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Reading speed in subtitling for hearing impaired children: an analysis in Spanish television

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ABSTRACT

Reading speed is one of the essential parameters to consider when designing subtitles for a hearing impaired audience. Images, subtitles and spoken dialogue are the three sources of information in a subtitled audiovisual text. These three sources of information, along with the reading capacity of the audience, make up the basic characteristics of the medium (De Linde and Kay 1999). Hence, it seems essential to comprehend and characterise the reading ability of the audience in order to create relevant subtitles. The present article seeks to investigate speed of D/deaf¹ and hard of hearing subtitling (SDH)—also known as captioning—for children. It seeks to do so by describing, analysing and evaluating the SDH broadcast by the three channels exclusively dedicated to the youngest audience in Spain. The analysis is compared with the UNE Standard 153010 and put into context by drawing on existing studies in the field.

KEYWORDS

Subtitling, SDH, audiovisual translation, accessibility, children, subtitling speed.

RESUMEN

La velocidad de lectura es uno de los parámetros fundamentales para diseñar subtítulos para un público con pérdida auditiva. Las imágenes, los subtítulos y el diálogo audible son las fuentes de información del texto audiovisual subtitulado. Estas tres fuentes de información, junto con la capacidad lectora de la audiencia, conforman las características básicas del medio (De Linde y Kay 1999). Parece, pues, indispensable, comprender y caracterizar la capacidad lectora de la audiencia para diseñar subtítulos relevantes para la misma. El presente trabajo pretende dar cuenta de la realidad de la velocidad de lectura para el subtitulado para personas sordas (SPS) dedicado a niños, mediante una descripción, análisis y evaluación del subtitulado emitido por los tres canales dedicados exclusivamente a la programación infantil y juvenil en España en comparación con la vigente norma UNE 153010 y con la revisión teórica de estudios previos.

PALABRAS CLAVE

Subtitulación, SPS, traducción audiovisual, accesibilidad, niños, velocidad del subtitulado.

1. Introduction

1.1 Object of study

The present piece of research aims at analysing and evaluating two variables, namely subtitling speed and pause between subtitles, related to the reading of subtitles in the Spanish television channels dedicated exclusively to the youngest audiences. To do so, previous relevant studies focusing on subtitling speed and pause between subtitles are reviewed. Based on those previous studies, a maximum subtitle speed and a

minimum pause between subtitles for hearing impaired Spanish children are established for the present study. These are then compared and analysed in triangulation with data gathered and with the current UNE Standard in Spain to discuss and draw conclusions about the homogeneity and quality of SDH for children in Spanish television. Those conclusions lead to hypotheses about the adequacy of current SDH practices in meeting the needs of the audience. Any hypotheses will need to be validated or refuted in a future reception study with hearing impaired children, in which comprehension scores of subtitles are analysed in relation to the variables.

1.2 Variables

For hearing adults, reading speed is considered to be around 66% of the average speaking speed (De Linde and Kay 1999). This means that subtitles for hearing adults should have a reduction of at least one third of what is being heard in order to be read completely. If the subtitle does not stay on screen long enough, the viewer is forced to read too fast and might have the feeling he or she has *read* the video instead of *watched* it (Díaz Cintas and Remael 2007). Studies claim that understanding a subtitle does not only rely on reading, but also on comprehending and assimilating its message (Díaz Cintas 2003). Reading does not necessarily mean understanding and, therefore, the time a subtitle remains on screen should be enough to allow, on the one hand, an adequate reading pace and, on the other hand, cognitive processing of the information to understand it.

In comparison with subtitles for adults, “children’s subtitles have to be displayed for longer, entailing more editing of the dialogue in order to keep them within the original structure of a programme” (De Linde and Kay 1999: 52). In the case of children with hearing impairment, it must be taken into account that they face the reading activity and its learning process in a very different way to their hearing counterparts (Neves 2005). More specifically, “as shown by both Conrad (1977) and Torres Monreal and Santana Hernández (2005)², the reading level of deaf high school students corresponds to that of hearing students who are seven years younger” (Romero Fresco 2010: 179). More recently, Traxler (2000) found out that the median reading skills of deaf students aged between 8 and 18 were equal to those of hearing students in fourth grade (aged between 9 and 10). Although reading habits and hearing aids have certainly changed over the last decades, it remains true that reading imposes added difficulties for deaf people, who usually have less language-specific knowledge (semantic and syntax) and also less of the oral skills necessary for reading (Torres and Santana 2005). Nevertheless, and bearing in mind that 80% of hearing impaired children attend mainstream schools (Zarate 2010a), it seems evident that “most deaf children are somehow in contact with the spoken [and written] language”

(Zarate 2010a: 160). It remains controversial, however, whether reading abilities are linked to oralisation and phonemic awareness derived from contact with spoken language or not. Authors, such as Adams (1990), argue that in very young children reading involves dividing words into smaller units and associating letters with sound and, then, with the larger meaning of the text. This is known as bottom-up reading comprehension theory, which states that reading comprehension starts with the comprehension of small linguistic units and moves towards the comprehension of larger units such as words, sentences or paragraphs to understand written text. In other words, phonemic awareness and the ability to name letters quickly and accurately will define success in reading for very young children (Adams, 1990 in Padden and Ramsey, 1998). On the other hand, surveys conducted by Simpson et al. (1992) on deaf children aged 7 and above suggest that “reading comprehension scores [of hearing impaired children] are higher than their reading accuracy scores” (in Zarate 2010b: 117), lending weight to the argument that “language is only one of the factors involved in comprehension” (Zarate 2010b: 117). This top-down reading comprehension theory supported by Simpson et al. (1992) argues that reading comprehension relies on more global aspects, such as general linguistic knowledge or prior knowledge of the world, and then moves to smaller linguistic units in the text, such as sentences and words.

Despite contact with oral language, the way deaf children communicate might still differ from that of their hearing counterparts. According to a study conducted by Gregory (1976) with deaf children aged 2 to 5 years “deaf children naturally choose to communicate through a visual modality” (in Zarate 2010a: 160). However,

Up until fairly recently, Deaf children were brought to ‘oralise’. This meant that they were taught to pronounce words and to make use of lip reading to understand speech. Communicating through sign language was not widely accepted and Deaf people were forced to use the national oral language, regardless of the fact that their hearing and speech apparatuses were not tuned to such a task. The ways in which Deaf children are educated determine their development and their perception of the world. Their proficiency in the use of language will be of paramount importance in their ability to decode messages (Neves 2009: 155).

Furthermore, it should be kept in mind that the group of hearing impaired children is a heterogeneous one and reading speed and ability of hearing impaired children might differ greatly from that of hearing children, especially in prelocutive Deaf children:

Firstly, they lack the reinforcement in the oral language that hearing children receive from the womb (a foetus is said to be able to hear the mother’s voice sixth months into the pregnancy) and throughout their lives (continuous exposure to conversations, television, sound information in the street and means of transport, etc.). Secondly, the overall Spanish educational system currently displays serious shortcomings with respect to

the education of deaf children, which leads to poor development of both communicative skill in general and of oral language in particular. This, in turn, makes it much more difficult for deaf individuals to have access to culture (Lorenzo 2010: 124).

Moreover, other problems linked to hearing impairment, such as the difficulty in storing and processing information (Neves 2005), might contribute to the above mentioned poorer reading skills and comprehension of hearing impaired children, who still lag behind their hearing counterparts (cf. Cambra et al. 2009). Despite some controversies, all these findings lead to the conclusion that hearing impaired children communicate and read in a different way to their hearing counterparts and therefore will need subtitles that are adapted to their reading ability and speed. Nevertheless, when determining the maximum words per minute (wpm) or characters per second (cps) for SDH for children, research also seems to point in different directions. Some studies suggest that a subtitle speed of 90 wpm is too fast for children aged between 8 and 15 (Padmore 1994, in De Linde and Kay 1999); a speed of about 60 wpm has been considered more effective not just to read the message, but also to process and comprehend subtitles in various languages (cf. Baker et al. 1984, Baker 1985, De Linde and Kay 1999). The Office of Communications (Ofcom), after carrying out an experiment with hearing impaired adults—21 being moderately deaf and 22 being profoundly deaf—concluded that subtitling speed for hearing impaired adults should not exceed 180 wpm or 15 cps (Romero Fresco 2010: 180). Being 15 cps the maximum speed recommended for hearing impaired adults, it seems obvious that the maximum cps for hearing impaired children should be lower. Thus, the same report recommends a speed of between 70 and 80 wpm for hearing impaired children. In contrast, research conducted by Tyler et al. (2009) with 20 deaf students between 9 and 16 years old, who watched audiovisual texts with no sound and subtitling speeds of 90, 120 and 180 wpm, concluded that a speed of around 120 wpm may be appropriate for hearing impaired children.

Be that as it may, it seems evident that reduction in subtitling speed is needed to adapt SDH to the needs of the youngest hearing impaired audiences. To achieve such reduction, a “greater amount of word omissions and increased on-set and off-set times” (De Linde and Kay 1999: 57) might be needed. Nevertheless, these kinds of adjustments might affect comprehension, since the lack of synchrony between image and text could have negative effects in legibility (De Linde and Kay 1999: 57). The priority in SDH, however, seems to be “the conveyance of meaning as fully as possible in as ‘readable’ manner as possible” (Neves, 2009: 160) which quite often requires extra reading time (Neves, 2009) in order to read and assimilate subtitles. Such a priority makes other key aspects in subtitling for the hearing community (such as synchronisation with the audible message) less relevant. In this sense, in order to provide the hearing impaired audience with the extra reading time they need,

subtitles may appear a little earlier or stay a little longer than the time provided by the audible message they refer to, thus sacrificing synchronisation (Neves 2009: 160). It is also worth mentioning that “reading speed is closely linked to the delivery of speech. Programmes aimed at very young children [...] generally present a more acceptable and lower reading rate because the speech rate is slower too” (Zarate 2010b: 115). Hence, achieving an adequate subtitle speed in audiovisual texts might not always require a great amount of omission and/or reduction of information if the programme has been specially designed for the youngest audiences.

Furthermore, it cannot be forgotten that watching subtitled audiovisual programmes cannot be reduced to the activity of reading subtitles. Enough time should be allowed for taking in images. Research carried out by Cambra et al. (2014), which aimed at exploring visual-attention patterns of hearing and hearing impaired children, suggests that the faster the reading speed, the more time the audience spends paying attention to the subtitles, showing that viewers’ reading speed correlates positively with attention to subtitles. Therefore, surprisingly, deaf children in the study spent less time reading subtitles, when compared to their hearing classmates. These results and conclusions, nevertheless, may be questioned due to the limited number of participants (11 hearing children and 11 prelingually profound deaf children). The same study also suggests that children stop paying attention to subtitles even when watching a short clip (the clip used was only 105 seconds long). Based on these two findings, the authors suggest that a slower subtitle speed that allows spaced reading may help hearing impaired children pay more attention to subtitles while allowing them greater enjoyment of the audiovisual material (Cambra et al. 2014).

The 2012 Standard in Spain, the UNE 153010, states that “the exposure speed of the text should follow the rhythm of the original and facilitate comfortable reading” [author’s translation] (AENOR 2012: 10) and emphasises that “when necessary, subtitle speed could be reduced to facilitate reading by using strategies for the economization of vocabulary” [author’s translation] (AENOR 2012: 10) but, in contradiction, points out that “subtitles should be literal” [author’s translation] (AENOR 2012: 18).

Considering the heterogeneity of children to which SDH of analysed programmes are addressed in the present study and bearing in mind all previous studies mentioned above and new empirical findings about the need for spacing captioning to enable better comprehension and enjoyment of the audiovisual material as a whole, a subtitling speed of 60 wpm has been set as the maximum recommended speed for the present study. The average length of a word in Spanish is considered to be 4.9 characters (cf. Arnáiz 2012: 119, Pierce 1980, Morelli 2010), which sets the maximum subtitle speed at around 12 cps for children with hearing impairment as the recommended speed in this study.

A variable closely linked to the reading speed parameter is the pause between subtitles, which is the second variable under study in the present paper. For subtitles to be processed correctly, besides an adequate subtitling speed, a minimum pause between subtitles is needed for the human eye to notice the presence of a new subtitle:

At least four frames should be inserted between two consecutive subtitles in order to avoid the effect of a subtitle overlay. This time break is necessary to signal to the brain the disappearance of one subtitle and the appearance of another (Sponholz 2003: 24).

Similar to the disagreements found in determining the optimal subtitling speed, discrepancies have also occurred when trying to determine the ideal duration of the pause between subtitles. Yet it seems clear that such a pause is needed to avoid an overlay effect:

About $\frac{1}{4}$ of a second needs to be inserted between two consecutive subtitles in order to avoid the effect of subtitles' 'overlay.' This time break is necessary to signal to the brain the disappearance of one subtitle as a piece of linguistic information, and the appearance of another. If no such gap is maintained, the viewers' eye cannot perceive the change of the new subtitled text, especially if it is of the same length as the antecedent one (Karamitroglou 1998: 4).

Some researchers such as Karamitroglou (1998) suggest a minimum pause of six frames, which corresponds to around one quarter of a second. Other authors such as Ivarsson (1992), Castro Roig (2001) or Sponholz (2003) recommend four frames while Mayoral (2001) and Díaz Cintas (2001) lower the minimum pause needed to three frames (cf. González Iglesias 2012: 40) and Díaz Cintas and Remael to only two frames (2007: 92). In the present study, a value of 4 frames (corresponding to 0.16 seconds in television) will be taken as a minimum pause, as recommended by authors such as Ivarsson (1992), Castro Roig (2001) or Sponholz (2003), and taking also into account that it is an in-between value of all recommendations mentioned above. The current UNE Standard does not mention this parameter in its recommendations.

Other aspects that might affect pauses between subtitles (such as camera cuts) have not been considered for the present study, although research on how visual channel editing of audiovisual products affects pause between subtitles would be useful in the field, since this minimum pause recommended might vary when a camera cut occurs:

Because the eye is sensitive to the twitch that occurs when a subtitle break does not coincide precisely with a cut, subtitles that go over a cut between camera takes should be avoided. Subtitles should disappear at least four frames before the cut and should be inserted no earlier than three frames after the cut in order to avoid a flashing effect. Where it is unavoidable for a subtitle to go over a cut, it should stay on for at least one full second after the cut. (Sponholz, 2003: 24)

The literature review of studies focusing on the variables of the present article allows establishing a minimum pause between subtitles and a maximum recommended subtitle speed, that serve as a base for the discussion of the analysed products. In the following section, materials and methods for the present study are introduced.

2. Materials and methods

In the present study, all three Spanish DTT (Digital Terrestrial Television) channels exclusively aimed at children and young audiences were studied, i.e. Boing, Clan and Disney Channel. Specific data for different children's programmes relating to the variables and subject of study were collected and analysed in a qualitative and quantitative manner in order to investigate the reading speed for hearing impaired children in Spanish television.

The programmes of the corpus were directly recorded from DTT with the DVD player Easy Home Combo HD. This DVD player recorded files in .ts format. The software ProjectX was used to extract the subtitles in .srt format from the .ts files. Once all subtitles were gathered in .srt format with cue-in and cue-out times, quantitative data was gathered. Data regarding the two variables being studied, subtitle speed and pause between subtitles, was gathered quantitatively using the tool BlackBox³ designed by González Iglesias (2012). Although the data is numeric and analysable in a purely quantitative way, a qualitative analysis was also carried out in comparison with the theoretical consideration of the variables discussed above. A qualitative approach helps to draw conclusions when taking into consideration differences between genres, specifications of the UNE Standard, and contradictory conclusions of existing research, as discussed above. The variables and their possible values in Corpus 1 are shown in Table 1:

PARAMETER	VARIABLE	POSSIBLE VALUES
Reading Speed	Subtitling Speed (in cps)	≤10 11 12 (maximum recommended in the present study after theoretical analysis discussed in the previous section) 13 14 15 (maximum recommended by UNE Standard) 16

		17 18 19 ≥20
	Pause between subtitles	≤0.16 seconds (4 frames) >0.16 seconds (4 frames)

Table 1. Variables studied and their possible values

Data from each of the two variables was imported to the statistical analysis software IBM SPSS Statistics. The qualitative analysis regarding possible consequences of the observed practice was carried out based on quantitative data measured in cps and seconds. Then, hypotheses and conclusions concerning current practices related to reading speed for SDH aimed at children watching Spanish television were derived from the quantitative and qualitative analysis.

With the aim of selecting a corpus relevant for the present study, research conducted by Barambones (2012) was taken as a reference, as it makes use of methodologically reasoned criteria applicable to the selection of the object of study for the present paper. Such criteria were used to extract the catalogue or Corpus 0 and, subsequently, Corpus 1, which served as an instrument for the extraction of data for the present study.

In the present study, data was gathered subtitle by subtitle, since both variables can be represented numerically and data can be gathered individually for each subtitle without taking into account their audiovisual context.

The basic data of the catalogue or Corpus 0 can be summarised as follows:

Physical space	Clan, Boing and Disney Channel
Temporary space	From 14/01/2013 to 14/02/2013
Sample	8,654 broadcast programmes in 32 days
Number of entries	8,654
Minutes	124,544 (2,075 hours and 44 minutes)

Table 2. Summary of the data of Corpus 0

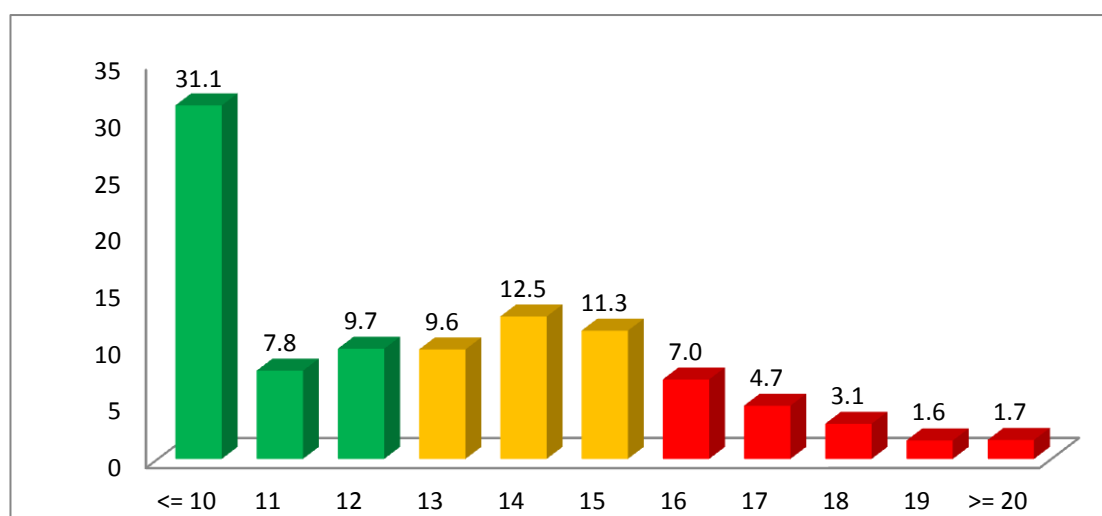
Corpus 1 is made up of a group of audiovisual texts which are representative of Corpus 0. For Corpus 1 to be representative of Corpus 0, a significant sample of Corpus 0 was chosen to assure access to relevant and reliable data. For the sample to be representative of Corpus 0 the minimum sample size for Corpus 1 was calculated using a statistical

formula. The formula used for the calculation of the minimum sample size (see Morales Vallejo 2012) facilitates the extraction of an exact amount of minutes, ensuring that the analysed corpus is representative of the catalogue. A minimum of 383 minutes were calculated to be necessary. These minutes were divided equally between the three channels, resulting in a total of 128 minutes for each channel. For the distribution of these minutes to be, on the one hand, relevant for the present study and, on the other hand, representative of Corpus 0, the main objective of the present study was taken into account as well as the percentages of audiovisual genres⁴ and origins⁵ extracted from of one whole week of broadcasts on all three channels. Hence, programmes of different genres and origins in accordance with their frequency on each television channel were included. This permits an analysis and discussion of data not only generally and according to each channel, but also regarding differences shown by various audiovisual genres.

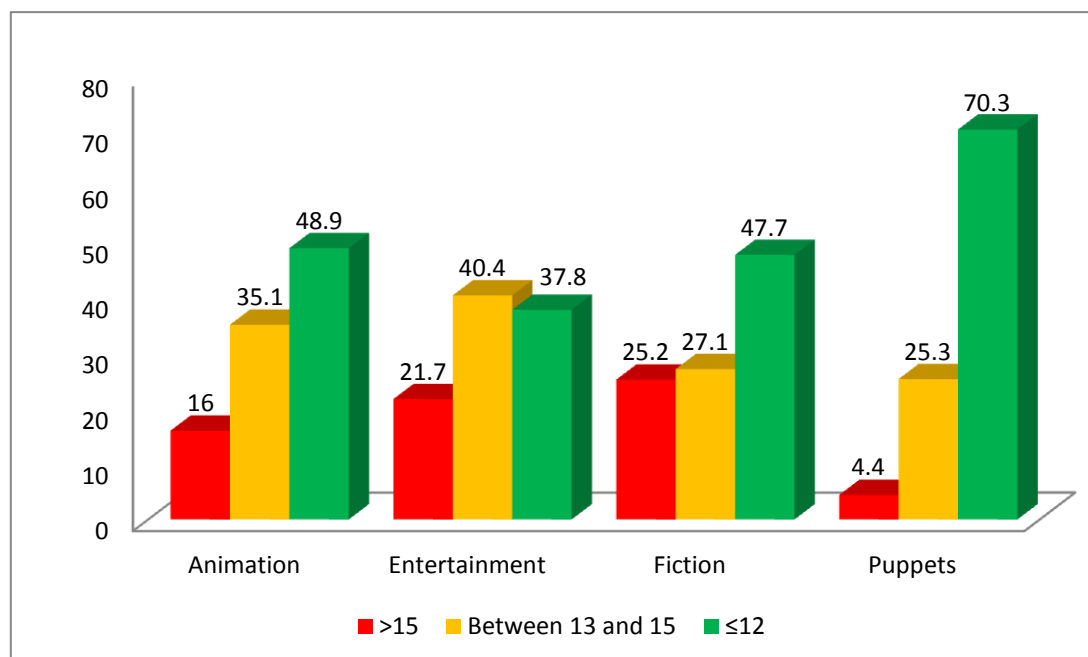
3. Results and discussion

In this section, results regarding subtitle speed and minimum pause between subtitles will be discussed in general terms and for every audiovisual genre in Corpus 1. These results will then be filtered by TV channel to discuss differences in the subtitling practice in the three channels under study.

Graph 1 illustrates percentages of the different possible values in subtitling speed and Graph 2 shows these same percentages focusing on genres and in three different groups, namely, above 15 cps and therefore not complying with the recommendations of the UNE Standard (in red), between 13 and 15 cps (in yellow) and equal to or below 12 cps (in green), therefore complying with the maximum established according to existing theory outlined in the present article.



Graph 1. Subtitle speed in Corpus 1



Graph 2. Subtitle speed, comparison between genres

These two graphs show that the genre *puppets* is the most adequate, in terms of subtitle speed, for the needs of children with hearing impairment: above 70% of subtitles in this genre are broadcast at a subtitle speed equal to or below 12 cps. On the other hand, it is worth noticing that 20% of subtitles for the genres *entertainment* and *fiction* do not comply with UNE Standard recommendations.

Animation and *puppets* are the genres that present a lower percentage of subtitles that demand excessively fast subtitle reading. These genres are usually addressed at younger audiences and, generally speaking, the presence of dialogue is less frequent and uttered at a lower speed (cf. Zarate 2010b). In other words, because they are addressed at very young children, these genres encode more information through non-linguistic signification codes (iconography, lighting, music, special effects...) and the audiovisual texts themselves present different characteristics. The dialogue fragments are fewer and of slower utterance and allow more exposure time for subtitles on screen.

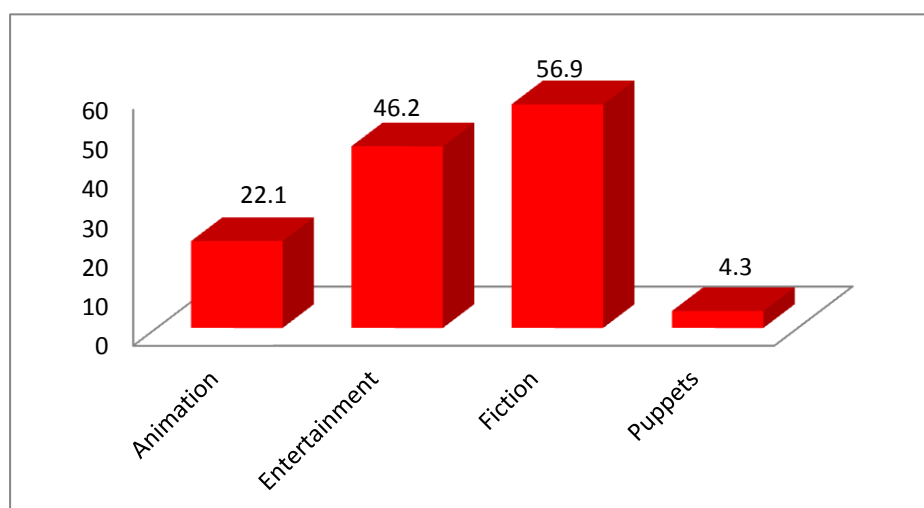
In Corpus 1 a total of 102 subtitles at a speed of 20 cps or faster were found. Although this figure does not translate into a representative percentage of the corpus (only 1.7%), any subtitle at such speed within a corpus aimed at young audiences is worth mentioning, since that speed is not even recommended for hearing adults, as demonstrated by various researchers (cf. Bannon 2009; Díaz Cintas 2008 and 2010; González Iglesias 2012; Gottlieb 2001). Genres broadcasting more subtitles at this

speed rate are animation (79 cases, 1.8%) and fiction (23 cases, 1.8%). These data might be due, in the first case, to the fact that it is the most preponderant genre in Corpus 1. In the second case, it might be due to the very nature of the fiction genre, which is aimed at older children or teenagers and usually includes a more dynamic dialogue. When subtitling for these two genres, a greater effort at omission and condensation of the information should be made, as recommended by the UNE Standard, in order to provide adequate subtitles for hearing impaired children.

Regarding the second variable under study, the pause between subtitles, over 30% of analysed subtitles do not comply with the minimum, according to existing findings, of 4 frames or the equivalent 0.16 seconds (TV broadcasting speed is 25 frames per second) (Díaz Cintas 2003; González Iglesias 2012).

Similar to subtitle speed, data shows that the minimum pause between subtitles is probably dependent on the audiovisual genre; this pause is observed less frequently in texts where dialogues tend to be more dynamic, such as in fiction or entertainment genres.

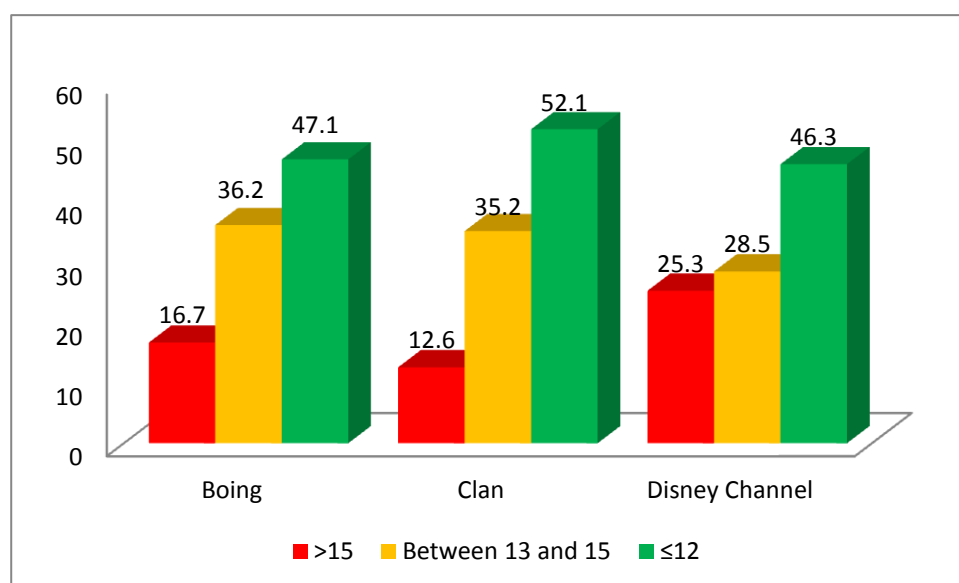
Percentages of cases with a pause of less than 0.16 seconds show that, presumably, this pause is directly related to the subtitle speed and therefore to the audiovisual genre. Thus, the fiction genre shows the highest percentage of subtitles at 15 cps or faster and also the highest percentage of cases with less than 4 frames between subtitles, in relation to the total subtitles of this genre, as shown in Graph 3:



Graph 3. Minimum pause between subtitles, comparison between genres in relation to the total subtitles of each genre

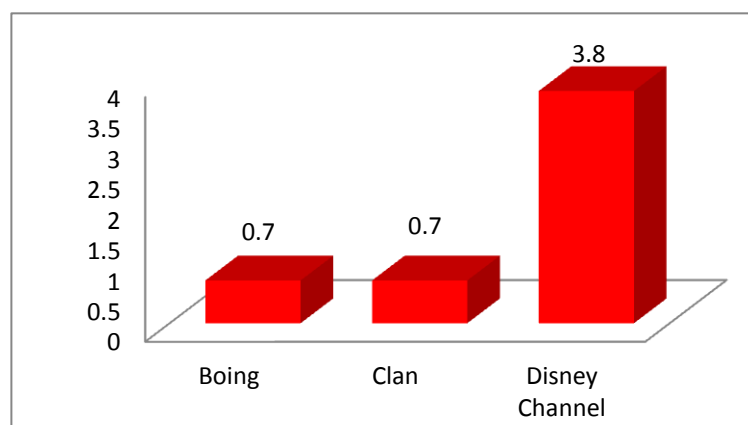
When analysing the first variable, depending on the TV channel, Graph 4 shows that Clan is the channel, in proportion to the subtitles analysed, which broadcasts more subtitles at an adequate reading rate (87.3% of subtitles at 15 cps or slower), although this is not significantly different to the data for Boing (83.3%); for this value, the Disney Channel broadcasts

less than the other two (74.8%). Clan also broadcasts more subtitles at 12 cps or slower (52.1%). However, it must be pointed out that Boing dedicates more of its broadcasting time to the animation genre (89%) and less to the fiction genre (4%). The Disney Channel, in comparison with Boing, dedicates more time to fiction (28%) and less to animation (62%). The above mentioned characteristics, linked to the linguistic code of these two genres might explain, but not justify, the differences encountered regarding subtitle speed. Distribution of broadcasting time in Clan, dedicating 63% to animation and 36% to fiction, is close to that of the Disney Channel. Time dedicated to fiction in Clan exceeds that of the Disney Channel and, Clan nevertheless broadcasts proportionally less subtitles at 15 cps or faster than the Disney Channel and Boing.



Graph 4. Subtitle speed, comparison between TV channels

It is worth mentioning subtitles at 20 cps or faster, the percentage of which is shown in Graph 5. The Disney Channel broadcasts the most subtitles at this inadequate speed for hearing impaired children. Almost 4% of its subtitles are displayed at 20 cps or faster, although this percentage is not significant for the more than 6000 subtitles analysed in the present study. As explained above, Clan dedicates more time than Disney Channel to the fiction genre and along with Boing, uses a lower percentage of subtitles at 20 cps or faster. Data in Graphs 4 and 5 suggest that Clan makes a greater effort to omit and condense information than the other two channels. Nonetheless, the conclusions of the present article do not rely on analysing the process of subtitling, but the product. For this reason, such a hypothesis could only be validated by a study focused on the process of elaboration of captioning for hearing impaired children in Spanish television.



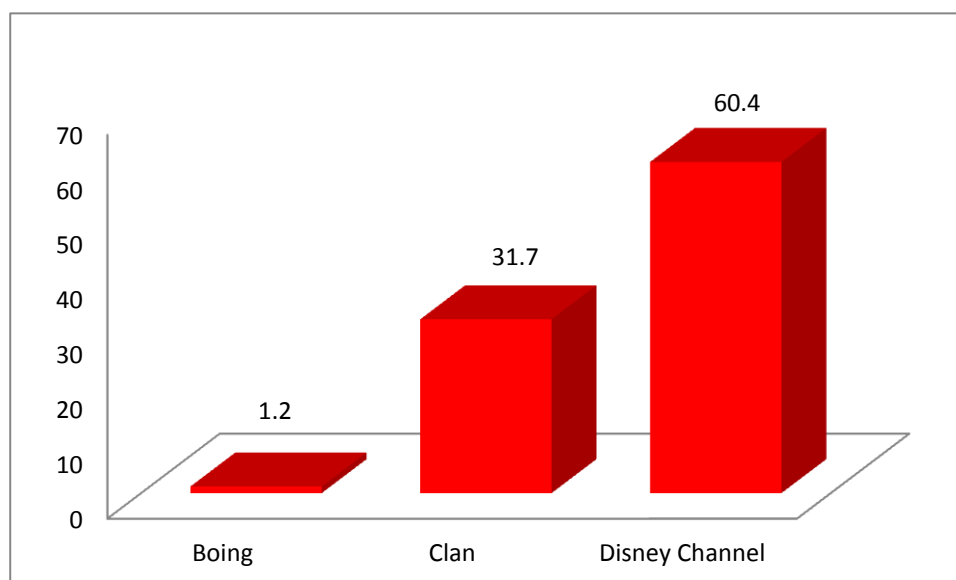
Graph 5. Subtitles at 20 cps or faster, comparison between TV channels

On a different matter, computer software used to measure subtitle speed might bring to light differences in the percentages and values highlighted here. Thus, if a subtitling company should use professional software such as WinCAPS for the elaboration and subsequent quality control of subtitling speed, its data might vary from that obtained in this study. As explained in the PhD dissertation of González Iglesias (2012), software such as WinCAPS, does not count a space as a character. A subtitle like [Inaugurarán mañana,/tras nuestro concierto en Lisboa,], belonging to the sample D149 in Corpus 1, will add up to 48 characters according to WinCAPS while, according to the tool BlackBox⁶ (used to measure both variables in the present study), this same subtitle will add up to 53 characters. Although a space is not a *readable* character, several authors claim that when reading, cognitive processing of words is carried out through reading units that include spaces (cf. González Iglesias 2012). On the other hand, WinCAPS always generates subtitling speed values by rounding to the lowest whole number (González Iglesias 2012: 50), while BlackBox shows it with up to three decimal points. Hence, a subtitle of 15.101 cps and another one of 15.953 cps will have, according to WinCAPS, the same speed (15 cps). For the measurements in this study, subtitle speed was rounded downwards or upwards depending on the decimal points generated by BlackBox. Thus, in this study, a subtitle of 12.5 cps has been considered to be broadcast at 12 cps and a subtitle of 12.501 has been considered to be broadcasted at 13 cps. The rest of the criteria for measuring subtitle speed follow criteria set out by González Iglesias (2012).

To summarise, using different criteria and different tools to measure subtitle speed allow for the extrapolation of different data for the same subtitles (González Iglesias 2012). Criteria applied in this study follow previous theoretical and empirical studies, but it is expected that such criteria will not be the same as that of other researchers or professionals and, in this sense, data here might not agree with that of other research.

Regarding the second variable, pause between subtitles, filtered by TV channel and analysed using BlackBox, data show that Boing, in proportion

to the subtitles analysed, most respects the minimum pause between subtitles established according to the theoretical framework discussed above. Boing presents an anecdotal 1.2% of its cases without this minimum pause, while Clan has more than 30% of cases and the Disney Channel more than 60%, as shown in Graph 6:



Graph 6. Absence of minimum pause between subtitles, comparison between TV channels

Concerning this variable, although Clan broadcasts fewer subtitles at 15 cps or faster, it does not use the most pauses of 4 frames or more. This data, along with data shown in Graph 3, supports the hypothesis that there is a relationship between genre and minimum pause. Boing broadcasts a higher percentage of animation programmes (89%) and less fiction programmes (4% versus 28% on the Disney Channel and 36% on Clan) and also broadcasts more minimum pauses. However, once again this hypothesis should be validated by a study focusing on the process of captioning and not on the end product, in order to shed some light on the criteria used by different TV channels. Moreover, and as pointed out earlier, the UNE Standard does not include a recommendation about a minimum pause between subtitles and in this sense none of the TV channels being studied would be failing to comply with the UNE Standard. Nevertheless, data suggest that Boing does take this variable into account when creating its SDH while the Disney Channel does not. This hypothesis, again, should be validated by a study focusing on the processes and criteria of the three channels.

In the following section, conclusions derived from the analysis of the data gathered will be presented. Such conclusions will still need to be reviewed after a study involving participant engagement and feedback.

4. Conclusions

In the variables being studied, a possible direct relationship between audiovisual genre, subtitle speed and pause between subtitles can be observed. Genres traditionally aimed at younger children show a more adequate speed and tend to respect a minimum pause between subtitles more than genres aimed at older children or teenagers. When comparing channels, it was found that the channel with a greater percentage of its broadcast texts dedicated to genres aimed at younger children, Boing, does not show the highest percentage of subtitles at 12 cps or slower (although the difference with Clan is marginal). On the contrary, Boing does show more pauses between subtitles than the other two channels. The TV channel with the most broadcast material dedicated to older children, the Disney Channel, is the one with a higher percentage of subtitles that seem too fast for younger audiences and, in addition, the one with a lower percentage of subtitles with a minimum pause of 0.16 seconds. These results, nevertheless, might be partly dictated by the lower speech rate of programmes tailored for younger children, as suggested by Zarate (2010b).

The maximum speed recommended by the UNE Standard, as explained earlier, is 15 cps. This Standard, nevertheless, has been designed for the whole hearing impaired community and does not take into account the specific needs and expectations of children. Taking this Standard as a reference, the analysis shows that both in general terms and for each TV channel, the recommendation for maximum speed is generally fulfilled. All three channels broadcast more than two thirds of their subtitles at 15 cps or slower (Boing 83.3%; Clan 87.3%; Disney Channel 74.8%). However, complying with recommendations of a Standard that has not been specifically designed for the youngest audiences does not necessarily guarantee an adequate subtitle speed for the reading and processing of captions within their audiovisual context. Having established a subtitle speed for hearing impaired children of 12 cps as an adequate maximum according to the theoretical review, it can be concluded that only around half of the subtitles of each channel are broadcast at this speed or slower (Boing 47.1%; Clan 52.1%; Disney Channel 46.3%). This conclusion leads to the hypothesis that, in the absence of a study validated by participant involvement and observation, around half of the subtitles broadcast by the TV channels exclusively dedicated to the youngest audiences in Spain cannot be read, processed and understood by their target audience with hearing impairment within an audiovisual context.

Regarding minimum pause between subtitles, the present study cannot draw relevant conclusions in comparison with the UNE Standard, since such a Standard does not consider this variable as an aspect to be taken into account when generating captioning. However, if data is compared to the recommendations of previous studies (Díaz Cintas 2003; González

Iglesias 2012; Karamitroglou 1998; Sponholz 2003; among others) and having established, for the present study, a minimum pause of 4 frames (or 0.16 seconds) it can be concluded that generally, there is a minimum pause between subtitles in the analysed corpus, as around 70% of cases show a pause of 4 frames or more. A study involving participants that analysed every specific case and related it to the subtitling speed could lead to relevant conclusions about the relationship of these variables. Although a minimum pause is observed in general terms, differences between TV channels are quite noticeable. Boing seems to take this variable into account, since almost all of its subtitles contain a pause of 4 frames or more, which, according to previous studies, would facilitate the understanding of the subtitle and, thus, of the subtitled audiovisual text as a whole. Clan broadcasts around 30% of its subtitles without the established minimum pause, which suggests that it is taken into account, but not in every case. The Disney Channel is the only channel that broadcasts more than half of its subtitles without the established minimum pause, leading to the hypothesis that this channel does not take this variable into account when generating subtitles and therefore the reading of its subtitles might lead to greater problems in the understanding and processing of the message by hearing impaired young audiences. Once again, a reception study would be necessary to validate such hypotheses and draw conclusions about the relationship between the pause between subtitles and the understanding of the subtitled audiovisual programming.

Although the data and conclusions reflect the reality of current practices regarding subtitle speed and pause in the TV channels exclusively dedicated to the youngest audiences in Spain, the present study cannot assure the optimum suitability of criteria established here without carrying out a reception study in which hearing impaired children, with their responses to comprehension questionnaires, validate or refute the hypothesis derived from the analysis. For the time being, the data analysed can only lead to speculation—based on the theoretical analysis of each variable—depending on the most suitable situation regarding subtitling speed (12 cps maximum) and pause between subtitles (4 frames minimum), and present descriptive conclusions derived from analysis of the data in comparison with the most suitable situation. The data and conclusions examined in this article will be complemented, in the future, with a reception study that sheds light on the real needs and expectations of young, hearing impaired audiences regarding programmes broadcast by the three channels included in the present study.

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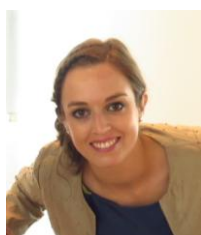
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Biography

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Her research focuses on audiovisual accessibility, more specifically on the study of subtitling for the D/deaf and the hard-of-hearing (SDH). Her PhD thesis (2015) analyses the SDH for children in Spanish television and presents an alternative subtitling according to the needs of children with hearing impairment.



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Notes

¹ Although distinction between the 'Deaf' and the 'deaf' is often made in the literature (cf. Neves 2005 and 2009), such distinction will not be made throughout this article, as there is no previous studies dealing with differences in reading speed of hearing impaired children in Spain in an audiovisual context. Future research focusing on reception of subtitle speed with hearing impaired Spanish children might bring empirical evidence that could allow making such distinction.

² Torres and Santana (2005) conducted research with a population of 93 Spanish deaf students aged between 9 and 20 and concluded that reading comprehension of deaf students does not correspond to their age and matches that of their hearing counterparts considered poor readers.

³ Available for free at <http://sourceforge.net/projects/usalblackbox/> (consulted 10.05.2016).

⁴ Divided into animation (cartoons, computer-animated cartoons, anime and animated films), fiction (series and films), entertainment (quizzes and handicrafts) and puppets.

⁵ Divided into domestic production (Spanish production or coproduction) and international production.

⁶ The tool BlackBox was used for the present study for various reasons. Firstly, it is a free multi-platform tool which was easily available to conduct research. Secondly, and more importantly, this tool was developed after a PhD dissertation (González Iglesias 2012) focusing on subtitling speed, the criteria to measure it and the lack of homogeneity in the results provided by current software. The present article follows research conducted by González Iglesias (2012) and criteria exposed by this author to measure reading speed.