2011) argued, they are only useful if consumers know to recognise them. Most consumers, however, are not aware of any quality standards for health information (Akerkar et al., 2005), and usually do not check for details regarding information sources (Eysenbach & Köhler, 2002). This highlights the need to raise awareness among consumers of the variable quality of online information and how to evaluate it as well as the need to increase the quality of the available information.

4.3. Study limitations

It was assumed for this study that the information found using the search criteria is representative of the information that Spanish speakers would be likely to encounter while searching the internet for hearing information. This study included only results accessed through Google, using 4 key search terms, and analysed the first 10 resulting webpages without exploring the full website. As this system did not involve real participants searching for information, there may be differences between this method and how consumers actually navigate the internet. Eysenbach and Köhler (2002)'s study suggests that consumers do not search for and evaluate information by entering a single search term and systematically reviewing the results, as is often assumed by researchers assessing internet information quality. However, using the most popular search engine and the top results is likely to reflect common experiences, and Laplante-Lévesque, Brännström, et al. (2012) pointed out that using country specific Google domains means that the search results are more representative of the population who might be searching Google in Spanish. Of course, the information available on the internet is always changing; this internet search was conducted on the 14th of

Sept 2017 and the same search conducted today would likely provide slightly different results.

This study also did not test the understanding of real people searching for hearing information. Instead, readability was assumed through the use of readability formulas which have their own limitations. Additionally, the two readability formulas used in this study produced substantially different outputs. Using more formulas may have provided a more accurate result. Although this study originally also employed the GPMG, the results from this third formula were not used due to many of its results corresponding to RGLs beyond the limits of the graph. Future research could use a wider range of formulas or test the understanding of real participants.

Another possible limitation of this study is that Spanish was not a native language for either of the DISCERN raters. Although both raters ensured that they had a good understanding of the content of the webpages before rating, differences in interpretation are possible. Also, the reliability between the two DISCERN raters was only fair. Although this was considered to be acceptable for the present study, ideally this reliability would be higher. DISCERN ratings are inherently subjective for most items; however, further practice and discussion before starting to rate the study materials may have improved the reliability. Additionally, some of the differences may have been related to some of the webpages not being entirely suitable for rating with DISCERN. The DISCERN tool was created to be used in its entirety and is specifically designed for use on materials related to treatment decisions (Charnock, 1997), yet many of the webpages rated in this study did not focus on treatment. This created an additional subjective decision during rating regarding whether or how to apply a DISCERN item that was not entirely appropriate. Future research could use more than one tool to judge quality.

4.4. Limitations of DISCERN and readability formulas

It is important to note that while the DISCERN tool incorporates many important aspects of quality, it does not cover all possible factors that contribute to the quality of health information. For example, it does not confirm the scientific accuracy of the evidence behind information provided in the publication (Charnock, 1997). This is demonstrated by questions 4 and 5 which address whether information sources are provided, but do not specifically require confirming whether these sources are trustworthy. Likewise, questions 6: *Is it balanced and unbiased,* 14: *Is it clear that there may be more than one treatment choice?* and 8: *Does it refer to any areas of uncertainty?* all surround the concept of reliability and trustworthiness of information but do not directly address accuracy. According to the DISCERN handbook, the tool does not attempt to confirm accuracy, but "assesses the most common causes of inaccurate or unreliable information" (Charnock, 1997, p. 7).

Mayer et al. (2009) recommended specifically analysing the content of internet information to appraise its accuracy. Fifteen to twenty percent of the webpages on vaccines analysed in their study that scored highly on their quality criteria still contained information that was misleading or incorrect (such as linking vaccines with cancer and autism). None of these webpages had quality certifications, although their criteria were similar to those required by HON. They found that websites containing incorrect or misleading information could still score highly by meeting criteria such as displaying author information and contact details, citing information sources (although not reliable ones), and displaying a publication date. While that particular study did not use DISCERN, it demonstrates how publications could score reasonably well overall on quality criteria while still missing essential elements such as accuracy.

Estimating readability through readability formulas also has some limitations. Although some readability formulas were developed using comprehension tests in their

validation (Mc Laughlin, 1969), readability as calculated by a formula cannot directly assume comprehension, as formulas do not account for all of the factors that will influence this. For example, prior knowledge and topic interest contribute to comprehension (Baldwin, Peleg-Bruckner, & McClintock, 1985), yet readability formulas are not specific to the reader and therefore cannot take into account any personal attributes (Redish, 2000).

Also, all of the readability formulas introduced in chapter 1 use word and sentence length to estimate readability. While longer words and sentences often are more difficult to read (Bailin & Grafstein, 2001; M. D. Wang, 1970), these factors do not account for all of the complexity of a text. Bailin and Grafstein (2001) pointed out is that although longer words are often more complex and less familiar, there are also many instances of shorter words that are less likely to be understood (Bailin & Grafstein, 2001). Similarly, although sentence length does play a part in comprehension (M. D. Wang, 1970), it does not represent sentence complexity alone (Bailin & Grafstein, 2001; M. D. Wang, 1970). On top of this, most readability formulas do not account other aspects of the text that can support comprehension such as its layout and visuals (Redish, 2000). L. W. Wang et al. (2013) found that the same formula could produce varying results by up to 6 RGLs depending on factors such as formatting and sample size.

Despite these limitations, readability formulas provide a quick and objective way to gauge how difficult a text is to read (DuBay, 2004; Klare, Rowe, St. John, & Stolurow, 1969), and are used commonly in research on the readability of health information (Barak & Sadovsky, 2008; Berland et al., 2001; Cheng & Dunn, 2015; Cooley et al., 1995; Gottlieb & Rogers, 2004; Greywoode et al., 2009; Hosey et al., 1990; Jolly et al., 1993; Laplante-Lévesque & Thorén, 2015; Wallace et al., 2005; Walsh & Volsko, 2008). Although the RGLs produced by different readability formulas are not always consistent (L. W. Wang et al., 2013), their outputs generally correlate well with each other and with comprehension

measures (DuBay, 2004). Similarly, Doak, Doak, and Root (1996) reported that readability measures are usually strongly correlated with suitability ratings given by the Suitability Assessment of Materials (SAM; Doak et al., 1996). The authors point out that although readability formulas are based on a small portion or the factors that can influence how easy a publication is to understand, their strong correlation with SAM scores suggest that they are an important predictor of overall suitability.

4.5. Clinical implications

HL is a prevalent health condition (WHO, 2012) that can greatly affect quality of life (Dalton et al., 2003; Mulrow et al., 1990; Scarinci et al., 2008), yet its impacts can be reduced with suitable management (Chisolm et al., 2007; Mulrow et al., 1990; Sprinzl & Riechelmann, 2010). People with HL and their families need to have access to information that can support them to properly understand their HL and management options. This study provides some insight into the quality and readability of information that Spanish speakers might find if they search the internet for information on HL.

If health information is either too difficult to read or of poor quality, it is unlikely to be sufficient to support proper understanding. Health professionals need to be aware of the type of information that patients may be accessing online and the possible disparities between the skills of their patients and the demands of the information. Increasing awareness among health professionals of the quality and readability of information could also help to improve information sharing practices: McVea, Venugopal, Crabtree, and Aita (2000) demonstrated that patient education materials were most effectively used in clinic if the clinicians were involved and familiar with the materials.

The internet can be a useful tool for sharing information: it can provide extra information outside of what is discussed during appointments, and it has potential to increase

access to health and hearing information to a winder population of people who may not visit a medical professional for a range of reasons. However, this study's results suggest that even if the internet can increase the number of people obtaining health information, this information may still not be fully accessible and useful to its readers.

The readability and quality of online hearing information in Spanish needs to improve for the internet to provide its full potential; therefore, the findings of studies such as this are also relevant to distributors and producers of health information such as authors and web developers. Hoffmann and Worrall (2004) suggest that the when creating written health information, authors should assess the reading level of a sample of their intended audience to ensure that they are writing their materials at a suitable RGL. The 6th RGL has been recommended as an appropriate target if this is unknown (Weiss, 2003), and DuBay (2004) recommends the revision of any materials written above the 9th RGL. Also relevant to producers of health information are the quality deficiencies identified in this study. Completeness of referencing and discussions around treatment options (specifically regarding risks/negatives, quality of life impact, and support for shared decision making) are two areas identified for improvement. Coulter et al. (1999) stress that creators of health information must start with clearly understand the needs of their readers, provide evidence-based treatment options, and involve multidisciplinary teams in the development and testing of materials.

4.6. Future directions

Readability formulas, the DISCERN tool, and HONcode were used to gauge the quality of online hearing information in Spanish. Together, these measures provide valuable information towards describing the standard of the information currently available on the internet. There are, however, other factors that contribute towards how useful information is

likely to be to its readers. Future research could address the accuracy of information. Additionally, the suitably of information could also be further investigated: the SAM tool (Doak et al., 1994) would provide some additional information on features such as graphics, layout, and cultural appropriateness. Future studies could also test the understanding of real participants searching for health information or measure real-world outcomes of internet information use such as HA use or confidence in audiological appointments. There is also a need for similar research in other languages. Multiple studies have focussed on the English language (Laplante-Lévesque & Thorén, 2015) but there are many languages for which the standard of online hearing information is unknown. Additionally, the available information on the internet is always changing. Similar studies to refresh or add to these results will be needed.

4.7. Conclusion

The mean RGL of the webpages assessed in this study is significantly greater than the recommended 6th RGL, meaning that it is likely to be too difficult to read for many people. The mean DISCERN score of 2.64 suggests that the information is generally of fair quality, has some shortcomings, and would require supplementary information to be a useful source of information on treatment choices; however, the quality was also highly variable with scores ranging from 1.5 to 4. Particular problem areas include describing risks of management options, discussing the effects of management options on quality of life, and providing support for shared decision making.

The internet is a common source of health information and quality and readability deficiencies may negatively impact on readers' understanding. These results suggest that people looking for Spanish-language hearing information on the internet may have difficulties finding information that is of sufficient quality and that they can read and

understand. If people are using the internet to support decision making regarding their hearing, the standard of the information they encounter requires attention.

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APPENDIX: LIST OF WEBPAGES

Table 8. List of webpage URLs with readability and DISCERN scores

Organisation	Website	Locality	Type	Hon	Crawford	GPMG	SOL	Mean RGL (SOL; Crawford)	DISCERN score	Word count
Junta de Andalucía	http://www.juntadeandalucia.es/educacion/webportal/abaco-portlet/content/aca52fcb-f247-4c4b-88b6-690486023ca3	Europe	Governmental	No	6.2	15	12.4	9.3	3.75	15873
Chile Ministry of Education	http://portales.mineduc.cl/usuarios/edu.especial/File/GuiaAuditiva.pdf	Americas	Governmental	No	6		9.7	7.85	3.75	11770
Clínicas de la Audición	http://www.clinicasdeaudicion.com/espanol/index.htm	Americas	Commercial	No	5.3	7	10.1	7.7	1.75	1974
Ecu Red	https://www.ecured.cu/Audición	Americas	Non-profit	No	6.9	14	12.5	9.7	3	2884
Innovación y Experiencias Educativas	http://www.csi-csif.es/andalucia/modules/mod_ense/revista/pdf/Numero_16/SABINA_PABON_2.pdf	Europe	Governmental	No	5.4	8	10.7	8.05	3.25	2611
Vera Cruz	http://eespecial.sev.gob.mx/difusion/auditiva.php	Americas	Governmental	No	6.7	11	11.8	9.25	2.75	781
Consejo Nacional de Fomento Educativo	https://www.gob.mx/cms/uploads/attachment/file/106806/discapacidad-auditiva.pdf	Americas	Governmental	No	6.4	11	13.6	10	3.75	19976
Catarina	http://catarina.udlap.mx/u_dl_a/tales/documentos/ldg/juarez_s_e/capitulo2.pdf	Americas	Commercial	No	5.3	7	10.1	7.7	3	5012
Fabioloasaca	http://fabiolasaca.blogspot.co.nz/2008/10/definicion-de-la-discapacidad-auditiva.html	World	Commercial	No	6.3	10	10.4	8.35	2.25	151
Auditiva S. A.	http://www.auditiva.org	Americas	Commercial	No	6.3		9	7.65	1.5	148
UAB	http://liceu.uab.es/~joaquim/phonetics/fon_percept/audicio/audicion.html	Europe	Governmental	No	6.3		9	7.65	3.25	1427
Descargas	http://descargas.pntic.mec.es/cedec/atencion_diver/contenidos/nee/discapacidadauditiva/cules_son_las_causas.html	Europe	Non-profit	No	6.7	11	11.8	9.25	2.75	424
FIAPAS	http://www.fiapas.es/FIAPAS/queeslasordera.html	Europe	Non-profit	No	6.2	12	11.9	9.05	3.5	366
Universidad Internacional de Valencia	http://www.viu.es/el-aprendizaje-en-los-ninos-con-discapacidad-auditiva/	Europe	Non-profit	No	5.6	8	9.7	7.65	2.75	699

Arcas Óptica	http://www.arcasoptica.com/audicion.html	Europe	Commercial	No	5.3	7	9.5	7.4	2.5	3305
Centro Europeo de la Audición	http://www.centroaudicion.com	Europe	Commercial	No	6.2	10	10.4	8.3	1.75	580
Centro Navarro de la Audición	http://www.centronavarrodelaaudicion.com	Europe	Commercial	No	6.3		9	7.65	2.25	811
Fundación Oír es Clave	http://www.oiresclave.org/index.php?option=com_content&view=article&id=1001:orientaciones-generales-sobre-discapacidad-auditiva-en-el-entorno-universitario&catid=12:articulos&Itemid=86	world	Commercial	No	6.1	9	10.2	8.15	2.5	1569
Viviendo el Sonido	http://www.viviendoelsonido.com/perdida_auditiva/ver/9/perdida-auditiva/sintomas/que-hacer	Europe	Commercial	No	5.6	10	11.1	8.35	2.5	376
EUMUS	http://www.eumus.edu.uy/docentes/maggiolo/acuapu/sac.html	Americas	Non-profit	No	7.2	13	16.2	11.7	2.5	933
Clínica Auditiva	http://www.clinicaauditiva.com.uy	Americas	Commercial	No	7	15	11	9	1.75	477
CDC screening	http://www.cdc.gov/ncbddd/spanish/hearingloss/screening.html	Americas	Governmental	No	5.1	7	9.1	7.1	3	798
CDC Sordera	http://www.cdc.gov/ncbddd/spanish/hearingloss/types.html	Americas	Governmental	No	5.5		9.2	7.35	2.75	583
CDC NIHL	http://www.cdc.gov/spanish/niosh/docs/2001-103_sp/	Americas	Governmental	No	6.2	15	12.4	9.3	3	724
CDC childhood	http://www.cdc.gov/ncbddd/spanish/hearingloss/facts.html	Americas	Governmental	No	5.1	7	8.6	6.85	3	1272
Medline Plus	https://medlineplus.gov/spanish/ency/article/003044.htm	Americas	Governmental	Yes	6.2	15	12.4	9.3	2.5	768
American Academy of Physicians	http://es.familydoctor.org/familydoctor/es/prevention-wellness/staying-healthy/occupational-health/hearing-noise-induced-hearing-loss.html	Americas	Non-profit	Yes	5.3	7	10.1	7.7	2.5	1200
Healthline	http://es.healthline.com/health/perdida-de-la-audicion	World	Non-profit	Yes	5.9	10	11	8.45	3	1279
ASHA	http://www.asha.org/uploadedFiles/Tipo-grado-y-configuracion-de-la-perdida-de-audicion.pdf	Americas	Non-profit	No	4.4	5	9	6.7	2.25	472
ENT Net	http://www.entnet.org/content/en-español-la-pérdida-de-la-audición	Americas	Non-profit	No	3.9	4	9.4	6.65	2.25	924

Understood	https://www.understood.org/es-mx/learning-attention-issues/child-learning-disabilities/auditory-processing-disorder/understanding-auditory-processing-disorder	Americas	Non-profit	No	5.4	8	10.7	8.05	4	2206
Inclúyeme	http://www.incluyeme.com/todo-lo-que-necesitas-saber-sobre-discapacidad-auditiva/	Americas	Governmental	No	5.9	8	10.3	8.1	2	664
Kids Health	http://kidshealth.org/es/kids/hearing-impairment-esp.html	World	Non-profit	No	4.4	5	9	6.7	2.5	401
GAES	http://www.gaes.es/conoce-tu-oido/problemas-auditivos/que-es-la-perdida-auditiva	Europe	Non-profit	No	5.6	8	9.7	7.65	2	577
Hear-it	http://www.hear-it.org/es/Los-discapacitados-auditivos-y-el-lugar-de-trabajo	World	Non-profit	Yes	5.6	10	11.1	8.35	2.75	449
WHO	http://www.who.int/mediacentre/factsheets/fs300/es/	World	Non-profit	Yes	6.2	15	12.4	9.3	2.75	2179
Wiki Audición	https://es.wikipedia.org/wiki/Pérdida_de_audición	World	Non-profit	No	6.2	10	10.4	8.3	3	1843
Wiki Sistema Auditivo	https://es.wikipedia.org/wiki/Sistema_auditivo	World	Non-profit	No	5.1	7	8.6	6.85	2.25	267
Wiki Sordera	https://es.wikipedia.org/wiki/Sordera	World	Non-profit	No	6.9	14	12.5	9.7	3.5	2297
Cochlear	http://www.cochlear.com/wps/wcm/connect/es/home/understand/hearing-and-hl/hl-treatments/hearing-aids	World	Commercial	No	6		9.7	7.85	1.75	428
Med-El	http://www.medel.com/es/hearing-loss/	World	Commercial	No	6.2	10	10.4	8.3	2.25	361
Oticon	http://www.oticon.es/hearing/what-is-hearing/what-is-hearing-loss/	World	Commercial	No	6.2	15	12.4	9.3	2.5	1081
Siemens	https://lat.bestsoundtechnology.com/hearing-loss/	World	Commercial	Yes	6.4	11	13.6	10	2.75	1409
Phonak	https://www.phonak.com/es/es/hearing-loss.html	World	Commercial	No	6.2	10	10.4	8.3	1.75	178