Analysis of comprehension by deaf pupils of captioned television documents and criteria for improvement

CRISTINA CAMBRA
Senior Lecturer in the Faculty of Psychology at the Universitat Autònoma de Barcelona and Deputy Director of the Research Group on Deafness and Language Acquisition Disorders (GISTAL)

cristina.cambra@uab.cat

NÚRIA SILVESTRE
Professor in the Faculty of Psychology at the Universitat Autònoma de Barcelona and Director of the Research Group on Deafness and Language Acquisition Disorders (GISTAL)

nuria.silvestre@uab.cat

AURORA LEAL
Senior Lecturer in the Faculty of Psychology at the Universitat Autònoma de Barcelona and Member of the Research Group on Deafness and Language Acquisition Disorders (GISTAL)

aurora.leal@uab.cat

Abstract
This article analyses how deaf students understand captioned cartoon programmes on Catalan television. Results indicate that students with deafness have problems in understanding cartoons, not only because the captions are too fast, but because literal captioning does not allow them to look at the image and extract meaning from its content. It is deduced that new captioning criteria should be introduced to facilitate reading of captions and the "reading" of images to improve understanding of television programmes.

Key words
Deafness, subtitling, television, cartoons.

Resum
Aquest article analitza com l'alumnat sord entén els dibuixos animats subtitulats de la televisió de Catalunya. Els resultats indiquen que l'alumnat amb sordesa te dificultats per comprendre els dibuixos animats no sols perquè la velocitat dels subtítols és excessiva, sinó també perquè la subtitulació literal no els permet mirar la imatge i extreure'n una significació del seu contingut. Se'n dedueix que és necessari introduir nous criteris de subtitulació que facilitin la lectura dels subtítols i la "lectura" de les imatges per millorar la comprensió dels programes de la televisió.

Paraules clau
Sordesa, subtitulació, televisió, dibuixos animats.

Introduction

The main problem with the social integration of people with deafness arises from the communicative barriers they come up against in the hearing world. Today, technological advances are helping to break down these barriers, one good example being accessibility to audiovisual content provided by captioning.

Since the captioning service began in the 1990s, almost total captioning of television programming has been achieved. For deaf people, this has created new expectations of access to communication, information and knowledge on equal terms with other citizens. Furthermore, with digital terrestrial television (DTT) and its multiple captioning options, caption quality itself has improved, beating the traditional teletext, and new services are offered.

Although it may seem obvious that the technological improvement in captioning will guarantee that television pro-

gramming can be understood by people with hearing impairment, no studies have been made in Spain to demonstrate that this is so. Furthermore, there has been no real reflection on how people with deafness combine reception of information from oral language, captions and images when watching television. That is, a great effort has been made to improve captioning in technological terms, but no consideration has been made of how this information is received by the main users of the service: deaf people themselves.

Are television captions really useful in helping deaf people to understand programmes better? Do people with hearing impairment have time to read the captions? Do they have time to look at and interpret the images? To respond to these questions, we must examine how people with deafness come to understand captioned television programmes, evaluating the functions of oral language, captions and interpretation of the image in the process.

Studies on the captioning of television programmes

As noted above, many technology-based studies have been carried out, mostly outside Spain, on the formal and aesthetic characteristics required of captions, and on their users' preferences.

One of the issues on which most studies have been carried out is the speed with which captions are emitted. A range of studies coincide in indicating that the average speed of captions is estimated at 141 words per minute (Jensema 1998, Kirkland 1999 and Jensema, Danturthi and Burch 2000). Programmes with the fastest-moving captions are debates, news and television series, while the slowest are sports and children's programmes. Maxon and Welch (1992) point out that one of the variables which predicts the degree of comprehension of televised messages is the linguistic competence of the deaf person concerned. The authors consider that this medium uses more complex language than that spoken by people with hearing impairment, and requires them to have high enough levels of language and reading competence to understand the message. In Catalonia, the research group directed by Anna Torrent of the Department of Catalan Philology at the Universitat Autònoma de Barcelona, has analysed the linguistic style used in captions to obtain linguistic and discursive guidelines that when applied to captioning will allow it to reflect the variety of language use (Cros, Segarra and Torrent 2000).

According to Jensema, Danturthi and Burch (2000), the percentage of time spent reading captions is 84%, while only 14% is devoted to watching images and in 2% the screen is not watched.

This data shows the importance of learning and expertise in reading for deaf people to be able to access information from the television. The study by Jensema, Sharkawy, Danturthi, Burch and Hsu (2000) confirms that reading captions is a priority activity that dominates eye movement, while watching action in the images tends to be secondary. By using a technological system to analyse eye movement (Eyegaze Development System) it can be proved that television viewers start by looking at the centre of the screen, then they look at the captions, and after reading them, return to observing the action on the screen until new captions appear. The authors point out that the speed of the captions influences their reading time: the more quickly they are run, the more time is spent reading them, and the less time looking at the images.

Another aspect studied is the preferences of television viewers with deafness as regards the typeface, letter colour, location on the screen and way of presenting captions. Kirkland (1999) compares preferences in the presentation of captions in two groups of deaf people, one of school children and another of adults. The results indicate that there are differences between the two groups. The children prefer captions in the Helvetica typeface in white presented on a semi-transparent or totally transparent background and located depending on the speaker;

conversely, adults prefer captions presented in Times New Roman on a dark background and located in the centre of the screen.

Apart from any preferences that television viewers with hearing impairment may have as regards the characteristics of captions, it is interesting to review the reading difficulties of deaf people thrown up by the studies.

The reading comprehension of deaf people

Comprehension of captions and the action taking place in a programme does not just depend on prior knowledge, it also varies with the viewer's linguistic competence. In the case of a person with deafness, this might be poor, in spite of technological improvements in the form of digital hearing aids and cochlear implants (Valero and Villalba 2004).

Jelinek and Jackson (2001) compare a group of deaf boys and girls with a group of hearing children with the same reading level. They conclude that the deaf children have more problems in generalising information and using their prior knowledge because they have less experience with oral language, and this affects their recognition of important information.

Readers use prior knowledge so they can make inferences and complete information that is not explained. Some skill with oral language and past exposure to diverse linguistic experiences are also required. Ramspott's study (1991) on the comprehension of stories by a sample of deaf children in Catalonia shows that compared with hearing children they are not as used to making inferences. This negatively affects the process of interpreting a text, although difficulty varies depending on how familiar they are with its content.

Reading captions is a special situation. First, because it demands great precision and speed in reading, and second, because television viewers cannot look back for example to find the referents of the text. As Nugent indicates (1983), this is why images seen on the screen are an essential support to facilitate comprehension of the message. In this regard, Braverman and Hertzog (1980) consider that the language level of captions is not an important factor in programmes with a high visual content.

Comprehension of captioned cartoons

In view of the results of the studies on the reading competence of students with deafness mentioned above, we must ask what happens when a deaf child, only just learning to read, has to cope with the captions of a children's programme with high visual content like cartoons.

This was investigated in a pilot study (Cambra, Silvestre and Leal 2006) with a group of seven children with deafness aged 6-7 (1st and 2nd year primary pupils) studying in normal schools in oral mode. All had worn cochlear implants for at

least two years and had achieved good hearing gain. The participants were asked to say what was happening in a fragment of a *Shin-Chan* cartoon in which a short story was told after seeing it in two versions: one with sound but without captions, and the other with both sound and captions.

The first interesting element was the speed of the captions. Subtitles in a *Shin-Chan* cartoon have to be read at an average speed of 96 words per minute, while the average speed demanded of 1st and 2nd year primary school pupils is 40 and 62 words per minute, respectively. Taking into account that, as has been proved, comprehension levels and reading speeds of deaf students at these educational stages are lower than expected for their age, it can be deduced that, *a priori,* they will not be able to read or understand the captions. Added to which, the captions would also be too fast for their hearing companions to read. This lack of synchronisation between the speed of captions and the reading speed of deaf children means that they get tired of reading and most opt to watch television without captions.

It is therefore understandable that differences between comprehension of cartoons viewed with and without captions are not significant. Basically, the captions are used to complete information and obtain shades of meaning on what has been seen, but this does not always mean a better comprehension of the story's overall content. In fact, the conduct most frequently observed in deaf children is trying to remember as accurately as possible what the characters say instead of selecting relevant information and summarising it, so they do not retain the story's narrative structure.

This means that: *a*) captioning cannot be limited to the literal transcription of all the oral language. New criteria must be introduced to let viewers read and understand the captions but also look at the images to extract information, and *b*) it is important to prioritise captioning of narrative sequences that are difficult to infer, like intentions of characters that are not spelled out in visual or verbal form, over sequences including facial and corporal expressions of feelings and emotions, where the image already brings enough information to the receiver.

These results have been the starting point for ongoing work concerning improving the captioning of children's programmes as regards both captioning criteria and the preparation of didactic material. This material would be useful not only for improving deaf children's comprehension of televised information, but also as a learning resource and tool for improving the reading levels of all children, for use in the classroom and with television.

Contributions to improving the captioning of cartoons

The need to define new criteria for captioning children's programming is the main implication of the study outlined above.

The design and application of new criteria for captioning car-

toons has been the object of a second study, to verify the criteria's suitability and effectiveness (Cambra, Silvestre and Leal 2008). The general criteria used for the adaptation of captions are as follows:

• Average words per minute required of primary readers: when captioning, the total number of words to be read per minute was lower than in the original version, adjusting to a reading speed that corresponded to the early years of primary education.

• Linguistic complexity of captions: the linguistic complexity of captions was not reduced. There were two reasons: there had to be synchrony between what was heard and what was read in the captions, and captions should stimulate language development. The morpho-syntactic structure was therefore respected, but sentences were shortened whenever possible.

• Length of time of captions on the screen: to allow longer reading time, captions were kept on the screen for longer, but making sure that they did not interfere with other oral emissions.

• Relevance of information: as regards the structure of narrations, captions were designed to highlight essential information in sequences where the plot had to be understood and the images were not explicit, such as characters' intentions, the conflict of the story, and the final result.

• Elimination of captioning of emotional states reflected in the images: external emotional states are normally clearly seen in the images and so were not captioned. Deaf children were left to infer their meaning. In fact, the interpretation of emotional states from cartoon images is a very useful activity to help deaf children improve their social interaction.

The study involved a sample of 16 pupils (eight girls and eight boys) in the 2nd to 4th year of primary school (aged 7-10) with prelingual deafness (deafness appearing before language acquisition) and with severe or profound hearing loss. All except one child belonged to a hearing family and went to normal oral schools. They used the oral language to communicate and in the classroom.

This study proved that captioning designed using the criteria indicated above to facilitate the reading of captions and leave time for "reading" the images considerably improved comprehension of cartoons, whatever the speed levels or reading comprehension of the pupils with deafness in the sample. So, for example, the characters' intentionality and the conflict, sequences that had previously caused greatest difficulty in comprehension but are key to understanding the story, were correctly identified by most participants. It was interesting to note that the expression of emotions, ignored by almost all the children with deafness in the earlier study (Cambra, Silvestre and Leal 2006), was referred to by all except two of the participants in this study, possibly because they had more time to look at the images.

To sum up, the results obtained contribute criteria for reflection of great interest for proposing modifications to the caption-

ing of cartoons, taking into account the specific characteristics of the child population with deafness and their need for time both to read captions and to observe and allocate meaning to images.

Taking these considerations into account may help pupils to learn to read, whether they are deaf students or students who although not hearing-impaired for a variety of reasons (like not having Catalan as a first language), require to complement their understanding of oral language with written input.

Finally, we believe that it is very useful to transmit to families and educators the reflection brought by this line of research on the complementary function of interpreting the image and linguistic information in the overall understanding of the audiovisual message. In fact, educators may help the children themselves to reflect on the sources of information, and the need to read captions or interpret images, depending on the context, to obtain specific information.

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