Quality in Live Subtitling
The Reception of Respoken Subtitles in the UK[1][2]

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Abstract

The present article addresses the so far largely neglected issue of quality in live subtitling from the point of view of its reception. Drawing on Romero-Fresco (forthcoming 2010), where the comprehension and perception of live subtitles by hearing viewers in the UK was analysed, this article goes a step beyond, including also deaf and hard of hearing viewers. In this case, the study tackles not only their comprehension and perception of live subtitles but also their preferences, which were obtained through the use of a questionnaire disseminated in collaboration with the Royal National Institute for Deaf People. The results of this study may help to provide a clearer picture of how live respoken subtitles are received in the UK and what aspects may need to be reconsidered or modified.

1. Introduction

Most broadcasters could do without having to provide live subtitles. They are expensive, they require skilled professionals and they are almost invariably flawed, as more often than not they contain errors and are delayed with regard to the images. Yet, in many cases broadcasters no longer have a choice, as EU and national legislation sets quotas for specific numbers of hours that must be subtitled (live and offline) depending on the country, type of channel, means available, etc. Indeed, from the beginning the emphasis has been placed on the amount of live subtitles, which has also traditionally been the users' main concern.

Yet, this situation is changing. Now that respeaking seems to have become consolidated as a cost-effective method to provide live subtitles and companies and broadcasters are beginning to meet their targets, a change of focus from quantity to quality is in order. This applies not only to the UK, where the BBC already subtitles 100% of its programmes, but also to other countries where live subtitling is still in its infancy but where it would be sensible to apply quality standards now before "bad habits" are acquired.

The question is now how to assess quality in live subtitling and, in this case, in respeaking. The approach adopted by most subtitling companies and broadcasters nowadays seems to be that of error calculation, often carried out by in-house trainers or respeakers. This is a very interesting topic that would merit a study in itself and that needs further research. Suffice it to say that there seems to be no consistency between the different methods used in the field, which in many ways invalidates the comparison between the live subtitles provided by the different companies (Boulianne et al. 2009). The approach adopted in this article for the study of quality in live subtitling in the UK is different. As part of the EU-funded project DTV4ALL (http://www.psp-dtv4all.org/), the focus here is placed on deaf, hard of hearing and hearing viewers. More specifically, on their comprehension, perception and preferences regarding live subtitles. Results of hearing viewers' comprehension and perception of live subtitles in the UK were already provided in Romero-Fresco (forthcoming 2010). The present study completes these results with data on deaf and hard of hearing viewers' comprehension and perception, and adds one more element: the viewers' preferences.

2. Deaf and hard of hearing viewers' comprehension of live subtitles

In Romero-Fresco (forthcoming 2010), an experiment was presented to find out how much visual and verbal information viewers obtain from news programmes in the UK. Four clips from *Six O'clock News* broadcast on 4 July 2007 by BBC1 were shown to 30 hearing viewers between 20 and 45 years old, native or near native in English, proficient readers and habitual subtitle users. Half of them were postgraduate students doing an MA on Audiovisual Translation at Roehampton University and the other half was formed by lecturers and professional subtitlers. Participants were shown two clips with two news items each and were asked to answer questions about one of them. The clips had respoken subtitles displayed at two different speeds: 180 wpm, the usual speed in the UK, and 220 wpm, so as to ascertain the effect of speed on comprehension. In order to determine how much visual and verbal information was retrieved by the viewers, the news clips were divided, drawing on Chafe's (1980) concept of *idea units*[3], into 14 semi-units: 8 verbal units and 6 visual units. If participants happened to identify a semi-unit that was not included in these 14, the new unit was also considered in the final results, which are shown in percentages (0%-25% is zero to poor information retrieval, 25%-50% from poor to sufficient, 50%-75%, from sufficient to good and 75%-100% from very good to perfect). Finally, in order to have a yardstick with which to compare the results obtained by viewers watching news with respoken subtitles, a pilot test was conducted with a control group of 15 other students from the same course at Roehampton University. In this case, their comprehension without subtitles was tested, the hypothesis being that viewers under "normal" conditions (no subtitles) do not obtain 100% of the visual and acoustic information of a news clip.

Moving on from the above tests, for the present article the study was extended to 15 deaf and 15 hard of hearing viewers. The hard of hearing participants were between 60

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[3] Chafe (1985:106) defines idea units as "units of intonational and semantic closure", which can be identified because they are spoken with a single coherent intonation contour, preceded and followed by some kind of hesitation, made up of one verb phrase along with whatever noun, prepositional or adverb phrase are appropriate, usually consist of seven words and take about two seconds to produce.

and 80 years old, the most common age range for viewers with this type of hearing loss (Ofcom 2006). 13 out of the 15 became hard of hearing after the age of 50 and were habitual users of subtitles. The 15 deaf participants were between 20 and 45 years old. 13 of them were oralist (i.e. they use English as their first language) and only 2 were signing (they use British Sign Language as their first language). All of them were university students, experienced readers and frequent subtitle users. Their comprehension was tested using the same clips (with subtitles at 180 wpm and 220 wpm) and methodology (Chafe's idea units) as in Romero-Fresco (forthcoming 2010).

2.1. Results

The following table includes the results of the tests with no subtitles and with subtitles at 220 wpm and 180 wpm for hearing, deaf and hard of hearing viewers:

	No subtitles	Subtitles at 220 wpm			Subtitles at 180 wpm		
	Hearing	Hearing	HoH	Deaf	Hearing	HoH	Deaf
Perfect	0%	0%	0%	0%	0%	0%	0%
Very good	93.3%	0%	0%	0%	0%	0%	0%
Good	6.7%	0%	0%	0%	3.3%	3.3%	0%
Almost good	0%	6.7 %	6.7%	6.6%	6.7%	6.7%	6.7%
Sufficient	0%	13.3 %	13.3%	6.6%	36.7%	36.7%	40%
Less than sufficient	0%	20%	30%	26.7%	20%	20%	13.3%
Poor	0%	30%	30%	26.7%	20%	13.3%	20%
Very poor	0%	30%	20%	33.3%	13.3%	20%	20%

Table 1: Performance with no subtitles, subtitles at 220 wpm and subtitles at 180 wpm

As expected, hearing participants under "normal" conditions (watching news with no subtitles) did not obtain 100% of the visual and verbal information included in the clips. As far as the tests with subtitles are concerned, the results show very little discrepancy across the different types of viewers. Overall the figures are very low, most participants obtaining less than sufficient, poor and very poor information.

2.2. Discussion

First of all, the fact that normal conditions do not yield a perfect score by the participants suggests that short term memory may play an important role here. Be that as it may, overall comprehension was very good (80% on average), particularly regarding images (90.5%, as compared to 73.2% for verbal information), which makes sense considering that no subtitles were displayed. As for the similarity in the results obtained by hearing, hard-of-hearing and deaf viewers with subtitles displayed at 220 wpm and especially at 180 wpm, it may be explained by the above-mentioned familiarity of the participants with TV subtitles, whether as an object of study (hearing viewers) or as a means to access the news on a daily basis (deaf and hard-of-hearing viewers). Needless to say, this makes the low overall score regarding comprehension even more meaningful. With subtitles displayed at 220 wpm, nobody obtained good information and only 20% of the participants obtained sufficient information. 60%

could only give a poor or very poor account of the news. While it is true that subtitles are not usually shown at this speed, it is not uncommon for presenters of debates, interviews and weather reports to speak at this rate (Uglova and Shevchenko 2005). These results may thus be seen as a warning against the provision of verbatim subtitles for these programmes.

The most surprising results were, however, yielded by the test with subtitles displayed at 180 wpm, the usual speed of live subtitles in the UK. More than half of the participants (51%) did not obtain sufficient information, only 3% obtained good information and 31% got poor or very poor information. Furthermore, 1 out of 3 participants retrieved incorrect information, mixing up names and faces from one piece of news to another.

It must be underlined that the participants taking part in this experiment were highly literate and frequent subtitle users. Viewers who are not used to subtitles or signing deaf viewers, whose first language is not English and whose reading skills are often regarded to be poorer (Torres Monreal and Santana Hernández 2005), can hardly be expected to obtain better results. Why do programmes with these respoken subtitles trigger such mediocre comprehension results? A possible answer to this question may lie in how viewers read and process these subtitles. This can be studied with eye-tracking technology, which constitutes the basis of the second experiment included in the present article.

3. Deaf and hard of hearing viewers' perception of live subtitles

In Romero-Fresco (forthcoming 2010), an eye-tracking test was conducted with 5 hearing participants (hearing lecturers on subtitling, and professional subtitlers) to find out how they read respoken word-for-word subtitles as opposed to block subtitles. They watched two news clips from *Six O'Clock News* (4 July 2004) with subtitles displayed first of all in scrolling mode (word-for-word) and then in blocks of two lines, while their eyes were monitored by a non-intrusive eye tracker[4]. The aim of the experiment was to calculate the amount of time spent on the images vs. the amount of time spent on the subtitles and also the number of fixations per subtitle. A brief explanation is in order here to stress the importance of fixations in the reading process. As can be seen in the pictures below, when we read, our eyes don't sweep continuously across the page (or the screen). Instead, they pause and rest for short periods of 110ms-500ms called *fixations*, which is when we obtain the visual information we need (Rayner and Pollatsek 1989).

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[4] The eye tracker used was the Tobii x50, working at a frame rate of 50Hz. Viewing was binocular and the images were presented on a 17" monitor at a viewing distance of 60 cm. The computer kept a complete record of the duration, sequence, and location of each eye fixation, and Tobii Studio was used to analyse all data recorded.

"The response from our students has been overwhelming.

Pictures 1 and 2: Fixations and saccades

The movements between fixations are called *saccades*. They are ballistic movements (once started, they cannot be stopped) which may take as little as 20ms-100 ms and during which no visual information is obtained (Wolverton and Zola 1983). All visual information comes in during the fixations. Also worth highlighting here is the fact that every fixation spans 8-10 characters; in other words, our eyes need not fixate on every word when reading a subtitle, which enables us to read faster (Rayner 1998).

While all this refers to "normal" lines in print and block subtitles on the screen, it remains to be seen whether it also applies to scrolling subtitles. The experiment presented in Romero-Fresco (forthcoming 2010) tested this with hearing participants. In the present article, the study has been extended to 10 hard of hearing and 10 deaf viewers who also took part in the comprehension study.

3.1. Results

The following table shows the results obtained in the study, namely the number of fixations per subtitled line and the time spent on images by the different types of participants, with subtitles displayed in blocks and scrolling:

	Number of fixations		Time spent on images	
	Blocks	Scrolling	Blocks	Scrolling
Hearing	3.75	6	33.3%	11.7%
Hard-of-Hearing	3.75	6.5	33.2%	11.4%
Deaf	3.9	6.5	31.7%	14.3%

Table 2: Number of fixations and time spent on images with blocks and scrolling subtitles

In line with what has been described regarding the comprehension test (see section 2.1), the results are fairly consistent across hearing, hard of hearing and deaf viewers. In order to read scrolling subtitles, viewers need almost twice as many fixations as for block subtitles. The number of fixations per subtitled line in scrolling mode ranges from

3 to 10, with an average of 6 for hearing viewers and 6.5 for hard of hearing and deaf viewers. The number of words per line in the clips analysed is 6, which means that hearing viewers fixate on every word of every scrolling subtitle and deaf and hard of hearing viewers feature even more fixations than words. In contrast, the number of fixations in block subtitles ranges from 2 to 6, with an average of 3.75 fixations for hearing and hard of hearing viewers and 3.9 for deaf viewers. In other words, viewers manage to read block subtitles skipping almost every other word. Needless to say, this has a direct impact on the time viewers spend looking at the subtitles and the time they devote to the images. As shown in table 2, in scrolling mode viewers spend most of their time bogged down in the subtitles (an average of 87.5% vs 12.5% spent on the images), whereas in block subtitles they have more time to focus on the images (an average of 67.3% on the subtitles and 32.7% on the images).

3.2. Discussion

The analysis of the reading patterns of each participant reveals some interesting elements. Rather than differentiating the participants into hearing, deaf and hard of hearing, the results seem to establish a distinction between fast and slow readers that was not considered at the beginning of the experiment[5]. Besides, there seem to be two phenomena, astray fixations and regressions, that may explain the viewers' difficulty reading scrolling subtitles and perhaps the poor comprehension results obtained in the previous experiment. As can be seen in the following picture, fast readers often get ahead of the subtitles and cast their eyes on gaps where no word has been displayed yet, which results in astray fixations.

Picture 3: Astray fixation

This "quicksand effect" (Romero-Fresco forthcoming 2010), as they struggle to find solid ground (a word or a whole line) causes them to lose precious time in their reading process. On average, fast readers incur in 2 astray fixations per subtitled line. In half of the cases, they go back and re-read at least one word, which means they incur in 1

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[5] The details of this distinction will be the subject of further investigation focusing on the length of the saccades, the duration of the fixations and the number of characters per fixation in the different conditions. This may help to determine if and how the presence of a moving target (scrolling subtitle) affects the viewing experience. Likewise, as suggested by Duchowski (2007), it may also be useful to analyse scanpaths (eye-movement patterns) to compare how subtitles and images are viewed.

regression per subtitled line. In the other half of the cases, they decide to go on reading the subtitle.

In contrast, slow readers do not get ahead of the subtitles (they usually lag behind them) and therefore their patterns do not feature astray fixations and the quicksand effect. However, their eyes often land on words in the middle of a subtitle that are not meaningful enough for the reader to make sense of what is being said. In order to go on reading, slow readers then have to go back and re-read previous words, which happens 1.5 times per line in the subjects analysed. In the following picture, the viewer's eyes are first cast on the word "have" and then go back to the beginning of the line:

Picture 4: Regression

These results seem to corroborate the view of Rayner et al (2006) about the importance of the word to the right of the fixation for maintaining normal reading patterns. In the experiment conducted by these authors, the absence of such a word causes significant disruption to reading and decreases reading speed. In scrolling subtitles, the word to the right of the fixation is often absent, which may explain the very chaotic reading patterns yielded in the present experiment. On the one hand, fast readers get ahead of the subtitles and cast their eyes on gaps without words (astray fixations); on the other hand, slow readers lag behind and constantly go back to re-read words (regressions). Either way, all viewers waste time chasing subtitles which seem to be playing hide-and-seek with them, preventing them from watching the images.

Needless to say, this chaotic reading pattern and the almost non-existent time left to 'read' the images may go some way towards explaining the poor comprehension results obtained by deaf, hard of hearing and hearing participants in the comprehension test described above. What remains to be seen now is what viewers think about this and other types of respoken subtitles. Are they happy with them? Do they realise that this display mode may be hindering their comprehension of live programmes?

4. Deaf and hard of hearing viewers' preferences regarding live subtitles

Very often, many of the decisions adopted by broadcasters regarding subtitling features are based on the viewers' preferences. This sounds logical and certainly preferable to

adopting decisions without consulting the audience, but there are some matters that deserve further study. On the one hand, it may be useful to conduct comprehension studies and perhaps even eye-tracking studies, such as the ones included in this chapter, to ascertain whether (and how) viewers understand subtitled programmes. On the other hand, viewers' preferences are not set in stone, which means that surveys need to be conducted periodically.

To name but one example, the choice of scrolling vs. block subtitles in the UK has traditionally been based on two arguments, namely that scrolling subtitles have less delay than block subtitles and that viewers prefer scrolling subtitles for live programmes because they have grown accustomed to them. As explained in Romero-Fresco (forthcoming 2011), the first argument can now be easily refuted. SwissTxT in Switzerland have shown that respoken subtitles produced with Dragon NaturallySpeaking 11 (Nuance) can have a 4-6 second average delay, very much like the scrolling subtitles produced with ViaVoice 10 (IBM)[6]. As for the second argument, it may be necessary to revisit viewers' preferences, especially considering the lack of reception studies on live subtitling and the way new technology develops.

One of the most recent surveys regarding SDH in the UK is the one carried out in early 2009 by the Royal National Institute for the Deaf (RNID)[7]. Although it was focused generally on TV access, participants identified subtitling as the main issue they wanted the RNID to campaign on. Almost 80% of the participants experienced problems with subtitles and more than half had to stop watching a programme as a result. The two main issues were the delay of subtitles with regard to the audio (25%) and their inaccuracy (17%). These were identified as more important factors than having no subtitles available (7%). In other words, it would appear that viewers are now prioritising quality over quantity and, judging by their main concerns (delay and accuracy), it is the quality of live subtitling they are particularly worried about.

Given the absence of data with regard to viewers' preferences about live subtitling in the UK, a questionnaire was prepared as part of the DTV4ALL project and disseminated through the RNID website[8]. The following sections include information about the participants as well as a discussion of their replies.

4.1. Description of the survey

A total of 434 viewers took part in the survey. 259 were hard-of-hearing, 164 were deaf, of whom 27 were BSL users, and 11 viewers were hearing. The results included here will focus mainly on the first two groups, as the numbers are more representative. More than half of the participants (58.7%) were over 60 years old, 33% were between 35 and 59 and 8.3% were between 17 and 34. As suggested also in Ofcom (2006), this reflects

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[6] Reducing the delay to less than 3 seconds is very difficult, as at least one second is necessary for the respeaker to listen and one or two more seconds are needed to speak and have the words displayed on the screen.
[7] Accessible on http://www.rnid.org.uk/howyoucanhelp/join_rnid/_member_community/volunteering_campaigning/volunteering_campaigning_news/tvaccessresults.htm
[8] The questionnaire can be accessed at https://rnid.wufoo.com/forms/what-are-your-views-on-tv-subtitling/

the reality of the UK, where the largest group of SDH viewers are hard of hearing people over 60. As for education, most participants in the survey (72.6%) attended university or a technical college. Finally, with regard to subtitle use, 70% of the participants use subtitles all the time, while 20% watch them some of the time, 6.5% do so only occasionally and 2.5% never. As shown in the following table, deaf viewers proved more likely to use subtitles as the only way to access the audio of the programmes, whereas in the case of hard of hearing viewers, the results were more evenly split among those who use them to understand the original soundtrack better and those who rely on them completely.

What do you use subtitles for?	Deaf		HoH		Hearing	
	Number	Percentage	Number	Percentage	Number	Percentage
They are the only way to access the dialogue	100	61%	118	45.6%	0	0%
They help me understand	63	38.4%	133	51.3%	9	81.8%
I use them to learn English	0	0%	1	0.5%	0	0
I don't use them	1	0.6%	7	2.7%	2	18.2%
N/A	0	0%	0	0%	0	0%
Total	164	100%	259	100%	11	100%

Table 3: The use of subtitles by deaf, hard of hearing and hearing viewers

Participants were asked 14 questions regarding live subtitling. The first three questions covered general aspects, namely how live subtitles are produced (questions 1 and 2) and the viewers' opinion on their quality (3). The next six questions (4-9) asked for the viewers' opinion of live subtitling on the main UK channels: BBC, ITV, Channel 4, Channel 5 and Sky. Finally, the last 5 questions (10-14) dealt with specific respeaking issues such as mistakes, delay and display mode.
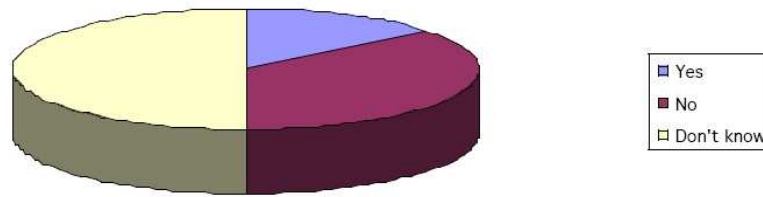
4.2. Results and discussion

The data obtained from the questionnaire yielded the following results.

4.2.1. Awareness of how live subtitles are produced:

Most participants don't know how live subtitles are produced, 26.7% claim to know, but only 13.3% identify current live subtitling methods.

A) Do you know how live subtitles are produced?


Legend:
- Yes
- No
- Don't know

.There seems to be a general belief that live subtitles are produced by automatic speech recognition, with little or mostly no human intervention. In other words, viewers' expectations of current speech recognition technology are unrealistic, which may go some way towards explaining some frequent complaints about live subtitles not being error-free or in perfect synch with the original soundtrack. As for respeaking, only 3.5% of the participants knew this method. Overall, deaf participants proved more knowledgeable about live subtitling methods than hard of hearing, and so did frequent subtitle users. According to this, the more viewers rely on subtitles, the more likely they are to know about them and perhaps to take an interest in how they are produced. In any case, the very low figures regarding knowledge about live subtitles in general and respeaking in particular send a worrying message about the visibility of this activity.

4.2.2. General opinion of live subtitles in the UK

As the pie chart below indicates, there is overall dissatisfaction with live subtitles in the UK.

B) What do you think of live subtitles in general?

Legend:
- Don't know
- Satisfactory
- Could be better
- Unsatisfactory
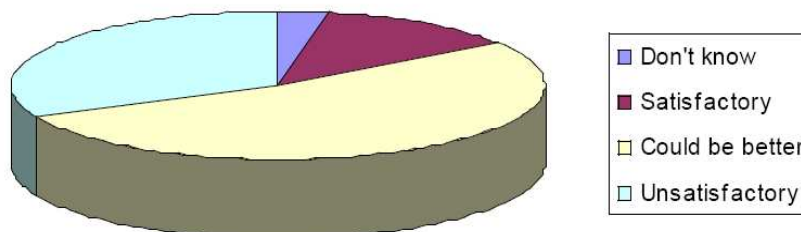
Most participants (55%) think they could be better, many (30.6%) find them unsatisfactory and only 11.2% consider them satisfactory. Deaf viewers seem to have a more favourable opinion than hard of hearing viewers, and so do frequent subtitle users as compared to occasional users, 50% of whom find live subtitles unsatisfactory. In other words, it would seem that the more viewers watch, or rely on, live subtitles, the happier they are with them. However, it must be noted that this difference is only reflected in more viewers choosing the "could be better" option rather than the "unsatisfactory" option. The percentage of viewers regarding live subtitles satisfactory remains low at 11-12%.

4.2.3. Opinion on subtitles as shown in the BBC, ITV, Channel 4, Channel 5 and Sky

As shown in this survey, BBC live subtitles are rated slightly more favourably than those shown on other UK channels, 28% of the participants considering them satisfactory. Yet, in line with what was explained in the previous section, most participants (52.2%) think they could be better and 19.7% find them unsatisfactory. In general, participants seem to be very familiar with live subtitles on the BBC and deaf viewers have a better opinion of them than hard of hearing viewers.

As for live subtitles on ITV, the score is slightly lower than that of BBC subtitles. Although there is a similar result regarding those who think they could be better (56%), fewer viewers find them satisfactory (18.6%) and more find them unsatisfactory (25.3%).

As for live subtitles on Channel 4, Channel 5 and Sky, participants do not seem to be very familiarised with them. 25.5% chose the "I don't know" option for Channel 4, 38% for Channel 5 and as many as 62.9% for Sky. In general, viewers seem to have a higher opinion of live subtitles on Channel 4 than those on ITV, whereas Channel 5 and Sky obtain the lowest scores (with a dissatisfaction rate of 32.3% and 38.5% respectively).

More specific comments made by some participants show criticism of the subtitles provided in some sport events, many regional news programmes and talk shows, where the presence of subtitles seems to be erratic or their quality very poor. Programmes such as *Question Time*, *Have I Got News for You*, *Mock the Week* and *The One Show*, all talk shows, are singled out as particularly problematic. Of all the concerns voiced by viewers, the main one seems to be the delay with which the live subtitles are presented, followed by the number of mistakes they contain. These mistakes appear to be particularly noticeable in regional news. Other complaints refer to not being able to see the speakers' faces to lip read what they say, excessive editing, the volume of commercials being too loud, the intervention of unnecessary on-air corrections and the failure to indicate in the subtitles that a new topic is being introduced.

In sum, while in the past user satisfaction seemed to focus mainly on quantity, now that the different channels are meeting their targets, viewers are placing the emphasis on quality, which seems very much subject to improvement.


4.2.4. Extent to which different errors and delay are perceived to affect comprehension and appreciation of subtitles

The results obtained for the question asking to what extent the viewers feel errors affect their comprehension show that participants are split between those who think that it is often possible (45%) to understand the original meaning when there is a mistake in live subtitles, and those who think it is only sometimes possible (45.5%). A noticeable difference is found here between deaf and hard of hearing viewers. Whereas the former struggle to restore the original meaning more than half of the times, the latter tend to find it easier. This makes sense considering that many hard of hearing viewers can mentally correct a misrecognised word by thinking of the similar-sounding word that was meant to be in its place. Many deaf viewers, particularly pre-lingually deaf, who

have no recollection of sounds, may not be able to do so. Still, further research is required in this regard.

When asked for their opinions on the acceptability of current delays in presentation considering that it is currently impossible to eliminate it, viewers tend to be rather negative.

F) Considering that it is currently impossible to match live subtitles and images perfectly, what do you think of the current delay in live subtitles?

- Very satisfactory
- Satisfactory
- Unsatisfactory
- Very unsatisfactory
- Don't know
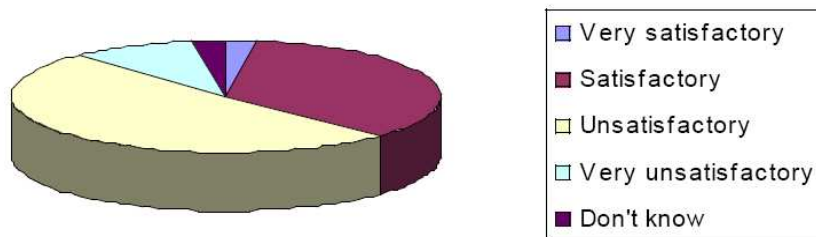
Most participants (49.6%) find the current delay of respoken subtitles on UK TV channels unsatisfactory. Although a significant percentage (35.5%) finds it satisfactory, there are more who consider it very unsatisfactory (10.2%) than very satisfactory (2%).

When asked whether it is possible to relate the subtitles to the images despite the delay, results are worse than in the question about mistakes, and the distinction between deaf and hard of hearing resurfaces. Whereas hard of hearing participants are evenly split between those who can often relate images and subtitles and those who can only do it sometimes, most deaf participants choose the latter option.

G) Can you relate the subtitles to the images despite the delay?

- Always
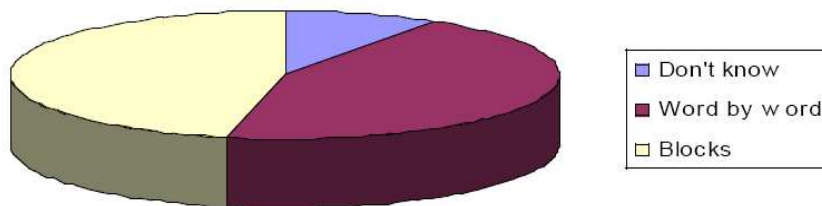- Often
- Sometimes
- Never
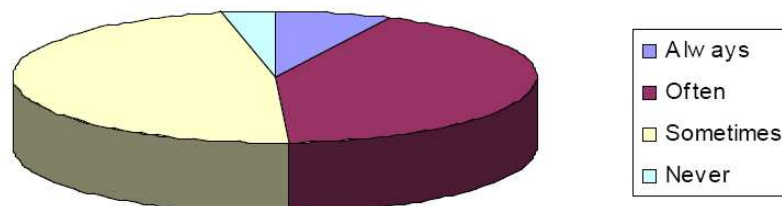
In any case, it seems that most people find it more difficult to relate the subtitles to the images than to mentally correct mistakes. This may explain why, in the next question, when asked whether it is more important to reduce the delay or to reduce the mistakes in respoken subtitles, 2 out of 3 participants chose delay over mistakes, with very similar results among deaf and hard of hearing viewers:
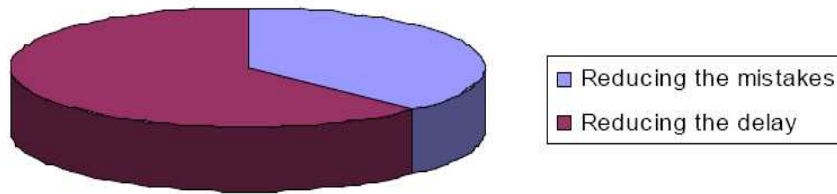
Finally, respondents were asked for their general opinion on the display mode of live subtitles

I) In general how would you prefer live
subtitles to be shown (if the accuracy and
delay were the same for each of the following)

As noted in section 4, the viewers' preference for word-for-word subtitles is often posited as one of the main reasons why live subtitles in the UK are not displayed in blocks. Yet, the results obtained in the survey under discussion, question this assumption. Far from showing a clear preference for scrolling subtitles, the results are very divided and, if anything, more favourable to block subtitles (45.6% vs. 44.8%). A more thorough analysis reveals that word-for-word display is mostly preferred by deaf viewers, particularly those who use BSL or who have lost their hearing at birth or in the first years of their lives. Many of them cannot hear the original soundtrack but they can see how people speak and they know language is not spoken in blocks, but word for word. Some of these viewers specified in the survey that subtitles displayed in blocks look manipulated, edited or tampered with, whereas scrolling subtitles look like the real thing, giving them the impression that they are listening with their eyes in real time. Yet, this does not apply to all deaf viewers and certainly not to hard of hearing viewers, who seem to be more favourable towards blocks. In this sense, the strongest preference for blocks is registered among those participants who may be described as "most different" from the above-mentioned deaf viewers, that is, hard of hearing viewers who

are not BSL users, who resort to lip-reading and who have lost their hearing after the age of 50[9].

In any case, what is interesting here is that, contrary to what has been held for a long time now, there is no overall preference for word-for-word subtitles over subtitles in blocks. Taking into account the potential negative effect that scrolling subtitles may have in terms of comprehension and reading efficiency (see sections 2 and 3 above), the choice for live subtitling seems no longer justified.

5. Final thoughts and future research

Now that respeaking has been consolidated as the preferred method to provide live subtitles and that many broadcasters are meeting the targets set by European and national legislation, the time has come for research in this field to focus on the quality rather than on the quantity of live subtitling. Viewers seem to share this view as their complaints about lack of subtitles in live programmes take a back seat to other issues such as the delay of respoken subtitles, the number of mistakes, etc.

It is equally important for research to adopt a broad approach to the assessment of the quality of live subtitling. Significant as they may be, the viewers' preferences are but one element to take into account. This may be complemented by data from other approaches such as comprehension tests or eye-tracking studies that can cast some light on the extent to which live subtitles are understood or on how they are viewed/perceived. In the case of the respoken subtitles currently provided in the UK, the tests included in this article suggest that there is much room for improvement. The results obtained by the hearing, deaf and hard of hearing participants in the comprehension tests are extremely low. The eye-tracking study shows that this may be due to the scrolling display mode of respoken subtitles, which causes unnatural and chaotic reading patterns, with the viewers chasing the subtitles and having no time to focus on the images.

A possible solution for this may be the use of a non-scrolling speech recognition software such as Dragon NaturallySpeaking (Nuance) to subtitle in respeaking units (Romero-Fresco [2011]) as opposed to word-for-word. These respeaking units can help a) respeakers to make sense of the original text, b) the software to increase accuracy by producing phrases rather than individual words and c) viewers to read commonsensical blocks and then focus on the images. As suggested by the results obtained in the opinion poll presented in this chapter, the claim that viewers are massively in favour of scrolling subtitles for live programmes may no longer apply. Furthermore, the results of the survey point to other areas that may be subject to improvement. Firstly, most viewers seem to be unaware of how live subtitles are produced. Many actually believe that they are produced by automatic SR, with little or no human intervention. If companies and broadcasters gave more visibility to respeaking and the (human) difficulties involved, viewers might be more lenient in their demands.

All the same, the current view is that respoken subtitles are open to improvement, notwithstanding differences between genres, channels and viewers. The main complaint

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[9] A full statistical analysis of the data is still underway.

is the delay of the subtitles with regard to the images, ranked as more important than the number of errors creeping into the text. The reason for this may be that, as most viewers point out, it is more difficult to relate images to delayed subtitles than to understand what was originally meant in a programme despite the mistakes. Given that it is virtually impossible to eliminate the delay in respeaking, broadcasters have at least two possible solutions. The first one could be to use automatic (speaker-independent) speech recognition, with no need for a respeaker to intervene. Here, though, more time is needed, as issues such as automatic punctuation and general accuracy still require further research and improvement. The second solution would be, as some participants have pointed out, to delay the video signal and thus provide respeakers with some seconds to respeak the original soundtrack, correct the errors and cue the subtitles live with no delay. This has already been done in Holland to subtitle live events from English into Dutch with very good results. The issues of competition among channels and even censorship that this may bring about could be solved if the decision to have the signal delayed or not was taken at the viewers' end. Set-top boxes could feature an application allowing those viewers who wish to have synchronous subtitles to have the video signal delayed.

Future research in the field of respeaking could focus on the reception of respoken subtitles with and without delay, but also on other areas such as more in depth analysis of comprehension in scrolling versus block subtitles, the reception of on-air corrections and, based on the different preferences expressed by deaf an hard of hearing participants, the possible provision of different respoken subtitles depending on the viewers' hearing impairment. The latter may not be a realistic option for TV, but it may be for public events where an all-hard of hearing audience may have a different preference regarding live subtitles (display mode, delay, error correction, etc.) to an all-deaf audience.

In all cases, though, partnership between enterprise and academia, which has so far only been successful in a few countries, is a key element to make research viable and ultimately successful.

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