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VERBATIM VS. ADAPTED SUBTITLING AND BEYOND
An empirical study with deaf, hard-of-hearing and hearing children[1]

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Abstract – This study tests two different existing approaches to Subtitling for the Deaf and the Hard-of-Hearing (SDHH) on deaf, hard-of-hearing and hearing primary-school children in Italy: verbatim subtitles aimed at accuracy (SKY style); and adapted subtitles aimed at usability (RAI style). To this aim, three short, self-contained cartoons were intralingually subtitled (Italian into Italian). The videos were then shown to 35 hearing children and five DHH children. The subjects were administered three questionnaires: one collected background data, one measured perception and one measured reception. The data showed that verbatim subtitles not only were the preferred approach by each group of children, but they also facilitated understanding more than adapted subtitles. We also found that SDHH for children did not interfere with comprehension of images in the video, and that adapted subtitles seemed to favour understanding of images more than verbatim ones. Furthermore, analysis of the data collected provided food for thought regarding speaker identification, legibility, readability, text comprehension, and ways to express diegetic sounds, along with a new theoretical framework for the production of SDHH.

Keywords: SDHH; perception; reception; legibility; readability; comprehension.

1. Introduction

In Italy, subtitling for the Deaf and the Hard-of-Hearing (SDHH) dates back to 1986, when subtitles first appeared on the national public broadcaster RAI's teletext *Televideo*, after a study on the reception and perception of subtitles by Italian signing deaf people, jointly conducted by RAI, the National Research Centre and the Rome-based institute for the blind (De Seriis 2006). The results of this work were used to develop norms aimed at producing subtitles technically and linguistically adapted to the reading needs of both deaf adults and deaf children (Volterra 1986). *Televideo* has been providing adapted SDHH since then, thus setting a standard focused on the usability of subtitles. At the same time, other broadcasters started providing subtitles in Italy with various editorial approaches. Particularly interesting is the case of the international private broadcaster Sky, which adopted a verbatim approach aimed at accuracy, regardless of the target audience.

The current study aims to test two different existing approaches to SDHH on deaf and hard of hearing (DHH) and hearing primary-school children in order to highlight the strengths and weaknesses of the two approaches, one each having been adopted by two of the main broadcasters providing SDHH in Italy:

[1] Francesca Bianchi is responsible for sections 3 and 4 of the current paper and for coordinating the study; Carlo Eugeni is responsible for sections 1, 2, 5, and 6 of the current paper; Luisa Grandioso is responsible for the subtitles and for collecting the data.

- adapted subtitling, oriented towards usability and used by RAI;
- verbatim subtitling, oriented towards accuracy and used by Sky.

The general purpose was to carry out an experiment to test the accuracy and usability of the two approaches. The specific goals were to answer the following research questions:

1. Which approach is preferred by each group of children?
2. Do both approaches equally facilitate understanding?
3. Do these types of subtitles interfere with the observation of images in the video?
4. Is SDHH suitable for non-DHH children, too?

To do so, existing research in the fields of SDHH for children in general and SDHH in Italy in particular will be reviewed in Section 2, so as to better frame the current work. Section 3 will describe the materials and methods used in the experiment. Finally, the data collected will be described and discussed in Sections 4 and 5.

2. Literature Review

International research on SDHH for children has quite a long tradition. Since the beginnings of research on Audiovisual Translation, authors like Baker (1985), Maxon and Welch (1992), Gregory and Sancho-Aldridge (1996), Koolstra *et al.* (1997, 1999) and De Linde and Kay (1999) have tried to approach the specific question of SDHH for children within the wider scope of SDHH, the latter being an emerging topic with contributions from various research fields. In these cases, researchers have tried to understand how subtitlers should change their approach when it comes to producing text to be read by a non-conventional audience (DHH children). With the new millennium and the increase of literature in the field of Audiovisual Translation in general, further works have been produced focusing on both the theory and practice of SDHH for children. In this context, particularly meaningful are the works by Neves (2005), D'Ydewalle and Bruycker (2007) and Di Giovanni (2011), as well as numerous works produced by "the Spanish school": Cambra *et al*. (2008, 2009, 2010, 2013, 2014, 2015), Lorenzo (2010), Zárate (2008, 2010, 2014a, 2014b) and Tamayo (2017). All these authors assert the view that "nowadays, there is no way of making audiovisual products understandable for hearing impaired young audiences other than to adapt what can be heard [...]" (Tamayo 2017, p. 75). Despite the pioneering works by Quigley and Paul (1984) or Neuman and Koskinen (1992), who highlighted the major role played by usability (subtitles should allow the audience to understand what characters say on screen) over accuracy, international research and practice regarding SDHH have generally followed the idea that subtitles should read what is said on screen as literally as possible (Eugeni 2007). More recent works have suggested taking a different stance on the matter. Neves (2009), for example, recommends keeping syntax as simple as possible to improve comprehension, while Zárate (2010) warns about the more limited vocabulary of DHH children as compared to hearing children.

Exceptions to the international scenario are Italian research and professional practice in the field of SDHH, which have traditionally focused on the usability of subtitles in terms of both readability (understanding the text) and legibility (facilitating its reading). Here, the subtitler's main goal is to allow users to grasp the meaning of dialogues as quickly as possible (Eugeni 2008). In practical terms, for children, these norms give readers more reading time (up to 8 seconds per subtitle) and focus on syntactic reformulation as well as lexical and semantic simplification, always considering the relationship between written and spoken language (Orletti 2016). This means that, in Italy,

research has come before practice, thus making SDHH in Italy quite a unique product, as confirmed by De Seriis (2006).

Although the Italian norms were constructed around readability and legibility, Orletti (2016) points out that Italian SDHH these days are produced by omitting and compressing too many sociolinguistic aspects, especially those which differentiate spoken language from written language, such as politeness, affection, rhetoric and speech acts in general. At the same time as reducing text, this approach to producing subtitles may elevate register, thus – paradoxically – reducing comprehension (Orletti 2016). This means that both researchers and professionals should, in the future, start concentrating on something more specific to the current needs and expectations of the DHH audience and avoid opting for standardised language (Romero-Fresco 2015); or in other words, they should avoid standardising the audience (Orletti 2016). To do so, Orletti proposes moving the focus from accuracy and usability to a sociolinguistic approach (rendering the sense of the interaction), thus merging the two priorities with the need of the industry "for guidelines and practice to reflect the special needs of the audience by means of resources and adaptations that have already proven to be efficient" (Tamayo 2017, p. 84).

Current trends on accessibility suggest going beyond a restricted approach, so as to include as many targets as possible (see Greco 2017, Romero-Fresco, Eugeni 2020). In this respect, two approaches have been suggested in recent years: Design for All and Universal Design. Design for All refers to the attempt to provide one type of subtitling which suits the needs of all categories of users. As shown by Romero-Fresco (2015), this approach is not the right solution, because it tries to standardise an audience that is comprised of people with different needs. Consequently, it satisfies nobody. Precisely because of that, the ASPHI foundation for the promotion of technology to the benefit of people with disabilities explicitly advocates for a Universal Design approach. In their words, accessibility should not try to provide one solution intended "for everyone", but alternative solutions that can be activated on demand, thus suiting different specific needs.[2] This is perfectly in line with the notion of Accessible Filmmaking proposed by Romero-Fresco (2019).

The empirical experiment reported in this paper was designed and organised with two specific reference models in mind: Paivio's dual coding theory and Gile's effort model. According to Paivio (1986), information is represented both visually and verbally in the mind. If we apply the dual coding theory to SDHH, we can formulate the hypothesis that hearing people – who are able to access the same information acoustically as dialogues and graphically as subtitles – use less effort to understand and remember information because of redundancy. On the other hand, Gile (1995) suggests that our processing capacity is limited and only capable of doing one non-automatable thing at a time. This means that three simultaneous, non-automatable activities – in this case listening to dialogues, reading subtitles and watching images – require our processing capacity to be split into three. In this context, the energy needed to listen to dialogues reduces the processing capacity available. Consequently, listening to dialogues and watching images should be less well performed.

[2] https://asphi.it/2013/09/16/progettazione-universale-o-universal-design-o-design-for-all/ (last accessed 02/02/2020)

3. Materials and methods

For the purposes of this study, three short, self-contained videos in Italian were selected and intralingually subtitled (Italian into Italian). We selected three episodes of *Pororo* (the Italian version of *Pororo the Little Penguin*), a Korean animated series for children which has been broadcast dubbed in Italian on the national public channel *RAI 2* and various digital channels since 2008.[3] This series is characterised by slow, easy, everyday dialogues (on average, 77.8 words per minute), colourful graphics and short episodes. These features made *Pororo* the perfect candidate for an experiment targeting DHH primary-school children and investigating viewers' ability to process images and written text at the same time. The following episodes were selected to be subtitled: 1. *Il magnifico mondo dei colori* (*Beautiful Color Land*; 5'35"); 2. *Io sono il preferito di Patty* (*Petty Likes Me the Most*; 5'34"); and 3. *Navigare nella foresta* (*Sailing in the Forest*; 5'33"). These three episodes were chosen because of their almost identical lengths and because they seemed comparable in terms of language complexity. Video 1 was subtitled in keeping with RAI's general approach to SDHH; Video 2 was subtitled following Sky's general approach to SDHH; while Video 3 was not subtitled at all (see Section 3.1 for details). The subtitles were produced by the third author, who has received training in interlingual subtitling and intralingual subtitling for the Italian deaf audience at the University of Salento. They were then revised by the second author, who has extensively collaborated with providers of teletext services for Italian-speaking audiences.

The videos were shown to 35 hearing children and five DHH children (Grandioso 2018). The hearing subjects belonged to two parallel classes from the same school and were aged 7-9. Of the DHH participants, three belonged to the same classes as the hearing children. They were aged 8 and have hypoacusis. Two of them wear a cochlear implant and one has an auditory prosthesis (hearing aid). The remaining two children, aged 9 and 10, are oralist deaf. The hearing and implanted DHH children watched the three videos in the following order: 1-2-3. The two oralist deaf only watched Videos 1 and 2, in this order (see Section 3.2 for details).

The order in which the videos were shown was decided randomly. However, in order to establish the actual impact of the video order in the experiment's results, a parallel experiment using the same videos in a different order was carried out in another local school with a group of hearing children of the same age (Ferraro 2018). In this second experiment, no DHH children were involved. Its results are very much in keeping with the results of the hearing children in the current experiment, thus suggesting that the results obtained in the current experiment are not influenced by the order in which the videos were shown.

Returning to the current experiment, the number of the DHH subjects is clearly low compared to that of the hearing children. We tried to involve more DHH children by contacting other local primary schools as well as the local sections of Italian national associations for the deaf (ENS and FIADDA), but to no avail. Despite this, we decided to proceed with the experiment, considering that managing to engage only a few DHH subjects is a common occurrence in academic research. While the results of such a small number of DHH subjects cannot be generalised to the entire DHH audience, they can still be compared to previous research and used to formulate hypotheses.

[3] https://www.antoniogenna.net/doppiaggio/anim/pororo.htm; https://it.wikipedia.org/wiki/Pororo; http://www.theanimationband.com/it/news/86-09082010-pororo-su-sky-boomerang.html; http://www.rai.it/dl/RaiYoyo/programma.html?ContentItem-d9b04862-81af-48fb-8115-3066054ba9a4.

The videos were viewed individually on a PC, using headphones. From a technical perspective, this helped the researchers to carry out the experiment on the school premises while minimising surrounding noise and favouring participants' concentration. Although this is not a traditional way of watching TV, it certainly mirrors one of the many possible ways in which today's viewers can approach multimedia products. Immediately after watching a video, the subjects were given a questionnaire with a general section and a specific one.

The purpose of the general section was to measure *perception*, i.e. the subject's feelings and impressions of the video, its dialogues and the subtitles (if present), including their layout. By selecting from a 4-degree Likert-scale (1 = not at all; 2 = not much; 3 = sufficiently; 4 = very much), the children provided their subjective assessments on the following items:

GQ1 - Did you like the video?

GQ2 - Were the dialogues easy to understand?

GQ3 - Did you understand all words?

GQ4 - Was it easy to understand and follow the plot?

GQ5 - Did the subtitles help you to identify the various characters?

GQ6 - Were you always able to understand who was talking?

GQ7 - Were you always able to read all subtitles?

GQ8 - Were the subtitles too long to read?

GQ9 - Was the meaning of [onomatopoeic word / explanation] clear?[4]

The specific section aimed to verify the subject's *reception*, i.e. their actual understanding of the dialogues and/or action. This part was comprised of ten multiple-choice questions on the content of each video. For each video, some of the questions tested the children's understanding of the dialogues/subtitles (six questions for Videos 1 and 2, and four questions for Video 3), while others assessed their attention to the images (four questions for Videos 1 and 2, and six questions for Video 3). The slightly unbalanced number of questions focusing on dialogues vs. images is due to the actual possibilities offered by each video's content. A picture accompanied each item. Without suggesting the correct answer, the picture helped respondents to contextualise the question. Among the multiple-choice answers provided, there was always the option "I don't know" (*Non lo so*) included, as shown in Figure 1.

Figure 1
Example of a specific question regarding Video 1.[5]

[4] E.g.: *Era chiaro il significato di RONF RONF e TOC TOC?* [tr.: Was the meaning of RONF RONF and TOC TOC clear?]

[5] The question asks: "What do Pororo and Crong do when the snowman goes away? ● Talk to each other; ● Meet their friends; ● Go back to sleep; ● I don't know.

Finally, a third questionnaire collected data about the participants' familiarity with subtitles, their familiarity with the cartoon series *Pororo* and the three specific episodes, and their reading habits. For the SDHH subjects, this questionnaire also included questions about the child's auditory history. The school teachers gave this questionnaire to the participants' families at the end of the school day when the experiment was carried out; the parents were invited to fill in the questionnaire at home with their child and return it by the end of the week. For this questionnaire, the families' help was necessary given the technical tone of some of the questions. It should be noted that this questionnaire was provided at the end of the experiment, rather than at the beginning, otherwise the contents of the experiment would be disclosed beforehand, thus influencing the participant's responses. The data collected with the background questionnaire are summarised in Section 3.2.

The hearing children, whose number supports statistical analysis, were considered as a group and their answers were analysed both qualitatively and quantitatively using the Friedman test, a non-parametric test suitable for comparing three or more matched or paired groups, or the Wilcoxon signed-rank test, a non-parametric test suitable when only two related samples are involved. All statistical analyses were carried out with SPSS. The hypoacusic and deaf children were considered separately and individually, and their answers will only be commented on qualitatively.

3.1. RAI's and Sky's approaches to SDHH

The Italian national broadcaster, RAI, boasts a long tradition in subtitling (De Seriis 2006) and provides rather detailed guidelines (Volterra 1986).[6] As explained by Orletti (2016), RAI's approach to SDHH aims to simplify and shorten text to allow for easier reading. The international private broadcaster, Sky, also has guidelines. However, these are less detailed and are based on the idea that users should read as subtitles what is said in dialogues – in other words, subtitles should be a careful reproduction of the original dialogues whenever possible (Orletti 2016). Below is a comparative summary of RAI's and Sky's general approaches to subtitling TV programmes where children are the target audience (Table 1); the table lists only those features which appeared in the videos used in this experiment.

	RAI	**Sky**
Maximum line length	37 characters.[7]	37 characters.
Display time	- Single-line: up to 4". - Double-line: up to 8". - Minimum display time: 2".	Double-line: no specifics for children. 3"- 6" is the norm for SDHH for adults. Normally up to 8" is accepted in case of SDHH for children.
Lexical/syntactic simplification	- Ample syntactic reformulation: SVO structure. - Limited set of verb tenses. - Reformulation of periphrastic constructions and infinitive sentences into simpler forms. - Indirect complements always following direct ones.	No lexical or syntactic reformulation unless necessary due to time or space constraints.

[6] RAI's guidelines are available at http://www.rai.it/dl/docs/1521654837138PREREGISTR_22_feb_2016_-_Norme_e__Convenzioni_essenziali_per_la_composiz....pdf

[7] White subtitles on a black box allow for 37 characters per line, while coloured subtitles allow for 36 characters per line because of the colour-code function used by the teletext service.

Other stylistic guidelines	- Strong preference for self-contained subtitles: sentences should preferably not be split over two subtitles. - Limited use of commas, with a preference for full stops. - No use of semicolons. - Space before exclamation marks and question marks. - Parenthesis used to provide information about the speaker's tone. - Distorted words in all caps.	- Integral transcription of dialogues, including interjections, hedges, etc. - Only non-words are omitted (e.g. *uhm*, *ohh*).
Character identification	- Colour coding system (both box and characters). - Two hyphens if two characters speak in the same subtitle. - < or > if characters speak off camera.	- Only white is used. - Two hyphens if two characters speak in the same subtitle. - < or > if characters speak off camera.
Diegetic sounds	Reported as displays (all caps), possibly by means of onomatopoeia (e.g.: DRIN DRIN; RONF RONF).	Reported as subtitles (small caps), within parentheses, by means of explanations, i.e.: (telephone rings) or (boy snores).
Songs	# followed by a space at the beginning of every subtitle; # should also appear at the end of the last sung line, preceded by a single space.	No guidelines.
Font	Arial	Tiresias
Alignment	Left (dialogues), Centre (captions)	Centre

Table 1
RAI's vs. Sky's approach to subtitling children's programmes.

The subtitles for Video 1 were specifically created following RAI's general approach to SDHH for children. Some sample screenshots are provided in Figure 2.

Figure 2
Sample screenshots from Video 1.

An analysis of Video 1's subtitles shows that 47.7% of the subtitles were orthographic transcriptions of the dialogues, while in the remaining text (52.3%) some form of adaptation was employed, including omission (28.6%; e.g. "*Il pupazzo di neve è bianco.*" → "*Il pupazzo è bianco.*"), reformulation (21.7%; e.g. "*Scende la notte nella foresta di Pororo.*" → "*E' notte nella foresta di Pororo.*") and expansion (2%; e.g. "*Davvero una bella casa.*" → "*E' davvero una bella casa.*").[8] In particular, some of the adaptations can be said to result in a more formal register than the original dialogues. In five subtitles, we observed the following: the omission of three syntactic elements (a noun, an adjective and

[8] Here and elsewhere in the paper, underlining is used to highlight differences between the dialogue and the corresponding subtitle.

a complement); the use of a specific verb instead of a general one (one case: "*Andiamo. Si riparte.*" → "*Ripartiamo.*"); the replacement of a noun with a pronoun (one case: "*La prossima tappa è il magico mondo del rosso.*" → "*Il prossimo è il magico mondo del rosso.*"); the use of deixis instead of a verb group (one case: "*Anche tu sei arrivato nel mondo del rosso!*" → "*Anche tu qui!*"); and the substitution of an infinitive clause with a noun (one case: "*La notte Pororo e Crong sognano di viaggiare ancora nel magico mondo dei colori.*" → "*La notte sognano ancora il viaggio nel mondo dei colori.*").

The subtitles for Video 2 were specifically created following Sky's general approach to SDHH for children (verbatim transcription). Some sample screenshots are provided in Figure 3.

Figure 3
Sample screenshots from Video 2.

An analysis of Video 2's subtitles shows that, due to time and space constraints, some form of adaptation was applied in 17.3% of cases. These were mainly omissions of non-verbal utterances (e.g. from 1'56" to 1'58" Eddy says "*Wow! Ah ah ah. Grazie.*", but the subtitle only says "*Grazie.*"), exclamations (e.g. from 1'33" to 1'37" the following exchange takes place: Eddy: "*Io sono sicuro che Petty tra tutti preferisce me.*" Poby: "*Cosa?!*"; Poby's exclamation of surprise – uttered over a shot change – does not appear in the subtitles), and superpositions (e.g. omission of background voices at 3'52"), plus a few instances of substitutions and/or omissions of other elements (e.g. from 3'30" to 3'33" the following exchange takes place: Petty: "*Adesso il pupazzo è bellissimo, proprio come te, Crong.*" Crong: "*Bello io, dici davvero?*"; in the subtitles, this became: – *Ora è bellissimo, proprio come te. – Dici davvero?*).

3.2. Background information on the subjects

All the subjects in this experiment communicate by speaking and are children of hearing parents. Of the hypoacusic children, two had been implanted or started wearing a prosthesis before the age of three, and one after that age. Of the deaf subjects, one had lost her hearing after the age of three, while the other one before that age.

Most of the subjects stated that they had no problems in reading the subtitles. The only exception were three hearing children who reported having difficulty in reading subtitles on the computer screen. All the subjects except five hearing children reported that they liked reading.

The two oralist deaf children indicated that they were used to watching subtitled videos and that the presence of subtitles is a main deciding factor for them when it comes to choosing which TV programmes to watch. One of the children with hypoacusis expressed that he likes to activate the subtitles on TV because they help his understanding; the other two hypoacusic children were not used to watching subtitled videos. Overall,

slightly more than 50% of the hearing subjects had previous experience with subtitles. With regard to the *Pororo* series, the deaf children were not familiar with it, while 34.2% of the hearing subjects and one hypoacusic subject (33% of the hypoacusic subjects) had watched it before.

The relationship between background data and reception of the video in hypoacusic and deaf children is discussed in Sections 4.2.2 and 4.3.2.

4. Results

The following sections illustrate the results of the questionnaires. Each section focuses on a separate group of children, based on their hearing status.

4.1. Hearing subjects

4.1.1. Perception questionnaire

The hearing subjects' responses to the perception questionnaire are summarised in Table 2. The columns refer to the questions in the general questionnaire, while the rows correspond to the Likert scale options. Each cell reports the percentage of subjects who selected that particular Likert value for the given question.

The results of GQ1 show that 34 subjects (97.14%) liked Video 1 (very much = 62.86%; sufficiently = 34.29%) and only one subject (N19) did not like the cartoon much. For question GQ2, 33 subjects (94.29%) declared that the dialogues in Video 1 were easy to understand (very much = 48.57%; sufficiently = 45.71%), while two subjects (N12, N18; 5.71%) considered them not very intelligible. For question GQ3, 18 children (51.43%) declared they could perfectly understand all the words and 12 participants (34.29%) stated that they could understand most of the words, while five children (N10, N11, N13, N31, N6; 14.29%) declared having some difficulty in understanding all the words; in particular, N6 declared having great difficulty in understanding all the words. According to 27 children (77.14%), the plot (GQ4) was easy to follow (very much = 37.14%; sufficiently = 40%), while six children (N2, N3, N6, N18, N19, N29; 17.14%) considered the plot of this video not very easy to follow and one child (N15; 2.86%) considered it not easy at all. For GQ5, 29 subjects (82.86%) indicated that the subtitles helped to identify the various characters (very much = 48.57%; sufficiently = 34.29%). However, five children (14.29%) indicated that the subtitles did not help much (N11, N14) or did not help at all (N3, N7, N25). Understanding who was talking (GQ6) seemed always possible for 24 children (68.57%) and sufficiently possible for eight (22.86%), but it was considered not easy by two children (N19, N32; 5.71%) and it seemed never possible for one child (N14; 2.86%). For question GQ7, 24 children (68.57%) stated they were able to read all the subtitles (very much = 22.86%; sufficiently = 45.71%), while 10 children (28.57%) declared they were not always able to read all the subtitles (not much = 20%; not at all = 8.57%). For GQ8, 25 subjects (71.43%) considered the subtitles not too long to read (not at all = 45.71%; not much = 25.71%), while for nine subjects (25.72%) they seemed somewhat long to read (sufficiently = 14.29%; very much = 11.43%). Finally, 20 children (57.14%) reported that the meaning of the given onomatopoeic words (GQ9) was clear (very much = 51.43%; sufficiently = 5.71%), while 14 children (40%) mentioned having problems in understanding the onomatopoeia (not much = 14.29%; not at all = 25.71%).

Video 1 (adapted subtitles)									
Likert value	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
4 (very much)	62.86	48.57	51.43	37.14	48.57	68.57	22.86	11.43	51.43
3 (sufficiently)	34.29	45.71	34.29	40.00	34.29	22.86	45.71	14.29	5.71
2 (not much)	2.86	5.71	11.43	17.14	5.71	5.71	20.00	25.71	14.29
1 (not at all)	0.00	0.00	2.86	2.86	8.57	2.86	8.57	45.71	25.71
no answer	0.00	0.00	0.00	2.86	2.86	0.00	2.86	2.86	2.86
Video 2 (verbatim subtitles)									
Likert value	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
4 (very much)	74.29	62.86	65.71	48.57	37.14	54.29	48.57	11.43	80.00
3 (sufficiently)	25.71	28.57	28.57	40.00	31.43	28.57	37.14	5.71	5.71
2 (not much)	0.00	8.57	5.71	5.71	14.29	11.43	5.71	28.57	5.71
1 (not at all)	0.00	0.00	0.00	2.86	14.29	5.71	5.71	51.43	5.71
no answer	0.00	0.00	0.00	2.86	2.86	0.00	2.86	2.86	2.86
Video 3 (no subtitles)									
Likert value	**GQ1**	**GQ2**	**GQ3**	**GQ4**		**GQ6**			
4 (very much)	88.57	57.14	65.71	60.00		60.00			
3 (sufficiently)	8.57	31.43	25.71	31.43		25.71			
2 (not much)	2.86	11.43	5.71	5.71		5.71			
1 (not at all)	0.00	0.00	2.86	2.86		8.57			

Table 2
Hearing subjects' collective answers to the perception questionnaire.

With reference to Video 2, according to the children's replies to GQ1, all 35 subjects (100%) liked the video (very much = 74.29%; sufficiently = 25.71%). For question GQ2, 32 subjects (91.43%) asserted that the dialogues in Video 2 were easy to understand (very much = 62.86%; sufficiently = 28.57%), while three subjects (N6, N12, N32; 8.57%) considered them not very intelligible. For question GQ3, 23 children (65.71%) declared they could perfectly understand all the words and 10 (28.57%) indicated they could sufficiently understand the words, while 2 subjects (N7, N14; 5.71%) declared having some difficulty in understanding all the words. According to 31 children (88.57%), the plot (GQ4) was easy to follow (very much = 48.57%; sufficiently = 40%), while two children (N2, N13; 5.71%) considered the plot of this video not very easy to follow and one child (N4; 2.86%)

considered it not easy at all. For GQ5, 24 subjects (68.57%) reported that the subtitles helped to identify the various characters (very much = 37.14%; sufficiently = 31.43%). However, five children (N2, N11, N18, N19, N32; 14.29%) declared that the subtitles did not help much, and five (N4, N7, N9, N22, N25; 14.29%) indicated that they did not help at all. Understanding who was talking (GQ6) seemed always possible for 19 children (54.29%) and sufficiently possible for 10 (28.57%), but it was considered not easy by four children (N4, N12, N13, N19; 11.43%), and it seemed never possible for 2 children (N14, N22; 5.71%). For question GQ7, 30 children (85.71%) declared they were able to read all the subtitles (very much = 48.57%; sufficiently = 37.14%), while four (11.43%) declared they were not always able to read all the subtitles (not much = 5.71%; not at all = 5.71%). For GQ8, 28 subjects (80%) considered the subtitles not too long to read (not at all = 51.43%; not much = 28.57%), while for six subjects (17.14%) they seemed somewhat long to read (sufficiently = 5.71%; very much = 11.43%). Finally, 30 children (85.71%) indicated that the meaning of the explanation (GQ9) was clear (very much = 80%; sufficiently = 5.71%), while four children (11.43%) reported having problems in understanding the explanation (not much = 5.71%; not at all = 5.71%).

With reference to Video 3, according to the children's replies to GQ1, 34 subjects (97.14%) liked the video (very much = 88.57%; rather liked = 8.57%) and only one child (N15; 2.86%) did not like it very much. For question GQ2, 31 subjects (88.57%) declared that the dialogues were easy to understand (very easy = 57.14%; rather easy = 31.43%), while four subjects (N12, N22, N31, N32; 11.43%) considered them not very intelligible. For question GQ3, 23 children (65.71%) declared they could perfectly understand all the words, nine (25.71%) stated they could understand most of the words, 2 subjects (N8, N12; 5.71%) declared having some difficulty in understanding all the words and one child (N4; 2.86%) declared having great difficulty. According to 32 children (91.43%), the plot (GQ4) was easy to follow (very easy = 60%; rather easy = 31.43%), while two children (N14, N22; 5.71%) considered the plot of this video not very easy to follow and one child (N4; 2.86%) considered it not easy at all. Finally, understanding who was talking (GQ6) seemed always possible for 21 children (60%) and generally possible for nine (25.71%), but it was considered not easy by two children (N19, N28; 5.71%), and it seemed never possible for three children (N3, N12, N22; 8.57%).[9]

The participants' responses to each question under the different experimental conditions were compared using non-parametric tests on medians (Friedman test for questions 1-2-3-4-6; Wilcoxon text for questions 5-7-8-9), in order to verify whether any of the videos ranked consistently higher or lower than the others for any of the given features. The tests returned values corresponding to $p > 0.1$ for questions 1 to 8, which indicates that for these questions the differences observed cannot be considered statistically significant. On the other hand, for question 9, the Wilcoxon test indicated that the perception of subtitles displaying diegetic sounds was statistically significantly lower for Video 1 than Video 2 ($Z = -2.695$, based on negative ranks; $p = .007$).

4.1.2. Reception questionnaire

Let us now analyse the participants' actual understanding of the audiovisual products. Chart 1 illustrates the hearing subjects' results for the specific questions about the content of the videos. As these questions had multiple-choice answers, the overall percentage of

[9] General questions 5, 7, 8, and 9 referred to subtitles and were not included in the general questionnaire on Video 3.

correct answers per question was used to plot results.[10] A Friedman test was conducted to verify the statistical significance of the results.

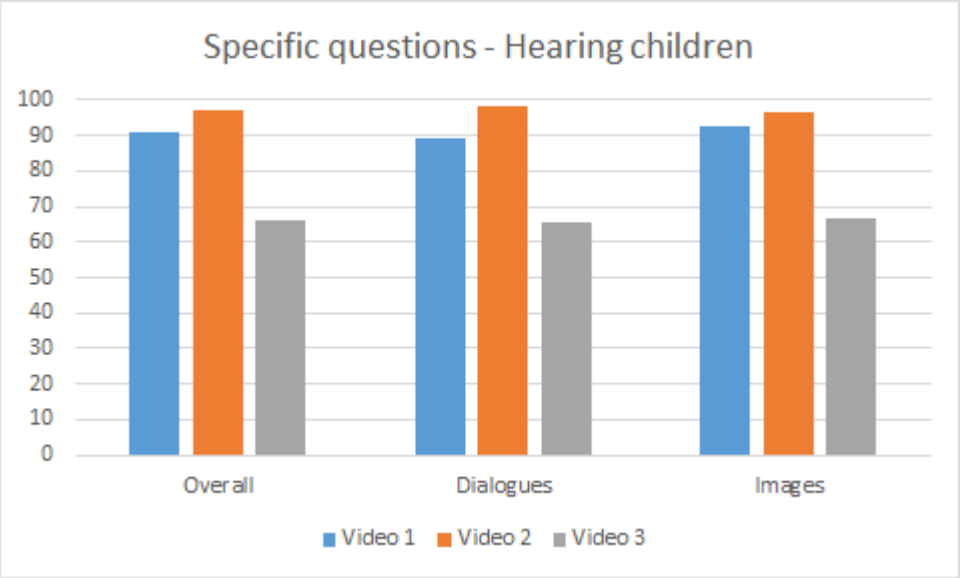

Chart 1
Hearing subjects' results for the specific questions relating to the content of the videos.

All in all, the hearing subjects performed very well on Video 2 (group mean: 97.4% correct answers), immediately followed by Video 1 (group mean: 90.8% correct answers). On the other hand, the students scored relatively low (group mean: 66.3% correct answers) on Video 3, the only video with no subtitles. At this level, the Friedman test rendered a Chi-square value of 53.349 ($p < .000$). This indicates that the differences observed are highly significant. To examine where the differences occurred, we ran separate Wilcoxon signed-rank tests on the different combinations of related groups. These indicated that comprehension was statistically significantly lower for Video 1 than Video 2 ($Z = -4.738$, based on negative ranks; $p < .000$), statistically significantly higher for Video 1 than Video 3 ($Z = -4.245$, based on positive ranks; $p < .000$), and statistically significantly higher for Video 2 than Video 3 ($Z = -5.039$, based on positive ranks; $p < .000$).

This trend is confirmed even if we separately consider questions whose answers required an understanding of the dialogues/subtitles (Video 2: 98.1%; Video 1: 89.1%; Video 3: 65.7% correct answers). At this level, the Friedman test rendered a Chi-square value of 65.185 ($p < .000$), which indicates that the differences observed are highly significant. The post-hoc Wilcoxon signed-rank tests indicated that comprehension was statistically significantly lower for Video 1 than Video 2 ($Z = -4.785$, based on negative ranks; $p < .000$), statistically significantly higher for Video 1 than Video 3 ($Z = -4.982$, based on positive ranks; $p < .000$) and statistically significantly higher for Video 2 than Video 3 ($Z = -5.209$, based on positive ranks; $p < .000$).

When considering only the questions regarding participants' observation of the images, Video 2 scored better than Video 1, while Video 3 scored the lowest (respectively:

[10] During the test, we realised that Question 1 in Video 1 was ambiguous and misleading. We let the students answer that question, but we removed the item from our analysis. The students scored very low on that question (group mean: 22.9% correct answers).

96.4%; 92.9%; and 66.7% correct answers). The Friedman test rendered a Chi-square value of 2.659 (p = .265), which obliges us to consider the differences as not statistically significant.

Finally, it is worth noticing that in Video 1 students scored relatively low (74.3% correct answers) on the question testing their understanding of onomatopoeia. This confirms their subjective feeling of not being able to understand onomatopoeia.

4.2. Hypoacusic subjects

4.2.1. Perception questionnaire

The three hypoacusic subjects' answers to the perception questionnaire are reported in Table 3. The columns refer to the questions in the general questionnaire, while the rows correspond to one participant each. The cells report the Likert value that each subject selected for the given question.

Video 1 (adapted subtitles)									
subject	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
H1	4	2	4	4	4	4	4	1	1
H2	4	3	4	3	4	4	3	2	2
H3	2	3	3	3	3	2	3	3	2
Video 2 (verbatim subtitles)									
subject	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
H1	4	4	4	4	4	4	4	1	4
H2	4	3	4	3	2	4	3	3	4
H3	3	3	2	3	2	2	2	3	2
Video 3 (no subtitles)									
subject	**GQ1**	**GQ2**	**GQ3**	**GQ4**		**GQ6**			
H1	4	4	4	4		4			
H2	2	2	3	4		2			
H3	3	2	2	2		2			

Table 3
Hypoacusic subjects' responses to the perception questionnaire.

The results for GQ1 show that two subjects (67%) liked Video 1 very much, while subject H3 (33%) did not like the cartoon much. For question GQ2, two subjects (67%) declared that the dialogues in Video 1 were rather easy to understand (very much = 0; sufficiently = 2), while subject H1 (33%) considered them not very intelligible. For question GQ3, two children (67%) declared they could perfectly understand all the words and H3 (33%) indicated he could sufficiently understand the words. According to the three children

(100%), the plot (GQ4) was easy to follow (very much = 1; sufficiently = 2). For GQ5, all three subjects (100%) reported that the subtitles helped to identify the various characters (very much = 2; sufficiently = 1). Understanding who was talking (GQ6) seemed always possible for two children (67%), but it was considered not easy by subject H3 (33%). For question GQ7, all three children (100%) declared they were able to read all the subtitles (very much = 1; sufficiently = 2). For GQ8, only subject H3 (33%) considered the subtitles not too long to read (not at all = 0; not much = 1), while to the other two subjects (67%) they seemed somewhat long to read (sufficiently = 1; very much = 1). Finally, all three children (100%) declared that the onomatopoeic subtitle was not clear (not much = 2; not at all = 1).

With reference to Video 2, according to the children's replies to GQ1, all three subjects (100%) liked the video (very much = 2; sufficiently = 1). For question GQ2, all the subjects (100%) maintained that the dialogues in Video 2 were easy to understand (very much =1; sufficiently = 2). For question GQ3, two children (67%) declared they could perfectly understand all the words, while H3 (33%) reported having some difficulty in understanding all the words. According to all three children (100%) the plot (GQ4) was easy to follow (very much = 1; sufficiently = 2). For GQ5, only H1 (33%) declared that the subtitles helped to identify the various characters (very much = 1; 33%), while the other two children (67%) indicated that the subtitles did not help much. Understanding who was talking (GQ6) seemed always possible to two children (67%), but was considered not easy by H3 (33%). For question GQ7, two children (67%) reported they were able to read all the subtitles (very much = 1; sufficiently = 1), while H3 (33%) recorded that he was not always able to read all the subtitles (not much = 1; not at all = 0). For GQ8, two subjects (67%) considered the subtitles not too long to read (not at all = 0; not much = 2), while H1 (33%) indicated they seemed definitely very long to read. Finally, two children (67%) reported that the meaning of the explanation (GQ9) was very clear, while H3 (33%) stated having problems in understanding the explanation (not much = 1; not at all = 0).

With reference to Video 3, according to the children's replies to GQ1, two subjects (67%) liked the video (very much = 1; sufficiently = 1) and only H2 (33%) did not like it very much. For question GQ2, only H1 (33%) maintained that the dialogues were easy to understand (very much = 1; sufficiently = 0), while the other two subjects (67%) considered them not very intelligible. For question GQ3, one child (33%) stated he could perfectly understand all the words and one child (33%) indicated he could sufficiently understand the words, while H3 (33%) reported having some difficulty in understanding all the words. According to two children (67%), the plot (GQ4) was very easy to follow, while H3 (33%) considered the plot of this video not very easy to follow. Finally, understanding who was talking (GQ6) seemed always possible for H1 (33%), while it was considered not easy by the other two children (67%).

If we analyse the data by subject, H1 fully appreciated all the features in Videos 2 and 3, and most of the features in Video 1; the latter video, however, scored rather low on QG2 (dialogue understandability) and very low on QG9 (onomatopoeia). For H3, Videos 2 and 3 scored rather low on most parameters, while Video 1 was the one he considered the clearest and easiest to understand, apart from the onomatopoeic subtitles. H2 generally appreciated the various features of both Videos 1 and 2. He considered the coloured subtitles of Video 1 clearer than the white subtitles of Video 2, but the explanations of diegetic sounds in Video 2 much clearer than the onomatopoeic words in Video 1. Video 3 scored lower than the other two videos in terms of dialogue understandability and ease of identifying who was talking.

4.2.2. Reception questionnaire

The hypoacusic subjects' results for the specific questions on the content of the videos are reported in Table 4. The table reports the overall percentage of correct questions per subject, per video, considering: 1. the whole set of questions (All); 2. only the questions whose answers required an understanding of the dialogues/subtitles (Dialogues), and 3. only the questions whose answers required observation of the images (Images).

	All (%)			**Dialogues (%)**			**Images (%)**		
	V1	**V2**	**V3**	**V1**	**V2**	**V3**	**V1**	**V2**	**V3**
H1	80.0	100.0	80.0	66.7	100.0	75.0	100.0	100.0	83.3
H2	80.0	100.0	30.0	66.7	83.3	50.0	100.0	50.0	16.7
H3	60.0	50.0	40.0	50.0	66.7	50.0	75.0	25.0	33.3

Table 4
Hypoacusic subjects' results for the specific questions on the content of the videos: percentage of correct answers.

Considering the entire set of questions, two of the hypoacusic subjects (H1, H2) performed better on Video 2 than Video 1, while H3 performed better on Video 1. As could be expected, Video 3 was the most difficult to understand for all the participants. If we consider only the questions whose answers required an understanding of the dialogues/subtitles, all three children fared systematically better on Video 2, followed by Video 1 and lastly Video 3. If we consider only the questions whose answers required observation of the images, two subjects (H2, H3) performed better on Video 1 than Video 2, while H1 answered all questions correctly in both cases. Still examining images, all the children fared the worst on Video 3. Finally, none of the three hypoacusic subjects correctly answered the question testing their understanding of the onomatopoeia (Question 2 in Video 1).

Subject H1 fared very well under all circumstances, and generally better than the others, while H3 seemed to be the weakest of the three when considering the entire set of questions or questions referring to dialogues. However, H3 seemed to fare similarly or slightly better than H2 when watching Video 3, the only video without subtitles. If we compare these results to the background factors investigated in the sociological questionnaire, no correlation can be observed. In fact, all three subjects are oralists. H2 were implanted in both ears at the age of 5 months; H1 and H3 were implanted in one ear at 16 months and 3 years of age, respectively. H1 and H3 wear glasses, and do not like reading. All the subjects reported spending an average of two hours a day reading. H1 and H3 spend only one hour a day watching TV, while H2 indicated spending two hours a day watching TV. H2 was the only child who had seen *Pororo* before, though none of the given episodes. Finally, only H3 is used to activating subtitles when watching TV, which he does systematically.

These data seem to suggest that, at least for the hypoacusic subjects involved in this experiment, verbatim subtitles favoured understanding of the dialogues more than adapted subtitles, but hampered the observation of the images more than adapted subtitles.

4.3. Deaf subjects

4.3.1. Perception questionnaire

The two deaf participants' answers to the perception questionnaire are reported in Table 5. The columns refer to the questions in the general questionnaire, while each row refers to one subject. Each cell reports the Likert value provided by the subject for the given question.

Video 1 (adapted subtitles)									
subjects	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
D1	3	4	4	4	4	4	4	1	4
D2	4	4	4	4	4	4	3	3	3
Video 2 (verbatim subtitles)									
subjects	**GQ1**	**GQ2**	**GQ3**	**GQ4**	**GQ5**	**GQ6**	**GQ7**	**GQ8**	**GQ9**
D1	4	4	4	4	4	4	4	1	4
D2	4	4	4	4	4	4	3	1	4

Table 5
Deaf subjects' answers to the perception questionnaire.

Both deaf subjects liked Video 1 (GQ1), albeit one of them more than the other (very much = 1; sufficiently = 1). For this video, general questions 2-6 all scored top marks with both deaf students. In other words, both subjects reported that the dialogues were very easy to understand (GQ2), they could perfectly understand all the words (GQ3), the plot was very easy to follow (GQ4), the subtitles made it very easy to identify the various characters (GQ5), and it was always possible to perfectly understand who was talking (GQ6). For question GQ7, subject D1 declared he was perfectly able to read all the subtitles, while subject D2 declared he was able to read the subtitles but not perfectly well. For GQ8, subject D1 considered the subtitles not too long to read (not at all = 0; not much = 1), while D2 indicated they seemed too long to read (sufficiently = 0; very much = 1). Finally, the two children declared that the meaning of the given onomatopoeic words (GQ9) was clear (very much = 1; sufficiently = 1).

Video 2 was fully liked by both deaf subjects (GQ1). General questions 2-6 scored exactly the same marks as for Video 1. For question GQ7, subject D1 declared he was perfectly able to read all the subtitles, while subject D2 reported he was able to read the subtitles but not perfectly well. For GQ8, both subjects considered the length of the subtitles perfectly adequate to read. Finally, the two children indicated that the meaning of the explanations (GQ9) was very clear.

4.3.2. Reception questionnaire

The deaf subjects' results for the specific questions on the content of the videos are reported in Table 6. The table reports the overall percentage of correct questions per subject per video, considering: 1. the whole set of questions (All); 2. only the questions whose answers required understanding of the dialogues/subtitles (Dialogues), and 3. only the questions whose answers required observation of the images (Images).

	All		**Dialogues**		**Images**	
	V1	**V2**	**V1**	**V2**	**V1**	**V2**
D1	80.0	90.0	66.7	83.3	100.0	100.0
D2	50.0	40.0	33.3	33.3	75.0	50.0

Table 6
Deaf subjects' results for the specific questions on the contents of the videos: percentage of correct answers.

In this group, individual differences are very marked. D1 fared systematically better than D2 on both videos, whichever type of question we consider. If we look at the background data collected, we see that D1 lost her hearing one year later than D2 (at the age of 3 vs. 2), reads twice as much as D2 (4 hours per day vs. 2), and knew *Pororo* as a cartoon, though she had never seen the two specific episodes. We may speculate that one or more of these features could be the reasons for D1's better results on the reception questionnaire; however, this cannot be proved with any certainty.

Looking at the whole set of questions, or questions whose answers required an understanding of the dialogues/subtitles, both subjects fared better on Video 2. On the other hand, if we consider only the questions whose answers required observation of the images, Video 1 can be said to facilitate understanding slightly more than Video 2, at least for D2.

These results are in keeping with those of the hypoacusic group and seem to confirm that, at least for most of the subjects involved in the experiment, verbatim subtitles favoured understanding of the dialogues more than adapted subtitles, but hampered observation of the images more than adapted subtitles.

Finally, none of the deaf subjects correctly answered the question testing their understanding of onomatopoeia (Question 2 in Video 1), a result which is in keeping with those of the previous groups.

5. Discussion

The hearing children had better comprehension results with verbatim subtitles than with adapted subtitles or no subtitles at all; this proved statistically significant when considering questions referring to dialogues only, as well as when considering the entire set of questions. As regards images, according to our data, the presence and type of subtitle cannot be said to impact on the viewer's ability to understand images. This suggests that the effort of accessing the same text twice (reading it and listening to it) helps hearing users to understand its content better, in line with Paivio's dual coding

theory. Further investigation with eye-tracking technology might help to shed some light on the way children cope with the co-presence of images and each type of subtitles, and to understand the role of Gile's effort model and dual coding theory with respect to this result. Furthermore, with hearing children, the results of both perception and reception tests suggest that conveying extradiegetic sounds by means of onomatopoeic subtitles is not the best option. In fact, the onomatopoeic subtitles were not understood by almost 30% of the children in the group, and the children's preference for descriptive subtitles rather than onomatopoeic ones proved to be the only statistically significant result of the perception test.

The children with hypoacusis declared that coloured subtitles facilitated speaker identification more than white subtitles (GQ5). However, they preferred the video with white subtitles much more than the one with no subtitles, probably because they could not rely solely on their remaining hearing to understand who was speaking. This suggests that children with hypoacusis can easily determine who is speaking only when some sort of accessibility aid is provided. Concerning language manipulation, the hypoacusic subjects involved in this study appreciated the video with verbatim subtitles the most and understood the video with verbatim subtitles better than the video with adapted subtitles, which confirms the above-mentioned hypothesis about the role of dual coding theory in subtitling. Finally, two of the hypoacusic children understood images in Video 1 (adapted subtitles) better than in Video 2 (verbatim subtitles), while the third understood all the images in Videos 1 and 2, regardless of the type of subtitle. This is probably because verbatim subtitles facilitate the understanding of dialogues by the audience, but they also limit the time available to watch images. Again, an eye-tracking test could help to verify this hypothesis.

With regard to the deaf children, our findings here were not in line with the aforementioned results on speaker identification. The subjects reported that they were always able to understand who was speaking regardless of the subtitling technique. They considered both the coloured subtitles and the white subtitles equally useful for speaker identification. This may be due to their higher skills in accessing videos through subtitles (because they are older than the other respondents and more used to SDHH), or to the fact that they did not want to admit having problems understanding the subtitles, as frequently happens in this kind of experiments (see Eugeni 2015). Similarly, the deaf respondents in this experiment also found the two subtitled videos identically easy to understand. What is more interesting for our purposes is the fact that they slightly preferred the video with verbatim subtitles and found verbatim subtitles equally easy to understand as adapted subtitles. We expected that deaf children would have preferred and better understood the video with adapted subtitles, given that these were specially designed to suit their needs, and that they are the standard approach adopted by the main provider of SDHH for children in Italy. However, this was not the case. Moreover, similarly to the hypoacusic children, the deaf participants perceived the adapted subtitles as longer to read than the verbatim subtitles. This may be due to the fact that, as Orletti observes, reduction in adapted subtitles sometimes increases register, thus reducing subtitle comprehension and consequently increasing the amount of time needed to read the subtitles. In Video 1, for example, there are five cases of subtitles with a higher register compared to the original dialogues. However, to confirm this hypothesis further research is necessary, with more respondents and more written material to analyse.

6. Conclusions

This study was designed to test two different approaches to Subtitling for Deaf and Hard-of-Hearing children – verbatim subtitles aimed at accuracy, and adapted subtitles aimed at usability – on different types of users (hearing children, hard-of-hearing children and deaf children). The main goal was to compare the two approaches and comment on them in the light of the never-ending debate between and among researchers and practitioners on the best way to subtitle programmes for DHH children, thus contributing to a more recent debate between 'media for all' and 'universal design'.

To these aims, a perception test and a reception test were administered to a group of hearing children, a small group of hypoacusic children and a small group of deaf children. The perception test was designed to gain information on speaker identification, legibility, readability and text comprehension, while the reception test aimed to measure understanding of the dialogues and images. Given the number of subjects involved, only the results of the hearing children could be analysed quantitatively.

Quite clear results emerged with reference to Research Question 1 (Which approach is preferred by each group of children?) and Research Question 2 (Do these approaches equally facilitate understanding?): verbatim subtitles not only are the preferred approach by each group of children, but they also facilitate understanding more than adapted subtitles.[11] Concerning Research Question 3 (Do these types of subtitle interfere with the observation of images in the video?), we found that SDHH for children does not interfere with comprehension of images in the video, but that adapted subtitles seem to favour understanding of images more than verbatim ones, possibly because they engage the eye for less time given that they imply less characters. Concerning Research Question 4 (Is SDHH suitable for non-DHH children, too?), the answer is quite clear: any form of SDHH is suitable for non-DHH children, who systematically benefit from the presence of subtitles.

Finally, one important finding emerged: non-verbal elements rendered as onomatopoeia are less intelligible than their descriptions. This finding is in line with international research on this topic (Tamayo 2017), and suggests that related results of previous literature in Italy (Volterra 1986, Eugeni 2008, 2015) may no longer reflect today's reading skills.

From a theoretical perspective, the current data seem to confirm Gile's (1995) theory. If, on the one hand, accessing the same information twice (through listening and through reading) facilitates the understanding of a video, on the other hand, when the extra effort required to process subtitles is too demanding – as in the case of adapted subtitles – it stops increasing both comprehension and appreciation, as confirmed by our results on comprehension: when it comes to understanding subtitles, our subjects all scored higher with the video with verbatim subtitles.

Furthermore, this study shows that although SDHH may also benefit hearing children, especially if they are verbatim, the three categories of users react differently to the same type of subtitles. Hence, Universal Design seems to be a highly interesting paradigm to pursue and test in Italy, as well as in other countries where adapted subtitles are used. Hybrid Broadcast Broadband Television makes it possible to offer users three types of solutions, without extra costs for the provider: verbatim subtitles, intended as the dialogue list pasted in a subtitling file; adapted subtitles for the benefit of slower readers

[11] It is to be noticed that the source text in our experiment is less than 80 wpm on average. In case of more rapid speech rates, this may no longer be the case.

(provided no increase in register is involved); and captions of non-verbal aspects (to be activated in addition to one of the previous solutions) for DHH children or hearing children watching the cartoon in a noisy environment.

Last but not least, an interesting theoretical framework for the understanding of SDHH has emerged, which may help practitioners, service providers, and researchers when dealing with the best approach to SDHH for children. Generally speaking, all categories of viewers prefer word-for-word subtitles, in line with Paivio's dual-coding theory, according to which accessing the same information through two different channels favours understanding. However, when dialogues are too rapid, it is necessary to compress them by reducing the verbal component in the subtitles, thus facilitating readability and access to images. However, as Orletti suggests, this may lead to a vicious circle: in creating adapted subtitles, subtitlers may raise the register, thus forcing viewers to make an extra effort in processing the subtitles. This sometimes results in perceived longer reading time and more difficulty comprehending the text, especially for hearing and hypoacusic subjects, who can also rely on their hearing to access dialogues. In line with Gile's effort model, the effort made in reading something which is not diamesically equivalent to what is heard (i.e. when the subtitle text is not exactly the same as the dialogues) requires more processing capacity than reading something which is diamesically equivalent to what is heard. This processing capacity is subtracted from that needed to understand dialogues (in their spoken or written form) and/or to watch images. To avoid this, a sociolinguistic approach seems the only solution, but further investigation is needed to understand how this can ideally be done.

To conclude, the present experiment aimed to answer several questions. While doing so, it seems to have also raised several doubts, to which we have provided partial answers needing further investigation. Generally, our data lead to the suggestion that SDHH for children should go in the direction of verbatim subtitles, because subtitles that read the same as the dialogues are the preferred option of both hearing and DHH children. However, it is equally important to keep in mind that dialogues in cartoons for children aged between 5 and 10 are not always as slow and easy to understand as *Pororo, the Little Penguin*. Moreover, images play an important role in the narration of the plot, and this semiotic redundancy influences both perception and reception. In the end, our data seem to suggest that the following two extremes should be avoided when producing subtitles: verbatim subtitles of rapid dialogues, as they may affect usability (as mainstream literature in the field suggests); and adapted subtitles of easy dialogues, as they may affect understanding. However, to confirm this, further investigation is needed in the field, including experiments similar to the current one (with more children and videos with higher speech rates), more analyses on register in adapted subtitles and more experiments with eye-tracking technologies.

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References

ASPHI 2013, *ASPHI e la progettazione universale*. https://asphi.it/2013/09/16/progettazione-universale-o-universal-design-o-design-for-all/ (04.01.2019).

Baker R. 1985, *Subtitling television for deaf children*, in "Media in Education Research Series" 3, University of Southampton, Dept. of Teaching Media, pp. 1-46.

Cambra C., Silvestre N., and Leal A. 2008, *Función de la subtitulación y la interpretación de la imagen en la comprensión de los mensajes televisivos: la comprensión de una serie por parte de los adolescentes sordos*, in "Cultura y Educación" 20 [1], pp. 81-93.

Cambra C., Silvestre N. and Leal A. 2009, *Análisis de la comprensión por parte del alumnado sordo de los documentos televisivos subtitulados y criterios de mejora*, in "Quaderns del CAC" 31-32, pp. 155-159.

Cambra C., Silvestre N. and Leal A. 2010, *How Deaf and Hearing Adolescents Comprehend a Televised Story*, in "Deafness and Education International" 12 [1], pp. 34-51.

Cambra C., Silvestre N. and Leal A. 2013, *The interpretation and visual attention of hearing impaired children when watching a subtitled cartoon*, in "JoSTrans, The Journal of Specialised Translation" 20, pp. 134-146.

Cambra C., Penacchio O., Silvestre N. and Leal A. 2014, *Visual attention to subtitles when viewing a cartoon by deaf and hearing children: an eye-tracking pilot study*, in "Perspectives: Studies in Translatology" 22 [4], pp. 607-617.

Cambra C., Silvestre N. and Leal A. 2015, *How useful are television subtitles in helping deaf children to interpret cartoon programmes?*, in Díaz Cintas J. and Neves, J. (eds.), *Audiovisual Translation: Taking Stock*, Cambridge Scholars Publishing, Newcastle, pp. 245-260.

D'Ydewalle G. and De Bruycker W. 2007, *Eye movements of children and adults while reading television subtitles*, in "European Psychologist" 12 [3], pp. 196-205.

De Linde Z. and Kay N. 1999, *The Semiotics of Subtitling*, St. Jerome Publishing, Manchester.

De Seriis P. 2006, *Il Servizio Sottotitoli RAI Televideo per i non udenti*, in Eugeni C. and G. Mack (eds.), *Respeaking*, "inTRAlinea" special issue. http://www.intralinea.org/specials/article/1687 (04.01.2019).

Di Giovanni E. 2011, *Connecting the dots in audiovisual translation research: Translation, reception, accessibility and children*, in Di Giovanni E. (ed.), *Between Text and Receiver: Translation and Accessibility*, Peter Lang, Frankfurt am Main, pp. 7-18.

Eugeni C. 2007, *Il rispeakeraggio televisivo per sordi Per una sottotitolazione mirata del TG*, in "inTRAlinea" 9. http://www.intralinea.org/archive/article/1638 (04.01.2019).

Eugeni C. 2008, *La sottotitolazione in diretta TV - analisi strategica del rispeakeraggio verbatim di BBC news*, University of Naples "Federico II", PhD thesis. http://www.fedoa.unina.it/3271/1/Carlo_Eugeni.pdf (04.01.2019).

Eugeni C. 2015, "Eyetracking in Italy", in Romero-Fresco, P. (ed.) *The Reception of Subtitles for the Deaf and Hard of Hearing in Europe*, Frankfurt am Main: Peter Lang.

Ferraro D. 2018, *Sottotitoli per non udenti e bambini udenti: uno studio empirico*, unpublished Master's thesis, University of Salento, Lecce.

Gile D. 1995, *Basic Concepts and Models for Interpreter and Translator Training*, John Benjamins, Amsterdam & Philadelphia.

Grandioso L. 2018, *Sentire con gli occhi. La leggibilità dei sottotitoli per bambini non udenti tramite gli standard RAI e SKY*, unpublished Master's thesis, University of Salento, Lecce.

Greco G. M. 2017, *L'accessibilità come strumento per i diritti umani di tutti*, in Cetrelli G. and Guido M.R. (eds.), *Il patrimonio culturale per tutti - fruibilità, riconoscibilità, accessibilità*, Quaderni della valorizzazione, 4, pp. 97-106. http://musei.beniculturali.it/wp-content/uploads/2018/06/Il-patrimonio-culturale-per-tutti.-Fruibilità-riconoscibilità-accessibilità.-Quaderni-della-valorizzazione-NS-4.pdf (04.01.2019).

Gregory S. and Sancho-Aldridge J. 1996, *Dial 888: Subtitling for Deaf Children*, ITC, London.

Koolstra C.M., Van Der Voort T.H.A. and Van der Kamp L.J. TH. 1997, *Television's impact on children's Reading comprehension and decoding skills: a 3-year panel study*, in "Reading Research Quarterly" 32 [2], pp. 128-52.

Koolstra C.M., Van Der Voort T.H.A. and Van der Kamp L.J. TH. 1999, *Lengthening the presentation time of subtitles on television: Effects on children's reading time and recognition*, in "Communications" 24 [4], pp. 407-422.

Lorenzo L. 2010, *Criteria for elaborating subtitles for deaf and hard of hearing children in Spain: A guide of good practice*, in Matamala A. and Orero P. (eds.), *Listening to Subtitles. Subtitles for the Deaf and Hard of Hearing*, Peter Lang, Bern, pp. 139-147.

Maxon A.B. and Welch A.J. 1992, *The Role of Language Competence on Comprehension of Television Messages by Children with Hearing Impairment*, in "The Volta Review" 95, pp. 315- 326.

Neuman S.B. and Koskinen P. (1992) "Captioned television as comprehensible input: effects on incidental word learning from context for language minority students", in *Reading Research Quarterly*, 27 (1) pp. 95-106.

Neves J. 2005, *Audiovisual Translation: Subtitling for the Deaf and Hard-of-Hearing*, PhD Thesis University of Surrey Roehampton, http://roehampton.openrepository.com/roehampton/bitstream/10142/12580/1/neves%20audiovisual.pdf (04.01.2019).

Neves J. 2009, *Interlingual Subtitling for the Deaf and Hard-of-Hearing*, in Díaz Cintas J. and Anderman G.M. (eds.), *Audiovisual Translation: Language Transfer on Screen*, Palgrave Macmillan, New York, pp. 151-169.

Orletti F. 2016, *La lingua dei sottotitoli per non udenti*, in Manco A. and Mancini A. (eds.), *Scritture Brevi – Segni, testi e contesti. Dalle iscrizioni antiche ai Tweet*, Quaderni di AION, Napoli, pp. 219-234.

Paivio A. 1986, *Mental representations: a dual coding approach*, Oxford University Press, Oxford.

Quigley S.P. and Paul P.V. 1984, *Language and Deafness*, College-Hill Press, California.

Romero-Fresco P. 2015 (ed.), *The Reception of Subtitles for the Deaf and Hard of Hearing in Europe*, Peter Lang, Bern.

Romero-Fresco P. 2019, *Accessible Filmmaking: integrating translation and accessibility into the filmmaking process*, Routledge, London.

Romero-Fresco P. and Eugeni C. 2020, *Live subtitling through respeaking*, in Bogucki L. and Deckert M. (eds.), *Handbook of Audiovisual Translation and Media Accessibility*, Palgrave, London.

Tamayo A. 2017, *Subtitling for d/Deaf and Hard of Hearing Children*, in "CoMe" II [1], pp. 74-90.

Volterra V. 1986, *Il linguaggio dei sottotitoli e gli spettatori sordi*. RAI-Televideo, Roma.

Zárate S. 2008, *Subtitling for deaf children on British television*, in "The Sign Language Translator and Interpreter" 2 [1], pp. 15-34.

Zárate S. 2010, *Subtitling for deaf children*, in Bogucky Ł. and Kredens K. (eds.), *Perspectives on Audiovisual Translation*, Peter Lang, Frankfurt am Main, pp. 107-122.

Zárate S. 2014a, *Word recognition and content comprehension of subtitles for television by deaf children*, in "JoSTrans, The Journal of Specialised Translation" 21, pp. 133-152.

Zárate S. 2014b, *Subtitling for deaf children. Granting accessibility to audiovisual programmes in an educational way*, PhD thesis, University College London. http://discovery.ucl.ac.uk/1455707/1/Thesis_Soledad_Zarate.pdf (04.01.2019).