University College London
Centre for Translation Studies

Subtitling for deaf children

Granting accessibility to audiovisual programmes in an educational way

Soledad Zárate

Supervisors:
Dr Jorge Díaz-Cintas
Dr Ros Herman

Declaration of originality

I, Soledad Zárate, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Soledad Zárate

11th August 2014

Abstract

This thesis is a contribution towards the subtitling practice of audiovisual programmes for deaf children. It starts by offering an overview of relevant research on Subtitling for the Deaf and the Hard of Hearing (SDH), conducted both in the UK and abroad. A descriptive and comprehensive study on how children's programmes broadcast in British television are subtitled for deaf children constitutes the starting point of the project. In an attempt to gain an understanding on how deaf children read subtitles, the linguistic difficulties encountered in the acquisition of a spoken language as well as their reading characteristics are examined. In doing so, contributions from both Deaf Studies and Audiovisual Translation are considered. Deaf children are placed in their social context and the different types of hearing loss, prelingual and postlingual deafness, and cochlear implantation are discussed. Education for the deaf is also tackled, encompassing the history, philosophies and current trends.

The ultimate aim of the project is to contribute to the subtitling practice of deaf children by conducting empirical analysis. Hands-on research is conducted with a group of deaf children recruited from a mainstream school. Case studies are used in the piloting leading to the main experiment, which consists of exploring techniques to enhance word recognition and content comprehension. The findings of the main experiment, analysed using statistics, and the children's feedback, obtained orally at the end of the main activity and presented in a narrative form, are discussed as a contribution towards future research.

Acknowledgements

I would like to thank Dr Jorge Díaz-Cintas, my primary supervisor, for accompanying me on this research journey and providing me with unconditional support. His guidance has had a great influence on how I have developed as a researcher. I cannot stress enough how his corrections, often strict and detailed, but always constructive, have contributed to my work and to broadening my understanding of the subject. He is both a distinguished scholar and an excellent mentor, a rare combination that I have been privileged to witness.

I would also like to thank Dr Ros Herman, my secondary supervisor, for her very thoughtful and insightful contribution to the experimental part of this doctoral research project.

I am very grateful to my examiners, Dr Rocío Baños-Piñero and Prof. Aline Remael, for reading my thesis in a most detailed manner and providing valuable suggestions to refine it.

As good teachers are those who inspire, I must thank Chas Donaldson, whose seminars on Subtitling for the Deaf and the Hard of Hearing, taught at Roehampton University as part of the MA in Audiovisual Translation in 2006, impacted me enormously.

Another major influence has been Dr Josélia Neves, whose talk as a guest speaker at Roehampton University in 2006 sparked my interest in researching the subject. I found her enthusiasm contagious and admired her ability to think and plan in concrete ways. In the early stages of my research, I engaged on several occasions in conversations with Josélia, the most memorable one being during the Summer School in Screen Translation, in Bertinoro, Italy, in 2009. What started supposedly as an ordinary conversation ended up being a rollercoaster of new ideas and exciting projects. This is how, as soon as I got back to London from Bertinoro, I organised a trial project on SDH for children at the Puppet Theatre Barge, London, in 2009.

One of my dearest friends, Dr Marcello Morciano, during these years of research, despite his very busy schedule as a Research Associate at the School of Medicine, Health Policy and Practice at the University of East Anglia, has taken an interest in my work and has shown me how a scientist thinks about data and findings. During his visits to London, at the most unexpected moments, he would take pen and paper and start noting down tasks for me to complete by the time of his next visit, including publications in relevant journals, which he encouraged me to seriously consider, for which I am very grateful.

I would like to thank my partner, Fabio Ricchiuto, for his support during these years of research. On the very first day we met, introduced by my friend Marcello, he witnessed and engaged on a long conversation about data, and that was only the beginning… Subtitles and deaf children were to follow on a much more constant basis.

Special thanks go to Joseph Eliahoo, from Statistical Advisory Service at Imperial College London, for his support in analysing the data collected for the experimental part of the thesis, and to Howard Cardinal for proofreading this thesis thoroughly and in no time.

Thanks to the subtitling companies – IMS, Intelfax, ITFC, Nickelodeon UK, Red Bee Media, and Subtext – and subtitlers – Greig Forbes, Claude Le Guyader, Helene McGowan, Ant Purvis, and Neal Rattee – who collaborated on this project with open-mindedness by completing questionnaires about their subtitling practices.

Last but not least, this project would not have been possible without the deaf children who took part in it and without the support of the head teacher and staff working in the London-based primary school they were recruited from. This thesis is dedicated to them and to all deaf children worldwide.

TABLE OF CONTENTS

List of tables

List of figures

Abbreviations

3D	Three Dimensional
4oD	4 on Demand
AD	Audio Description (for the blind and the partially sighted)
ADPS	Achievements of Deaf Pupils in Scotland
ASL	American Sign Language
ASR	Automated Speech Recognition
ATS	Applied Translation Studies
ATVOD	Authority for Television On Demand
AVMSD	Audiovisual Media Service Directive
AVT	Audiovisual Translation
AVT	Auditory Verbal Therapy
BAHA	Bone anchored hearing aid
BATOD	British Association of Teachers of the Deaf
BBC	British Broadcasting Corporation
BCIG	British Cochlear Implant Group
BDA	British Deaf Association
BFI	British Film Institute
BI	Bilateral implant
BSL	British Sign Language
BTE	Behind-the-ear
BW	Body-worn
CA	Chronological Age
CAIAC	Centre d'Accessibilitat i Intel·ligència Ambiental de Catalunya
CBBC	Children’s British Broadcasting Corporation
CC	Content Comprehension
CENELEC	Comité Européen de Normalisation Électrotechnique
CHL	Conductive Hearing Loss
CI	Cochlear Implant
CIC	Completely-in-the-canal
CICS	Cochlear Implanted Children’s Support
CPH	Critical Period Hypothesis
CRIDE	Consortium for Research into Deaf Education
CRPD	Convention on the Rights of Persons with Disabilities

CRTC	Canadian Radio–Television Telecommunications Commission
CSA	Conseil Supérieur de l’Audiovisuel
CVF	Caption Films / Videos
dB	Decibel
DCPM	Described and Captioned Media Program
DCT	Dual Coding Theory
DES	Department of Education and Science
DfES	Department for Education and Skills
DTS	Descriptive Translation Studies
DTS-CSS	Digital Theatre Systems - Cinema Subtitling System
DTT	Digital Terrestrial Television
DTV	Digital Television
DTV4ALL	Digital Television for All
DVD	Digital Videodisc / Digital Versatile Disc
EFHOH	European Federation of Hard of Hearing
EU	European Union
EUD	European Union of the Deaf
FCC	Federal Communications Commission
GISTAL	Grup de Recerca sobre Sordeses i Trastorns en l'Adquisició del Llenguatge
HA	Hearing Aid
HBB4ALL	Hybrid Broadcast Broadband for All
HL	Hearing Level
ICREC	Imperial College Research Ethics Committee
IMS	Independent Media Support
ITC	In-the-canal
ITC	Independent Television Commission
ITE	In-the-ear
ITFC	Independent Television Facilities Centre
ITV	Independent Television
L1	First language
L2	Second language
LSQ	Langue des Signes Québécoise
M	Month
MCE	Manually Coded English

NatSIP	National Sensory Impairment Partnership
NCIUA	National Cochlear Implant Users
NDCS	National Deaf Children's Society
NHSP	Newborn Hearing Screening Programme
NICE	National Institute for Health and Clinical Excellence
ODPS	On Demand Programme Service
Ofcom	Office of Communications
OME	Otitis Media with Effusion
PCHI	Permanent Childhood Hearing Impairment
PM	Progress with Meaning
POST	Post-lingually deaf
PRE	Pre-lingually deaf
RA	Reading Age
RITE	Receiver-in-the-ear
RNID	Royal National Institute for the Deaf
RTP	Rádio e Televisão de Portugal
S	Subtitles
SDH	Subtitling for the Deaf and the Hard of Hearing
SE	Signed English
SEE1	Seeing Essential English
SEN	Special Educational Needs
SIC	Sociedade Independente de Comunicação
SL	Sign Language
SLS	Same Language Subtitling
SNHL	Sensorineural Hearing Loss
SSE	Signed Supported English
ST	Source Text
TC	Total Communication
TS	Translation Studies
TT	Target Text
TV	Television
TVI	Televisão Independente
UK	United Kingdom
UN	United Nations
UNI	Unilateral implant

USA	United States of America
VOD	Video on Demand
VRT	Vlaamse Radio- en Televisieomroeporganisatie
WGBH	West Great Blue Hill
Wpm	Word per minute
WR	Word Recognition
Y	Year

PART ONE

STATE OF THE ART

Chapter One

Introduction to the project, aims and methodology

Subtitling for the deaf and the hard of hearing (SDH) is a fast-growing area both professionally and academically. The four major broadcasters in the UK (BBC, Channel 4, Channel 5, ITV) subtitle between 92.6% and 100% of their programmes, and they have overall achieved higher targets than the ones set by the regulators, which vary between 80% and 100% (Ofcom 2013). The UK is ahead of all European countries in the provision of this type of subtitles on television. The Netherlands and Belgium are in a similar situation to the UK, having achieved targets of 90% and 95% respectively (EFHOH 2011). Most European countries are very slowly progressing in their subtitling targets and routines and have yet to learn from the three pioneering countries.

Traditional works on SDH (De Linde and Kay 1999; Neves 2005) are rapidly being complemented by more up-to-date ones (Díaz-Cintas et al. 2010; Matamala and Orero 2010), some of them compilations of papers given at international conferences. SDH is proliferating academically, as more modules in postgraduate programmes in Europe are specifically tailored for students willing to become subtitlers for the deaf and the hard of hearing. The following institutions are among those offering specific training in SDH: Universitat Autònoma de Barcelona (Spain), Université Charles de Gaulle (Lille, France), Università di Bologna (Italy), University College London (UK), University of Leeds (UK), University of Roehampton (UK), and University of Surrey (UK).

The industry is rapidly expanding, but little empirical research on the subject has been conducted to date. The research available seems to almost entirely rely on the survey method rather than direct observation. Broadcasters, organisations and subtitling companies are asked to express their views on the reading speed for television programmes (including children's programmes), the use of colours for speakers' identification and font sizes (Ofcom 2006a). Similarly, viewers are asked to voice their opinions on the degree of satisfaction with the subtitling services, their perceived quality of the subtitles, and the reading speed (Ofcom 2006b). Most studies on subtitling for deaf children are also based on surveys completed by parents and educators (NDCS 2005; 2006). The National Deaf Children's Society (NDCS 2006) responded to the consultation on *Television Access Services: Review of the Code and Guidance* (Ofcom 2006b). Among the points addressed, organisations were asked to express a view on the use of fonts, colours for speakers' identification and reading speed. It is evident that the NDCS used feedback from viewers in the responses. This is clearly expressed in the feedback they provide on reading speed: "30% of families have told us that they generally do not feel that subtitles stay on the screen for long enough for their child" (NDCS 2006: 5). Similarly, the report *In Their Own Words: Young Deaf People's Access to Television* (NDCS 2005) is based on opinions of family members, schools and young people who were recruited to take part in focus groups. The focus groups worked with television programmes that had (1) no access at all, (2) subtitles, (3) sign language, (4) subtitles and sign language. Children were asked to express their views of the different formats presented and to share their experiences of accessing television programmes. Young viewers expressed their opinions on the following elements: relation between subtitles and literacy, appropriateness of reading speeds, placement of subtitles on screen, synchronicity between subtitle and image / sound, and accuracy with respect to the soundtrack and correctness of spelling.

Of a similar nature is the trend of recent research conducted mainly in Spain, where viewers are asked through the use of surveys to express their preferences about speakers' identification, number of lines used, positioning of text, and length of display on screen (Arnáiz-Uzquiza 2010; Lorenzo 2010a; 2010b; Pereira 2010). Other variables researched are the use of fonts and various linguistic strategies implemented (Arnáiz-Uzquiza 2010), synchrony (Pereira 2010) and comprehension of the source dialogue through the use of questionnaires (Lorenzo 2010a; 2010b).

Surveys on viewers' preferences about font types and size, speakers' identification conventions, and positioning and justification of the lines on screen are also popular in other European countries – namely Denmark, Italy and Poland and also the already mentioned UK and Spain – all of which were participating countries to DTV4ALL (www.psp-dtv4all.org) (Romero-Fresco 2010), a EU funded project that ran from 2008 until 2012 and aimed at facilitating the provision of access services on digital television across the European Union. This project, apart from using surveys to gather information on the viewers' preferences and questionnaires to test their comprehension of the audiovisual programme, advocated the use of eye-tracking technology, which seems to have ample potential for research in this field and might become a more exploited possibility for SDH researchers in the future. This project has been now superseded by HBB4ALL (www.hbb4all.eu), launched in December 2013 for the duration of 36 months, which has as its main objective the delivery of accessible multi-platform audiovisual content using any devices. Among the 12 European partners involved in the project, including broadcasters, research institutes and small to medium enterprises, there are two academic institutions, that is Universitat Autònoma de Barcelona (Spain), acting as the project co-ordinator, and Universidad Politécnica de Madrid (Spain).

Arguably, the use of surveys is of little relevance when the viewers are children and the ultimate aim is to assess their understanding of the subtitles. In fact, the dictionary definition of *survey* is "an examination of opinions, behaviour, etc., made by asking people questions".[1] The opinions that children might have on the subtitles are beside the point of this type of study. It would be reductive and methodologically dubious to use surveys for the purpose of assessing how children read and understand subtitles. Also, even assessing whether they prefer the use of certain colours, fonts, etc. is of little significance, since the main point is finding out what works best for them. This is, of course, also applicable to the case of adults. Working closely with children using direct observation, on the other hand, is a more suitable way of measuring the usefulness of the current broadcast subtitles and of testing possibilities to improve them. This kind of research has been conducted

[1] Cambridge Advanced Learner's Dictionary (accessed January 7, 2013).

sporadically in the past. The first example is provided by Baker et al. (1984), who investigated the effectiveness of subtitling methods in secondary schools for the deaf and tested comprehension at various degrees of language complexity and reading speeds. Following their study, a set rate of 60 wpm (words per minute), the use of simple language and vocabulary, and the contextualised introduction of new words were recommended for future practice.

Gregory and Sancho-Aldridge (1996) also conducted direct research on deaf children's comprehension of subtitled television programmes (see Section 2.6.1). Their research suggests that broadcast subtitles can be improved to better suit the needs of young viewers. In order to understand the reading characteristics and abilities of deaf children, more research is needed in this field, as the works mentioned, although valid, are rather limited in number and scope and outdated.

Promising for this project, which explores the potential didactic role of subtitles for children with hearing impairments, are the premises put forward by the dual coding theory (Paivio and Lambert 1981; Paivio 1991), which considers that receiving the same information through different channels promotes the learning of a second or foreign language. Paivio and Lambert (1981: 532) explain that:

> Dual Coding Theory (e.g. Paivio 1971, 1975) is based on the assumption that memory and cognition are served by two separate symbolic systems, one specialized for dealing with verbal information and the other with nonverbal information. The two systems are presumed to be interconnected but capable of functioning independently. Interconnectedness means that representations in one system can activate those in the other, so that, for example, pictures can be named and images can occur to words. Independence implies, among other things, that nonverbal (imaginal) and verbal memory codes, aroused directly by pictures and words or indirectly by imagery and verbal encoding tasks, should have additive effects on recall.

DCT has been used by many authors who have investigated the value of subtitling in foreign language learning. Among them, Danan (1992) looked into how reversed subtitles – audio in first language (L1) and subtitles in second language (L2) – and bimodal input (L2 audio and L2 subtitles) enhanced foreign language learning for a group of American university students learning French and found that both conditions, but in particular reversed subtitles, were beneficial. Similarly, Talaván (2009; 2010) investigated the function of bimodal input (subtitles and audio in the same language) as foreign language learning support and of subtitling as a task by the students that encouraged the development of oral comprehension skills and found that subtitles developed comprehension and the acquisition of vocabulary in the foreign language.

Generally speaking, in an audiovisual environment, verbal and nonverbal elements are easily distinguishable: subtitles and titles report verbal information, while pictures report nonverbal information. This boundary becomes blurred in an SDH context where nonverbal information available in the soundtrack is included (verbally) in the subtitles, i.e. description of music and sound effects, speakers' identification and paralinguistic features among others.

Paivio (2006) distinguishes between (1) a verbal system that deals with language and (2) a nonverbal (imagery) system that deals with nonlinguistic objects and events. The dual coding theory (DCT) has elements that find a direct application in the audiovisual translation field. Firstly, from an educational point of view, Paivio (ibid.) argues that the growth of the verbal system will depend on the richness of the nonverbal foundation. This concept is somehow related to the development of literacy through exposure to a nonverbal system, one of which could be sign language. Secondly, beginner readers learn to read concrete words by sight much faster when the words are connected to images than when they are paired only with their pronunciations. This concept strongly suggests that subtitles can be exploited as a tool for word recognition – even for pre-school children who are unable to read. In fact, Paivio (ibid.) explains how DCT methods have been used in remedial literacy education for children with learning difficulties. This is not directly applicable to deaf children as deafness and learning difficulties are two separate spheres. However, some of the methods explained are highly visual and could be explored in an educational setting with deaf children. For example, phonemic awareness is not taught orally but by associating phonemes with motor acts, pictures of the mouth and colours. In audiovisual programmes for pre-school children, where the general pace is slow, verbal elements (generally in the form of narration) tend to match the images on screen. Deaf children will have varied access to the auditory elements depending on their level of hearing loss and their use of cochlear implants or hearing aids.

Subtitles, being a visual representation of the verbal element that is delivered orally, combined with the pictures shown on screen, allow deaf children to create the connection between verbal and nonverbal elements.

The present project contributes to the research that has been carried out in the field of SDH and that is relevant to the widespread subtitling practice by presenting work conducted empirically with a group of deaf children in the UK.

1.1 Motivation and aims

While medical and technological research on deafness proliferates, there is a lack of research aimed at helping deaf children to move beyond their hearing loss by creating inclusive, cultural and educational environments – e.g. theatres, cinemas, museums, television – that could support and enhance their emotional and social well-being, making their lives substantially better and boosting their interaction with their hearing peers. This is part of the motivation behind my research project, which ultimately aims at having a direct impact on the provision of subtitles for deaf children in the UK, in particular on television. It is expected that the results could be easily extrapolated to improve the creation of SDH for deaf children in other countries and languages.

The exponential growth of medical and technological research is supported by different agencies in the UK. Two major organisations that have been traditionally separate from one another, Deafness Research UK and Action on Hearing Loss (www.actiononhearingloss.org.uk), decided to merge in April 2013.[2] Both charities have in the years supported biomedical research, specifically research on treatments and cures for hearing loss and tinnitus, with the main difference being the geographical regions served, as Action on Hearing Loss supported both UK and international research while Deafness Research UK was focussed on the UK only.

Since the advent of the merger, 19 Deafness Research UK-funded projects co-exist with 71 other projects presumably co-funded by the two merged bodies.

[2] Deafness Research UK was founded in 1985 by Lord Jack and Lady Pauline Ashley of Stoke, while Action on Hearing Loss, originally known as National Bureau for Promoting the General Welfare of the Deaf and subsequently as Royal National Institute for the Deaf, has a much longer history, having been started by deaf founder Leo Bonn in 1911.

Among the research areas listed on their website are: age-related hearing loss, childhood deafness (e.g. early detection of deafness and hearing rehabilitation programmes), cochlear implants (e.g. improving benefits, genetics of deafness, hearing aids (e.g. improving benefits), noise-induced hearing loss, protecting hearing, restoring hearing, and understanding hearing loss. The grants seem to fund predominantly research in the medical field and therefore it can be inferred that the improvement of deaf people's quality of life depends merely on medical research. The intention of the merger is to raise the profile of biomedical research into hearing loss and tinnitus. The biomedical research strategy in place has four main areas of research: (1) restoring hearing; (2) preventing hearing loss; (3) improving medical devices (hearing aids and cochlear implants) and (4) silencing tinnitus. Researchers are working on all four areas and funded PhD studentships are also awarded on a regular basis to conduct research on all areas except for (1) restoring hearing. While there seems to be a strong link between deafness and medical / technological research, there is little or no room for research on deafness from a humanities perspective that would be contemplated by this merger.

The technical and legal advancements made on the provision of subtitles for the deaf and the hard of hearing in the UK are considerable from a quantitative perspective, i.e. in terms of the volume of subtitles being actually produced and of targets reached, but research on aspects related to the quality of subtitles for the deaf and the hard of hearing, particularly for young audiences, is rather limited and outdated (see Chapter Two). This is probably a reflection of the regulations in place published by the Office of Communications (Ofcom 2012a), the independent regulator and competition authority for the UK communications industries and television access services (subtitling, signing and audio description) (see Section 2.6.2). The regulations are legally binding as far as the targets are concerned but not in the case of the stylistic, editorial and technical production of the subtitles. In fact, a set of general recommendations is available online (Ofcom 1999) but most subtitling companies generally adopt their own stylistic guidelines, which may or may not follow the ones put forward by Ofcom. This results in a lack of standardisation and in the coexistence of a variety of styles in the subtitling practice for broadcast programmes. For a detailed analysis on how programmes for children are subtitled on British television, refer to Chapter Three and see Zárate (2008).

The main objectives of this doctoral project are to gain an understanding of how deaf children read subtitles and of the difficulties they encounter in this process, in order to ultimately shed some light on good practices for the subtitling of children’s television programmes. By looking at how deaf children acquire language, read, and communicate with their families and at school, the implications that different degrees and onsets of hearing loss have, it is possible to gain an understanding of what potentially works best for them. This knowledge can act as a guide for practitioners in their subtitling choices and as a starting point for researchers willing to work with deaf children in an audiovisual context. In this project, it constitutes the basis of the experimental part, focused mainly on visual word recognition and to a lesser extent on subtitle content comprehension.

1.2 Research methodology

This project encompasses different methodologies depending on the area of study and these are discussed in depth in the appropriate chapters (Chapter Three and Chapter Six). Nevertheless, this section offers a general framework discussed in connection with methods of investigation and theories traditionally used in Translation Studies (TS).

To contextualise the project and explain the logic behind the methodology used, Holmes's map of TS (Toury 1995: 10) constitutes a good starting point:

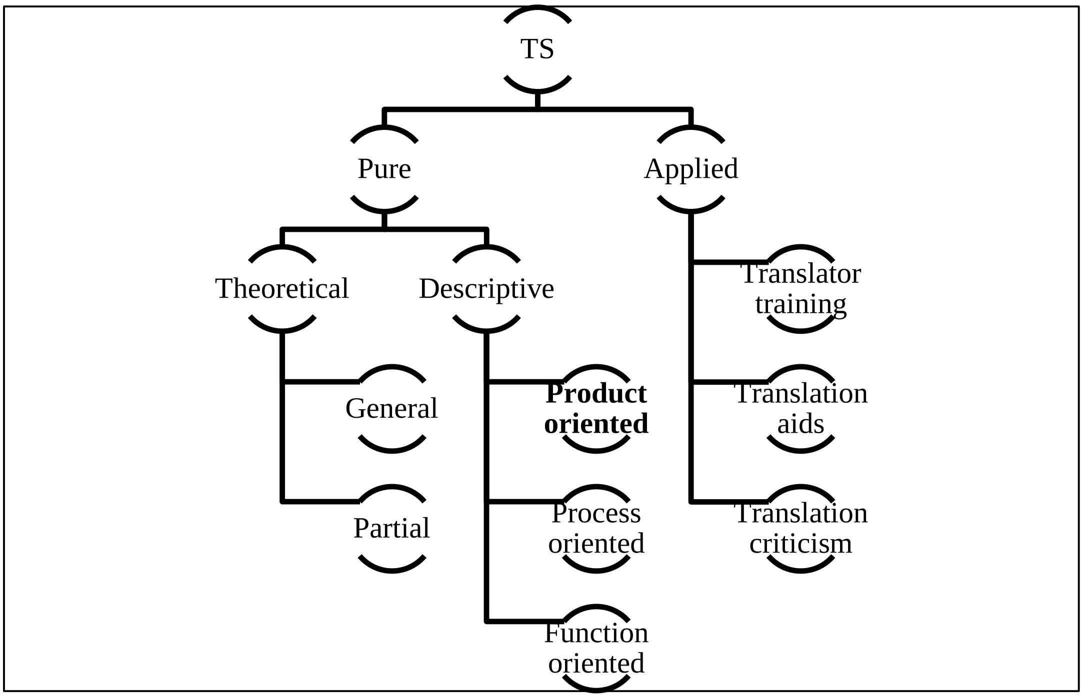


Figure 1: Holmes's map of TS

According to this map, the theoretical and descriptive activities that characterise pure research constitute the core of the discipline, while the prescriptive orientation is relegated strictly to the applied branch (Baker and Saldanha 2009). Toury (1995) considers Applied Translation Studies (ATS) – i.e. the study of the professional and more practical aspects of translation – to be an extension of the pure (theoretical and descriptive) branches of TS, where the results generated by descriptive studies are transmitted through theoretical statements in a unidirectional way. This has determined a situation where ATS has traditionally been granted a lower scholarly status compared to the pure branches of TS. Other authors (Naaijkens and van Leuven-Zwart 1991) consider that despite the different approach required, the two branches – pure and applied – are dialectically connected. Saldanha and O'Brien (2014) explain that the distinction between the two is not clear-cut and contend that *basic* generally refers to the acquisition of new knowledge whereas *applied* refers to research that has an application in life. The dialectical relationship between the two branches suits this project better than the unidirectional relationship advocated by Toury (1995). The subtitles, as produced by practitioners for broadcast, are observed and described, and no theories are drawn from the analysis. Instead, subtitlers are invited to complement the findings by providing an insight on specific practical aspects related to the subtitle choices, which are often accompanied by comments on the professional subtitling world and its evolution.

This mapping of TS as proposed by Holmes (1988) and subsequently developed by Toury (1995) has been criticised by Pym (1998) as an instrument of power that directs researchers to look into certain directions neglecting socially important issues. While Van Doorslaer (2009) agrees with Pym (1998) on this aspect, he proposes the use of an open and descriptive map, that is, a map that evolves and welcomes new terms and concepts, as shown in Figure 2:

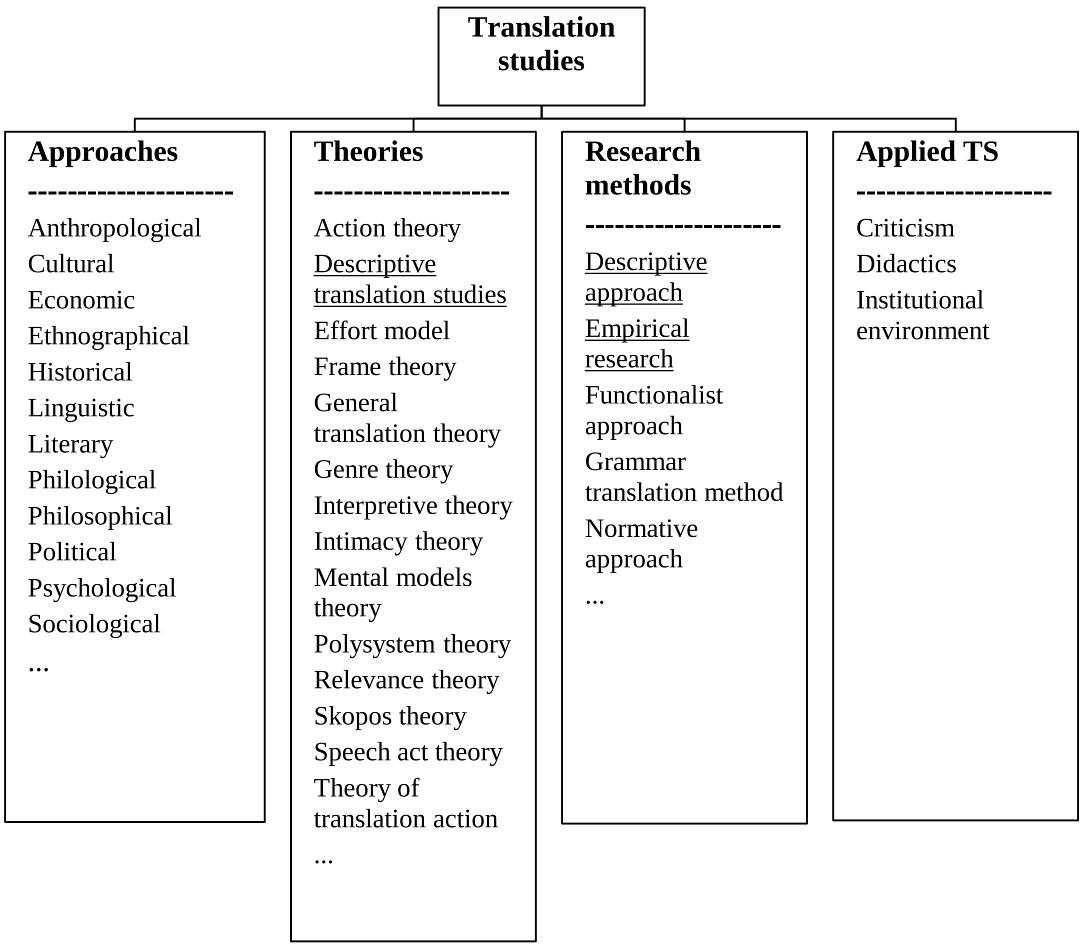


Figure 2: Van Doorslaer's map of TS

The main core of this project is the empirical research completed using a case study methodology (see section 6.5), as advocated by Yin (2014), for the preliminary studies, followed by the main experiment, which has been analysed using inferential statistics (see Part Three) to answer specific research questions mainly on word recognition, but also on content comprehension, by deaf children watching subtitled TV programmes in English. Yin's case study methodology was useful in providing a procedure that was applied to the preliminary studies, and partly to the main study (at least at the design stage), including four steps: (1) designing the case study; (2) conducting the case study; (3) analysing the case study evidence; (4) developing conclusions. Yin's methodology was particularly suitable for this project as the traditional place given to case studies within the category of qualitative research is challenged by the author, who points out that case studies can be based on any combination of quantitative and qualitative evidence. As discussed in Section 6.5, statistical analyses were applied to the main study's findings, an approach which is not excluded by Yin (ibid.), who nevertheless offers an alternative approach consisting of identifying and addressing rival explanations (see Chapter Seven).

In preparation for this empirical part, it was considered useful to study first how children's programmes are subtitled on British television. A number of children's programmes were selected from the main national broadcasters and an analysis and discussion are presented in Chapter Three, using Descriptive Translation Studies (DTS) as the main methodological framework. The focus was on finding out about (1) editing of vocabulary and expressions; (2) segmentation of text, subtitle line breaks and spotting; (3) the use of typographical cues to convey paralinguistic features; and (4) reading speed. These aspects are all observed and discussed with a variety of examples. The discussion is complemented by tailored questionnaires completed by the subtitling companies involved. Looking at Van Doorslaer's (2009) map of TS, illustrated in Figure 2, the study of broadcast subtitles that preceded the empirical research can be placed within the descriptive approach method and is closely connected to the theoretical framework advanced by DTS. The analysis carried out in this context proved useful in the preparation of the preliminary studies (or case studies) conducted prior to the main study (or experiment), which helped in narrowing the research question to two aspects only, that is, word recognition and content comprehension.

Holmes (1988) and Toury (1995; 2012) distinguish between three different interdependent aspects in DTS, as illustrated in Figure 1: product, process and function. The approach adopted for the first part of the research is mainly product-oriented, as the textual-linguistic elements of the subtitles are analysed in detail. The questionnaires that subtitlers were requested to complete provide the link between the product (subtitles) and the subtitling process, as they explain how the textual information provided (target text) is derived from the audio (source text). Finally, the function is inevitably interlinked with both the product and the process, as SDH aims to provide deaf and hard of hearing viewers with access to audiovisual material. This role is or should be the main motivation behind both product and process. Access being the main function of SDH, other more specific roles can be defined depending on other factors, such as age group – for instance, SDH for children may also have a didactic function – or genre – i.e. comedies may have as their main function to engender laughter –, and so on.

The descriptive approach method to research leaves ample space to empirical research when new data is collected from the experimental work with hearing impaired children. Empirical research is based on direct observation, followed by statistical measurement of phenomena in an attempt to show the relevance of the results. In this sense, the findings are based on actual experience rather than theory. Research can be defined as *experimental* when the focus is on finding cause and effects relations (Saldanha and O'Brien 2014). The present study compares two groups: (1) the experimental group, or treatment group, formed by participants exposed to enhanced subtitles (see Chapter Six) and (2) the control group, formed by participants exposed to broadcast subtitles. The preliminary studies follow Yin's (2009) protocol of the use of case study as a research method. The switch from case study to field experiment was dictated by the research questions, fully defined after the piloting. The condition that changed concerned the control of behavioral events, which was inexistent in the preliminary studies but became a requirement of the main study. The type of experiment conducted is identified as *field experiment* as it did not take place in the artificial and controlled setting of a laboratory, but the two groups received two different treatments (broadcast and enhanced subtitles) in a natural setting, under actual use conditions.

Both the preliminary studies and main study had as the focus a *how* form of research question (Yin 2009) as the aim was to look at how deaf children read subtitles on screen. The preliminary studies, unlike the main study, did not have a comparative element but were useful in defining the methodology of the questionnaire – which resulted in the use of structured multiple choice closed questionnaires with four possible options to choose from, the last one always being ‘not sure’, following a vertical layout (see Section 6.3) – and the design of the experiment, which ended up considering only two units of analysis or variables (see Section 6.5). The main study or experiment, focusing on word recognition and content comprehension, compared the children's performances when using broadcast and enhanced subtitles (a thorough discussion of the enhancements introduced is available in Chapter Six). This part of the research adopts a quantitative approach, although this is complemented by the presentation and discussion of the children's reactions after the activity, recorded through the use of a Dictaphone (refer to Chapter Six).

The combination of pilot case studies and main experiment dictates the use of a mixed method approach (Saldanha and O'Brien 2014). Specifically, the initial phase consists of a number of pilot case studies that explore data qualitatively and in so doing define the topic of the quantitative phase (this is further discussed in Chapter Six). This study coincides with one of the types of mixed method studies defined by Creswell and Clark (2007: 11):

> A researcher conducts an experiment in which quantitative measures assess the impact of a treatment on outcomes. Before the experiment, the researcher collects qualitative data to help design the treatment.

The pilot case studies introduced a number of enhancements in the subtitles and, following a qualitative analysis, some were eventually adopted as treatment in the main experiment (e.g. use of a different and bigger typeface to encourage word recognition). The pilot case studies helped in defining the research questions and in designing the treatment and the questionnaires’ methodology. The data collected from the main experiment were analysed quantitatively through the use of inferential statistics, as discussed in Chapter Seven.

The children's feedback, included in the discussion of the results (see Chapter Seven), is analysed in a qualitative way, using a narrative report complemented with direct quotations from participants to illustrate specific points. Finally, the analysis includes a discussion of the characteristics of the participants, defined through the use of questionnaires sent to the parents and also with the help of the school, and this is also done qualitatively in the form of a narrative report, using charts.

Saldanha and O'Brien (2014) propose a model of TS that distinguishes among four types of research depending on the aims of the researcher: (1) product-oriented; (2) process-oriented; (3) participants-oriented; (4) context-oriented. The empirical part of this project is *participant-oriented* as its ultimate aim is to gain an understanding of how deaf children read subtitles. Of course the other three dimensions are also interconnected and equally important but do not constitute the focus of the study. In this context, the *product* (the quality of subtitles) is what participants are exposed to in the study and this is the component that could eventually change as a result of the findings. The *process* refers to the cognitive aspect of translation, that is, to the challenges faced by the subtitler and the solutions found. For example, one of the major challenges consists of identifying with the deaf and the hard of hearing audience and with the way they experience audiovisual materials. Finally, the *context* in which translation takes place includes political, economic, social and ideological factors that may affect translators and / or recipients. For example, the importance given to SDH socially and politically may have a direct impact on the status or training of subtitlers. Also, the quotas imposed by Ofcom on broadcasters would have a significant impact on the quantity of programmes that are made accessible to the deaf and the hard of hearing audience. However, since participants constitute the focal point of this study, the approach can be defined as *participant-oriented*. A distinction between participants (or agents) involved in the process of translation – that is translators, commissioners, trainers, etc. – and those who are invited to participate in the research process – that is, in this case, deaf children – is made by Saldanha and O'Brien (2014: 150) who state that “knowledge is seen as constructed among the research participants rather than pre-existing in the mind of 'subject', from where researchers need to extract it using scientific methods”.

1.3 Thesis structure

In order to contextualise this project within the field of Audiovisual Translation (AVT), Chapter Two offers an overview of relevant research on SDH, conducted both in the UK and abroad. The research carried out so far within the AVT framework is generally outdated and limited in scope and does not seem to convey a clear picture of deaf children's worlds, their reading abilities and linguistic difficulties. Nevertheless, it helps to locate SDH within the wider AVT discipline.

Chapter Three consists of a descriptive and comprehensive study that focuses on how children's programmes broadcast on various British television channels (BBC, Channel 4, Channel 5, CITV) are subtitled for deaf children. This analysis constitutes the starting point of the project. Some of the elements analysed (e.g. segmentation of subtitles and line breaks, editing, reading speed, use on non-standard language) are common to the subtitling practice in general and not only to SDH, while some are specific to SDH, i.e. the use of typographical features in the subtitles to represent paralinguistic aspects that are conveyed through the auditory channel (intonation, accents, pauses, interruptions, singing, etc.). The project started with an observational analysis of the type of children's programmes that are seen on British television and the subtitles that are used to make them accessible to deaf children (Chapter Three) and moved then onto a more experimental analysis that included working with groups of deaf children, collecting data and analysing them (Chapter Six and Chapter Seven). This shift to a more experimental approach was determined by the necessity to understand how deaf children read subtitles and to elucidate which approaches and conventions seem to work best for them.

Chapter Four starts with a definition of language (both signed and spoken, native and non-native) and moves on to consider the linguistic difficulties encountered by deaf children in the acquisition of a spoken language, a particularly relevant matter for deaf children reading subtitles. The reading characteristics and abilities of deaf children are also examined. Extensive research on the subject is offered by Deaf Studies, a discipline that has developed independently from AVT. In an attempt to gain a comprehensive picture of deaf children's reading characteristics and abilities, the theoretical analysis of the PhD thesis considers contributions from both disciplines, thus bridging the gap between the two of them.

Chapter Five focuses mainly on communication, placing deaf children in their social context. It starts by introducing the different types of hearing loss, pre-lingual and post-lingual deafness, and the impact of cochlear implantation. It moves on to discussing different communication methods used routinely by deaf children with their families and in their entourage. Finally, education for the deaf is tackled, encompassing the history, philosophies behind different approaches and current trends. This chapter is partly of a technical nature, but useful in portraying the diversity of the deaf audiences, which ultimately translates into the considerations that should direct the decisions taken during the subtitling process.

The observational analysis on the subtitling practice common on British television (Chapter Three) and the study of the relevant literature provided by AVT (Chapter Two) and Deaf Studies (Chapter Four) on the reading characteristics of deaf children, culminate in the core of the thesis, that is, the empirical analysis delineated in Chapter Six and Chapter Seven. As already discussed, the case study is chosen as the main research method for the pilot studies that preceded the subsequent, main experiment. Hands-on research is then conducted with a group of deaf children recruited from a mainstream school. The aims and methodology of the preliminary studies and the main study, consisting in examining how deaf children read broadcast and enhanced subtitles, and in particular in ascertaining how these helped them in the tasks of word recognition and content comprehension, are explained in Chapter Six. The findings of the main experiment, analysed using statistics, and the children's feedback, obtained orally at the end of the main activity and presented in a narrative form, are discussed in Chapter Seven.

Chapter Two

Subtitling for the deaf and the hard of hearing (SDH)

2.1 From the origins of subtitles

Intertitles, or title cards, are at the origin of subtitles. Intertitles consisted of short sentences, drawn or printed on paper, filmed and placed between sequences of the film. Normally the text was written in white on a black background. They were used mainly to convey dialogue and narrations related to the images (Díaz-Cintas and Remael 2007). They were first seen in 1903 as epic, descriptive titles in Edwin S. Porter's *Uncle Tom's Cabin* (Ivarsson 2004).

In 1927, the first sound film, *The Jazz Singer*, appeared. Intertitles disappeared with the end of the silent film era and the new soundtrack had to be replaced by means of subtitles or dubbing. The Netherlands, the Scandinavian countries, Hungary and France were pioneers in developing early subtitling techniques (Ivarsson 2004).

With the advent of sound films, deaf actors lost their jobs. One of them, Emerson Romero, from Cuba, moved to New York in 1947, purchased a number of sound films, inserted intertitles to account for the dialogue exchanges and rented them to deaf associations. Although this method was successful in giving access to the film to deaf and hard of hearing viewers, it was technically unsatisfactory as the film was lengthened considerably (Kovalik 1992).

In 1950, the American Schools for the Deaf found a subtitling solution that consisted in superimposing subtitles upon existing print without having to cut and insert intertitles. The subtitles would appear at the bottom of the screen without interrupting the film (Boatner 1950).

An optical subtitling process was developed for television. The subtitles were written on paper and then one-frame stills of each subtitle were shot. The resulting film negative was put in a scanner and fed either manually by the translator or automatically. The writing was generally white on a black background. Where no subtitle was required, blank frames were inserted between subtitle frames (Ivarsson 2004).

The technical evolution of subtitles culminated in 1979 in the first transmission of a TV programme with subtitles using Ceefax, the world's first Teletext information service, by BBC. The programme subtitled was a documentary about deaf children called *Quietly in Switzerland.* During that year, several other programmes were subtitled, including the Queen's Christmas message.

This soon became the trend in other European countries. In the 1980s, Flemish-speaking Belgium, France, Germany, Italy and the Netherlands started providing SDH, followed by Portugal and Spain in the 1990s (Remael 2007).

In terms of regulations at an international level, the United Nations (2006a) in Article 30 of the *Convention on the Rights of Persons with Disabilities* (CRPD) requires that:

> States Parties recognize the right of persons with disabilities to take part on an equal basis with others in cultural life, and shall take all appropriate measures to ensure that persons with disabilities [...] enjoy access to television programmes, films, theatre and other cultural activities, in accessible formats.

States parties are those countries that have approved and ratified the treaty and that are legally bound by the same. Signatories are those countries that in principle agree with the treaty but have not ratified it yet. The implementation of the Convention is supported by the *Optional Protocol to the Convention on the Rights of Persons with*

Disabilities (2006b). Figure 3 provides a graphic representation of countries in the world that have signed and ratified the Convention and Protocol:

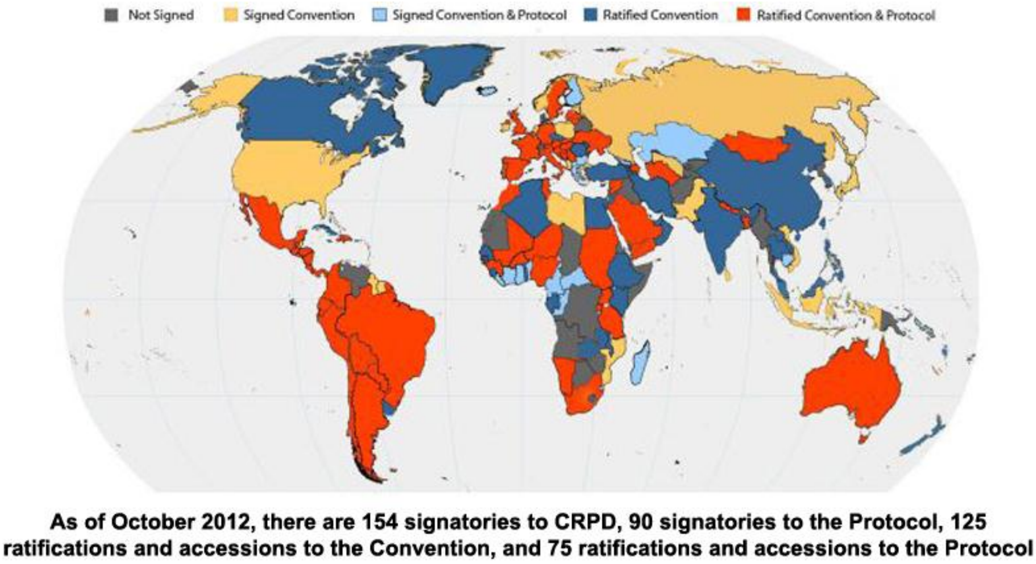


Figure 3: Signatories and ratifications to the CRPD and Protocol (AGENDA n.d.)

Accessibility to the physical environment, transportation, information and communications (including technologies and systems), is one of the eight principles set out by the Convention (United Nations 2006a) in Article 3 and regulated in Article 9. States parties are required to adopt appropriate standards and guidelines for the provision of information in accessible formats. The Convention and Protocol (United Nations 2006a; 2006b) can be considered a first step towards the regulation of accessibility at an international level.

At a European level, further to the recommendation of the Commission of the European Communities (2009: 4) stating that "member states should take all the measures necessary to ensure that all terrestrial television broadcasting services use digital transmission technology and cease using analogue transmission technology on their territory by 1 January 2012", the following countries have completed the switch-over from analogue to digital television (DTV): the Netherlands (in 2006); Finland, Sweden and Switzerland (in 2007); Denmark, Germany and Norway (in 2009); Belgium, Croatia, Estonia, Latvia, Luxembourg, Slovenia, and Spain (in

2010); Austria and France (in 2011); the Czech Republic, Ireland, Italy, Portugal, Serbia, Slovakia, and the United Kingdom (in 2012).

The switch-over from analogue to digital technology has had a great impact both in the provision and the layout of SDH. However, as discussed in Chapter Three, for programmes broadcast and subtitled before the advent of digital television, the old subtitle files produced for transmission in analogue television (using Teletext) are still commonly used, possibly due to financial reasons.

Teletext was a television information retrieval service developed in the UK in 1971. Ceefax, as mentioned earlier, was the world's first Teletext service, developed by the BBC originally to provide subtitles for the deaf and the hard of hearing and launched in 1974. Oracle, another Teletext service, was also launched in 1974 for use by Channel 4 and ITV. In 1993 Teletext Ltd replaced Oracle for Channel 4 and ITV, and in 2002 introduced the service to Channel 5. Teletext was withdrawn from Channel 4, Channel Five and ITV in 2009, while Ceefax continued to exist until 2012, when the switch-over from analogue to digital television took place.

It is also worth mentioning that digital technology opens up new possibilities for research as a myriad of solutions previously non-existent in an analogue context, become available. To mention some of the advantages, digital television allows greater flexibility, higher resolution pictures, better sound quality, the use of a wider range of colours and a multitude of complex fonts.

The current European legislation is covered by the *Audiovisual Media Service Directive* (AVMSD 2010), which states, in Article 46, that:

> The right of persons with a disability and of the elderly to participate and be integrated in the social and cultural life of the Union is inextricably linked to the provision of accessible audiovisual media services. The means to achieve accessibility should include, but need not be limited to, sign language, subtitling, audio-description and easily understandable menu navigation.

In terms of standards at a European level, there are some minimum guidelines and best practice dictated by CENELEC (2003), the European standards organisation designated by the European Commission. The national regulations of pioneering or relevant European countries are discussed in Section 2.7 (for countries outside Europe, see Section 2.8), whereas the SDH panorama in the UK is presented in Section 2.6.

2.2 Within Audiovisual Translation (AVT)

The term *audiovisual* encompasses programmes that exist through the combination of visual and auditory channels. Due to the co-existence of these two channels, the audiovisual text has been defined as polysemiotic (Gottlieb 1997). According to Delabastita (1989), the audiovisual text comprises the following dimensions: (1) verbal auditory elements (dialogues, music), (2) nonverbal auditory elements (music, sound effects and paralanguage such as intonation and accent), (3) verbal visual elements (inserts, letters, mouth movements, subtitles) and (4) nonverbal visual elements (gestures, facial expressions, and body movements).

Back in 1959, Jakobson (2012) made a distinction between three types of translation that has now become seminal: *intralingual*, *interlingual* and *intersemiotic*. Based on this classification, a distinction has traditionally been made in the field of subtitling between *interlingual subtitling* – that is, the practice that implies translation from one language to another – and *intralingual subtitling* – the type in which translation takes place within one same language, the latter being associated with subtitling for the deaf and the hard of hearing. Due to the fact that in *intralingual subtitling* there is no translation from a source language into a target language, there were some initial reservations by scholars in accepting SDH as falling within the remit of the umbrella term *Audiovisual Translation*, but this has now been fully overcome.

SDH is often referred to as *intralingual subtitling*, reflecting the type of linguistic transfer that characterised subtitles when they first appeared on television in the 1980s. Nowadays, this definition is reductive as SDH is also performed interlingually, particularly on DVDs, as pointed out by Neves (2008).

Neves (ibid.), while addressing some misconceptions that surround SDH, argues that attempts should be made to produce *inclusive* rather than *accessible* audiovisual media. In other words, audiovisual experiences should be implemented in such a way as to include as many able and disable people as possible. Also, it is worth rethinking the use of the word *disability* itself since it denotes a lack of ability, hence foregrounding the existence of a disadvantage. While many may indeed agree that being deaf is a disadvantage, others – certainly those belonging to the Deaf community – may consider themselves as happily diverse and different rather than disabled. The term *Deaf* with a capital *D* refers to the group of people who have a strong deaf identity and belong to a cultural and linguistic minority. They disassociate themselves from those who identify linguistically and culturally with mainstream society.

It is also true that the existence of a hearing loss may lead to a different experience of the audiovisual product on the part of the viewer. In this sense, the experience may be more visual than auditory, without implying any lack or disadvantage, especially if the requirements of the audience in question are known and being taken account of through accessible services.

2.3 The case of cinema

Subtitling for the deaf and the hard of hearing is generally the predominant form of translation of audiovisual material for deaf viewers, well beyond the provision of sign language. The website www.yourlocalcinema.com provides information on accessible cinemas in the UK as well as figures on the provision of SDH (and audio description for the blind and partially sighted). The expansion has been rapid and, in the UK, the website states that most cinemas (particularly multiplex but also smaller ones) screen most of the latest releases (nine out of the weekly top 10) with SDH, resulting in around 1,000 screenings weekly. In the last decade more than 1,000 films have been made available and with the advent of digital cinema screenings with SDH have increased by 120% weekly. The considerable increase in subtitled releases goes hand in hand with the Digital Screen Network initiative promoted by the UK Film Council. Between 2006 and 2011, 230 digital screens were established in both commercial and independent cinemas in the UK (BFI n.d.). Digital systems have rapidly been replacing 35 mm film systems. It is up to film distributors which releases are made available to cinema with subtitles. In practical terms, film distributors provide cinemas with copies of the actual film plus the subtitle file on a separate disc. The subtitle and video files are synchronised through an electronic subtitling system, with which most, if not all, mainstream cinemas are equipped.[3] For digital systems the subtitle facilities are built-in, whereas for 35 mm film systems, the transmission of subtitles requires the installation of either the DTS-CSS Cinema Subtitling System or Dolby ScreenTalk, where the subtitles are superimposed over the projected image, without the need of overlaying them onto the film itself. Most cinemas – Cineworld, Odeon, Picturehouse, Vue – have digital subtitle facilities and cinemas with 3D systems also have the equipment required to screen subtitled releases. Table 1 provides an overview of weekly screenings in four major London cinemas – (1) Cineworld, London - Shaftesbury Avenue; (2) Odeon, London - Leicester Square; (3) Clapham Picturehouse, London; (4) Vue, London - Piccadilly – applicable to the week between 15th and 21st May 2014:

Cinema	**Total releases**	**Subtitled releases**	**Total screenings**	**Subtitled screenings**
Cineworld	14	3	272	7
Odeon	7	2	144	3
Picturehouse	21	2	117	2
Vue	15	2	161	2

Table 1: Weekly cinema screenings

The four cinemas listed in the table are mainstream multiplex cinemas that provide releases with SDH. The one figure that appears to be similar among all four cinemas is the number of subtitled releases (generally two weekly), suggesting that this may depend on decisions taken by film distributors. Note that there is a discrepancy between the number of weekly subtitled releases reported by the website www.yourlocacinema.com, – that is nine – and the actual weekly subtitled releases

[3] A comprehensive guide of accessible cinemas in the UK is provided by www.yourlocalcinema.com. The website was founded in 2000 by Dean Rhodes-Brandon, a deaf boy aged 9 at the time, winner of the national Daily Mail 'People's Choice' award and the RADAR 'Young Persons Award for Fresh Impact on the Human Rights of Disabled People'.

by the four mainstream multiplex cinemas listed in the table. The number of screenings varies between two and three a week, with the exception of Cineworld that offers seven subtitled screenings but also a much higher number of total screenings compared to the other three cinemas. Looking at the table, what becomes clear is that the number of subtitled screenings is extremely low (between 1.2% and 2.5%) compared to the number of total screenings. Access of deaf and hard of hearing viewers to cinemas seems to be dictated by logistical and financial reasons, as in order to cater for these viewers cinemas need to devote a screen to films with SDH, which could otherwise be used for the general hearing audience.

Many cinemas are equipped with a screen that can provide SDH but this may be instead mainly used to screen films for hearing viewers instead. Different is the case of audio description for the blind and the partially sighted (AD), which is usually made available during all screenings of films that have been released with an AD commentary. The reason for this ubiquity of AD is due to the fact that to provide access to the film for the blind and partially sighted is logistically less complex than SDH since this is made available through the simple use of headphones that does not affect the cinema experience of sighted viewers. In the case of deaf and hard of hearing viewers, it is clear that although the facilities to provide access are available, their use is limited due to priority given to other concerns (i.e. not intruding in the experience of the hearing audience).

New personal solutions for deaf and hard of hearing viewers have recently been investigated. BBC (2011) announced that new wearable subtitle glasses would have been available to deaf and hard of hearing viewer, allowing them to attend screenings with general audiences. The glasses, developed by Sony, display the subtitles onto the screen of the glasses, which become superimposed on the cinema screen, with the advantage of not having to refocus, which is necessary when using small seat-mounted displays. To this day this solution does not seem to have become popular and there is no readily available information of cinemas providing this service.

The most recent development in this direction is the 'Off-Screen Invisible Subtitles' system (Disabled World 2014), which uses a special display below the main film screen, where the subtitles become visible only to those wearing the special glasses, otherwise seen as a dark grey area. The subtitles do not get displaced as the viewer's head moves, which was one of the limitations of the first subtitle glasses developed. The system was tested in Cineworld Milton Keynes on 7th February 2014 and has also found support in the form of feedback, testing and promotion from Regal Entertainment Group in the USA and Regal Cinemas in the UK, the Cinema Exhibitors' Association and Odeon. Inventor Jack Ezra, of 3D Experience UK (www.3dexperience.co.uk), is using crowd-funding to raise the necessary funds for the prototype to be available in cinemas worldwide.

In the past, there have been a few isolated cases of BSL (British Sign Language) interpreting in cinemas. The provider of this service was *Talking with Hands*, a group of profoundly deaf and hard of hearing people who introduced the first signed screening, the film *Harry Potter and the Philosophers Stone* (Chris Columbus), in 2001. The group is no longer operating.

Although there is no statutory obligation to provide subtitles for cinema releases, the provision of subtitles has increased considerably in the last years. This trend has been possibly encouraged by the legislation in place that regulates the provision of access services on television programmes, the growing social awareness of distributors and exhibitors, as well as by advances in technology that allow for more cost-effective and uncluttered and intrusive systems designed for the transmission of subtitles.

2.4 The case of DVD releases and videogames

Within the DVD industry, the current trend is also to provide SDH for most programmes. However, not all releases are satisfactorily subtitled for deaf and hard of hearing viewers and some DVDs may be partly subtitled, meaning that only the main feature contains SDH whereas the extras, such as interviews and commentaries, may not be subtitled. As for the trailers, they may or may not be subtitled. Action on Hearing Loss (2011a) conducted research in 2006 on a sample of 585 DVDs from a variety of genres, including children's programmes, and found that 52% were partially or fully subtitled, 31% were not subtitled at all and no information on subtitles was provided on the remaining 17%. A mere 3% of music DVDs were subtitled but the quality was particularly poor.

In the UK, there is a trend for deaf and hard of hearing viewers to organise themselves using social networks when the provision of a service is lacking or unsatisfactory. As discussed in the previous section, www.yourlocalcinema.com fulfils the role of a comprehensive guide on accessible cinema, whereas www.dvd-subtitles.com fulfils a similar role for DVDs. It is a UK DVD subtitle database created by viewers and freely available online where information is provided on what exactly is and is not subtitled, based on the viewers' actual experiences. Unconfirmed ratings based on the information supplied by the DVD retailers or available on the back covers of DVD titles are also provided.

Taking initiative and being proactive is a common characteristic among deaf and hard of hearing viewers in the UK, where also a variety of deaf blogs are available – www.deafread.com – as well as deaf online forums and groups. Among 'Yahoo! Groups', general ones such us 'Deaf UK Chat' and 'Hard of Hearing UK' can be found, alongside more specific ones on SDH, such us 'Captioning'. Note that this last group, despite being US-founded, is well attended by deaf and hard of hearing viewers based in the UK. The presence of groups campaigning for subtitling is extended to the social media – see, for instance, 'Subtitles Now!' on Facebook (website also available: www.peskypeople.co.uk/subtitles-now). These initiatives inevitably help SDH to move forward in the UK, while they seem to contrast with other countries where such awareness on the topic is absent.

In the DVD industry, the choice of providing SDH is very much left to the distributors and seems to be merely affected by commercial and possibly ethical marketing reasons. At present, there is no statutory obligation to include subtitles on DVDs and there are no plans to regulate the provision of subtitles by manufacturers (Action on Hearing Loss 2011a). However, it can be argued that the recent developments in the DVD industry towards the provision of more SDH might have been affected by the legislation in place that regulates the provision of access services on television programmes. A good example is the BBC, which subtitles all programmes produced in-house not only for their broadcast on TV and the internet but also for their commercialisation on DVD. A similar example has been set by the British Film Institute which also subtitles all their new releases.

The policy statement released by Action on Hearing Loss (2011a) calls for fully accessible DVD entertainment and games and specifies that the required equipment to play the discs has to be also compliant. For example, any DVD player used to show and / or record films, should also be able to display and / or record subtitles.

As far as videogames are concerned, a comprehensive database with reviews from deaf gamers has been available for 13 years on www.deafgamers.com. However, the website was recently taken down due to lack of funds necessary to purchase new consoles and PC hardware.

Changes on internet provision of audiovisual programmes have also accelerated in recent years, particularly with the move of TV channels to webcasting, and they are discussed in the following section.

2.5 The case of on demand programme services

An on demand programme service (ODPS) is an online service that has as its principal purpose "the provision of programmes the form and content of which are comparable to the form and content of programmes normally included in television programme services" (Ofcom 2012b: 15). In the UK, BBC iPlayer, ITV Player, 4oD and Demand 5 are among the providers of this service. Although there are some other broadcasters offering this service in the UK, in this section the focus remains on these four main providers so as to maintain continuity with the analysis carried out in previous pages of broadcast programmes. The regulation of on demand programme services is very recent and much less strict than the one in place for broadcast programmes. The Directive on Audiovisual Media Services (2010) justifies imposing lighter regulation on on demand audiovisual media services in view of the fact that users can exercise greater choice and control over the watching experience and that the impact on society is different. With this directive, Ofcom designated ATVOD (Authority for Television On Demand, www.atvod.com) to be the new co-regulatory body with the specific remit of ensuring that on demand services are made accessible to the deaf and the hard of hearing as well as to the blind and the partially sighted, and that they comply with the statutory obligations. The designation of an authority for the regulation of on demand services is a unique initiative in Europe, while in the USA a similar role is undertaken by the Federal Communications Commission (FCC).

In March 2011, ATVOD (2011) presented a proposal for best practice guidelines for access services on VOD, based on the guidelines previously developed by Ofcom (1999) on television broadcast services. Included among the best practices for video on demand subtitling were: (1) the use of Tiresias Screenfont; (2) the use of pre-prepared block subtitles[4] when possible; (3) the preferred use of two lines (although three lines are also possible); (4) the inclusion of music, sound effects and paralinguistic features; (5) the appropriate synchronisation between speech and subtitles; (6) the adherence to a reading speed of between 160 and 180 words per minute (wpm) as many viewers find subtitles faster than 200 wpm difficult to follow; and (7) the correct accuracy between the content of the original soundtrack and the onscreen subtitles. These recommendations are entirely based on available guidelines for broadcast subtitles and do not take into account that the platform used for watching on demand programmes is different from that offered by a TV set. The most immediate differences concern the vicinity of the viewer to the screen, who is more likely to be using a computer and be closer to the screen when using on demand services, and the screen dimension, as viewers may be using smaller screens since VOD is also accessible online and therefore potentially via a varied number of different devices such as tablets and smart phones. Another point to consider is that the viewer can be more in control when watching TV on demand and this is not just about choosing when to watch a certain programme, but also about being able to pause, rewind and fast forward the video. Finally, the quality of the image and sound are more likely to suffer when using on demand services as they are not only dependent on the device used, but also on the Internet speed, at least for programmes watched in streaming.

Responses to the above proposal about access service were given, among many others, by major access service providers (ITFC[5], IMS), broadcasters (Channel

[4] Subtitles are denoted as ‘block’ or ‘pop on’ when the text appears at once as a single block, stays on screen for a set duration and disappears completely before the next subtitle is displayed. This technique is used for pre-recorded programmes, while live programmes make use of ‘scrolling’ subtitles, where the text displayed moves to a different position in the subtitle area, eventually disappearing as new text appears.
[5] ITFC was acquired by Deluxe Entertainment Services Group in 2010.

4) and deaf associations (Action on Hearing Loss, Sense). ITFC (2011) agreed with modelling the best practices guidelines for VOD access services on the existing Ofcom (1999) guidelines on the provision of television access services and raised two points in regards to the stylistic recommendations: (1) since the service is accessed using devices that are not necessarily television monitors, the adoption of Tiresias Screenfont might need to be revisited; (2) subtitles on a solid black background are only used for Teletext subtitles while in other contexts legibility should be granted by outlining characters instead. IMS (2011) also agreed with modelling their subtitling guidelines for VOD on the existing broadcast subtitling guidelines (Ofcom 1999) for the purposes of effectiveness and clarity but, similarly to ITFC, noticed that the guidelines on font and size were only applicable to subtitles specifically made for the television screens. Channel 4 (2011) also argued that on demand subtitling guidelines should reflect as much as possible the content of broadcast subtitling guidelines for the purposes of consistency, acknowledging that some technical elements – e.g. the provision of an apology when subtitles are not provided due to a technical failure – may be less applicable in an on demand environment. Action on Hearing Loss (2011c), previously known as RNID (Royal National Institute for the Deaf), also supported the implementation of subtitling guidelines for on demand services based on the existing subtitling guidelines for broadcast television for reasons of continuity of standards across all platforms and stressed the need of providing clear information to viewers on how to activate the service easily and on the range of programmes that are accessible. A note on the importance of accuracy of the subtitles with respect to the soundtrack and correctness of spelling was added by both Action on Hearing Loss (2011c) and Sense (2011), the latter a national charity that supports children and adults who are deaf-blind. Besides emphasising the need for clear information about what is accessible and how to access it, Sense focused on the importance of having high contrast subtitles to enhance legibility, that is, subtitles that use a light coloured font against a solid black background. Sense also argued that the use of larger fonts should be preferred to compensate for the use of subtitles in low resolution environments or small screens and for this particular aspect referred fully to the guidelines in place for broadcast (Ofcom 1999).

Following the consultation, Ofcom (2012b) reported that there was general consent on using broadcast best practice as a model to delineate VOD best practice, but that a number of suggestions had been made by respondents regarding standards and potential solutions to technological issues and that these should be taken into consideration before the final publication of guidelines. It was also observed that technical limits on the use of pre-existing subtitles needed to be adequately addressed.

The following general, non-binding recommendations were made by ATVOD (2012):

1. To publicise the presence of access services on the VOD services by liaising with user organisations and by presenting clear signals of availability of access services prior to broadcast. This information should be included in the programme description and also within the programme file / data stream;
2. To be consistent in the provision of access services for series and programmes that require continuity;
3. To ensure that access services can be activated using simple means appropriate for the users of such services, and that these means are made consistent across all interfaces;
4. To monitor playout (that is the transmission from the VOD provider online to the audiences) at regular intervals as well as the quality of the access services provided, through focus groups and feedback from viewers;
5. To consult regularly with groups representing access services users on the quality of the services and the selection of the programmes shown with SDH and AD and to facilitate feedback from users by providing contact details on the service providers' websites.

Over 90% of programmes available on iPlayer (www.bbc.co.uk/iplayer) have subtitles (BBC 2014) while audio described and signed programmes can be easily identified on the main page under the *Categories* menu and in the online TV guide as AD and SL, as shown in Figure 4:

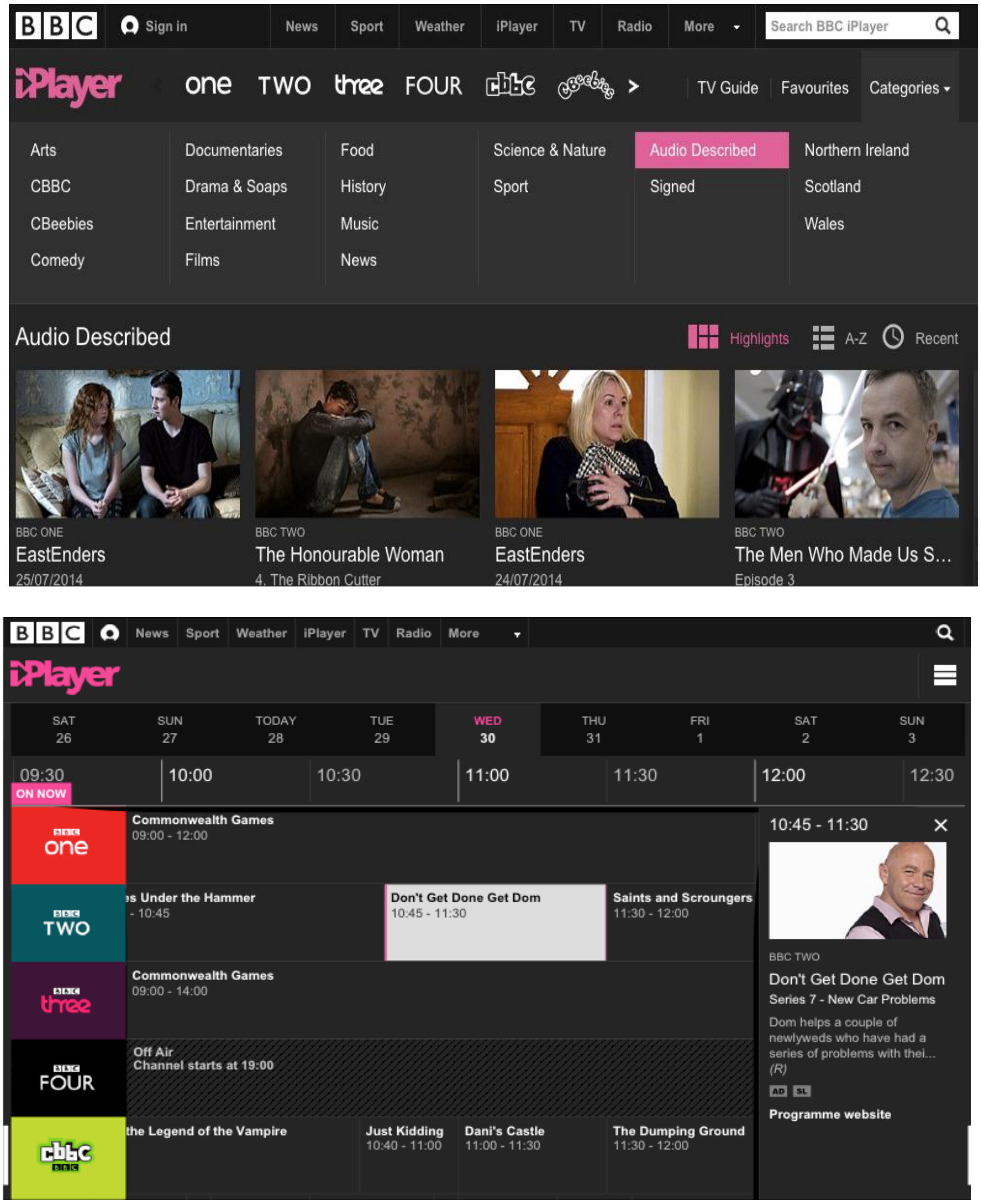


Figure 4: iPlayer online guide

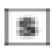
The case is different for subtitled programmes, as the only way for viewers to find out whether a programme has subtitles or not is by opening the video window and launching it. If subtitles are available, an S button, , appears on the right hand side of the bottom bar, as shown in the screenshot below from iPlayer. Following a direct query regarding this matter, the broadcaster replied that all on demand content on desktop is subtitled and hence there is no need to mention it on individual programmes (Sweeny 2014). However, this is not exactly accurate information since some programmes, namely sport catch-up clips broadcast the day before, are not subtitled.

Figure 5: iPlayer video window

On other VOD services, namely 4oD, Demand 5 and ITV Player, subtitles are enabled and disabled by pressing the S button positioned on the lower right-hand side of the video window, similarly to how it is done on iPlayer. Links to *Accessibility Help*, a page containing guides on how to activate access services, and *Contact the BBC* are also available in the lower part of the iPlayer main page (www.bbc.co.uk/iplayer).

Channel 4 (2014) provides subtitles for over 77% catch-up programmes available on 4oD (www.channel4.com/programmes/4od). Similarly to iPlayer, 4oD includes a category for audio described programmes but not to subtitled ones, as shown in Figure 6:

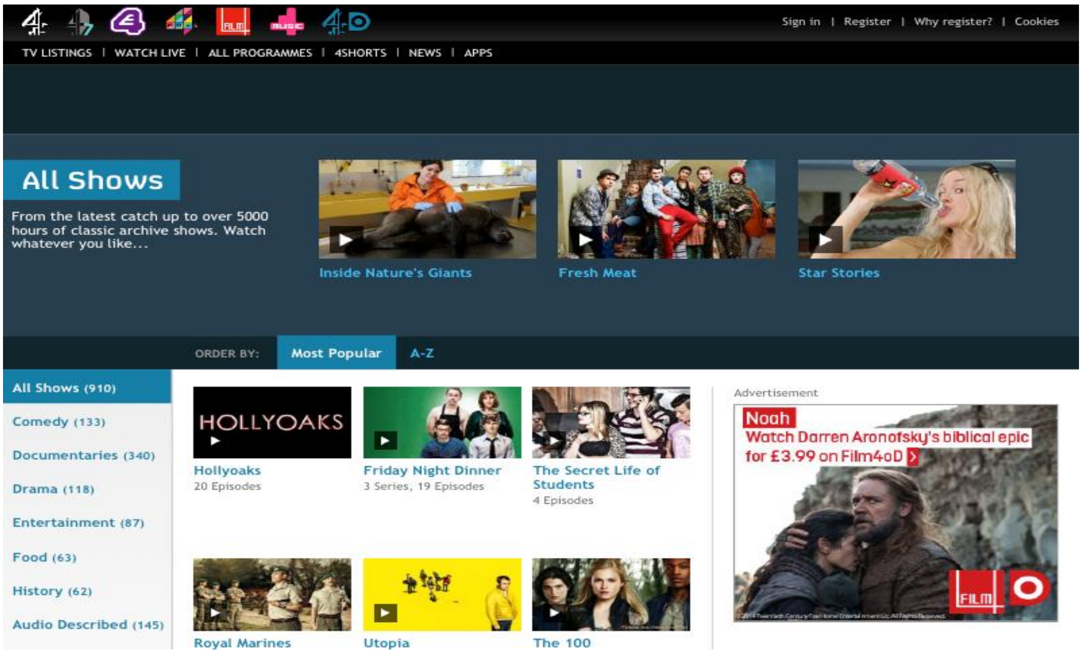


Figure 6: 4oD online guide

As in the previous case, the broadcaster explained that this is due to the fact that subtitles are available for the vast majority of 4oD content and therefore they feel it is not necessary to indicate their availability on each of the programmes (Redmond 2014). However, despite the lack of a category for subtitled programmes and therefore the possibility for the viewer to browse conveniently all programmes in the category, the online TV guide include an S next to each subtitled programme in the listings. Links to *Accessibility* and *Contact Us* are available in the lower part of the 4oD main page (www.channel4.com/programmes/4od). Below is a screenshot from the 4oD video window, which has a layout similar to the one seen for iPlayer, with the S button, 

, on the right hand side of the lower bar, but the subtitles output style is different, as here they have a drop shadow effect (while a ghost box is used in iPlayer):

Figure 7: 4oD video window

Demand 5 (www.channel5.com/demand5) provides subtitles to the very same programmes that are subtitled for TV and the online schedule of Channel 5 programmes includes information about which access services (AD, S, SL) are available, if any. The broadcaster explained that most programmes originally transmitted with subtitles on broadcast are also available with subtitles on Demand 5, with the exceptions of programmes produced within a very short period of time, such as *Big Brother*, that require automated speech recognition (ASR) software (Channel 5 2014b). In these instances the subtitle file produced with ASR is not compatible with Demand 5 and cannot be used on the internet. As for the provision of any further information, there is a link to *Accessibility* and to a *Contact Us* page, as previously seen for the two other broadcasters. The screenshot below shows an example from Demand 5, where the video window layout is similar to the ones previously seen, with the S icon, , on the right-hand side of the lower bar, but the subtitles use a different output style, that is an outline effect:

Figure 8: Demand 5 video window

ITV Player (www.itv.com/itvplayer) provides subtitles to some programmes, but there is no information on accessibility at all on their web pages. A link to *Contact Us* is however available. Personal communication with the broadcaster confirmed that the presence of the S label at the bottom of the screen, S, is the only indicator of subtitles availability (ITV 2014b). The screenshot below shows an example from ITV Player, where the subtitles, similarly to those in Demand 5, use an outline effect:

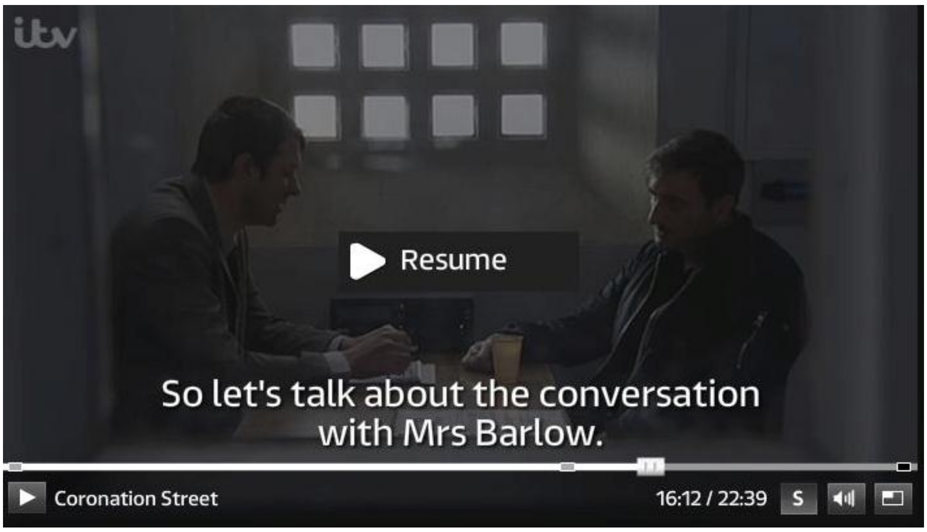


Figure 9: ITV Player video window

Having examined the access services, particularly the provision of subtitles, of the above four major providers of VOD, it can be noted that while the activation of subtitles is made simple and is consistent across all providers, clear information about what is accessible for the deaf and hard of hearing, as specifically demanded by Action on Hearing Loss (2011c) and Sense (2011), is not always available, despite it being one of the requirements of the guidelines put forward by (ATVOD 2012).

As already mentioned, some detailed guidance for service providers in relation to the programmes to be subtitled, as well as audio described and signed, is given by ATVOD (2012). In this respect, the guidance advises that when selecting the type of programmes to be made available with subtitles service providers ought to give priority to the most popular ones.

Following the first round of consultations on the proposal for best practice guidelines for access services on VOD delineated by (ATVOD 2011), the feedback received triggered some changes that have been incorporated in the new set of guidelines, as follows:

1. The use of Tiresias Screenfont is given as an example only, while, in accordance with what was suggested by ITFC (2011) and IMS (2011), the main priority should be for subtitles to be readable and for fonts to be highly legible on the various devices used for access service.
2. ATVOD (2012) states that readability is to be achieved by the use of high contrast subtitles. Note that since here a reference to form rather than content is made, the actual concept in question is that of legibility. ATVOD (ibid.: 7) specifies that “pre-prepared block subtitles are the best approach to providing accurate, easily legible and well-synchronised subtitles”. It is explained that legibility can be achieved by using white, yellow, cyan and green text against a solid black background. This shows that on the one hand the recommendation made by Sense (2011) about having high contrast subtitles that use a light coloured font against a solid black background has been fully considered, but on the other hand the point raised by ITFC (2011) about the use of subtitles on a solid black background being exclusively limited to Teletext subtitles has only partially been taken into consideration as the use of a black background is still identified as the best method to achieve legibility. In practice, as shown from the screenshots above, iPlayer is the only one to use something similar to

this method, that is a translucent block, or ghost box, slightly different from the traditionally opaque one used for Teletext subtitles. ATVOD (2012: 7) acknowledges that "where necessary and appropriate service providers should use other methods to achieve contrast, for example characters with a contrast outline". Subtitles with an outline effect are used by Demand 5 and ITV Player, as shown respectively in Figures 8 and 9 above, while 4oD opts for a drop shadow effect, as previously shown in Figure 7.

3. Users value the ability of easily enabling and disabling subtitles. This recommendation follows the feedback provided by Action on Hearing Loss (2011c) and Sense (2011) on the need for clear and simple instructions on how to access the services.
4. In line with the suggestion made by Sense (2011) to use a bigger font to compensate on those occasions on which the subtitles are used in lower resolution environments, ATVOD (2012: 7) states that "subtitling should be closed rather than open, ideally in formats where the visual characteristics of the subtitle text can be altered". In practice, Demand 5 and particularly ITV Player make use of bigger fonts. The four major broadcasters were contacted directly in regards to the possibility of altering the subtitles' font size and they all confirmed that this is not an option at the moment (Carson 2014; Channel 5 2014a; ITV 2014a; Swan 2014), although BBC (Swan ibid.) explained that some initial research on the subject has already been carried out.

VOD services are relatively new: 4oD was launched in 2006, followed by iPlayer and ITV Player in 2007, and by Demand 5 in 2008. In the few years of their existence, providers have been, and still are, constantly developing new services. Just to mention a few of the latest developments, since 2013 ITV Player has offered viewers using Apple devices the choice to watch content with or without advertising for a small fee (West 2013). A new iPlayer platform was introduced in 2014, with the aim of improving the design of the interface, so that it will be suitable for a multiscreen (mobile, tablet, TV, PC) world, and of simplifying navigation through a more visual and easier to browse home screen (Taylor 2014). Similarly, 4oD started testing a new platform for users to navigate in a more integrated way that allows them to discover more easily what content is available by using certain interactive features (Farber 2014). Demand 5 has been launched onto the latest generation of Sony smart TVs (Briel 2014). The video on demand world is fast changing, posing to ATVOD a myriad of new challenges, some of them similar to the ones existing for broadcast television. One of the key issues at present is that as more and more accessible programmes are made available on different platforms, how is the quality of the services offered affected and / or monitored? This is an area that would certainly benefit from tailored research, particularly since the latest study dates back to the only consultation carried out by ATVOD (2011) that resulted into the limited guidelines (ATVOD 2012) available nowadays to providers of access services in the UK.

2.6 The case of British television

This section offers a distillation of many works and guidance on SDH with a focus on deaf and hard of hearing children.

The first part (Section 2.6.1) discusses relevant aspects from early works conducted approximately thirty years ago by Baker and colleagues (Baker et al. 1981; Baker 1982; Baker et al. 1982; Baker et al. 1984; Baker 1985), research on the comprehension of subtitles by deaf children (Gregory and Sancho-Aldridge 1996) and a comprehensive account of the SDH panorama in the UK (De Linde and Kay 1999).

The second part (Section 2.6.2) is centered on guidance provided by Ofcom (www.ofcom.org.uk),[6] which in 2003 inherited the role of the Independent Television Commission (ITC). The guidance is discussed from its origins (Ofcom 1999) until its latest developments (Ofcom 2012a).

[6] Other countries also have regulators with a similar role to the one played by Ofcom: Australian Communications and Media Authority (www.acma.gov.au); Conseil supérieur de l'audiovisuel (France) (www.csa.fr); Federal Communications Commission (USA) (www.fcc.gov); Canadian Radio-television and Telecommunications Commission (www.crtc.gc.ca).

2.6.1 SDH research

The seminal *Handbook for Television Subtitlers* (Baker et al. 1984) was a ground-breaking publication that tackled subtitle display and editing in detail for subtitlers working for Teletext SDH. The handbook replaced the original guidelines proposed by Baker (1981) and made a much greater and comprehensive contribution to the subtitling field. The first guidelines by Baker (ibid.) were written following experimental research on subtitling techniques that had been conducted with the deaf and the hard of hearing in a period of two years, whereas the handbook (Baker et al. 1984) also took into account the wealth of information accumulated in the first two years of experience in subtitling as well as further research.

On editing style, Baker et al. (1984) refer with due reservations to guidelines adopted by West Great Blue Hill (WGBH), an US public television channel, named after the location of the station's transmitter. The reservations are due to three different factors: (1) the tests used were not subtitling experiments in schools for the deaf but psycholinguistic ones, where the dynamic pictorial context of television is not well represented; (2) the guidelines were developed with American children (and their language) in mind; (3) the guidelines are too conservative in regards to the introduction of new vocabulary and expressions, particularly colloquial English.

Among the many areas covered, the handbook includes a short section on subtitle editing for deaf children (Baker et al. 1984: 42-44), which recommends a reading rate of 60 wpm and the use of simple syntactic structures, derived from work conducted with schools for the deaf. Baker's investigations were focused on the effectiveness of subtitling strategies with children studying in secondary schools for the deaf, whose comprehension was tested at various language levels and reading speeds (varying between 30 and 120 wpm). A low level of comprehension of subtitles was one of the main findings obtained from the two pilots conducted with schools for the deaf (Baker 1982), although this result was later nuanced by Baker (1985) who partly attributed this low level of comprehension to the use of open questions in the written comprehension test as these required a certain level of expressive language that the students did not have. Learning from previous mistakes, multiple choice questionnaires were used for subsequent experiments. Among the various recommendations put forward by the authors (Baker 1985; Baker et al. 1984) when subtitling for deaf children, the following were the most important ones: (1) to set reading speeds at a maximum rate of 60 wpm; (2) to use simple vocabulary and syntax; (3) to gently introduce essential difficult words in familiar contexts, by allowing additional reading time and by highlighting the new word by means of some typographical devices such as change of colour or use of upper case. Furthermore, they recommended that Teletext information pages should be used to provide simple definitions of unusual vocabulary and to contextualise the programme.

Adherence to a maximum reading speed is one of the aspects tackled in detail by Baker (1985) and it is an area that has certainly changed over the last thirty years as viewers' lifestyles and cultural backgrounds have. The increased exposure to screens via television, computers, tablets, mobiles and other audiovisual devices may well have affected young audiences' reading speed on screen as well as other reading abilities. In addition, over the last three decades, education for deaf children has changed quite substantially. In particular, a larger number of deaf children are nowadays educated in mainstream schools that have in place some sort of inclusion programme. These changes may also have affected the way deaf children develop their reading abilities, although there is no explicit evidence (ADPS 2013) and further research would be certainly most welcome.

A decade later, the research project conducted by Gregory and Sancho-Aldridge (1996) was more audience-targeted and focused on assessing deaf children's comprehension of subtitled television programmes. They considered three age groups (5-7, 8-11 and 12-16) and presented them with subtitled material at three levels of complexity: complex / broadcast, simple / simplified and basic. The simplified level was characterised by: (1) simplified syntax but word order unchanged; (2) omission of less relevant information; (3) retention of complex vocabulary; (4) synchronicity between sound and subtitle as far as possible; (5) maximum of two speakers on screen at the same time. The simplified level resulted to be the one that provided children with the greatest source of information, whereas complex or broadcast subtitles proved to be suitable for the oldest group only (12-16). The youngest group (5-7) had difficulties in following the subtitles and only those regularly exposed to subtitles at home could pick up isolated words. It is noted in this research that exposing the youngest group to TV subtitles on a regular basis may help them improve their familiarity with subtitles as well as develop their general reading skills.

The authors recommended the provision of broadcast subtitles for children aged 12 and above and of simpler subtitles for the younger groups, where also special effort should be made to maintain synchronicity between sound and subtitle. They also stressed the importance of considering the reading age of the children for future research in the area and advanced the thesis that children with a reading age of nine and above gained the greatest amount of information from broadcast subtitles. Similarly to Baker (1985) who advocated the production of subtitles by teachers of the deaf, Gregory and Sancho-Aldridge (1996) recommended the implication of teachers in the process of familiarisation with subtitles by suggesting that teachers be sent scripts for school programmes before the transmission, a recommendation rather complex to accomplish when considering the time pressure under which the industry is forced to work.

The use of subtitles to develop the reading abilities, hence literacy, of all children and not only deaf children, has been taken up more recently by authors like Kothari et al. (2002; 2004). They have implemented Same Language Subtitling (SLS) in the state of Gujarat, in India, on a TV programme with Hindi and Gujarati film songs, specifically for first language literacy of hearing children and adults. Both studies showed an improvement in literacy in a short span of six months or less. The project has been extremely successful and it has continued as Planet Read (www.planetread.org). The didactic function of subtitles can also be extended to foreign language learning, as discussed by Danan (1992) and Talaván (2009; 2010) (see Chapter One).

A comprehensive account of subtitling for the deaf and the hard of hearing in the UK is provided by de Linde and Kay (1999). The authors challenge the traditional view that SDH is a form of editing and locate it fully within the field of AVT on the grounds that (1) there is a transfer between spoken dialogue and condensed dynamic written text that requires linguistic judgements and (2) there is interplay between linguistic and visual elements. The authors look into the reading characteristics of the deaf and the hard of hearing from a cognitive point of view. However, the analysis presented assumes that deaf viewers have sign language as their first language, which is the case for a minority of people but not all, mainly those belonging to the Deaf community. This subject is discussed in detail in Chapter Five, more specifically in relation to deaf children.

An important part of the book is the descriptive analysis of three main subtitling features equally important in both adult and children programmes on British television: (1) synchronicity between subtitle and dialogue; (2) synchronicity between subtitle and image; (3) extent of editing. The research highlighted how the reading speed in adult programmes varies according to the programme type (e.g. chat shows have higher reading speeds than documentaries). As far as children's programmes are concerned, the reading speeds tend to be kept lower at a maximum of 90 wpm, but this inevitably implies more editing of the dialogue exchanges and longer lead and lag times.[7] The authors explain how, on the one hand, increased editing can alter meaning and affect coherence and, on the other hand, extended lead and lag times, which often imply going over a shot change with a subtitle, are disruptive for reading.

De Linde and Kay (1999) conducted further eye movement research on viewing behaviour with a group of deaf adults and it was noted that when subtitle rates exceed the viewers' reading abilities, significant disruption occurs. On the other hand, when the subtitle rates are too slow for the reading abilities of viewers, a tendency to re-read the subtitle is noted, which can disturb the reading experience too. According to their findings, as mentioned before, keeping subtitles across shot changes can also lead to re-reading of text and to longer deflections away from the subtitle.[8] The eye movement experiments also showed that deaf viewers make use of facial cues, whenever possible, to identify the start and finish of an utterance, to confirm the wording of a subtitle, and to check unusual words.

---

[7] 'Lead' time refers to the time between the in-time of a subtitle and the start of speech (as well as music and / or sound effects), whereas 'lag' time refers to the time between the end of speech (music and or / sound effects) and the out-time of a subtitle.

[8] Recent research (Krejtz et al. 2013) shows that most viewers do not re-read subtitles crossing shot changes. It is clear that further research is needed to better understand the contradictory results.

2.6.2 From *The Guidance on Standards for Subtitling* (Ofcom 1999) to the *Code on Television Access Services* (Ofcom 2012a)

As mentioned earlier, Ofcom (www.ofcom.org.uk) took over from the previous Independent Television Commission (ITC) and acts as the independent regulator of the UK communications industries, promoting television access services, that is subtitling, signing and audio description. The main role of Ofcom in this area since its inception in 2003 until the present day has been to set out the targets for television access services, that is the obligations in terms of percentage of services that each broadcaster has to meet. Ofcom is required to set 10 year targets for subtitling, signing and audio description, as well as five year targets for subtitling only. There are also interim targets that apply to a calendar year and for which reports with percentages achieved by the broadcasters are produced every three to six months.

Ofcom acts transparently, publishing online and on a regular basis all their codes of good practice, consultations, reviews, statements, and reports.

The following table summarises the targets set by Ofcom for the major broadcasters in the UK and the actual achievements in 2013. Note that in most cases the percentages achieved are higher than the ones set initially by the regulator. The only exceptions are BBC1, BBC Four and BBC News 24 that did not reach the expected 100% quota by 0.1%, due to technical and / or operational problems:

Service	**Subtitling**		**Signing**	
	Target	**Achieved**	**Target**	**Achieved**
BBC One	100%	99.9%	5%	5.3%
BBC Two	100%	100%	5%	5.2%
BBC Three	100%	99.9%	5%	5.7%
BBC Four	100%	100%	5%	5.8%
BBC News 24	100%	99.9%	5%	5.8%
CBBC	100%	100%	5%	5.3%
CBeebies	100%	100%	5%	5.6%
ITV1	90%	97.5%	5%	8.3%
ITV2	70%	97.6%	4%	4.6%
ITV3	70%	95.4%	4%	4.2%
ITV4	70%	79.9%	4%	4.2%
CITV	68.3%	78.9%	30 minutes a month	3 hs 12 mins a month
Channel 4	90%	100%	5%	5.1%
Channel 5	80%	92.8%	5%	11%

Table 2: Report for 2013 on the provision of subtitling and signing (Ofcom 2014b)

Ofcom (1999) also provides recommendations on the technical standards that ought to be followed in the subtitling practice for the deaf and the hard of hearing, known as the *ITC Guidance on Standards for Subtitling*. In particular, the guidance addresses the following issues: (1) subtitles' presentation in relation to the use of colour, positioning of lines, formatting, timing, and synchronisation between sound and text; (2) the various techniques used to convey paralinguistic elements (rhythm, intonation), sound effects and music; as well as (3) the practices of real time subtitling and subtitling for children. Over 10 years after its drafting, the Ofcom website states that the guidance is in place until further notice. Although it is not prescriptive, all subtitling companies working for broadcasters state that they adhere to it and use it alongside their own in-house guidelines, according to the conclusions reached through a survey conducted for a study on subtitling for deaf children on British television (Zárate 2008). The Ofcom guidance relies almost entirely on premises and details from the *Handbook for Television Subtitlers* (Baker et al. 1984) (discussed in Section 2.6.1), hence on research conducted some thirty years ago, and, like this book, includes one section specifically devoted to children, where there are references to the most recent study with deaf and hard of hearing children carried out to date in the UK by Gregory and Sancho-Aldridge (1996) (also discussed in Section 2.6.1).

A review of the guidance has been more recently published by Ofcom (2006b), but no major changes have been remarked when compared to the original document from 1999 (Ofcom 1999). The main aspects that have been considered are: (1) reading speeds, (2) use of colours, (3) font size and (4) accuracy of the subtitles being correct and free of mistakes. Two of these aspects in particular – namely reading speeds and font size – seem to have been systematically disregarded by some broadcasters, who have chosen to adhere to higher reading speeds and smaller font sizes than those recommended, so that more text can be included per line and per subtitle (Ofcom 2006b).

The document refers mainly to the practice of SDH in general and states that feedback from case studies in the form of interviews with individual viewers and representatives of disability organisations has been taken into account when reaching their final conclusions. In line with the findings of research previously conducted on reading speeds (Ofcom 2005), the maximum speed recommended for general pre-recorded programmes is revisited and goes up to around 160 and 180 wpm against the 140 wpm originally recommended in the 1999 document (Ofcom 2006b). A rather unexpected change is introduced when it comes to recommending a lower maximum reading speed for children's programmes; in which case, the original recommendation of not exceeding 70-80 wpm is left out and it is decided instead that nothing should be specified since the abilities of children vary considerably. As an alternative, it is advised that broadcasters should take into account feedback from the actual viewers and their parents, as well as exercise common sense when applying reading speeds. This is clearly a step backwards from the previous guidance as it is very unlikely for young children to provide feedback to the broadcasters, and their parents could only provide feedback if the children expressed their frustration in reading fast (or too slow) subtitles. On this subject the NDCS (2005) has found that 30% of families feel that the subtitles' reading speed is too fast. It would be interesting to further the research with empirical studies involving children. Finally, to leave such an important aspect of subtitling to the broadcasters' common sense is unlikely to be of any real benefit to the children, since the expertise that broadcasters have in the field of SDH for deaf children may be rather limited and possibly out of date.

The use of colours is kept as per the old guidance and a change in the font size is introduced to reflect feedback from viewers and findings of previous Ofcom (2005) research. In practice, this means that the size should be reduced from 24 to 20 full brightness pixels in height and that anti-aliasing techniques (where various tones of grey are used to produce smoother edges to the letters) should be encouraged. The original guidelines of adopting a font size of 24 lines had been disregarded by the broadcasters, as confirmed by measurements conducted by Ofcom in 2005 (Ofcom 2006b), where BBC had a font size equating to 20 lines, ITV and Channel 4 to 21.5 lines and Channel 5 to 19.5 lines. Ofcom (2006b) acknowledged that the original guidance no longer acts as a training manual but should nevertheless be retained as reference material on Ofcom's website, together with other sources of information.

The review carried out by Ofcom (2006b) acted as a consultation to which respondents were invited to comment. In specific, feedback was requested on (1) reading speeds, (2) use of colours, and (3) font size. Among the questions about reading speed, there was one that specifically concerned subtitling for deaf children: "Do respondents agree that the guidance should not specify a lower maximum speed for children's programmes, but should advise broadcasters to exercise common sense?" (Ofcom 2006b: 38). All the main broadcasters – BBC (2006), Channel 4 (2006), Channel 5 (2006), ITV (2006) – agreed that the matter needed to be left to their common sense and access service providers such as ITFC (2006), now Deluxe Media Europe, and Red Bee Media also agreed with the proposition put forward by (Ofcom 2006a). The NDCS (National Deaf Children's Society) and the old RNID (Royal National Institute for the Deaf), now Action on Hearing Loss, also agreed that no maximum reading speed needed to be specified, but advised that broadcasters needed to understand that "deaf children's reading skills and knowledge of English may be less advanced than those of hearing children of the same age" (Action on Hearing Loss 2006: 2; NDCS 2006: 5). Nonetheless, the NDCS also expressed concern about leaving the matter to common sense and listed the variables that needed to be taken into account when deciding on a reading speed suitable for deaf children, namely, feedback from viewers, the programme's intended audience, and the perceived educational value of the subtitles.

Considering that reading speed is a matter of paramount importance in any type of subtitling, and that guidance is actually provided for adult programmes, it is quite worrying that in the case of children Ofcom has opted for a very vague approach by leaving it to the broadcasters' common sense, unlikely to be experts on the needs of deaf children. The result of such a policy can only be very approximate whereas the repercussions of an unsuitable reading speed are very noticeable and can have detrimental effects on the viewers and their appreciation of the audiovisual programme and, ultimately, of their perception and enjoyment of subtitles at an age when they are learning to read and discovering the world of subtitling. The groups that responded to the Ofcom consultation on this specific matter do not have the necessary expertise to be allowed to have such an impact on the policy adopted. To date, no access service providers have investigated this issue – or any other issues related to subtitling for deaf children – in depth. In addition to this, traditionally, behind the access service providers, there is normally a pool of translators who have generally not been trained as subtitlers for the deaf and, even less likely, for deaf children.

From a practical point of view, access service providers in the UK agree that young audiences have their own specific needs and this is normally reflected in the use of lower maximum reading speeds, a major degree of textual editing, and sometimes a preference to describe sound effects in onomatopoeic forms rather than using descriptive labels. Nevertheless, some of these subtitling strategies seem to owe more to intuition than to factual empirical information, highlighting a lack of solid knowledge and awareness of deaf children's reading abilities and needs. The NDCS (2006) and Action on Hearing Loss (2006) requested in their responses to the review of the guidance (Ofcom 2006b) a greater understanding of deaf children's needs. Having interacted with many subtitlers in the UK and in some other European countries in the course of my research, I have found that there is a general, genuine interest in reading and learning about deaf children and their needs. As already mentioned, subtitlers have generally not specialised in SDH for children. In fact the current trend in the industry – at least in the UK, where subtitling for broadcast is nearly exclusively intralingual and tailored for deaf audiences – is the training and recruitment of a versatile subtitler who can translate pre-recorded programmes for children, pre-recorded programmes for adults, and live programmes (such as news and sport events) through respeaking. The benefits of this trend are probably triggered by the considerable increase of broadcast subtitling targets by the main national channels, which in 2010 reached an output of 92.8% to 100% (Ofcom 2014b). However, it is necessary to bear in mind that with such large outputs and without the appropriate scrutinising channels there may be some drawbacks on the quality of the subtitles.

An observation that needs to be made is that while the targets to be met by broadcasters on the provision of SDH set out by Ofcom are legally binding, the guidance on the subtitling practice issued also by the same regulator is not at all prescriptive or compulsory. This inevitably creates a situation where quantity is prioritised to the potential detriment of quality. However, Ofcom (2014a) has recently published its first report on the quality of live TV subtitles and this may well be a new priority, hopefully in the future also extended to pre-recorded subtitles, now that the targets seem to have been won. At present, there is not a standardised guidance on how to ensure that the right SDH quality and standards are guaranteed. A recent Ofcom (2014b) publication on access services does not include subtitling guidelines but makes reference to an older report (Ofcom 2012a) that does include them as an annex and also provides a list of reference material that can be freely consulted by broadcasters and subtitling companies. Specifically, it provides the bibliographical references for a report on Tiresias font (Silver et al. 1998), a report on young deaf people’s access to television (NDCS 2005) and a note on how to deal with incidental music and effects (Hearing Link 2006).[9] Despite the six-year gap between the two publications (Ofcom 2006a; Ofcom 2012a), which crucially coincides with the advent of digital television (implemented between 2008 and 2012), no changes are noted in the guidelines.

In an attempt to reduce costs, broadcasters that only a few years ago had their in-house SDH units, including the BBC, started outsourcing the workload to external subtitling companies and other language service providers. As a result, there is no

[9] Hearing Concern and the LINK Centre for Deafened People merged in 2008 into Hearing Concern LINK. Hearing Concern LINK became Hearing Link in 2011.

immediate link between the subtitles that are supplied and the broadcaster. At the time of writing, the subtitle providers for the main UK broadcasters are as follows:

Channel	**Subtitling services**
BBC	Red Bee Media www.redbeemedia.com
Channel 4	Red Bee Media
Channel 5	Red Bee Media Deluxe Media Europe (former ITFC) www.deluxemediaeurope.com IMS www.ims-media.com
ITV	Deluxe Media Europe (former ITFC)

Table 3: Subtitle providers for UK broadcasters in July 2014

What is more, many subtitling companies do not operate fully in-house and often employ a pool of external freelance translators, which risks compromising the immediacy of communication between subtitler and user. Nonetheless, the flow of information can easily be encouraged by an active and dynamic line of communication between broadcasters, subtitling companies and actual subtitlers.

2.7 Research on SDH conducted in Europe

As suggested by the information collated by the European Federation of the Hard of Hearing (EFHOH, www.efhoh.org), shown in Figure 10 below, the UK is well ahead of other European countries in the provision of SDH on national television, followed by the Netherlands, France and Belgium:

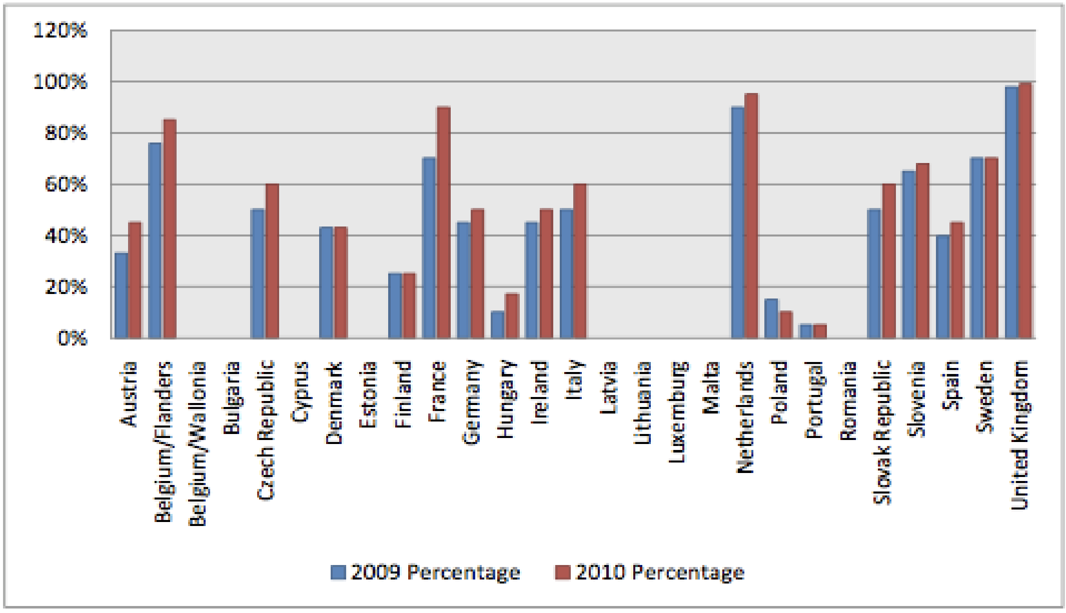


Figure 10: Provision of subtitles by national broadcasters (EFHOH 2011)

Of course, the percentages in Figure 10 do not necessarily reflect how much research has been conducted on SDH at a national level in each individual country. Nevertheless, it is worth looking at the national guidelines in place in an attempt to explore the principles upon which they are founded since they constitute the basis of SDH on television. It is then necessary to take also into account relevant research conducted in countries where the SDH percentages are still low, such as Portugal and Spain, to try and ascertain whether this is due to a situation where the regulators do not take on board the available research.

Before looking individually at what countries have done nationally, it is worth mentioning DTV4All (Digital Television for All, www.psp-dtv4all.org), a project funded by the European Commission between 2008 and 2012, to facilitate the provision of access services on digital television across Europe, as discussed in Chapter One. One of the project aims consisted of exploring the possibility of providing a common standard for subtitling for the deaf and the hard of hearing across the continent (Romero-Fresco 2010). Researchers and broadcasters from five European countries - namely Denmark, Italy, Poland, Spain and UK - were directly involved. Three main areas were explored by the project: (1) viewers' preferences about font type, font size, speaker identification, position and justification of subtitles; (2) comprehension of subtitles, through screenings followed by questionnaires; and (3) perception, using eye tracking technology. From the first area explored, it became clear that viewers were reluctant to changes and highly influenced by the practices in place, as well as not consistent in their responses. The two following areas explored highlighted the differences in SDH practices in Europe and in opinions among the countries involved. The comprehension results achieved by the hearing impaired were poor and different viewing patterns characterised the three groups of deaf, hard-of-hearing and hearing. As explained in Chapter One, DTV4ALL has been superseded by the current HBB4ALL (Hybrid Broadcast Broadband for All, www.hbb4all.eu), launched in December 2013 for the duration of 36 months.

Since this project is focussed on pre-recorded SDH on national public television, the overview that follows considers mainly pre-recorded programmes on national public television, unless otherwise specified.

2.7.1 The Netherlands

As one of the leading countries in Europe in the field of SDH, 95% of national Dutch-language television programmes in the Netherlands are subtitled for the deaf and the hard of hearing (van der Gon 2013). The matter is regulated by Article 15 of the *Mediabesluit 2008* or Media Decree (Raad van State 2008). All national public broadcasters were required to reach the 95% subtitling target by January 2011. The target is applicable to all subtitled programmes, be it pre-recorded or live. The *Commissariaat voor de Media* or Media Commission (www.cvdm.nl) monitors compliance with the quotes and produces a report every two years.

2.7.2 France

In France, the audiovisual industry is regulated by the *Conseil Supérieur de l'Audiovisuel* (CSA, www.csa.fr), which has recently been given the responsibility of making television programmes accessible to deaf and hard of hearing viewers, as well as to those members of the audience who are blind or partially sighted. Following the approval of a law stressing the equal rights and opportunities, participation and citizenship of people with disabilities, passed in February 2005 (L'Assemblée nationale et le Sénat 2005), any TV channel with more than 2.5% of the annual audience share is obliged to comply with this requirement. As the percentage is very low, this means that most French channels have to abide by this piece of legislation. The main public national television channels belonging to the state owned France Télévision – namely France 2, France 3, France 4, France 5 and France Ô – all subtitle 100% of their programmes. Broadcasters have recently adopted stylistic guidelines on the provision of subtitles (CSA 2011) that are the fruit of a joint effort among deaf associations, subtitling companies and broadcasters. Muller (2012) provides an overview of SDH on French television and discusses the conventions in place. In some respects, France is a peculiar case as the SDH practices implemented in the country are very different from those adopted by other European countries. For example, colours are not used for identifying different characters, but they are rather indicative of elements specific to SDH, for instance music, sound effects, voice-offs, characters' thoughts and narration. Muller (Forthcoming) conducted a reception study aimed at analysing the preferences of the deaf and the hard of hearing viewers in relation to the subtitling practices seen on French television using an adapted version of the DTV4ALL questionnaire. As it will be further discussed in Section 2.7.4, the research conducted in SDH is generally based on surveys that look at the preferences of viewers, while experimental research is almost non-existent.

2.7.3 Belgium

Similarly to the UK, the Flanders national television network Vlaamse Radio- en Televisieomroeporganisatie (VRT, www.vrt.be), started providing SDH in the late 1980s. The broadcaster is working towards achieving 95% subtitling of all programmes by the end of 2014 (VRT 2011), a feasible objective since in 2012, the target of 93.9% was already met (Saerens 2013).[10] VRT, similarly to the BBC, have published their stylistic guidelines, the *Stijlboek* (Dewulf and Saerens 2009), for the production of SDH, which have been updated in 2012 (Dewulf and Saerens 2012).

[10] The percentages include all live, semi-live and pre-recorded subtitled programmes for Dutch / Flemish content on all VRT channels (Eén, Canvas, OP12).

Flanders, a complex linguistic reality where standard Dutch, informal Flemish-Dutch (also called 'intermediate language') and regional dialect cohabit, constitutes an interesting case where subtitles (of Flemish fiction programmes, for instance) produced for the deaf and hard of hearing may be used by hearing audiences, since VRT provides open subtitles[11] only when there is no Teletext subtitling available (Remael et al. 2008).

In terms of research on SDH, it is worth mentioning the authors Verfaillie and d'Ydewalle (1987), who conducted research with pre-lingually deaf students aged between 16 and 20 years in order to establish their preferences when watching audiovisual programmes. To this aim, they were exposed to a spoken television story in the following formats: (1) speaker, sign language and subtitles; (2) sign language and subtitles; (3) speaker and subtitles; (4) speaker and sign language. Eye movement research showed a much greater preference for the use of speakers and subtitles.

2.7.4 Spain

Most of recent SDH research is conducted by Spanish scholars and academics, possibly due to a greater availability of funding. However, in this specific case, as suggested by Figure 10 above, the active research does not seem to have an impact on the actual provision of subtitles by national broadcasters. Indeed, when compared to the output seen in the Netherlands, France and Belgium, the Spanish percentages are considerably limited.

The common denominator of the latest SDH research in Spain seems to be a focus on viewers' preferences, explored through the use of questionnaires. Lorenzo (2010a; 2010b) focuses her research on subtitling for children, while all the other authors work mainly with adults. The elements studied vary from positioning of subtitles (Arnáiz-Uzquiza 2010; Bartoll and Martinez Tejerina 2010; Lorenzo 2010b; Pereira 2010) to speaker identification (Arnáiz-Uzquiza 2010; Lorenzo 2010b; Pereira 2010), and the number of lines used and length of display on screen (Lorenzo

[11] Subtitles which are burned in the picture and cannot be deactivated (or activated), generally tailored for hearing viewers.

2010b; Pereira 2010). The use of icons for speaker identification and signalling of mood are also explored by Civera and Orero (2010). Arnáiz-Uzquiza (2010), in line with Romero-Fresco (2010), highlights the potential of eye tracking technology and suggests that it is used for further research. In practice, at Centre d'Accessibilitat i Intel·ligència Ambiental de Catalunya (CAIAC, http://centresderecerca.uab.cat/caiac) eye tracking technology is used for several research projects on accessibility.

An active group of research on deafness and language acquisition is Grup de Recerca sobre Sordeses i Trastorns en l'Adquisició del Llenguatge (GISTAL, http://gistal.uab.cat), which has in the past mainly worked with hearing impaired adolescents. A recent study (Cambra et al. 2013) was conducted with a group of 11 younger children, aged seven to 11 and enrolled in a mainstream school. The children were shown a cartoon subtitled in Catalan and where asked to orally retell the story. To round off the findings with empirical data, eye tracking technology was also used. In this particular experiment, it was found that where the oral information can be understood by the images alone, it seems important to have sequences in the video without subtitles, even if the soundtrack contains dialogue, so that participants do not stop reading the subtitles due to tiredness, as it happened with the youngest children. Unfortunately not having subtitles when there is oral information in the soundtrack would mean defeating the purposes of subtitling. From a research perspective, it would be useful to explore ways of editing that suit the reading abilities of the youngest children so that they are encouraged to make use of the subtitles, which would ultimately fulfil a didactic function.

2.7.5 Portugal

According to the data collected by the EFHOH (2011), Portugal lags behind most European countries in the provision of SDH on national television. Nevertheless, it is being included in this discussion as it is the focus of some interesting SDH research (Neves 2005).

As far as the broadcasting of foreign programmes is concerned, a distinction has been traditionally made in Europe between dubbing countries – Austria, France, Germany, Italy and Spain – and subtitling countries – Belgium, Denmark, Finland, Greece, Luxembourg, the Netherlands, Norway, Portugal and Sweden (Koolstra et al. 2002). There is not a direct link between being traditionally a subtitling country and being pioneering in SDH, as shown in the case of Portugal, where there is a lack of interest in increasing the availability of SDH on television, despite groundbreaking research on the subject being conducted by scholars like Neves (2005; 2007; 2008). Only 10% of broadcast programmes are foreign (Neves 2013), meaning that deaf and hard of hearing viewers have limited access to foreign programmes – which are subtitled with hearing audiences in mind – and very little access to Portuguese programmes.

Apart from offering a detailed description of the deaf and hard of hearing addressees and contextualising SDH within the AVT framework, Neves (2005) also presents several case studies conducted in Portugal. One of the studies looked at the number of broadcast hours that were being subtitled specifically for the deaf and the hard of hearing in the space of 24 hours in two Portuguese public channels (RTP1 and RTP2) and two private ones (SIC and TVI). It was concluded that 81% of all broadcast programmes were in Portuguese and did not have any subtitles; 19% were foreign and came therefore subtitled into Portuguese following the conventions for the hearing viewers; and only 3% of programmes were actually subtitled for the deaf and the hard of hearing.

Another interesting case study looked at the television viewing habits of the Deaf, by means of questionnaires distributed with the help of national deaf associations. It is worth mentioning that those involved in the research were part of the Deaf community, therefore people who considered themselves part of a linguistic and cultural minority, and they were mainly signers. Interestingly, the results indicated that, unlike interlingual subtitles, intralingual subtitles were difficult to follow. One of the reasons that may explain this apparent contradiction is that the viewers seemed to be totally unaware of the possibility of having elements specific to SDH – e.g. description of sound effects, speaker identification, etc. – inserted in the subtitles, and this ‘new’ information was somewhat disturbing their reading experience.

Finally, a case study on the quality of the subtitles was also conducted in the last trimester of 2003; a symptomatic period in the history of SDH in Portugal as it coincided with all public and commercial channels having been requested to work towards the provision of one hour of SDH per day. The public channel Sociedade Independente de Comunicação (SIC,) approached Neves as an SDH expert to discuss possible solutions that could be appropriate for deaf and hard of hearing viewers and the rest of the broadcasters also seemed to follow the conventions initially adopted by SIC. Given its social and media repercussions, the study triggered the proposition of a number of recommendations aimed at increasing the quality of the subtitles, which seem to have been taken on board by the broadcasters. Neves's (2007) work as an SDH researcher culminated in the publication of a set of SDH guidelines that are now the official national norms. Ironically, and despite all these efforts at an academic level, Portugal lags well behind other European countries when it comes to the provision of SDH on television.

2.8 Research on SDH conducted outside Europe

For this thesis, it is also relevant to take into account SDH research conducted outside Europe, particularly in English-speaking countries that tend to be well developed in the provision of SDH, like the USA and Canada.

2.8.1 USA

In most English-speaking countries, including USA and Canada, a distinction is made between ‘subtitles’ – interlingual, for hearing viewers – and ‘captions’ – generally intralingual, specifically tailored for deaf and hard of hearing viewers. The term ‘captioning’ denotes what in the UK is identified as ‘subtitling for the deaf and the hard of hearing’ (SDH).

The Caption Center – part of the Media Access Group at West Great Blue Hill (WGBH) – was founded in 1972 with the aim of providing SDH on television. Their in-house reference manual (WGBH Media Access Group 2002) is based on the knowledge acquired in thirty years of experience. Although its operations started in the TV industry, the Caption Center does not only work for broadcast, but it also provides its captioning services to the web, cinema and DVD industries.

As far as legislation is concerned, in 1993, the Federal Communications Commission (FCC 2012) required all analogue television receivers with screens of 13 inches, whether they had been produced or sold in the United States, to contain a built-in decoder circuitry to display SDH. In 2002 this regulation was also extended to digital television receivers.

In 1996, Congress enacted the Telecommunications Act, demanding that broadcasters met specific SDH targets, which were detailed by the FFC as follows:

1. 100% English language programmes that first appeared on analogue television in 1998 or later (and on digital television in July 2002 or later) to be subtitled by 2006. For Spanish language programmes the deadline is extended to 2010.
2. 75% of English language programmes that first appeared on analogue television before 1998 (and on digital television before July 2002) must be captioned. For Spanish language programmes the deadline is extended to 2012.

Exceptions were made for public service announcements shorter than 10 minutes and not paid for by the government, for programmes shown between 2am and 6am, and for programmes whose content is primarily textual.

The most comprehensive SDH guidance is provided by the Described and Captioned Media Program (DCMP 2011), developed at the National Association of the Deaf, itself established in 1880. The first edition of the *Captioning Key* was developed in 1994 by the Caption Films and Videos Program (CVF), now the DCMP, appointed by the Department of Education as an agency to select a number of subtitling companies to provide SDH for films and educational material. The *Captioning Key* was produced using the in-house style guidelines adopted by the major subtitling companies as well as the knowledge of experienced CVF staff that contributed over the years to produce revised versions of the guidance. It provides detailed guidelines and examples on subtitle layout and presentation (i.e. case, font, line breaks, positioning on screen), linguistic matters (i.e. spelling, punctuation, grammar, typographical conventions), reading speed, extent of editing, indication of sound effects, speaker identification, synchronisation between soundtrack and subtitles, paralinguistic features and music.

The *Captioning Key* (DCMP 2011) cross-refers mainly to research on reading speed (Jensema 1998; Jensema and Burch 1999), but also to research on subtitling of non-speech information (Harkins et al. 1996), that is, speaker identification, sound effects, music, and paralinguistic features. Research in the latter field has concluded that viewers generally prefer to have more non-speech information included in the captions than the amount that is usually provided. As for reading speeds, Jensema (1998) conducted research with a group of deaf people aged between eight and 80, concluding that 145 wpm was the most comfortable speed. In a different article, Jensema and Burch (1999) tested subtitle presentation rates ranging from 80 wpm to 220 wpm and concluded that the fastest presentation rate allows viewers (aged between 11 and 95) to absorb facts and draw conclusions but only for short periods of time, i.e. 30 seconds, after which period their attention span dwindles. Research on reading speed, on this occasion only with children, has also been conducted by Jelinek Lewis and Jackson (2001), who found that the group of elementary deaf viewers watching subtitles at a rate of 78 wpm retained significantly more information than those watching the same programme at a rate of 116 wpm.

Jensema et al. (2000b) looked at the eye movement of six adult viewers, of whom three were profoundly deaf, and concluded that with the presence of subtitles the viewing process becomes primarily a reading process. In a similar experiment, but this time with a larger sample of 23 deaf viewers aged 14 to 61, it was confirmed that 84% of the time is spent reading subtitles (Jensema et al. 2000a).

As far as children are concerned, Jensema (2000; 2003) conducted eye movement research and found that deaf children aged seven and younger ignored the subtitles as the activity of reading them is dependent on the acquisition of prior reading skills. The author suggested that deaf children start using subtitles between the ages of seven and nine years, that is, when they have acquired the necessary reading skills to understand them. This piece of information is particularly meaningful for researchers working with deaf children. On the basis of these findings, the youngest children selected for the empirical study discussed in Part Three of this dissertation were in Year 3, which is the third full year of compulsory education in the UK and normally admits children who are aged seven.

2.8.2 Canada

In Canada, 100% of TV programmes are nowadays subtitled for the deaf and the hard of hearing. The national media regulator, the Canadian Radio–television Telecommunications Commission (CRTC), has announced that all TV commercials, sponsorship messages and promos will be also subtitled from 1 September 2014. This is the first time that a country demands that 100% of television content be subtitled (using either pre-recorded or live subtitling). CRTC is the agency responsible for setting the quality standards for French language SDH (CRTC 2012a) as well as for English language SDH (CRTC 2012b). The documents are complemented by appendices in which it is specified that some quality standards such as lag time, accuracy and reading speed are mandatory. The parameters are rather strict and it is required that broadcasters reach an accuracy level of 100% for both English and French in pre-recorded programmes. For live programmes the accuracy rate is lowered to 85% for French SDH and to 95% for English SDH. Lag time between audio and subtitles must be kept to a maximum of six seconds for English SDH and five seconds for French SDH. The mandatory standards came into effect on 1 September 2012 and broadcasters were given two years to produce the first reports on the efforts made to improve the accuracy of subtitling.

2.9 Research conducted with hearing children

Having discussed the main research conducted with deaf children (and adults) to date, this section takes a look at some of the studies conducted with hearing children that are relevant to this project and have helped to sharpen the initial question of how deaf children read subtitles on television. Indeed, following a revision of the available literature, the main objective has been scaled down to assess two variables only: content comprehension and, in particular, recognition of new vocabulary, as further discussed in chapters Six and Seven.

One of the earliest works in this field was carried out by Neuman and Koskinen (1992), who examined how the theory of *comprehensible input*, as intended by Krashen (1985), in the form of subtitled television, influences incidental vocabulary learning in a second language (L2). Krashen (ibid.) argues that children learn L2 incidentally, through exposure, by focusing on the meaning rather than the form or grammar of the message. Students stretch their knowledge when they are provided with and receive *comprehensible input*, i.e. information that goes slightly beyond the students' actual knowledge (Díaz-Cintas and Fernández Cruz 2008). Neuman and Koskinen (1992) conducted a study with 129 Southeast Asian and Hispanic bilingual hearing children in grades 7 and 8, aged 12 and 13, living in the US and having English as L2. Four different formats of a children's television science production, *3-2-1 Contact*, were considered: subtitled TV, TV without subtitles, reading along and listening to text, and textbook. They concluded that students incidentally learned more words from subtitled television than from any of the other three formats. In addition, students in the subtitling group also acquired more content as they were able to remember more science information than others. It has been observed that subtitled programmes can be used as a tool for language instruction (Caimi 2006; Danan 2004; Díaz-Cintas and Fernández Cruz 2008; Talaván 2006) in particular for the acquisition of new vocabulary and concepts (Neuman and Koskinen 1992).

These conclusions are supported by another study conducted by Koolstra et al. (1997) on the impact that television can have on hearing children's reading comprehension of foreign language subtitled programmes. They conducted a three-year panel study with a sample of 1,050 Dutch hearing children in grades 2 (8-year-olds) and 4 (10-year-olds), and observed that expansion of vocabulary was identified as the only sub-skill of reading comprehension that profited from watching subtitled programmes. In their own words (ibid.):

> Subtitles offer only short transcriptions of the dialogues in television programs, and, therefore, provide no practice in comprehending normal coherent texts. In addition, subtitles have to be read at a forced and fast pace, leaving little opportunity to reflect on the text. Therefore, it is doubtful that children's reading comprehension profits much from watching subtitled foreign language-programs. However, there is evidence that one subskill of reading comprehension, vocabulary, may profit from watching subtitled programs.

Subsequently, Koolstra and Beentjes (1999) conducted a study with Dutch children aged 9-10 and 11-12, using a 15-minute documentary. The children were exposed to three different versions: (1) a programme about grizzly bears with original English soundtrack and Dutch subtitles; (2) the same programme with original English soundtrack and no subtitles; and (3) a programme about prairie dogs in original Dutch language for the control group. The subtitled version proved to be the one that most benefited the acquisition of foreign words.

Another relevant study on the impact of subtitles on vocabulary recognition was conducted by d'Ydewalle and Van de Poel (1999), who presented a short subtitled cartoon to 8 to 12 year-old Dutch-speaking children with Danish and French subtitles. The fact that Danish is more similar to Dutch than French affected acquisition scores of the Danish language in a more positive manner. In both the visual and auditory parts of the vocabulary test, acquisition effects emerged when Danish was available in the soundtrack; when Danish was present only in the subtitles, there was only acquisition in the visual part of the vocabulary test. In the French vocabulary test, no acquisition was apparent, except in the auditory test when the soundtrack contained the French language. This study was conducted with hearing children but it is partially relevant to deaf children as it showed that visual acquisition of vocabulary can occur with none or limited access to the auditory channel.

As suggested by Koolstra et al. (1997), the development of decoding skills may be promoted through the use of subtitles since reading subtitles provides an opportunity to practise word recognition, here intended as the ability to recognise a word by sight without needing to apply word analysis skills. Having identified new words in a particular audiovisual programme, should they be introduced highlighted, repeated, or be left on the screen for longer? These issues are further discussed in Chapter Six.

Having described the guidelines that operate in some of the AVT pioneering countries as well as the relevant research conducted in the UK and abroad, Part Two will offer a descriptive analysis of the subtitling practice on British television, followed by an overview of some of the most important aspects related to deaf children’s communication and reading patterns.

PART TWO

THEORETICAL ANALYSIS

Chapter Three

Descriptive analysis of subtitling practice on British television

The main objective of this chapter is to observe and describe how children's programmes are subtitled on British television, which in turn creates the basis for the empirical analysis discussed in Part Three. Rather than using a prescriptive approach and only looking at the guidelines in use (BBC 2009b; Ofcom 1999; Ofcom 2012a), the present study focuses on the actual subtitling practice by observing and analysing the subtitling techniques used in a selection of children programmes across all major national British broadcasters. This study was conducted before completion of the switchover from analogue to digital television, which took place on 24 October 2012. It is important to note that in the case of programmes existing before the switchover, it is common current practice in the industry to convert the old subtitle files for use on digital terrestrial television (DTT) rather than create a new subtitling file from scratch using the very limited subtitling guidelines that have been written to deal with DTT (Ofcom 1999; Ofcom 2012a).

3.1 Corpus

Two programmes were selected from each of the five main British national channels and two episodes of each programme were recorded, as follows:

Channel	**Programmes**	**Episodes**
BBC1 (currently on CBBC)	*Mona the Vampire* www.bbc.co.uk/programmes/b006m9qy A Canadian television series that follows the supernatural adventures of a 10 year old girl and her friends. Based on the short stories written by Sonia Holleyman, and Hiawyn Oram. Released in 1999, four seasons and a total of 65 episodes were produced.	"Flea Circus of Horrors" (subtitled by Nickelodeon UK) "The Whirling Void" (subtitled by BBC Broadcast)
BBC2 (currently on CBBC)	*Arthur*[12] www.bbc.co.uk/programmes/b006mhc1 A Canadian / American television series that follows the adventures of an eight year old aardvark. Based on the book series written by Marc Brown. The first episode was aired in 1996 and it is the second longest running animated series in the USA, after *The Simpsons*.	"Kids are from Earth, Parents are from Pluto" (subtitled by Subtext) "Nerves of Steal" (subtitled by Subtext) "In the Contest" (subtitled by ITFC) "Prove It" (subtitled by ITFC)
	Maya and Miguel[13] www.bbc.co.uk/programmes/b0070tgw An American television series centred around the lives of 10 year old Hispanic bilingual twins Maya and Miguel. Released in 2004, four seasons and a total of 65 episodes were produced.	"The Letter" (subtitled by Red Bee Media) "Tito's Mexican Vacation" (subtitled by Red Bee Media)
Channel 4	*Inuk* A Canadian television series about a seven year old boy who lives with his family in the Arctic and acquires power to communicate with animals. Released in 2001, it has been discontinued.	"Kimik and Kamarluk" (subtitled by Red Bee Media) "Gone to the Dogs" (subtitled by Red Bee Media)

12 *Arthur* is broadcast in a 25-minute double-bill format. Two episodes are always merged together with no break in between. It is important to bear this in mind, as the subtitling company that appears at the end credits is certainly the one that subtitled the second episode, but not necessarily the first one.

13 One programme was originally chosen from BBC1, *Mona the Vampire*, and another from BBC2, *Arthur*. A third programme, *Maya and Miguel*, was added at a later stage for its particularly interesting feature of bilingual subtitling in English and Spanish.

	The Hoobs www.channel4.com/programmes/the-hoobs This BAFTA winning television series features five puppets called "Hoobs" and their interactions with Earth and the human race. A Jim Henson Company production, commissioned for Channel 4, made in the UK and released in 2001.	"Hair" (subtitled by Intelfax)
		"Clapping" (subtitled by Intelfax)
Channel 5	*Ebb and Flo* Flo is a five year old girl who lives with her mother and her pet dog, Ebb, on a house boat by the sea. Based on a series of books of the same name, it was aired by Channel 5 in the UK but it has been discontinued.	"Ebb's New Friend" (subtitled by IMS)
		"Ebb's Paw" (subtitled by IMS)
	Funky Valley www.channel5.com/shows/funky-valley A UK television series created, designed, and directed by Sarah and Simon Bor. It is produced by Honeycomb Animation for Channel 5, featuring stories in a farmyard.	"Episode 1" (subtitled by IMS)
		"Episode 2" (subtitled by IMS)
CITV[14]	*Louie* Each episode shows Louie, a rabbit, drawing things and characters that come to life to tell a story. Aired by ABC (Australian public broadcaster), it has been discontinued in the UK.	"Louie, Draw Me a Rhinoceros" (subtitled by ITFC)
		"Louie, Draw Me a Penguin" (subtitled by ITFC)
	Sponge Bob Square Pants[15] www.nick.co.uk/shows/spongebob This American animated comedy series features the misadventures of a fast-food restaurant working sponge, who lives under the sea. Released in 1999 in the USA and in 2000 in the UK, where it has been discontinued.	"Nasty Patty" (subtitled by ITFC)

Table 4: Corpus selected from British television[16]

[14] All programmes were recorded from analogue television except for *Louie* and *Sponge Bob Square Pants*, recorded from the digital channel CITV. This was unintentional and merely a result of logistical factors. In fact, the two programmes were also broadcast with subtitles on ITV1 and were originally selected from the analogue channel programming.

[15] For *Sponge Bob Square Pants* there is only one subtitled episode; this arose as not all programmes were subtitled, for unknown reasons. Two episodes were set for recording and only one had subtitles. Having attempted the recording several times, unsuccessfully, it was later discovered that the transmission of subtitles had been discontinued.

[16] All clips are available for viewing on the enclosed DVD.

Most of the programmes were recorded from analogue television as at the time of recording it was much more widespread and less costly than digital television. It was reasonably easy to record Teletext subtitles with some special video recorders, but not so in the case of digital broadcasting. However, recording programmes from TV with subtitles on, whether analogue or digital, was much less straightforward than it is nowadays with digital television.

Having as the main focus of the study deaf children who have learnt to read English and are developing their reading skills, the programmes were selected according to the targeted audience. The three programmes selected from the BBC – *Arthur*, *Maya and Miguel* and *Mona the Vampire* – are aimed at children aged 6 to 12 years, as stated in the commissioning page of CBBC (www.bbc.co.uk/commissioning/tv/what-we-want/service-strategies/cbbc.shtml), where the programmes have been broadcast. However, the programmes chosen from Channel 4 and Channel 5, *Inuk* and *The Hoobs,* and *Ebb and Flo* and *Funky Valley* respectively, targeting pre-school children, were deliberately included in the corpus as no other children's programmes were available for the age group in question. This is the case for *Louie* as well, selected from CITV, which also had a limited selection of programmes for school children, with the exception of *Sponge Bob Square Pants*. The inclusion of programmes for the youngest audience was also justified by an interest in investigating if the subtitling of pre-school children's programmes was similar or rather differed considerably from the subtitling of programmes aimed at school children. If the subtitles of programmes aimed at pre-school children were specifically tailored for them, perhaps rather than conveying all the verbal (and nonverbal) information present in the soundtrack, certain single words, appearing together with the image that represents them, could be subtitled so as to create a visual connection between the two. The child may not be able to associate the word to sounds or read it but may nevertheless be able to recognise the word by sight and associate its shape to the image. This way the child would also start gaining familiarity with letters.

3.2 Methodology

By adopting a descriptive approach in translation studies as advocated by Toury

(1985; 1995; 2012) the researcher's task moves to the elucidation of any recurrent patterns that can be ascertained in the translational behaviour of the translator. The researcher observes the product (i.e. the actual translations) and from there moves towards the study of the translation processes that have actually taken place in the transfer from the source language to the target language (Toury 1985). Particularly interesting in this respect is Toury's (1985; 1995) concept of norm, which he defines as:

> the translation of general values or ideas shared by a community - as to what is right and wrong, adequate and inadequate - into performance instructions appropriate for and applicable to particular situations, specifying what is prescribed and forbidden as well as what is tolerated and permitted in a certain behavioural dimension.

According to Toury (1995; 1998), norms range from idiosyncratic or subjective to rule-like or objective norms, depending on their potency, as illustrated in Figure 11:

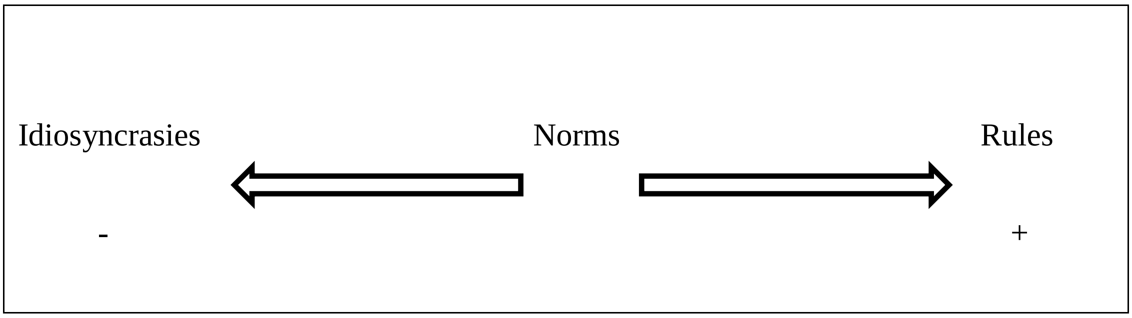


Figure 11: Potency of norms

He distinguishes three main categories of norms, namely *initial norms*, *preliminary norms* and *operational norms*. Translators in their norm governed activity of translating may embrace initial norms that govern the source text (ST) or initial norms that govern the target text (TT). When norms that govern the ST are adopted, adequacy prevails, whereas when norms dictated by the TT are adhered to, acceptability then prevails. Figure 12 below illustrates this concept:

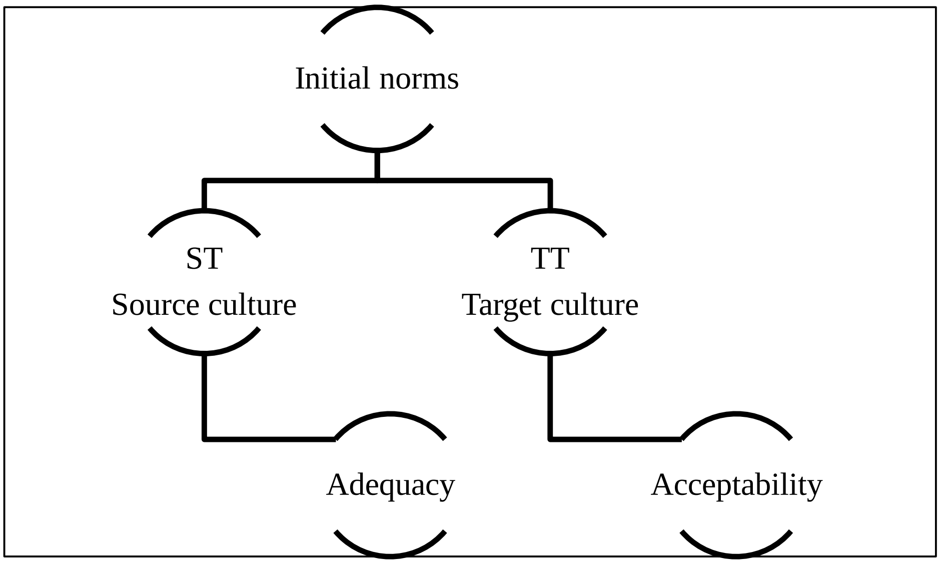


Figure 12: Initial norms

In the case of SDH, the subtitler works from a ST produced for the hearing audience to a TT specifically tailored for the deaf and the hard of hearing. The concept of culture is less applicable in this context, mainly because there is not necessarily a switch from one culture to another. As discussed in Section 2.2, the deaf and the hard of hearing constitute a very diverse group, which includes the Deaf community, whose members consider themselves as part of a linguistic and cultural minority, but also deaf and hard of hearing people who identify themselves with mainstream hearing society. Since the majority of deaf children are born to hearing parents, use an oral method of communication and attend mainstream schools (for further details, see Section 5.6), there is not really a switch from a source to a target culture. For this very reason, it is also difficult to distinguish between *adequacy* and *acceptability* in a SDH context, whereas in the case of sign language interpreting this distinction may be more relevant.

Preliminary norms can relate either to a given translation policy – that is, those factors that determine the choice of a certain text to be translated – or to the directness of translation – i.e. questions of what sort of translations the receptor culture will tolerate and the extent to which translations from pivot languages will be accepted or not (Toury 1995). Unlike the initial and operational norms, the preliminary norms lie outside the translator's preferences. In the UK, where the targets of subtitled programmes reached are extremely high and moving fast towards

100% in all major national channels (refer to Chapter One), the concept of preliminary norms is not applicable as the decisions on what gets subtitled are not guided by translation policies. Again, different may be the case of sign language interpreting on television, which although it is growing, it is much less common than SDH.

Operational norms, which concern the decisions made by the translator during the act of translation itself (Toury 1995), can be divided into *matricial* and *textual-linguistic norms*. Figure 13 illustrates the various types of norms postulated by Toury (1995):

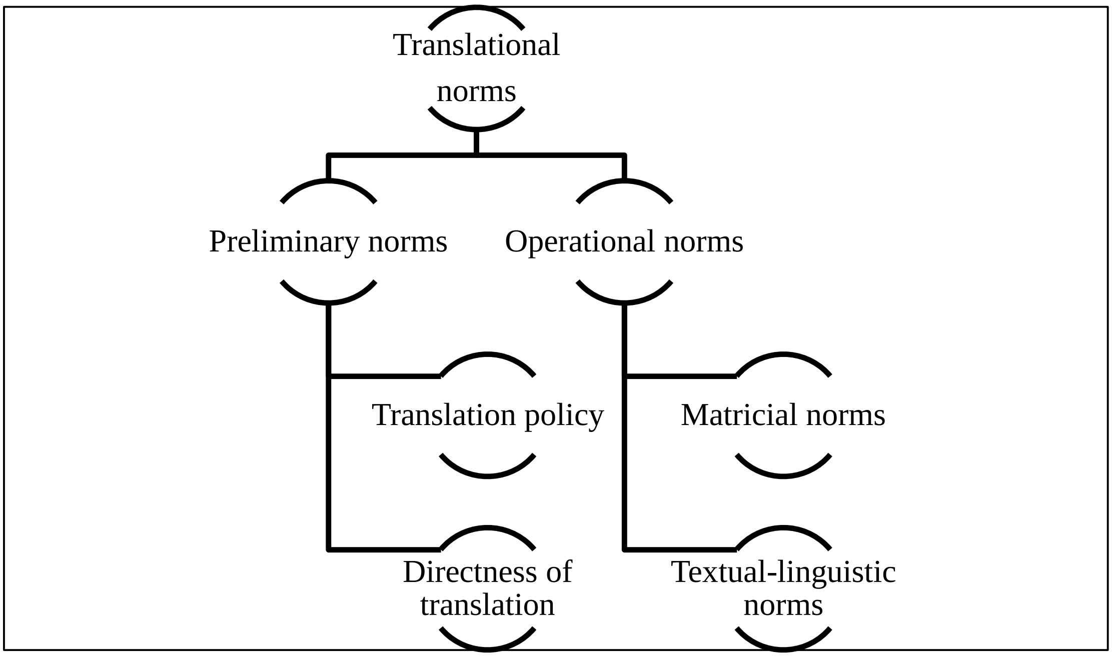


Figure 13: Translational norms

Of particular interest for this analysis are the matricial norms that determine, for instance, any omissions, additions, etc. that take place when moving from a ST to a TT. Díaz-Cintas (1997; 2003; 2004) has applied the descriptive approach in translation studies to the field of AVT in general and has also proposed an analytical framework for the specific practice of interlingual subtitling. The difference with our object of study is that, in these pages, the focus is on intralingual subtitling for deaf children. Some of the elements examined – editing, segmentation and line breaking, written recreation of non-standard language, reading speeds, lyrics – relate to the verbal auditory elements found in the original programme and, therefore, are shared with the subtitling aimed at a hearing audience. Some other elements, specifically the nonverbal auditory ones such as paralanguage (intonation, accents), speaker identification, music (beyond lyrics, instrumental) and sound effects relate specifically to the needs of a deaf audience and are part and parcel of subtitling for the deaf and the hard of hearing viewers.

The extent of the editing of words and expressions (see Section 3.3.1) is one of the most discussed areas in SDH, with many members of adult audiences expressing a preference for literal, verbatim subtitles. It is interesting to note that within the field of subtitling for hearing audiences, it has always been accepted that, due to the spatio-temporal constraints imposed by the audiovisual medium, editing and reduction of the ST are inevitable. Editing down the content of the original dialogue is strictly related to the assumed reading speed ability of the audience (see Section 3.3.4), an area that seems to be particularly problematic in the case of deaf children who are developing reading skills with limited access to the auditory channel. Crucially, this topic is not regulated and, as mentioned before, it is left to the broadcasters' common sense (see Section 2.6.2). Segmentation, line breaking and spotting (see Section 3.3.2) are other important aspects affecting reading speed and ultimately comprehension of the original dialogue.

The use of non-standard language (see Section 3.3.3), that is, of a speech variety that is different in its pronunciation, grammar and / or lexicon from the standard form of language, is a rather common occurrence in dialogue exchanges. One of the crucial questions here is to ascertain whether these features characteristic of speech are conveyed in written subtitles, and if so, how. In addition, it is of high interest in this research to evaluate whether variations in register are understood by deaf children who have limited or no access to speech sounds and rely mostly on the subtitles.

Finally, nonverbal elements are often conveyed through the use of certain typographical cues – hyphens, upper case, exclamation and question marks, suspension dots, single and double quotation marks – that are moulded to convey intonation, accents, pauses, interruptions, singing, speaker identification, music and sound effects, all of which are auditorily perceived in the source text. Section 3.3 provides an analysis of how verbal and nonverbal auditory elements are conveyed through subtitling practice on British television.

3.3 Analysis

As mentioned above, the current analysis aims at describing how verbal and nonverbal auditory elements present in children's programmes are subtitled by the major national British broadcasters. It is common practice for broadcasters in the UK to outsource this task and delegate the subtitling practice to external companies. There are no national specific detailed editorial guidelines for subtitling companies to adhere to (as discussed in Section 2.6.2). Therefore the subtitling techniques adopted vary mainly depending on the broadcaster, but also on the subtitling company and, on occasions, even the subtitlers themselves. The corpus of children programmes has been selected from all the major national broadcasters in order to present an overview of the subtitling practice on British television, which constitutes the basis for further research on the subject.

The analysis is based on observation by the researcher, who watched and analysed relevant elements of the programmes selected, and supported by questionnaires with open questions that focus predominantly on stylistic choices. Questionnaires were completed by the six companies involved in the subtitling of the programmes studied – namely IMS, Intelfax, ITFC, Nickelodeon UK, Red Bee Media, and Subtext, the details of which are included in Appendix One. The questionnaires were sent by e-mail and in one case, e.g. Red Bee Media, the completion of the questionnaire was followed by a personal visit to the company where an opportunity for further discussion was given. The questionnaires were prepared separately considering the characteristics particular to each programme, hence some minor differences in the questions are present. Questions common to all the programmes concerned the following issues: style guides, intended audience, reading speed, degree of editing, and quality control. The subtitlers involved in the completion of the questionnaires had been personally engaged in the subtitling of at least one episode of the programme in question. Note that the subtitling of some programmes, namely *Arthur, Louie, Mona the Vampire,* and *The Hoobs,* appeared to date back some time. The questionnaires were used as a tool for further clarification (and ratification) of all the features thoroughly analysed in this chapter.

3.3.1 Editing vocabulary and expressions

The term *editing* covers both omissions and paraphrasing or reformulation, and is synonym to what other authors like Díaz-Cintas and Remael (2007) refer to as *reduction*. The ITC guidance (Ofcom 1999) recommends simplicity of subtitles for children below the age of 11 years and because of this, omission of difficult words and expressions is one of the most favoured and recurrent techniques. As a collateral effect, by omitting words, the length of sentences can be reduced and, commensurately, the reading speed can be lowered as viewers have more time to read the text. Ivarsson and Carroll (1998), when discussing SDH, consider omission of parts of the original text rather than reformulation as the ideal technique, since it is less intrusive and less irritating for those able to lip-read. Paraphrasing is recommended only when none of the source information items can be disregarded. They further point out that omissions might, on certain occasions, also require paraphrasing to a certain extent.

The programmes considered for this research resort to all of these techniques in various degrees. In the following examples, the omissions are reported within brackets:

Example 1 *Arthur*, ITFC

> Francine and I have a (better) story.

Example 2 Funky Valley, IMS

> "You have to remember," said Hoot,
> ("there are two ends to a rainbow".)

Example 3 *Mona the Vampire*, Nickelodeon UK

> (It looks like) The flea circus has come to town (and put up their tent on Fang).

Note how in Example 2 the omission leaves the sentence incomplete, resulting in an illogical subtitle that does not convey the main message. The subtitle in Example 3, besides the pronounced editing at the beginning and the end of the sentence, shows a case where grammar and lexis have been normalised, a choice that affects characterisation by not conveying Mona's father's witty talk. This decision, which is likely to have been dictated by time constraints, could however be appropriate, as young deaf children who are in the process of learning a (spoken) language might find the original (spoken language) usage confusing. By reducing the ST in Example 3, assuming the same in-time and out-time are used, that is 00:00:59:20 and 00:01:04:04, giving a duration of 4 seconds and 9 frames, the reading speed decreases from 167 wpm to 74 wpm.

Ebb and Flo, *Funky Valley* and *Louie* are aimed at a younger audience and therefore the speech rate of the original dialogue is already much slower than in the other programmes. As a result, editing is usually not required.

A crucial aspect that needs to be discussed at this stage is the introduction of new vocabulary in subtitles, beneficial for the building up of deaf children's vocabulary. Sometimes, subtitlers opt for verbatim subtitles and retain words that might not be particularly easy to read or even understand, such as 'bamboozled' in *Sponge Bob Square Pants*. This strategy can, however, have a didactic function and help children expand their vocabulary. However, this is not always the strategy used on British television. The opposite strategy, adopted in *Arthur*, simplifies vocabulary and replaces high register words such as 'cholesterol' and 'health conscious' with low register words like 'fat' and 'healthy', as seen in Example 4:

Example 4 *Arthur*, ITFC

You were too high in fat! Evil aliens are still healthy! (It appears that you were too high in cholesterol for them, Arthur. These aliens, though evil, must be health conscious.)
What? I'm high in fat? (What do you mean I'm high in cholesterol?)

Interestingly, in this instance both *Arthur* and *Sponge Bob Square Pants* were subtitled by the same company, ITFC, who explained that as far as style and vocabulary are concerned, they try to follow the programme makers' intentions (see Appendix One). This shows that the use of systematic and straightforward strategies is clearly needed (Zárate 2010). These editing choices seem to obey technical constraints since the TT is considerably shorter than the ST. The speech rate of the first paragraph in Example 4 is of 197 wpm, whereas the reduced TT has a reading speed that varies between 83 wpm (in-time at 00:03:41:14 and out-time at 00:03:44:11; the duration being 2 seconds and 22 frames) and 100 wpm (in-time at 00:03:44:13 and out-time at 00:03:47:16; the duration being 3 seconds and 3 frames). The speech rate of the second paragraph in Example 4 is of 167 wpm and the reduced TT has a reading speed of 88 wpm (in-time at 00:04:00:12 and out-time at 00:04:02:23; the duration being 2 seconds and 11 frames).

Ofcom (1999) suggests resorting to omission in preference to changing difficult words. In their previous work, Baker et al. (1984), however, argue that *access* also means introducing new words to the audience and recommends that from a linguistic point of view this be done through the use of simple syntactic constructions, by relying on the context or, if necessary, by explaining the meaning of the term or expression beforehand. From a technical perspective, the authors suggest allowing additional reading time to the audience, though no exact indications are provided as to how much more time to allow. Vocabulary is a variable that has been extensively researched within Deaf Studies (discussed in Section 4.3.1).

Another point that needs to be addressed is the use of figurative language, ranging from alliterations to metaphors, similes, onomatopoeias and idioms, most of which are mainly found in *The Hoobs*. This subject has been considered by researchers in Deaf Studies (as discussed in Section 4.3), but has not been sufficiently addressed in the field of AVT. In SDH, the introduction of new words concerns not only verbal acoustic signs, i.e. speech, but also the description of nonverbal acoustic signs, e.g. sound effects and instrumental music. To describe animal noises, for instance, subtitlers can either use onomatopoeias, hence reproduce sounds orthographically (for a dog ‘arf arf’), or descriptive labels, where an active statement is made (‘dog barks’). While onomatopoeias may be more amusing and creative, it is arguable whether deaf children are naturally able to associate onomatopoeias to sounds and understand them immediately. However, it would be interesting to look into whether the consistent introduction and repetition of onomatopoeias in many programmes would benefit the recognition or even acquisition of this figure of speech by deaf children. It is important to bear in mind that children might have gained familiarity with onomatopoeias while engaging in other forms of reading, namely comics, or playing video games, where onomatopoeias could have been assimilated at least by sight (if not by sound). In addition, some onomatopoeias clearly suggest the sounds that they describe – 'moo' – and are not just orthographic transcriptions, but they have also become part of the lexical repertoire as nouns and verbs. It would be interesting to explore whether this latter type of onomatopoeic annotation, explanatory and simple, could be didactically exploited in a subtitling context. In other words, looking into whether children recognise onomatopoeias and eventually associate them to the meaning (of the verb and the noun) could be revealing for subtitlers.

Editing also concerns the use of non-standard language, mainly used in programmes aimed at older children. The subtitles can also reflect this informal use of language in the unorthodox way in which the words are spelt (e.g. 'gotcha', 'kinda', '‘em', 'fella', 'cos'). By using this strategy, the subtitles try to reflect pronunciation and accent. However, it would be interesting to study whether readability is in any way impaired or affected, considering the lack of familiarity that deaf children supposedly have with contracted forms and non-standard spellings.

Subtitles, besides fulfilling the functional role of transmitting the semantic content of what is conveyed by the soundtrack, also have the potential of improving children’s reading abilities and help them build up their vocabulary and lexis. Although most of these lexical forms are colloquial expressions that can be found in most dictionaries of the English language, it is not an easy task for deaf children to recognise them in written form in the short space of time they appear on screen as part of the subtitles. The subtitler can either remain faithful to the soundtrack and reproduce these words as closely as possible in their written form (as in Example 5) or can opt for the homogenisation of the oral language used, whereby any departure from the standard register is corrected and neutralised (e.g. the use of ‘fellow’ instead of ‘fella’, ‘because’ instead of ‘cos’, and so on). The second option would certainly favour readability but would lack in creativity and would counteract the aim of the original of representing the way people actually speak as there would be no indication of colloquial intonations and mannerisms in the written text. Further research in this area is required to determine to which extent non-standard language is understood by different age groups.

Example 5

Arthur, Subtext

Maya and Miguel, Red Bee Media

Mona the Vampire, BBC Broadcast

Sponge Bob Square Pants, ITFC

The Hoobs, Intelfax

3.3.2 Segmentation, line breaks and spotting

In practice, the ST is segmented or spotted into subtitles and long subtitles are then broken into generally two (sometimes three or four) lines when the text goes over the maximum number of characters available in one line, that is between 32 and 34 for broadcast (Ofcom 1999). This recommendation is not always respected by broadcasters, who often add more characters per line. From a purely spatial perspective, line breaks are mainly constrained by the subtitle safe area which has a direct impact on the number of characters that are available per line.

The safe area is the area of the television picture that can be seen on television screens. The shape of a television screen is given in aspect ratio, i.e. as the ratio of its width to its height. A standard TV screen has a ratio of 4:3, whereas a widescreen TV has a ratio of 16:9, as illustrated in Figure 14 below:

Figure 14: Aspect ratio[17]

In the UK, since the advent of digital television, programmes are delivered in 16:9 widescreen, meaning that the active picture fills a 16:9 screen vertically and horizontally without geometric distortion (BBC 2012). Archive materials that were originally produced for delivery in analogue television and have a different aspect

[17] Source: www.vanillahd.com/wp-content/uploads/2007/01/lotr-16x8-4x3.jpg (accessed 5 August 2014)

ratio (of 4:3) are either zoomed to fill the 16:9 format where possible or presented in a pillar box format of an intermediate ratio between 4:3 and 16:9.

A 14:9 aspect ratio has also become part of the equation as a compromise ratio that captures all the important action that happens in the centre of the picture, and is mostly used to create an acceptable picture on both 4:3 and 16:9 televisions. The safe area for subtitles of material to be broadcast in 16:9 format in the UK is generally of 14:9, as shown in the following figure:

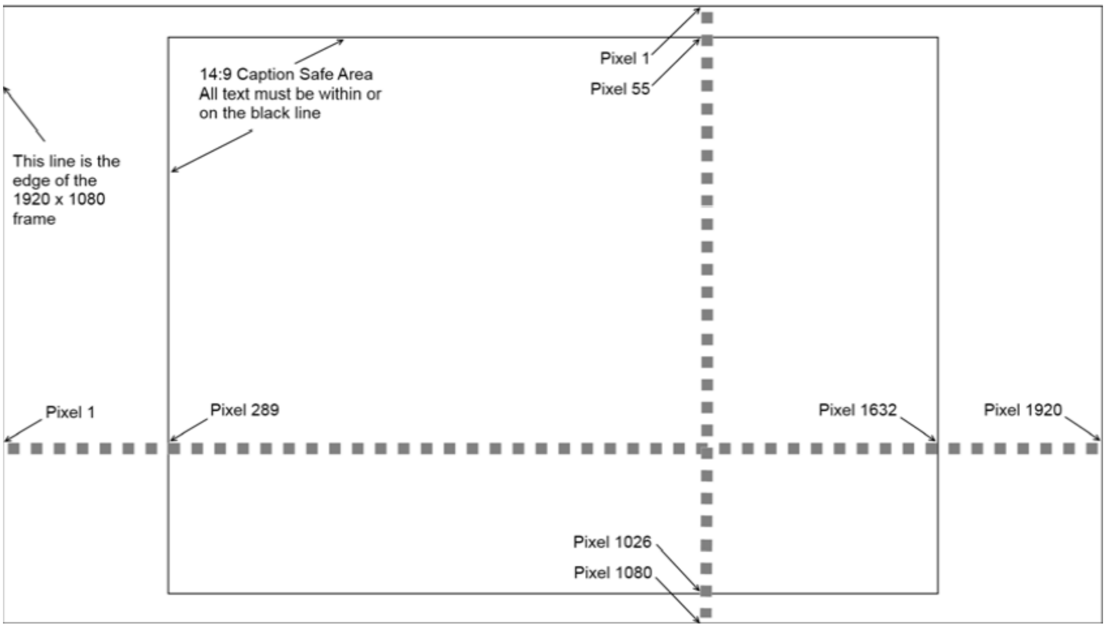


Figure 15: 14:9 Caption safe area (BBC 2012)

The 4:3 aspect ratio (see Figure 16) is exceptionally required for certain programmes / broadcasters or for programmes that are to be distributed internationally:

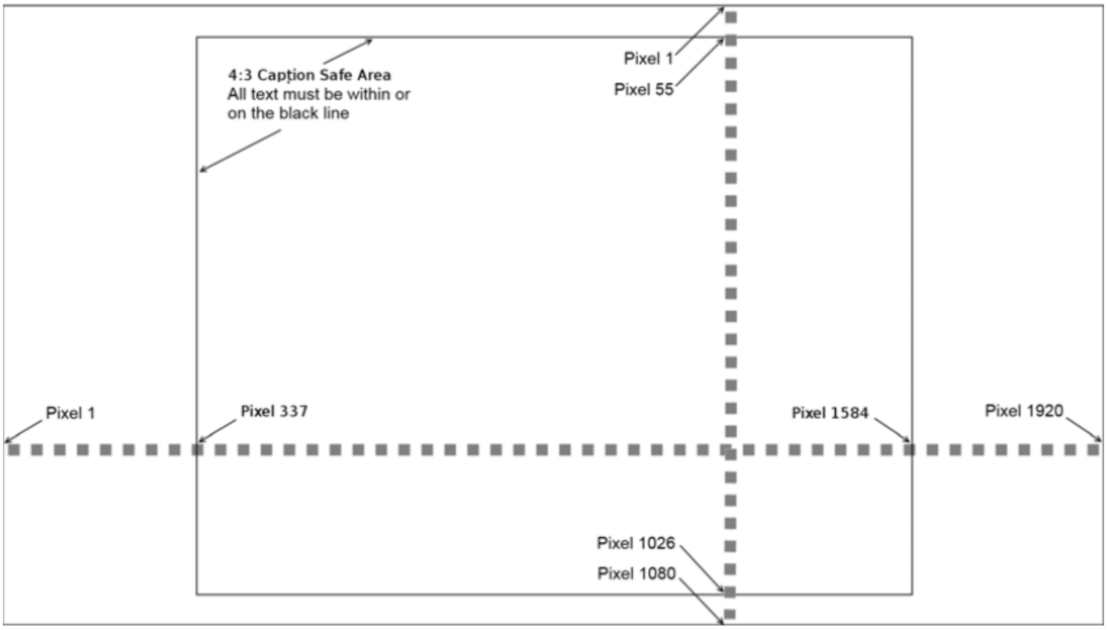


Figure 16: 4:3 Caption safe area (BBC 2012)

Ofcom (2006a: 28) specifies that:

> subtitles should be placed within the ‘safe caption area’ of a 14:9 display and should normally occupy the bottom of the screen, except where they would obscure the speaker’s mouth or other vital information or activity.

Most digital broadcasts from main British TV corporations are now in widescreen format to suit widescreen TV sets, where the full 16:9 frame is left intact and fills the whole screen. On standard TV sets with a 4:3 display, the widescreen picture can be displayed without distortion by choosing through the digital receiver between the letter box mode (showing the full width of the picture with black bands at the top and bottom of the screen because the picture is not high enough to fill the screen) and the pillar box mode (showing the full height of the picture with the sides of the widescreen image cropped from 16 to 14).

Old material shot on a 4:3 format can be broadcast in 16:9 by cropping the top and bottom of the original frame to 14:9 and adding black pillar boxes to either side. When broadcast in 4:3, the 14:9 crop is often used since the 4:3 footage is generally included in an otherwise 16:9 programme.

As for the importance of line breaks, Ivarsson and Carroll (1998: 77) suggest that “lines should be divided in such a way that words intimately connected by logic, semantics or grammar are written on the same line wherever possible”. In other words, article / noun, pronoun / verb, conjunction / clause and preposition / relative phrase should not be split, if at all possible. In a similar manner, and as a general guide, Ofcom (1999) recommends that line breaks follow natural linguistic breaks. Priority should be given to linguistic considerations over geometric ones, i.e. it is preferable not to split a unit and have two lines different in length rather than split a unit to have lines with equal length. Nonetheless, the geometry of the subtitle is not just an aesthetic matter, it is also related to viewers’ eye movement and different dispositions of the text that appears on screen ultimately aim at making the reading process smoother. The line breaking choices from the various programmes analysed do not always adhere to these guidelines, as it can been seen in examples 6 to 9:

Example 6 *Louie*, ITFC

Example 7 *Sponge Bob Square Pants*, ITFC

Example 8 *Arthur*, Subtext

Example 9 *Maya and Miguel*, Red Bee Media

In Examples 6 and 7, showing subtitles produced by ITFC (see questionnaire in Appendix One), first lines appear to be much longer than second lines for no apparent reason. The company explained that segmentation is not as much a priority now as it used to be a few years ago due to new time and cost constraints in the work flow. Another respondent, Nickelodeon (see Appendix One), pointed out that efforts are made to avoid having long first lines and short second lines, a common failure of automated subtitling which is increasingly used throughout the industry.

Both linguistic and geometric considerations are most important when taking decisions concerning line breaks. From a linguistic perspective, it is advisable to have a greater semantic load in the first line so that the forced break has less impact on the linguistic processing (Díaz-Cintas and Remael 2007). For instance, the ideal segmentation of the third screenshot in Example 7 would be:

Who lives in a pineapple

under the sea?

Karamitroglou (1998) explains that geometry is also important and that the first and second line should be as equal in length as possible because the viewers' eyes are more accustomed to reading text in a rectangular rather than a triangular format.

The segmentation of text and the spotting of subtitles, also called *time-coding, cueing* or *originating*, is another very important aspect of subtitling. The main objective is to include a complete idea in each subtitle whenever possible in order to ease readability, but always respecting the maximum reading speed set and ensuring synchronisation between the subtitle, the soundtrack and the images. As explained by Díaz-Cintas and Remael (2007), albeit for the case of interlingual subtitling though equally important in SDH, the logic behind segmentation within subtitles – of creating semantic and syntactic units – is also applicable to segmentation across subtitles. One more point raised by the authors is that viewers may have limited memory spans and it is therefore advisable to split complex sentences into shorter ones.

Example 10 shows how sentences are split into two subtitles merely due to spatial constraints and not to a long pause between the two subtitles or a shot change:

Example 10 *Louie*, ITFC

The segmentation in this specific instance could have been improved considerably if the syntactic and semantic units had been identified and kept on one line or possibly have the sentences split into shorter ones.

It is also worth noting the number of lines employed in each subtitle. Ofcom (1999) recommends a maximum of two lines and, exceptionally, three, provided that the subtitle is not too obtrusive and the image is not obscured by the text as a result. However, in some programmes such as *The Hoobs* and *Inuk*, four lines are used occasionally with a rather negative impact on the aesthetics of the programme. Four liners, as in Example 11 below, are, of course, more likely to obscure the image (in *Inuk* the dog's face is totally covered with text) and, additionally, it can be discouraging for a young child to have such long text on screen in one go:

Example 11

The Hoobs, Intelfax

Inuk, Red Bee Media

Note also how in the first screenshot in Example 11, the dislocation of the subtitles is confusing as yellow is allocated to Tula, the pink puppet, and her utterances are right aligned in the first intervention and left aligned in the second one.

3.3.3 Typographical cues

Ewoldt et al. (1992) conducted a study with sixteen deaf students aged 13 to 17 years using a metacongitive approach. Three types of text were presented to the students who were then interviewed to assess how interesting and difficult they found each type. The text perceived by the subjects to be the most difficult was also considered the most interesting. It was thus suggested that difficult materials should not be avoided or simplified for deaf students. This study is only partially relevant to this doctoral project because the age group was older than the one considered in these pages and the approach used was metacognitive. However, what is connected to this project is the argument advanced by the authors concerning the critical role that visual displays have in facilitating comprehension of texts. It was also added that children tend to remember well-organised texts and that, interestingly, underlined, bold and italicised texts are also useful in this respect. This can easily be transposed to the specific area of subtitles where some of these typographical features are already being used in a functional manner.

This section attempts to look at how all those aspects that are conveyed through the auditory channel (intonation, accents, pauses, interruptions, singing, etc.) are actually represented (or not) in the subtitles, and how certain orthotypographical features are used and moulded to convey what is only perceptible through hearing. In this respect, dashes, together with the repetition of some letters, are normally used to denote stuttering or lengthened sounds, as illustrated in Example 12:

Example 12

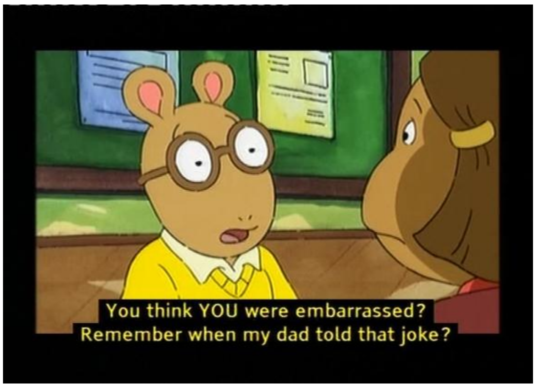
Arthur, Subtext

Maya and Miguel, Red Bee Media

The Hoobs, Intelfax

Upper case has a twofold function as it can be used to indicate emphasis of a word through intonation (see Example 13):

Example 13



Arthur, Subtext

Arthur, ITFC

or loud speech where some of the characters shout, as in Example 14:

Example 14

Maya and Miguel, Red Bee Media

Sponge Bob Square Pants, ITFC

Exclamation marks within brackets are used to express sarcasm or irony (Example 15):

Example 15 *Arthur*, Subtext

whereas the question mark followed by an exclamation mark (and not the reverse) indicates bewilderment as in Example 16:

Example 16 *Maya and Miguel*, Red Bee Media

Three suspension dots (…) are used to indicate pauses or interruptions, as in standard writing, whilst two dots (..) are sometimes used to introduce a second sentence that follows a brief pause, as illustrated in Example 17:

Example 17 *Mona the Vampire*, BBC Broadcast

If the two sentences are uttered by the same speaker and appear in the same subtitle, as in the example above, the use of two dots is perhaps superfluous and certainly not very aesthetically pleasing. Arguably, the hesitation in the delivery of the dialogue is also conveyed by the image and could also be reinforced, for instance, by means of a different positioning and placing the two sentences in different lines.

The Ofcom (1999) guidelines suggest different uses for single and double quotes: single quotes are to be employed when the speech comes from a character that is normally visible on-screen but at the moment of the delivery is off-screen or when it comes from a narrator that is always off-screen. Double quotes, on the other hand, should be used when the speech comes from a device (radio, speaker) or is the literal quotation of what somebody else has said.[18] Generally, the subtitlers of the programmes under analysis adhere to this use of single quotes, with the exception, however, of *Funky Valley*, a narrated cartoon where no indicator of off-screen voice is used and typographical cues are kept as close to standard punctuation rules as possible, ensuring consistency between conventional writing and subtitles. In some cases, such as in *Mona the Vampire*, the choice deviates from the Ofcom (1999) guidelines, and single quotes, instead of double, are used for mechanical speech.

It is interesting to note how, on occasions, different conventions can produce patterns that differ from the ones readers are used to seeing in print, e.g. indirect speech appears within single quotes (instead of double quotes) and two dots are used to convey a pause at the beginning of a line, a use that does not exist in conventional writing:

Example 18 *The Hoobs*, Intelfax

As illustrated in the examples 12 to 18 above, orthotypographical cues are used to convey paralinguistic features in a way that, on occasions, is slightly different from the use made of these elements in standard writing and print. However, some typographical cues, such as underline, are never used in SDH. If the restriction to only use certain orthotypographical resources was dictated by technical limitations related to the transmission of programmes using the analogue signal, with the advent

[18] This convention is very different from the one applied to interlingual subtitles, where italics are used for off-screen voices, songs and voices coming from electronic devices. The use of different conventions can be confusing for children who watch both types of subtitles.

of digital television, the use of typographical cues including different typefaces and sizes in the same audiovisual programme can be certainly exploited. However, the choice not to use certain orthotypographical resources could also be dictated by the belief that the best subtitles are the ones that do not stand out and are therefore kept as uncluttered as possible. This notion might be soon outdated, particularly in a digital era where the use of emotive captioning is being contemplated (Fels et al. 2005)

3.3.4 Subtitle presentation rates: reading speeds

One of the main issues in this field is that there is no standard reading speed that could be applied when subtitling children's programmes. The original guidelines drafted by Ofcom (1999) recommend a lower maximum speed for children's programmes of 70 to 80 wpm for profoundly deaf children, and broadcasters are advised to exercise common sense, as seen in Section 2.6.2.[19] The most up to date code (Ofcom 2012a) recommends reading speeds of 160 - 180 words per minute for pre-recorded programmes and a maximum of 200 wpm for live programmes tailored for deaf adult audiences; lower speeds are recommended for children's programmes but the value is not defined in the code. Looking at the reading speeds previously recommended by Ofcom (2006b) it can be noted that there is a clear tendency toward increasing the reading speeds of subtitles for adults: 140 wpm for pre-recoded programmes, and 180 wpm for live subtitling and for pre-recorded programmes in exceptional circumstances such as when for example add-ons are used.[20] According to a study conducted by Ofcom (2005), the average subtitle speed for pre-recorded programmes is 160 wpm. As far as SDH for children is concerned, De Linde and Kay (1999) found an average reading speed of 90 wpm, as mentioned in Section 2.6.1.

[19] For details on reading speeds, consult Ofcom (2005). The research considered deaf and hard of hearing children aged 16 years old or above and did not provide any specific information about subtitling for younger, school children, with the result that there is an urgent need for a focused study on children's needs when it comes to subtitling, and particularly reading speeds.

[20] Add-ons occur when the second part of the subtitle is added to the first part. While the appearance of the add-on is synchronised with the soundtrack, the first part of the subtitle remains on screen. The use of add-ons is recommended when the two subtitles fit naturally together (for example, in a question

The main broadcasters – BBC (2006), Channel 4 (2006), Channel 5 (2006) and ITV (2006) – were consulted by Ofcom (2006b) in regards to the matter and they all agreed on not having a set reading speed for subtitling children's programmes and exercising common sense instead. ITV (2006) also indicated that they use a maximum reading speed of between 130 and 150 wpm for pre-school / learning based children's programmes, while ITFC (2006) specified that speed for pre-school children can sometimes reach a maximum of 110 wpm, information that seems to be contradictory as ITFC, now Deluxe Media Europe, are the contracted subtitling providers for ITV (see Table 3). Associations of deaf people like the NDCS (2006) and Action on Hearing Loss (2006), at the time known as RNID, pointed out that a greater understanding of deaf children's needs is required on the part of broadcasters.

Of course, the concept of reading speed is closely linked to the rate of delivery of the speech component in the original material. Programmes aimed at very young children, such as *Ebb and Flo*, *Funky Valley* and *Louie*, generally present a more suitable and lower reading rate because the speech rate of the original is slower too. IMS, having subtitled both *Ebb and Flo* and *Funky Valley*, states that the maximum reading speed for children's programmes is 140 wpm and around 100 wpm for very young children. ITFC, having subtitled *Louie*, explains that the reading speed has increased in the years considerably from 550 cpm (110 wpm) to 900 cpm (180 wpm) and that no difference is made between adult and children's programmes (see Appendix One). This tendency in the industry seems to reflect the trend detected in the recommendations.

A very noticeable feature that occurs throughout the episodes of *The Hoobs* and *Inuk* is a serious problem of asynchrony with complete subtitles coming up and staying on screen for a mere two or three frames, which, of course, impedes their reading. It can only be assumed that this is due to a technical fault in the transmission and that the subtitlers did not intend to present information at such an unreadable speed. However, this is unfortunately a very frequent pattern with subtitles, especially in *The Hoobs,* and it raises the issue of whether appropriate review and revision was carried out prior to broadcasting, or whether any steps were taken by the broadcaster at a technical level after the first glitches took place, to avoid any

and answer sequence, or providing the punch line of a joke) and when two or more characters speak consecutively and time does not allow for individual subtitles (Ofcom 1999).

more in the subsequent episodes. The subtitling company Intelfax confirmed that the subtitles would have been reviewed and that the software would have detected such short times and therefore the problem would have been at a broadcast level (see Appendix One).

Having looked at the guidelines put forward by the regulator and at the feedback gathered from the various broadcasters and subtitling companies on subtitle presentation rate, it is interesting to look now at the available research on the subject. Baker et al. (1984) were the first authors in the UK to investigate reading speed and they recommend a maximum reading speed of 60 wpm for secondary school children. This same rate, which may seem a bit too constrictive in professional practice, is recommended by Padmore (De Linde and Kay 1999) for children aged between 8 and 15 years. The most recent study that looked into subtitle rate for primary school deaf children was conducted in the USA by Jelinek Lewis and Jackson (2001), who recommended the use of a rate at 78 wpm (as opposed to 116 wpm), as discussed in Section 2.8.1. The available studies on reading speeds are clearly outdated and more recent, up-to-date research seems to be needed in this field as reading abilities have certainly changed over the last decades with changes in lifestyles and cultural habits. For example, it is very likely that deaf children today come across subtitles much more often than they did in the past for several reasons. Firstly, many more programmes are subtitled today than they were in the past. Secondly, television, DVDs, videogames, the internet, and to a lesser extent cinema, are much more present in everyday life than they were previously and they are all embracing SDH. In this respect, lifestyles inevitably reflect technological changes, which have also had a considerable impact on the way interlingual subtitling has developed over the last decades (Díaz-Cintas 2010). Medical research has also impacted deaf children's lives. For example, more deaf children receive cochlear implants today than they did it the past (see also Chapter Five). Education for deaf children has also changed, inexorably affecting the way deaf children develop their learning abilities and skills, including reading. Nowadays more and more deaf children attend mainstream schools that use an exclusively auditory oral approach as opposed to a bilingual approach where both English and British Sign Language (BSL) are used. Education for the deaf, encompassing the history, philosophies and current trends, is further discussed in Chapter Five.

Table 5 illustrates the subtitle rates used in the programmes analysed according to what has been stated by the subtitling companies involved. Reading speeds tend to be much higher than anything discussed in relation to children so far, in a few cases reaching the rate of 180 wpm:

Company	**Reading speed**	**Programme(s)**	**Broadcaster**
IMS	100 wpm (pre-school shows) 140 wpm	*Ebb and Flo* *Funky Valley*	Channel 5
Intelfax	180 wpm	*The Hoobs*	Channel 4
ITFC	180 wpm	*Arthur* *Louie* *Sponge Bob Square Pants*	BBC CITV CITV
Nickelodeon	60 wpm (pre-school shows) 120 wpm	*Mona the Vampire*	BBC
Red Bee Media	180 wpm	*Inuk* *Maya and Miguel* *Mona the Vampire*	Channel 4 BBC BBC
Subtext	160 wpm	Arthur	BBC

Table 5: Maximum reading speeds for children's programmes

A debate specific to SDH and directly linked to reading speed is whether subtitles should be verbatim – that is a word-for-word transcription of the ST – or edited. As already mentioned, this has never been an issue within interlingual subtitling for the hearing audiences, while some deaf and hard of hearing demand verbatim subtitles as a way of getting the same access to the programme as the hearing audiences. Verbatim subtitles may not be a problem when the speech rate is low, as generally in the case of pre-school programmes, but they might become challenging when the original contains high speech rates. People can talk at up to 240 wpm with an average of 150 wpm as a typical rate (Wald and Bain 2005). Carver (1990) reports the results of extensive research on reading rates conducted by Taylor (1965), adapted by an empirical formula to the standard length word of six character spaces, and shows that the reading for understanding, in the case of hearing children, varies between 99 wpm (year 2, children aged 7 or 8) and 169 wpm (year 6, children aged 11 or 12). These findings are only to be considered as an orientation since they are based on conventional reading, which is a very different activity from reading subtitles that constantly appear and disappear from the screen, and they do not include deaf children, whose reading abilities differ from those of hearing children (see Chapter Four). In the USA, relevant research on reading speed has been conducted by Jensema (1998), Jensema and Burch (1999), Jelinek Lewis and Jackson (2001), and on eye movement by Jensema (2000; 2003), as discussed in Section 2.8.1.

Szarkowska et al. (2011) have tackled the debate between verbatim and edited subtitles in their eye tracking study conducted with deaf, hard of hearing and hearing adults. Three subtitling formats were used: verbatim (word by word), standard (free of features typical of oral speech) and edited (simplified text). Edited subtitles were found to be relatively the easiest to process for all groups of viewers, with standard ones being almost as easy.

As far as deaf children are concerned, by providing subtitles at an unacceptable reading speed, they are less likely to gain access to programmes and may even be discouraged from the whole experience of reading subtitles on screen, particularly the younger ones. Alternatively, these same programmes could be made accessible by performing some additional editing and reducing the textual volume. When considering what elements can be edited out, it is worth bearing in mind that in subtitling there is a switch from the oral to the written mode, which may lead to certain features typical of oral discourse, such as repetitions, hesitations, fillers and redundancy, to be partially omitted in the migration to subtitles. Yet, some indications of such features can still be given in the written version, especially if they contribute to characterisation and have diegetic value. Information that may be easily deduced from the image can also potentially be omitted. Moreover, in cartoons where speech is delivered in the form of narration rather than dialogue exchanges, as in *Funky Valley*, reporting utterances – "said a sad Dippy", "said Porker", "said Clara" – could be omitted as they tend to increase the degree of syntactic and lexical complexity when presented in writing. It is true that children are likely to be familiar with indirect speech as it is commonly found in print; however, as television is a more animated medium, children could possibly gain a clearer picture of the audiovisual programme if subtitles were kept simpler, as discussed in Section 2.6. In the specific case of *Funky Valley*, reading time could be also gained by omitting subtitles that narrate actions clearly visible on screen. However, it is important to know that subtitles that may appear to be redundant as they describe what is visually available on screen could have a didactic function. A number of factors should influence editing choices, i.e. speech rate, age group and type of the programme and its aims. Some programmes may be more educational than others, in which case the redundancy of subtitles – intended as textual description of actions visually available or repetition of words – may have an educational role if performed purposefully.

This study on how children's programmes broadcast on British television are subtitled for deaf children constitutes the starting point of this doctoral project. More specifically, the descriptive analysis of the programmes and the feedback obtained from the broadcasters and subtitling companies suggests routes for empirical and experimental research that have eventually culminated and materialised in the study of word recognition and, to an extent (mainly methodological), of content comprehension (chapters Six and Seven). The definition of these two research questions is also backed up by the literature provided by both Audiovisual Translation (see Chapter Two) and Deaf Studies, analysed in Chapter Four, which focuses on the linguistic difficulties encountered by deaf children in the acquisition of a spoken language as well as on their reading characteristics. The descriptive analysis shows that the subtitling conventions in place are not standardised but rather vary according to the subtitling companies and broadcasters. However, what is directly relevant to this project is that subtitlers work for children in a very similar way to how they work for adults, without making a clear distinction between the two very different groups, as it appears from their responses. If SDH for children was specific to the audience, the educational value of subtitles could be explored and programmes aimed at school children could be subtitled so as to help them develop their reading skills. Following this line of reasoning, programmes for pre-school children could also be subtitled in a way that appeals to those who are still unable to read but may, nevertheless, be able to associate the shape of letters or words to objects.

Chapter Four

How do deaf children read?

4.1 Definitions of language

Before initiating a discussion on how children – and in particular deaf children – acquire and develop language, it is necessary to dwell on the universal aspects of language. In doing so, some of the main theories of language will be presented in order to shape a comprehensive framework that includes concepts and ideas from different approaches and branches of knowledge, all from major classic linguists. This section is aimed at establishing a link between the deaf audience and the general notions of language in order to ultimately gain an understanding of what spoken and sign languages represent for them.

According to Sapir (1921: 7): "Language is a purely human and non-instinctive method of communicating ideas, emotions and desires by means of voluntarily produced symbols", which implies that language is symbolic, must be learned and is used as a means of communication. Most interestingly, language is here associated with symbols. In his work, Sapir refers mainly to vocal symbols, but he acknowledges that the auditory symbolism can be replaced by a motor or by a visual symbolism. He explains that many people can read in a visual sense without having an auditory image of the word. This is particularly interesting for the development of literacy of deaf children not enrolled in mainstream school programmes, who learn to read by associating words to visual cues rather than sounds. The printed word is probably the most common form of visual symbolism but another expression of visual symbolism is lip reading or speech reading, used by some deaf and hard of hearing as an alternative way of acquiring speech. Sapir refers to the motor processes involved in speech (tongue, lip and glottal cord movements), which in hearing people get stimulated even in situations where there is no articulation of sounds of speech, i.e. reading or intense thinking. Motor processes are also applicable to the deaf and hard of hearing using sing language, where other motor activities not necessarily connected to speech, such as facial expressions, hand and body movement, get activated. Sapir does not specifically refer to the use of sign languages but he mentions the gesture language of the Plains Indians of North America as one of the unlimited possibilities of linguistic transfer.

De Saussure (1986) defines language as a system of signs and distinguishes between *langue* (resource) and *parole* (manifestation). This distinction reflects well that the difference between spoken and sign languages is mainly on the level of modality – *parole* – only.

Different is the understanding expressed by Bloch and Trager (1942: 5) when they state that: “A language is a system of arbitrary vocal symbols by means of which a social group co-operates”. In this latter definition, language is restricted to speech, in the same way as Hall’s (1968: 158), for whom language is “the institution whereby humans communicate and interact with each other by means of habitually used oral-auditory arbitrary symbols”. Within the deaf education field (Easterbrooks and Baker 2002), this belief belongs to the past, while nowadays speech is considered as a communicative tool distinct from the cognitive system. Language can be represented by speech (as in spoken languages) as well as by signs (as in sign languages). Speech makes use of the auditory mode, while signs are based on the visual mode. Hence spoken and signed languages fulfil the same purpose of communicating, but in different ways. Evidence of this is given by hearing bilingual-bimodal infants – i.e. exposed to a spoken and a signed language –, who show to have no preference for speech even though they can hear (Petitto 2000).

According to Bloom and Lahey (1978: 4), language is “the code whereby ideas about the world are represented through a conventional system of arbitrary signals for communication”. A parallelism is here found with de Saussure’s (1986) distinction between concepts of the word (the signified) and the label of these concepts (the signifier), which can be spoken, written or signed. They identify three components or skills: content (topics in the message and relationships between them, i.e. the signified), use (purpose and context, usage of signs) and form (code or signifier). The form in speech is represented by units of sound (phonology), units of meaning (morphology) and the combination of units of meaning (syntax). Sign language also has a form represented by rules for handshapes (phonetics), rules for forming the words (morphology) and rules for creating the sentence (syntax). According to this model, form can indistinctively be either spoken or signed.

The confusion between language and speech arises from the fact that the word *language* derives from the Latin *lingua*, which means *tongue* (Stewart and Clarke 2003). This association of language to vocal symbols and speech is typical of some earlier linguists, as seen in some of the quotations above, and it has had significant repercussions in the education of deaf students (further discussed in Section 5.7). It is through the work of Brennan (1975) that changes began to occur in the UK and that British Sign Language (BSL) started to be characterised and recognised as a language in its own right, having the complexity of any spoken language. The use of sign language for education became a possibility and sign language somehow achieved linguistic credibility, although it was not until 2003 that BSL gained the status of an official language in the UK, and then with severe restrictions. To date BSL does not have any legal status, meaning that (signing) deaf people may not have full access to information and services, including education, health and employment. The ultimate purpose of this section is to fully locate sign languages within the wider concept of language. In this sense, Petitto (1994) demonstrates that they are real languages by drawing evidence from three branches of scientific research: linguistics, sociolinguistics and, most interestingly, biology. Firstly, linguistic analyses show that natural sign languages are used by distinct social and cultural groups and get transmitted from one generation to the other. They have a complex structure and a distinct grammar. Secondly, sociolinguistic analyses reveal that sign languages change over time, and that the users of a specific sign language tend to share the same beliefs, attitudes and customs. Thirdly, biologically speaking, spoken and signed languages differ as per the modality (sound or sight) and the motor control (tongue or hands) used. This last factor determines the use of specific neural substrates in the brain. Petitto (1994) concludes that spoken and signed inputs are processed equally in the brain, hence signed and spoken languages have the same biological status.

At European level, the European Commission (2007) published a final report by the High Level Group on Multilingualism, in which sign languages are mentioned only once in the whole document, where it is argued that they are, together with regional languages and dialects, a contributing part of multilingualism. It is paradoxical, to say the least, that this concept of multilingualism does not include any more specific references to sign languages, while other issues like promoting the learning of languages, through the use of media (including audiovisual translation), interpretation and translation, and regional and minority languages are tackled in detail. It seems that sign languages are simply not part of the agenda of European multilingualism and although we have moved on from sterile debates where the validity of sign language as a language was questioned, it is also certain that to date sign languages do not seem to have the same recognition that spoken languages have.

4.1.1 Spoken language versus sign language

Having stated that signing and speaking can both be considered as linguistic forms, the main components of both will be unravelled and compared. An immediate, obvious distinction is that while sign languages use only a visual spatial pattern, spoken languages use an auditory vocal one as their main support. Also, sign languages do not have a written form, apart from the notation system called *gloss* to which scholars in the field of American Sign Language (ASL) instruction have resorted. It consists of borrowing a word from English, writing it in upper case and allocating it to a sign. Of course, this method is not very successful since glosses only represent the meaning of a sign out of context and are dependent on the words of another language.

Firstly, looking at morphology, which is the field of theoretical linguistics that studies the structure of words or signs considering their smallest meaningful units, we note that while in spoken English the plural is generally rendered by adding a final 's' to the word, in BSL reduplication of the sign is used instead. The use of prefixes, suffixes and compound words also falls within this field of study. As Brennan (1997) points out:

> The fact that BSL morphology makes considerable use of size and shape classifiers, that verbs are inflected for agreement by being directed towards specific participants (verb arguments) and that the space in front of the body can be used to establish real or abstract locations of participants all demonstrate that the language itself has evolved to suit the visual world and a visual modality.

Secondly, looking at syntax, which deals with the structure of sentences and with how signs or words are put together to form grammatical sentences, we note that English and BSL use very different systems. The intermediate stage between words and sentences is the formation of phrases, that is, units that stay intact even when the sentence is rearranged. One main difference is that while English makes use of a subject prominent structure, BSL uses a topic prominent structure. For example, "The cat sat on the mat" would translate in BSL as follows: "Mat – cat – sat (on it)". Also, oral language is linear since only one sound can be made at a time; hence communication involves a number of words or sentences uttered one after the other. On the other hand, BSL has a spatial grammar and therefore information (verbal and adjectival, for instance) can be conveyed simultaneously. For example, to describe a winding and pleasant drive in BSL one sign is required, where the motion of the hand, accompanied by body posture and facial expression, convey the adjectival information.

Lastly, principles of phonological theory are applied to sign languages. Phonology in spoken languages deals with systems of sounds, that is to say, with phonemes that include consonants and vowels. Stokoe (2005) was the first author to publish work on the phonological structure of sign language back in 1960, identifying three elements – handshape, movement, and location – which represent what in spoken languages is conveyed by means of phonemes. Brentari (1998) has developed a prosodic model, which constitutes a point of entry into the study of sign language phonology. Taking into consideration the work by Stokoe, Brentari (ibid.) claims that sign languages have a visual / gestural phonetic basis where the consonant-like units and vowel-like units are expressed simultaneously with one another, rather than sequentially as in spoken languages. She also claims that body movements operate as the most basic prosodic units of sign languages.

BSL is clearly distinct from English and while it is a language, it is not oral but visual. As Brennan (1997: online) points out: “Sign languages are as they are in part because of universal principles covering human language, but also because of universal properties of visual gestural activity”.

4.1.2 First language and bilingualism

The difference between bilingualism and second language acquisition has been clarified by McLaughlin (1982; 1984) on a chronological basis: while children who have been exposed to two languages by the age of three are bilingual, those who experience a later exposure acquire it as a second language. According to McLaughlin then, a first language (L1) is acquired chronologically earlier than a second language (L2). He does not exclude the fact that a first language can be used for a brief stage and be subsequently forgotten and never used again, with the second language becoming the individual’s main and only language of communication. This position is arguable since a first language should possibly be the one that the individual uses more fluently in their daily lives, the one more naturally employed and not necessarily the first that was learnt.

In a previous work, Lenneberg (1967) also considers the acquisition of L1 to be influenced by age, and he argues that the critical period of language development for any child starts at the age of two and finishes at 13 or with puberty. According to Lenneberg’s critical period hypothesis (CPH), when the exposure to L1 happens after the critical period, the acquisition progress is slower than in the younger years and it is extremely difficult to become perfectly fluent. In 1970, three years after Lenneberg’s publication of *Biological Foundations of Language* (1967), where the CPH is advanced, Genie, a hearing but language deprived child who was isolated in a room by an abusive father until the age of 13 was found. At the time, she was unable to vocalise and although she eventually developed vocabulary, the ability to construct simple sentences as well as pragmatic abilities, her phonological and syntactic competence never exceeded that of a two year old.

Unlike Genie, hearing Isabelle, who was isolated in a darkened room with her deaf mother until the age of six, acquired the English language at an accelerated rate. Within two months she was singing nursery rhymes, within one year she could read and write, and after 18 months she had 2,000 words as part of her vocabulary and could create stories (Davis 1947). Isabelle's case was far more successful than that of Genie because she was discovered at an earlier age and before the end of the critical period of language.

A similar case, but on this occasion involving sign language, is that of Chelsea, a deaf child born to hearing parents, who thought that she was mentally retarded and emotionally disturbed. She only started to learn sign language at the age of 31, when she was discovered to be deaf. She showed poor linguistic abilities even after years of exposure to sign input (Han 2004).

For the purposes of this work, bilingualism applies to children who acquire two languages from birth. The modality of these languages is not relevant since, as proved by Petitto (2000), hearing babies acquiring signed and spoken language from birth do so in the same way as other babies acquire two different spoken languages. Petitto et al. (2001) also conducted a study with six hearing children, aged one to 3.6 years, three of them acquiring *Langue des Signes Québécoise* (LSQ) and French, and the other three acquiring English and French. The main objective of the study was to better understand bilingualism, and one of the main concerns was to determine if infant bilingual acquisition is similar to monolingual acquisition – or delayed and confused. The exposure to two languages with different modalities – signed and spoken – was considered a bilingual situation since sign language has the same levels of organisation as the spoken language, is lateralised in the same areas of the brain’s left hemisphere, utilises identical brain tissue to process linguistic functions, and is acquired in similar ways to the spoken language. An interesting point made by Petitto (2000) is that while children acquiring two spoken languages can produce language in sequence, children acquiring a signed and a spoken language can produce language simultaneously, that is, they can speak in one language whilst at the same time signing in the other language. The main finding from this study is that bilinguals are not delayed in their acquisition of each of their respective native languages, and they behave similarly to monolinguals in the acquisition of their first word, their first two-word combinations, and their first 50 words.

It is commonly believed that English is for most deaf students a second language. This view is supported by Charrow and Fletcher (1974) and Charrow (1975), who have shown that deaf students learning English perform some aspects similarly to hearing students learning English as a second language. A different view, though, is supported by Quigley and colleagues (Quigley, Smith, and Wilbur 1974; Quigley, Wilbur, and Montanelli 1974), who have found that deaf students acquire English in a qualitatively similar way, although quantitatively reduced, to that of first language learners of English.

To judge whether English is a first or second language for deaf children, a definition of first language needs to be provided. The chronological explanation already discussed can be valid. However, another factor that needs to be taken into account is to ascertain how natural a language needs to feel in order to be considered a first language. Marschark et al. (2002) speak of *language of their world* – i.e. sign language – to which deaf children born to hearing parents, who are non-signing, do not have full access. In circumstances like this, what can be said to be the first language of deaf children who, due to a lack of exposure to sign language, do not sign but are competent in English? This is certainly an issue in the case of congenitally deaf children in the UK, who are likely to be cochlear implanted between the age of one and two years (NDCS 2009). On a chronological basis, English would certainly be their first language.

The complexity of the issue increases as more and more deaf children in the UK are cochlear implanted and educated in mainstream schools that follow an auditory oral approach. However, the question remains: could a language that uses an oral auditory modality be considered a first language for deaf children who have an auditory deficiency? It seems to be contradictory, but somehow true, at least in the case of implanted children. Nevertheless, it is necessary to move away from those spoken language theories that were developed without a real focus on deaf children and get closer to the current reality of deaf children. For this purpose, the impact of the cochlear implant trend on deaf children’s reading abilities and some ethical considerations surrounding this issue are raised and further discussed in Section 5.4.

4.2 Sign language acquisition

According to Chomsky (in Chase 1992), language is neither taught nor learned, but it is simply acquired by default. When specifically asked to express his views on how this belief relates to hearing, he argues that deaf children do not learn to speak, but they have language capacity and learn to sign. He then refers to Pettito (1994; 2000), who considers that deaf children go through early stages of acquisition of signing similarly to the way hearing children acquire speech, and to Goldin-Meadow and Feldman (1977) and Goldin-Meadow and Mylander (1983), who argue that children without any linguistic environment at all may nevertheless develop their own sign language. Chomsky (in Chase 1992) explains that even in the case of deprivation of experience, the system may still manifest itself. An instance that illustrates this situation can be found in Nicaragua (Senghas n.d.), where the opening of a special education school in the city of San Judas and a vocational centre in Villa Libertad in the late 1970s and early 1980s respectively had a massive impact on the lives of deaf children. Through interaction – in a context where 200 deaf children met in school, from four and five years of age, in frequent contact with deaf adolescents – the children started changing the gestures and the home signs that they had been using regularly, their vocabulary expanded, and the signs became more systematised and less gestural. This is how Nicaraguan sign language originated and subsequently developed in the following decades to the system that it is nowadays. The children organised the information in a way that planted the structural and grammatical seeds of the Nicaraguan sign language, which is very different from the Spanish spoken language.

A contrasting view is held by Perfors (2002), who argues that deaf children, who are cognitively able but have not been exposed to sign language at an early stage in their lives, will have difficulty learning to use language at all. However, this argumentation does not seem to hold true in the case of Nicaragua, where, as discussed, children managed to create their own SL.

Petitto (1994; 2000; n.d.) has worked with hearing babies acquiring spoken languages (English or French) as well as with deaf babies acquiring sign language (American Sign Language, ASL, or *Langue des Signes Québécoise*, LSQ) up to the age of 36 months to investigate whether the view that the brain is hardwired for speech was tenable. She reached the conclusion that both spoken and sign languages are acquired on an identical maturational time course, and both deaf and hearing children acquire the same linguistic, semantic, and conceptual complexity at the same pace. This can be the case when assuming that babies are not sensitive to sound or speech, per se, but they are sensitive to the distributional, rhythmical, and temporal patterns, as well as to the physical dimensions that characterise natural language structures. Infants are inclined to acquire language and to reproduce the above language patterns regardless of the modality used, be it spoken or signed.

Petitto (2000; n.d.) distinguishes three different pre-linguistic stages for hearing and deaf children:

1. ‘babbling stage’, which includes both verbal and manual babbling, and is in turn subdivided into ‘syllabic’, between 7 and 10 months; ‘variegated’, between 10 and 12 months, and ‘jargon’, at 12 months and beyond;
2. ‘first word stage’ (11–14 months); and
3. ‘first two-word stage’ (16–22 months).

Observing deaf infants’ transition from pre-linguistic gesturing to first signs (9–12 months), she discovered that deaf infants babbled with their hands, in other words, babbled in a different modality. This phenomenon is termed by Marschark (1997) as *mabbling*, and is distinguished by gesturing as it does not have communicative intent. According to Petitto and Marentette (1991), deaf and hearing infants produce identical babbling units, making the act of babbling tied to the abstract linguistic structure of language.

Petitto (1994) further argues that hearing children who have been exposed to both signed and spoken language from birth acquire both languages at the same pace, and also in the same way as other children acquire two spoken languages. Similarly, hearing children who have been exposed exclusively to sign language from birth acquire sign language in the same way as hearing children acquire spoken language and deaf children acquire SL. Likewise, Spencer (1993) conducted research with deaf and hearing infants aged 12-18 months and concluded that both groups developed two important prerequisites: (1) intentional communication and (2) referential and symbolic gesturing; a distinction which is comparable to the previously mentioned distinction between gesturing and *mabbling.*

As for intentional communication, McAnally et al. (1994) refer to Feldman's (1975) finding that deaf children use deictic gestures – gestures that function similarly to the words *this* and *that* and whose meaning is dependent on the context in which they are used – to identify small rather than large objects, and correlate it with Nelson's (1973) findings on the first words used by hearing children. These words relate mainly to objects that the children can manipulate (e.g. bottles, shoes), but also to things capable of moving on their own (animals, cars). There is also another parallelism between the use of deictic gestures by deaf children to identify agents and patients, and the early employment of words made by hearing children. Deaf children make use of action propositions – e.g. 'the dog barks' – earlier and more frequently than attribute propositions – e.g. 'the dog is cute' – (Goldin-Meadow and Feldman 1975), in the same way as hearing children use one and two-word action utterances over attribute utterances. Also, gesture systems used by deaf children are semantically rather than syntactically focused (McAnally et al. 1994), an important aspect that is bound to affect the learning of the English language by deaf children. In the production of subtitles, the introduction of complex syntactic structures could be facilitated by the use of a slower reading speed, the repetition of certain words when they are repeated in the soundtrack, or possibly the highlighting of the relevant terms in some special manner, e.g. using a font that presents a different typeface and size to the standard one used throughout the programme. These same techniques are used and explored both in the pilot case studies and in the main experiment for the tasks of word recognition and content comprehension (see chapter Six and Seven).

4.3 Linguistic difficulties encountered by deaf children acquiring a spoken language

The view that language development is a natural process and that deaf children learning a spoken language follow the same general patterns as hearing children, in a possibly slower way, is supported by authors such as Quigley, Smith and Wilbur

(1974), Quigley, Wilbur and Montanelli (1974), as seen in Section 4.1.2, and Robertson (2000). Other authors (Charrow and Fletcher 1974; Charrow 1975) compare the acquisition of spoken language by deaf children to that of hearing children acquiring a second language.

The development of a spoken language by deaf children will depend on several factors, including the educational setting attended, the use or non-use of a cochlear implant, and the exposure to sign language among others (see Chapter Five). This section presents the available literature on the more common lexical, syntactic and morphological difficulties encountered by deaf children when acquiring a spoken language. One main distinction between deaf and hearing children is that deaf children are only exposed to visual stimulation in their process of acquiring a spoken language, while hearing children also receive auditory stimulation, which may be a contributing factor to the difference in learning speed. Streng et al. (1978) point out that a child's language development begins at birth – that is, with exposure to language – rather than with the child's first word utterance. Listening is, therefore, the first skill used by hearing children to learn language, while deaf infants are sensitive to other environmental stimuli such as lights, shadows and smell. Besides, deaf children miss an important precursor to language development, namely the possibility of sharing linguistic input with adults (Easterbrooks and Baker 2002). According to the available statistics, this is certainly the case for the majority of deaf children in the UK, as 90% are born to hearing parents (NDCS 2014). When listening is accompanied by oral interaction with adults, the child learns more about meaning making, and language learning becomes a much easier, more creative and social process. The auditory deficiency imposes a barrier in the interaction with hearing adults, and this certainly ends up affecting deaf children's linguistic development.

A vicious circle is triggered when the lack of interaction between infant and adults constitutes both a cause and a consequence of the linguistic difficulties faced by deaf children. In this sense, SDH offers a great opportunity for exploiting the use of visual stimuli to ensure that children gain full access to the audiovisual programme as any relevant auditory elements not perceived by deaf children can be visually reinforced – if needed. Subtitling is a tool that contributes to ensuring full accessibility and integration of deaf children in society. This integration may indirectly have also a collateral positive impact on their linguistic development.

Before considering the linguistic difficulties encountered by deaf children in their acquisition of a spoken language, it is worth expanding on how the spoken pre-linguistic stage of deaf children differs from the one of hearing children.

Both deaf and hearing children babble vocally, but deaf children's babbling at the age of 6-7 months decreases because the verbal feedback from the adults is not comprehensible (Easterbrooks and Baker 2002). This is a case where the lack of interaction with parents affects the linguistic development of deaf children. Deaf children born to deaf signing parents babble manually, as discussed in Section 4.2, and develop their language similarly to hearing children.

BSL, like other sign languages, has similarities with spoken languages in that different levels can be identified equivalent to the phonological, morphological and syntactic structures, as discussed in Section 4.1.1. The main difference lies in the patterning and while English is linear and sequential, BSL's linearity is cut across by simultaneity and spatiality. Thus, signing deaf children acquiring English need to understand a new language that makes use of a different patterning and modality to BSL. However, in most cases the majority of deaf children do not have a competence in sign language before acquiring the spoken language as they are born to hearing parents. Only a minority of deaf children attending bilingual school settings, that is 6% in the UK (CRIDE 2013a; 2013b; 2013c; 2013d), will experience the switch in patterning between English and BSL.

The following sections present the difficulties encountered by the children at different linguistic levels: lexical, syntactic and morphological. The focus of this project is mainly on language acquisition, or incidental language learning (discussed in Section 2.9), as opposed to language learning intended as direct instruction. In other words, the interest is mainly in how children subconsciously acquire language through exposure to subtitles. In the following sections, the expressions 'language acquisition' and 'language learning' are used as traditionally intended by linguists, one referring to the spontaneous process of acquiring language through communication, the other one referring to consciously learning a language through direct instruction.

4.3.1 Lexis

Research carried out in the field of Deaf Studies has proved that (new) vocabulary is one of the variables that create major problems in reading comprehension (Quigley and Paul 1984). Several experiments have been conducted on deriving words from context while reading static text, but mostly with older deaf children, as illustrated in Table 6.[21] One of the most extensive studies on deaf children's vocabulary, conducted by Silverman-Dresner and Guilfoyle (1970; 1972) and based on children aged seven to 17, concluded that deaf children have a quantitatively reduced vocabulary knowledge compared to their hearing peers. Notwithstanding this, according to Marschark (1993) new words should be introduced to children in an attempt to encourage the expansion of their vocabulary. Limbrick et al. (1992) argue that the relationship between language and reading is bidirectional, i.e. exposing children to print, signs and oral language at the same time helps them develop their language and reading skills. Hence, subtitles can potentially have an important role in the educational development of deaf children as a complement to oral language and images in the audiovisual field.

Luetke-Stahlman (1998: 249) claims that "increased exposure to forms within meaningful contexts leads to increased acquisition of meaning and form" and lists a number of strategies which can be used to attain that goal (e.g. frequency, parallel talk, repetition, etc.). Due to its inherent space and time constraints, subtitling is not a mode that lends itself well to these expansive strategies, but new vocabulary and difficult words can, and should, certainly be repeated or explained, especially if the script does so, rather than being edited out or replaced with simpler versions. Of course, the technical dimension must also be reconsidered in these circumstances and a margin of asynchrony with the original dialogue be allowed so that the audience can have a more appropriate reading speed to absorb the information.

Deaf children starting school at the age of four or five have, on average, 500 words as part of their vocabulary as opposed to the 3,000-5,000 words known by hearing children (Stern 2001). This reduced knowledge of vocabulary is certainly relevant to the production of subtitles. The position of subtitlers is, however, a difficult one since it is not always immediately self-evident whether deaf children are

[21] For a detailed literature review on vocabulary studies, see Paul (1998; 2001).

familiar or not with the vocabulary being used in the audiovisual programme. At any rate, though, subtitlers in the industry need to be able to assess which words may be unknown and new to the children, and apply a suitable strategy. Silverman-Dresner and Guilfoyle (1970; 1972) produced two reports containing descriptive data on the reading vocabulary of deaf children but these two works are unfortunately quite outdated and difficult to find, and where more recent data is not available – as seems to be the case – subtitlers will often need to use their own judgement.

Another added difficulty for the subtitlers is that programmes are usually made with hearing, not deaf, children in mind. In the CBBC commissioning webpage (BBC 2009a), it is stated that CBBC is for primary school children aged six to 12 years, and no mention of deaf (or blind) children is made.

McAnally et al. (1994) offer an analysis of the research available on deaf children's vocabulary development, including a small scale study conducted by Schäfer and Lynch (1980) with four pre-lingually deaf children, aged 15–34 months, and born to hearing parents. Two children were enrolled in an oral programme, and two in a total communication (TC) programme.[22] The subjects were using 0 to 9 words by the age of 18 months, as opposed to the 20 to 50 words used by hearing children (Lenneberg 1967; Nelson 1973). By the age of 22 months, the two children enrolled in the TC programme had respectively acquired 58 and 62 signed or spoken words, while the ones in the oral programme used 13 and 8 words respectively. The first words used by deaf children and hearing children corresponded and besides *mama* and *daddy*, these included *shoe* and *sock*, i.e. words that denote objects that can be manipulated, as well as *cat*, *dog* and *open*, i.e. words that denote apparent movement. Interestingly, deaf children used words expressing colour and numbers earlier than hearing children, although this might be related to the different curricula of the TC and the oral programmes. As far as the combination of words is concerned, according to Schäfer and Lynch (1980), hearing children start producing two-word utterances at approximately 18 months of age, while deaf children start combining words at the age of 26 months. Most researchers (Caselli 1983; Gardner and Zorfass 1983; Schlesinger and Meadow-Orlans 1972; Stoloff and Dennis 1978) argue that deaf children start combining words much earlier, at 17 and 18 months of age,

[22] Total Communication (TC) is a method that uses all different modes of communication, that is, auditory, visual (through signs, pictures and objects) and tactile. For more details, see Section 5.6.

similarly to hearing children. To sum up, Schäfer and Lynch’s (1980) study indicates a delay in language acquisition of eight months, as well as an overall reduced linguistic output. While similar results were reached by Caselli (1983), some investigators – namely Gardner and Zorfass (1983), Schlesinger and Meadow (1972), and Stoloff and Dennis (1978) – argue that deaf children acquire a larger vocabulary in a shorter period of time. Nonetheless, all researchers agree on the developmental stages of language acquisition being the same for hearing and deaf children.

Research on language acquisition and development tends to be based on conventional reading (i.e. printed, static text), both with deaf and hearing children. However, some authors (d'Ydewalle and Van de Poel 1999; Verfaillie and d'Ydewalle 1987) have conducted research with hearing children using subtitles, as discussed in sections 2.7.3 and 2.9 (see also Chapter Six).

DeVilliers and Pomerantz (1992) conducted a study with middle and high school deaf students on how they learned new words from written context and noted a lack of interaction between making correct syntactic judgements about words and deriving meaning from them. The acquisition of new words proved to be more closely related to the students’ overall reading comprehension, as further discussed in the following section on syntactic difficulties.

4.3.2 Syntax

Although the views on whether syntax plays a crucial role in reading comprehension are contradictory, vocabulary can be considered separately from syntax in an SDH context, since it has been identified by some authors as a component that profits from watching subtitled programmes (d'Ydewalle and Van de Poel 1999; Koolstra et al. 1997; Koolstra and Beentjes 1999; Neuman and Koskinen 1992) (see Section 2.9). Along these lines, Kelly (1996) conducted a study with a group of deaf adolescents trained in oral school programmes, another group schooled in TC programmes, and a third group of students entering a postsecondary institution using total communication. The study examined the relationship between vocabulary and syntax, and the contribution that each of them makes separately to reading comprehension. He found that vocabulary and syntactic knowledge did not function independently since the relationship between vocabulary and reading comprehension is dependent on syntactic abilities. Also, if syntactic abilities are limited, the reader may be unable to apply stored vocabulary knowledge. This can be due to the misinterpretation of syntactic relations that eventually misleads vocabulary processing, or to laborious syntactic analyses that neglect lexical processing. In any case, this view clearly contrasts with DeVilliers and Pomerantz (1992) and more generally with constructivist theories in which reading comprehension is considered a personal process of construction of meaning, influenced by existing knowledge. In this respect, Gormley and McGill Franzen (1978: 546) elucidate further:

> From a constructivist's point of view the deaf can understand a printed message without explicit control over the syntactic structure. This does not deny the usefulness of written language in aiding comprehension, but merely points out that the deaf, particularly good deaf readers, may bypass the surface structure of syntax and process written information at the deep structure level of semantic information.

What is important here is that Gormley and McGill Franzen (ibid.) observe that deaf students, particularly beginner readers, find syntactic structures difficult to understand at the level of individual sentences, while they are more likely to comprehend them in discourse of several sentences, where intersentence redundancies may be available to allow them to reconsider wrongly interpreted sentences. This point is very relevant for SDH where subtitles tend to appear in the form of single, isolated sentences that leave the screen after a few seconds. It follows that syntactic structures, particularly in subtitled programmes aimed at younger audiences, need to be as simple as possible.

Gormley and McGill Franzen (1978) foreground the fact that research has mainly focused on syntax, possibly due to the substantial syntactic differences between spoken and sign languages. In their words: "Unfortunately, nearly all research with the deaf has centered on the recognition of syntax in written language to the exclusion of semantic understanding" (ibid.: 544). What has probably been underestimated in research conducted so far is that deaf children may still comprehend the text by ignoring syntax and moving to meaning. Deaf children might apply a top-down reading model, where they bring meaning to the text through their knowledge of the world (LaSasso 1993; Simpson et al. 1992), rather than a bottom-up model, where they extract meaning from the text (Adams 1990; Padden and Ramsey 1998).

Understanding that deaf children acquire syntax at a lower rate than that of hearing children is crucially relevant to the production of SDH, particularly when dealing with programmes addressing young children. Evidence is provided by Geffner and Freeman (1980), who assessed language comprehension of six-year-old deaf children, of whom 95% were enrolled in TC programmes. According to their findings, the children had passed the one-word and two-word utterance stages of language development and acquired syntax at a lower rate than that of hearing children.

This view is also shared by Streng et al. (1978), who nevertheless observe that there are some exceptions in the acquisition of phrase structure rules of spoken English. In particular, when presented with sentence repetition tasks, deaf children, unlike hearing children, frequently violate syntactic rules (Sarachan-Deily and Love 1974). While hearing children introduce synonyms, deaf children produce ungrammatical sentences or insert words that change the semantic intent of the sentence. Also, when presented with a series of English strings that varied from grammatical to ungrammatical, deaf children, again unlike hearing children, do not seem to get cues from the grammatical correctness. Streng et al. (1978) argue that these results are due to a lack of depth in language acquisition and conclude that deaf children perform in a similar way to bilingual children tested in their non-dominant language.[23]

Quigley and several other colleagues conducted an extensive investigation during the 1970s on the comprehension and production of English syntactic structures by deaf children and young people (Power and Quigley 1973; Quigley, Smith, and Wilbur 1974; Quigley, Wilbur, and Montanelli 1974; Wilbur et al. 1975; Wilbur et al. 1976). Only simple syntactic transformations – e.g. formulation of negative clauses, appropriate use of conjunctions, and question formation – proved to be well mastered by pupils and, among them, the formulation of negation is the least

[23] For literature on deaf children's use of written language, not considered in this thesis where the focus is instead on reading comprehension, see Paul (1998; 2001).

difficult syntactic structure for deaf children to acquire. Yes-no questions are easier to understand than wh- questions, while tag questions are the most difficult to understand. This is the same pattern followed by hearing children with the only difference being that hearing children acquire them sooner and at a faster pace. Also, according to their research, linear structures are easier to comprehend than hierarchical ones (Streng et al. 1978) and, for instance, the appropriate use of the disjunctive conjunctions *but* and *or* is more difficult to master than the use of the coordinating *and.*

Deaf children tend to find it difficult to understand structures that do not conform to the usual rules and they also tend to over-generalise rules. For example, Quigley et al. (1976: 105-106) explain how the subject-subject deletion rule can be applied to the sentence 'The man washed the car. The man cut the grass', resulting in 'The man washed the car and cut the grass', without changing the meaning of the sentence. By over-generalising the subject-subject deletion rule, deaf children may change the sentence 'The boy kicked the cat. The cat ran away' into 'The boy kicked the cat and ran away', wrongly understanding that it was the boy who ran away. Those who have assimilated both subject-subject deletion and object-subject deletion rules may still find the meaning of the above sentence ambiguous. Another example provided by Quigley et al. (1976: 72) concerns the use of relative clauses. While both deaf and hearing children have difficulty in comprehending relative clauses embedded after the subject, deaf children stick to the subject-verb-object order and in doing so end up misinterpreting the sentence. Deaf children tend to connect the nearest noun phrase with the verb phrase; hence in ‘The girl who hit the boy went home’, deaf children would assume that the boy had gone home. These are linguistic dimensions that should be borne in mind when producing subtitles, so that when difficult structures are present in the dialogue, the subtitler makes a judgement as per whether the use of certain subtitling strategies – i.e. longer reading times, careful segmentation and line breaks, repetition – may ease comprehension or instead simplification may be required.

The use of figurative language also requires some thought. Walker et al. (1998) point out that recreational reading, an activity to which the watching of cartoons’ subtitles can be included despite their dynamism when compared to static texts like print, favours an understanding of figurative language. Research carried out by Luetke-Stahlman (1998) suggests that figurative language is understood if introduced with sufficient contextual information, a view that contrasts with that previously put forward by Blackwell et al. (1978), which is also supported by Marschark (1993), who consider that deaf children perform poorly in understanding figurative meanings even when context is supplied. In cartoons, language and image normally interact in the construction of figurative expressions, and the image certainly plays an important role in providing contextual information. Considering that deaf children are very visually aware, the role played by the picture in the construction of meaning should not be underestimated and children should certainly be exposed to figurative expressions, especially if supported by images. Further empirical research is however needed in this area to be able to collect harder empirical evidence.

4.3.3 Morphology

Very few studies have been conducted on the morphological development of deaf children. Gilman and Raffin (1975) and Raffin et al. (1978) conducted some pioneering studies with deaf children who had been exposed to Seeing Essential English (SEE1), a morpheme-based sign system.[24] The study showed that the acquisition of morphemes by deaf children occurs in a certain order. However, such a study cannot be considered relevant since the degree of exposure to SEE1 certainly affected the way children performed, and today this communication system based on spoken English is no longer prevalent, although in countries like Poland it has been adapted into Seeing Essential Polish (Gallaudet University Library n.d.).

The limited studies on the morphological development of deaf children (Kluwin 1982; Wilbur 1982) have reached the commonly accepted conclusion that deaf children develop in a similar way to hearing children, although their development is very delayed. In particular, Wilbur (1982) compared the performances of deaf children aged eight to 15 years to those of hearing children,

[24] SEE1 was developed in the US in 1966 by a deaf teacher to teach grammar by using signs borrowed from American Sign Language (ASL). These borrowed signs were complemented by signs created for the verb *to be*, and for morphemes: prefixes, roots, and suffixes. SEE1 is based on English grammar and syntax. As an example, compound words – *butterfly* – get divided into two signs: *butter* + *fly*.

reaching the conclusion that while deaf eight year olds lagged considerably behind their hearing peers, at seventh grade (where deaf children were aged 15 and hearing children were aged 12) the differences had disappeared. However, there is no supporting evidence that the processes involved in acquiring the knowledge are identical or even similar for both groups.

Table 6 summarises the key findings of some of the most important empirical studies conducted within the Deaf Studies field on the way deaf children acquire lexis, syntax and morphology, before moving on to the next section that focuses specifically on reading characteristics:

	Authors	Subjects	Study	Findings
Lexis	(Silverman-Dresner and Guilfoyle 1970; 1972)	Deaf children aged seven to 17 years.	Extensive study on vocabulary.	Two reports containing descriptive data on reading vocabulary.
	(Schäfer and Lynch 1980)	Four pre-lingually deaf 15 – 34 months old. Two enrolled in oral programme, two enrolled in TC programme.	Small case study on language acquisition.	Delay of eight months. Overall reduced linguistic output. Children enrolled in TC programmes performed better.
	(De Villiers and Pomerantz 1992)	Upper and middle school deaf students.	Study on vocabulary acquisition from written context.	Lack of interaction between making correct syntactic judgements about words and deriving meaning from them. Acquisition of new words more closely related to the overall reading comprehension.
Syntax	(Kelly 1996)	Deaf adolescents.	Study on the relationship between vocabulary and syntax, and the contribution that each of them makes separately to reading comprehension.	Vocabulary and syntactic knowledge do not function independently. In fact the relationship between vocabulary and reading comprehension depends on syntactic abilities.
	(Geffner and Freeman 1980)	Deaf children aged six, enrolled in TC programmes.	Study on language comprehension.	The children had passed the one word and two word utterance stages of language development and acquired syntax at a lower rate compared to that of hearing children.
	(Power and Quigley 1973; Quigley, Smith, and Wilbur 1974; Quigley, Wilbur, and Montanelli 1974; Wilbur et al. 1975; Wilbur et al. 1976; Quigley et al. 1976)	Deaf children and youth.	Extensive investigation on comprehension and production of English syntactic structures.	Yes-no questions are easier to understand than wh-questions, while tag questions are the most difficult to understand. Difficulty in understanding structures that do not conform to the usual rules (i.e. relative clause), tendency to over-generalise rules (i.e. subject-verb-object order).
Morphology	(Wilbur 1982)	Deaf and hearing children aged eight to 15 years.	Comparison of performances of deaf children to those of hearing children.	Deaf eight year olds lagged considerably behind their hearing peers, but at the seventh-grade level (where deaf children were aged 15 and hearing children were aged 12) the differences had disappeared.

Table 6: Summary of empirical studies on lexis, syntax and morphology within Deaf Studies

4.4 Deaf children's reading comprehension

Extensive research on the reading characteristics of deaf children has been carried out in the last thirty years, with most of this work taking into consideration older children, and being strongly focused on socio-cultural aspects, such as ethnicity, gender and parental support. Another consideration that needs to be highlighted is the fact that all the studies discussed in this section are based on printed, static text and no reference is ever made to reading comprehension of subtitles, which in this thesis is discussed in the empirical analysis presented in Part Three.

There has been evidence for more than seventy years that deaf learners lag considerably behind hearing learners in their reading achievement (Marschark 1993; Powers et al. 1998). According to Allen (1986), this lag in reading comprehension seems to increase throughout the school years. An important point to be borne in mind is the fact that deaf children who are learning to read do not have the same knowledge of vocabulary, syntax, and sounds that hearing children have (McLaughlin 1987). In an attempt to understand how deaf children read, two reading comprehension theories are outlined: bottom-up (text based) and top-down (reader based).

The bottom-up model, which begins at the bottom with letters and ends up at the top with comprehension, is adhered to by scholars like Adams (1990), who argues that the results reached by very young children who are beginning to read will depend on their ability to name letters quickly and accurately, and to associate sounds with these letters. In other words, comprehension involves a decoding process and, ultimately, the understanding of words. Padden and Ramsey (1998) also adhere to this model by suggesting that reading difficulties arise when children fail to segment the spoken word into smaller units.

The top-down model, which begins at the top in the reader's head – with predictions and inferences – and ends up at the bottom – with text, to confirm the predictions and inferences or to produce new ones (Paul 1998) – coincides with 'the story' or 'the whole book' approach adopted by the Leicestershire Service for Hearing Impaired Children. Children are encouraged to make use of all reading cues: their knowledge of the world, the book, the characters, the language and the pictures.

In this approach, words are considered in a holistic and semiotic manner that goes beyond phonics and takes into account not only their sound but also their shape and sight. Also, children are seen as “bringing meaning to the text rather than extracting meaning from it” (Simpson et al. 1992: 49). These scholars conducted surveys of deaf children aged seven years and above, and found that their reading comprehension scores (based on the ability of understanding the content of the text) were higher than their reading accuracy scores (related to the ability of reading the text correctly) a conclusion that suggests that language is only one of the various factors involved in comprehension. This means that the scores related to the comprehension of content were higher than those achieved in the delivery of reading the text correctly. This is a particularly interesting finding from the point of view of reading and understanding audiovisual programmes, where reading the subtitles is only one of the multiple tasks involved in the decoding of the entire semiotic apparatus. The familiarity with the programme, the knowledge of the characters, and of course the understanding of the subtitles, wrapped in the pictures, all contribute to the comprehension of audiovisual programmes. Similar results were reached by Ewoldt (1981), who conducted a study on four pre-lingually deaf children aged six to 16 years old, and found that students bypassed syntax and moved directly to meaning.

Walker et al. (1998), similarly to Robbins and Hatcher (1981), argue that, in order to be successful, reading comprehension must go beyond an understanding of textual variables, that is, of the literal comprehension of the text. Instead, they emphasise the necessity of comprehending inferential meanings, which is not the obvious message but rather the deeper meaning within the text. This is a particularly difficult and challenging task for deaf children and, according to this theory, it is one of the main reasons why they lag behind their hearing peers in reading comprehension performance. It is also believed that they are not able to draw inferences from either verbal or nonverbal contextual information (Marschark 1993). In contrast, Ewoldt et al. (1992) consider that visual displays help facilitate comprehension of textbooks, adding that children tend to remember well-organised texts and, interestingly from a SDH perspective, they mention that underlined, bold, and italicised texts are also very useful in this respect.

As Paul (1998) explains, deaf students learning English as L1 or L2 who use a phonological based code are better readers in short-term memory than those who use a non-phonologically based code, such as visual (orthographic) or sign strategy. The use of the phonological based code depends on the student's sensitivity to the morphophonological structure of words and is considered to be extremely difficult for deaf readers.

Reading theories seem to agree that the top-down model is typical of beginner readers and poor readers who are unaware of bottom-up processing strategies (Paul 2001). Besides, children who apply a top-down model seem to get a general idea rather than fully understanding all the nuances of the text.

Contrastingly, Webster and Wood (1989: 130) disagree with the bottom-up model as they argue that "there is a strong possibility that the experience of reading itself provides the child with insights about the visual and phonic features of print, and not the other way around".

An interesting point is raised by Lemley (1993), who argues that both reading comprehension theories (bottom-up and top-down) are based on the deficiency view, that is, on the identification of deficient skills that need remediation. More positive is the approach of literary critical theories, specifically reader response, where the focus is on gaining an understanding of reading and writing skills within a social context rather than attempting to teach those skills. For example, Lemley (ibid.) measured the engagement of the readers with the story by allowing them to create paper cutouts that were used as the story was being read so as to encourage the readers to connect their own lives to the story. This approach can easily be applied to SDH as the main pragmatic function of the subtitles is to enable deaf children to access the audiovisual programme. An immediate positive effect of good subtitling practice is the possibility given to deaf children to move beyond their hearing loss by allowing them to partake socially, share common interests with other children and boost their interaction with hearing peers.

Having examined some relevant theoretical concepts on language and reading, and having brought deaf children into the focus of the discussion, it is now necessary to have a closer look at deafness and its implications. The next chapter explores deaf children's experiences with their families and in educational settings, and also looks at how medical research and technology has affected their lives.

Chapter Five

How do deaf children communicate?

This chapter focuses mainly on communication, placing deaf children in their social context and environment. It starts by introducing the different types of hearing loss, pre-lingual and post-lingual deafness, and cochlear implantation. It moves on to discussing different communication methods used by deaf children with their families and in their entourage. Finally, education for the deaf is tackled, encompassing the history, philosophies and current trends. This chapter is partly of a technical nature, but useful in portraying the diversity of the deaf audiences, which ultimately should help inform the decisions made during the subtitling process.

5.1 Type of hearing loss, causes and implications

As shown in Figure 17 below, the ear is divided into three parts: external ear (pinna and ear canal), middle ear (eardrum and ossicles) and inner ear (cochlea, organs of balance and auditory nerve):

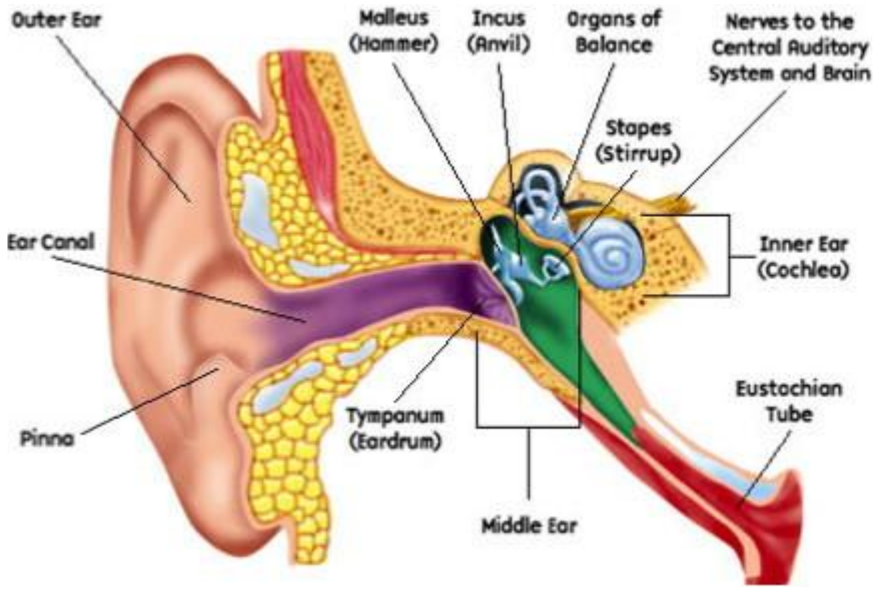


Figure 17: Anatomy of the ear (Shannan 2010)

The external ear catches sound waves and directs them down the ear canal. These waves then cause the eardrum to vibrate. These vibrations are passed across the middle ear by three tiny bones (or ossicles, namely hammer, anvil, stirrup), which increase the strength of the vibrations before they get transferred into the cochlea. The cochlea, shaped similarly to a snail’s shell, is filled with fluid and contains thousands of tiny sound-sensitive cells, known as hair cells. The vibrations entering the cochlea cause the fluid and hair cells to move creating a small electrical charge or signals that are carried to the brain by the auditory nerve, where they are understood as sound. Deafness happens when one or more parts of the system are not working effectively.

There are two main types of deafness – conductive and sensorineural – and when both types are present, it is referred to as ‘mixed hearing loss’. The main difference lies in the part of the ear affected, the implications attached to each of them, and the reversibility of the former (in most cases) and the irreversibility of the latter.

5.1.1 Conductive hearing loss

Conductive hearing loss (CHL) results from a fault in the external or middle ear that prevents sounds from passing freely to the inner ear. It is a mechanical problem with the conduction of sound vibrations. This is usually caused by a blockage, such as having too much ear wax, a build-up of fluid in the middle ear (glue ear), or an ear infection (otitis). Conductive hearing loss can also happen as a result of some abnormality in the structure of the external or middle ear, or be due to a perforated eardrum.

Below is an overview of some of the causes of conductive hearing loss (Hearing Link 2012a):

1. *Cerumen (ear wax) obstruction* denotes a blockage due to the accumulation of ear wax that impedes the conduction of sound waves by a build-up of wax in the ear canal, common among people of all ages. Hearing can usually be restored with the removal of the ear wax.
2. *Otitis media with effusion (OME)* – commonly known as 'glue ear' – occurs when the middle ear is filled with fluid that dampens the vibrations of the eardrum and ossicles made by the sound waves. The cochlea only receives dampened vibrations and so the volume of the hearing is lowered. Glue ear usually occurs in young children, but it can develop at any age.
3. *Otitis media* is the most common type of ear infection associated with conductive hearing loss. It occurs when the middle ear space sometimes becomes filled with fluid (often during a cold), which is subsequently infected by germs (bacteria or viruses). It is caused by the inability to ventilate the middle ear space due to poor Eustachian tube function (the channel which connects the middle ear space with the nasal passage). It mainly affects young children (children with glue ear being more prone), but can also affect adults.
4. *Otitis externa* – commonly known as 'swimmer's ear' – denotes an outer ear infection, which results in the inflammation of the outer ear canal. Although not the only cause, the infection is common in children and adults that spend a lot of time in the water as the moisture can irritate and break down the skin in the canal, allowing bacteria or fungi to penetrate.
5. *Otosclerosis* is the result of an abnormal growth of bone in the middle ear which prevents the ossicles from moving freely. It can cause severe conductive hearing loss that slowly progresses in early adulthood.

6. *Cholesteatoma* results from an abnormal collection of skin cells in the middle ear. If left untreated, it can damage the structures of the inner ear causing sensorineural hearing loss.
7. *Collapse of the ear drum* occurs when the excessive pressure behind the eardrum, due to poor Eustachian tube function, causes the ear drum to collapse onto the ossicles, damaging them.
8. *Damage to the ossicles* caused by trauma, infection, cholesteatoma or collapse of ear drum.
9. *Perforation of the eardrum* denotes a hole in the ear drum caused by trauma or infection that affects the performance of the ear drum in capturing sound vibrations.
10. *Bony lesions of the ear canal*, that is, growths of bone along the ear canal that can lead to obstruction from ear wax or water.

Conductive hearing loss is generally temporary and can be corrected with medication or minor surgery. If both treatments prove unsuccessful, amplification with different types of hearing aids is used. The result of this type of hearing loss is that sounds become quieter, although not usually distorted. According to Tidy (2014), 4% of all school children are affected by conductive hearing loss.

5.1.2 Sensorineural hearing loss

Sensorineural hearing loss (SNHL), also referred to as 'nerve hearing loss', results in most cases from damage to the hair cells within the cochlea – in the inner ear – and occasionally from damage to the auditory nerve (or both). Age and exposure to loud sounds are the most common causes of hearing loss. Below is an overview of some of the causes of sensorineural hearing loss (Hearing Link 2012b):

1. *Presbycusis* is the age related hearing loss, which occurs when the sensitive hair cells inside the cochlea become damaged or die. It is the biggest cause of hearing loss. Those affected start losing their hearing between the age of 30 and 40 and by the age of 80 the loss becomes significant (NHS 2013).

2. *Noise induced hearing loss* results from a regular and prolonged exposure to loud sounds (including music). A sudden noise, such as an explosion, can also cause hearing loss, denoted as *acoustic trauma.*
3. *Genetic predisposition.*
4. *Complications at birth.*
5. *Injury to the head.*
6. *Viral infections*, namely measles, mumps and rubella.
7. *Ménière disease*, a rare disorder that affects the inner ear causing vertigo, tinnitus, hearing loss and / or a feeling of pressure inside the ear.
8. *Acoustic neuroma* is a benign growth on or near the auditory nerve.
9. *Meningitis*, an infection of the protective membranes that surround the brain and spinal cord that leads to inflammation and sometimes damages to the nerves and brain. It is common among infants and young children, but adults can also get it.
10. *Encephalitis,* a rare but serious condition that causes inflammation of the brain.
11. *Multiple sclerosis,* a neurological condition affecting the brain and spinal cord.
12. *Stroke,* an interruption of blood supply to the brain.
13. *Ototoxic drugs.* 'Ototoxic' stands for 'toxic to the ear'. These drugs are generally used in the treatment of cancer though they also include certain types of antibiotics.

Sensorineural hearing loss not only affects the volume of the sound, but it also affects its quality, which is reduced. This type of deafness is in all cases permanent and irreversible, at least at the present time. According to Action on Hearing Loss (2009), 87% of deafness at all degrees of severity result from damage to the sensitive hair cells within the inner ear or cochlea. This is interesting data for the general population of the deaf and the hard of hearing, but cannot exactly be applied to infants and children, as age is the main cause of hearing loss. Sensorineural hearing loss in children is mostly congenital or has been acquired perinatally, that is, in the first month of life. A rather low percentage of 0.3% of all school children are affected by sensorineural deafness (Tidy 2014).

5.2 Degrees of hearing loss

Hearing loss is classified in four groups – mild, moderate, severe and profound – depending on the loudness of the quietest sound heard, measured in decibels (dB). Table 7 lists all four levels, the quietest sound heard in decibels and some simplified implications:

Degree of hearing loss	Decibels	Implications
Mild	25 to 39 decibels	Some difficulty following speech in noisy situations.
Moderate	40 to 69 decibels	Difficulty following speech without a hearing aid.
Severe	70 to 94 decibels	Use of lip reading or sign language. Cochlear implant.
Profound	95+ decibels	Use of sign language or lip reading. Cochlear implant.

Table 7: Degrees of hearing loss and implications

Each case is different so the implications will vary widely. For instance, some severely or profoundly deaf children may only communicate using sign language, whilst some others may have received a cochlear implant and developed a spoken language.

According to data collected in England, Wales and Northern Ireland (Figure 18) by the Consortium for Research in Deaf Education (CRIDE 2012),[25] 23% of all deaf children are severely or profoundly deaf, while 62% have a mild or moderate hearing loss, while the remaining 16% have some sort of hearing loss in one ear only (unilateral hearing loss):

[25] CRIDE brings together and is represented by the following organisations: the British Association of Teachers of the Deaf (BATOD), the Ewing Foundation, the National Deaf Children's Society (NDCS), National Sensory Impairment Partnership (NatSIP), Frank Barnes School for Deaf Children, Mary Hare School, London Borough of Barnet, UCL and the University of Bedfordshire.

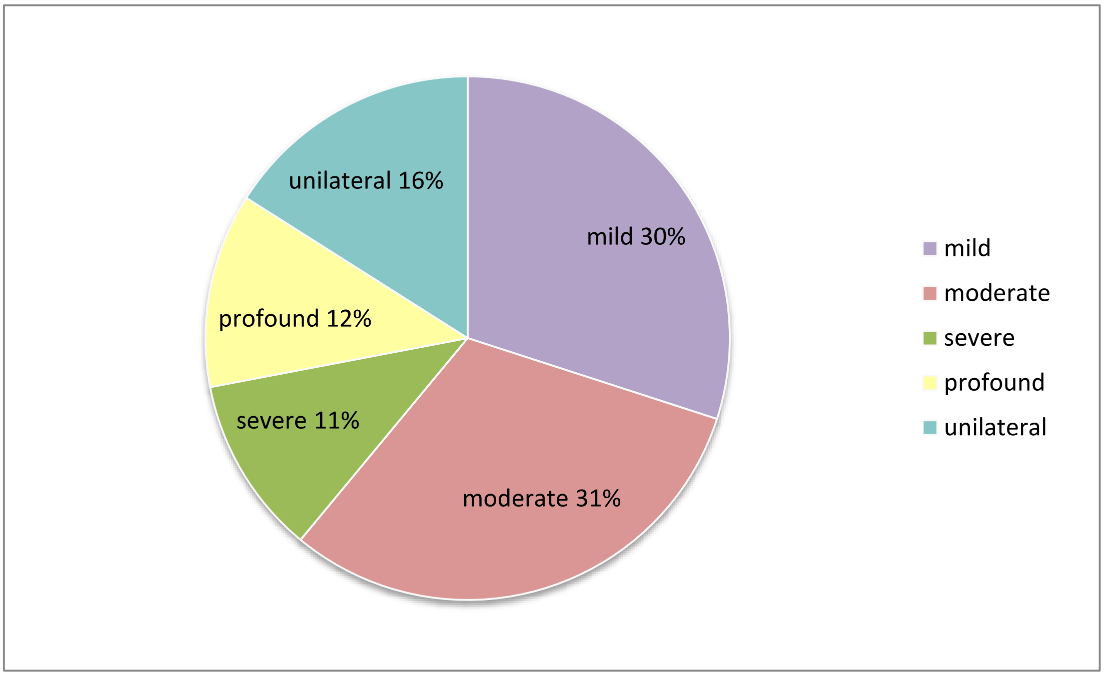


Figure 18: Levels of deafness

5.3 Pre-lingual and post-lingual deafness in children

According to the time in life when it has been acquired, deafness can be classified as pre-lingual or post-lingual. Pre-lingual deafness is either congenital or acquired before the child has learned the spoken language, whereas post-lingual deafness is acquired after the child has developed the spoken language. A child that acquires deafness before learning the spoken language faces communication difficulties that are different from the ones faced by the post-lingually deaf child who has acquired speech with sound and has possibly, depending on the age of the hearing loss, acquired some reading skills.

There are around 45,000 cases of deaf children below the age of 18 years old in the United Kingdom and half of them are congenitally deaf (Action on Hearing Loss 2011b).[26] In England, permanent childhood hearing impairment (PCHI) of >40 dB HL affects approximately one child in 1,000 newborns, but 50-90% more children are diagnosed by the age of 9 years, the equivalent of 1.65 in 1000 births,

[26] A total of 43,932 cases of deafness are reported but CRIDE (2012) explains that the figure is likely to be an underestimate as not all local authority services, special schools for deaf children, cochlear implant centres and specialist teaching organisations responded to their survey.

and may be as high as 2.05 in 1000 births (Fortnum et al. 2001). These higher percentages include children born deaf who either missed neonatal hearing screening or passed it erroneously, some who acquired deafness after birth, and others who manifested late onset or progressive impairments. About 50% of childhood deafness can be attributed to genetics (Bitner-Glindzicz 2002), 25% to environmental factors (prematurity, jaundice, hypoxia[27], meningitis[28], congenital infections such as rubella, cytomegalovirus and herpes simplex virus) and 25% is unknown.

5.4 Cochlear implantation

A cochlear implant (CI) is a surgically implanted electronic device that provides a sense of sound to a person who is profoundly or severely deaf. It comprises an external speech processor that captures sound, converts it to digital signals and sends it to the internal implant, where the signals are converted into electrical energy and sent to an array of electrodes located inside the cochlea. The electrodes stimulate the hearing nerve bypassing the damaged hair cells and nerve impulses are transmitted to the brain, where they are understood as acoustic sensations.

Cochlear implantation started in the mid-1980s. Implants were first made available to deafened adults and then to deafened children. The issue of making CIs available for children born deaf has been extremely controversial over the years. The US National Association of the Deaf (NAD 2000: online) explains its views on the matter:

> Unlike post-lingually deafened children or adults who have had prior experience with sound comprehension, a pre-lingually deafened child or adult does not have the auditory foundation that makes learning a spoken language easy. The situation for those progressively deafened or suddenly deafened later in life is different. Although the implant's signals to the brain are less refined than those provided by an intact cochlea, an individual who is accustomed to receiving signals about sound can fill in certain gaps from memory. While the implant may work quite well for post-lingually deafened

[27] Hypoxia is a condition in which the body or a region of the body is deprived of adequate oxygen supply.
[28] Meningitis is the inflammation of the protective membranes covering the brain and spinal cord.

> individuals, this result just cannot be generalized to pre-lingually deafened children for whom spoken language development is an arduous process, requiring long-term commitment by parents, educators, and support service providers, with no guarantee that the desired goal will be achieved.

The British Deaf Association (BDA 2014: online), without getting into too much detail about cochlear implantation, expresses a clear view on how deaf children should have sign language as their first language:

> Some deaf children will never have enough hearing to make use of their hearing aids or cochlear implants to the same extent that the rest of the population do. They are deaf. For those children, BSL is essential as a first language because it is a visual language. Once they have learned the basics, they can learn a second language which would be English.

The European Union of the Deaf (EUD) has produced a position paper on CIs where it is explained how implanted children need to undergo long term intensive training supported by speech therapists to be able to achieve results in the spoken language. It also stresses the necessity of providing parents with balanced information on all the available options and argues that information on Deaf culture, including sign language – the only language which is fully accessible for deaf and hard of hearing children and adults – should be included. EUD (2013: online) argues that all deaf children should learn sign language, concluding that:

> The medical ambition to cure deafness based on a medical model rather than a social model of disability cannot be the only solution especially in view of the UN Convention on the Rights of Persons with Disabilities, which clearly gives deaf people the right to sign language. This must include all children who are implanted, even at an early age to ensure their cognitive health.

The National Deaf Children Society (NDCS 2009) states in its policy document about CIs that the approach taken is a holistic one where all the spheres of a child's life are considered, i.e. education, health, social and personal needs. However, all the professional partners of the NDCS mentioned in the policy document – the British Cochlear Implant Group (www.bcig.org.uk), Cochlear Implanted Children's Support (CICS) Group (www.cicsgroup.org.uk), Ear Foundation (www.earfoundation.org.uk), National Cochlear Implant Users Association (NCIUA) (www.nciua.org.uk), the National Institute for Health and Clinical Excellence (NICE) (www.nice.org.uk), the old Royal National Institute for the Deaf (RNID), now named Action on Hearing Loss (www.actiononhearingloss.org.uk) – support cochlear implantation from a medical standpoint. There is no specific reference to organisations – such as the above mentioned NAD, BDA and EUD – that look at deafness from a cultural, social and linguistic perspective.

Worldwide, there are some 80,000 children with CIs (Kral and O'Donoghue 2010); 4,688 children and 6,088 adults with CIs are in the UK (BCIG 2012). In the space of one year, from April 2011 to March 2012, 714 children and 677 adults received implants in the UK. Looking at specific children data only, 15% of all children with CIs have received it in the span of one year: 2011-2012. This shows a noticeable growth in the use of CIs, particularly when considering that it was not until 1987 that the first child in the UK received a CI (NDCS 2009). From March 2006, all babies in the UK are offered a hearing screen, part of the NHS Newborn Hearing Screening Programme (NHSP) within a few days of birth, allowing for early detection of hearing loss. It is common for children with permanent congenital hearing loss (PCHL) to receive the implant between the age of one and two (NDCS 2009).

Considering that 23% of deaf children in the UK have a sensorineural severe to profound hearing loss and that, according to the data above, 10% of the entire population of deaf children have received a CI,[29] it can be concluded that 43% of those with severe to profound sensorineural hearing loss, make use of CIs. According to Raine (2013), approximately 74% of suitable children aged 0–3 years of age have received CIs and the percentage increases to 94% by the time they have reached 17 years of age. Interestingly, these figures drop considerably for the population of deaf

[29] The percentages reported by BCIG are slightly higher than the ones provided by CRIDE: 5% in Wales, 10% in Scotland, 8% in England and 8% in Northern Ireland (CRIDE 2013a; 2013b; 2013c; 2013d).

adults, where only about 5% of the eligible candidates, receive CIs. The author explains that the small percentage of adults receiving CIs is due to the lack of awareness among candidates and professionals, both of the criteria for eligibility and of the potential advantages that can arise from cochlear implantation. This gap between children and adults inevitably raises a question as per whether the social, cultural and linguistic pathway followed by the deaf person has an effect on the choice against the CI made by these potentially eligible deaf adults.

Cochlear implantation for pre-lingually deaf children is a delicate subject and a choice that will have a strong impact in the future pathway followed by the child. It will, for instance, affect the method of communication, which would generally be a spoken language, and the child's education, which in most cases would be in a mainstream setting where an oral auditory approach is used. The child would also need to be accompanied by speech and language therapists in his / her process of language acquisition and would end up being more prepared and inclined to interact in a mainstream context where the majority are hearing. It could be argued that later in life the child would have the choice to interact with the Deaf community and this is true except for the one element of irreversibility and that is that any residual hearing may be lost when the electrodes are implanted. This means that if the user decides later on in life to abandon the implant, he / she may no longer have any residual hearing that was present prior to implantation. On the matter, the NDCS (2009) explains that improved electrode designs and surgical techniques contribute more and more towards the preservation of residual hearing, but the risk of destroying it is still significant.

According to Action on Hearing Loss (n.d.: online), CIs "enable children who are deaf to learn language, speak intelligibly and perform better at school". It is clear that only the spoken language is being considered and that school is here intended in a mainstream setting. In line with this view, Svirsky et al. (2000) conducted a study with 23 profoundly deaf children before they received their CIs and followed them through 18 months afterwards. In the findings of their case study they claimed that children with CIs develop language at a higher rate than that expected from children without CIs, and in a similar manner to hearing children.

A few studies have been conducted on age of implantation. Connor and Zwolan (2004) examined 91 children with an average age of 11 years who had been using CIs for at least four years and reported that earlier implantation was associated with higher reading scores. Another study on age of implantation in regards to phonological awareness, vocabulary and word reading abilities was conducted by James et al. (2008) with 19 implanted children. They looked into how age of implantation impacts performance outcomes and, after having conducted two tests over a 12 month period, concluded that the children fitted earlier (between two and 3.6 years) performed better than those fitted later (between five and seven years). However, they found a wide individual variation in performance and also two participants with the best overall development had been fitted with CIs later in their childhood.

Another study, conducted with 27 pre-lingually deaf young adults who had received a CI between the ages of two and 12 years, showed that younger age at implantation was associated with higher rates of speech intelligibility and better performance on speech perception skills (Spencer et al. 2004). However, similarly to the results of James et al.'s study (2008), there were cases of high achieving individuals who had received their implants late (at age eight or older) and low achievers who had received implants before four years of age. The authors called for further research to gain a better understanding of all the variables that may contribute to the outcome.

Marschark et al. (2007), in their review of the literature, question the general assumption that early implantation and longer periods of implant lead to higher reading and academic achievement. They refer to Geers's (2002; 2003; 2004) studies on the development of reading skills by deaf children with early cochlear implantation. The studies were conducted with children aged eight to nine years who had received cochlear implants by the age of five. In his first study, Geers (2002) found that age of implantation was not associated with better reading scores, whereas chronological age and age of hearing onset were: older children read better and children who became deaf later were better readers. In addition, children who were in mainstream programmes and used spoken language were found to be better readers. In a later study, Geers (2003) confirmed that neither age of implantation nor duration of implant use was related to reading comprehension levels. Geers's studies suggest that later onset hearing losses (and therefore later implantations) are associated with better reading abilities, possibly because of a greater exposure to spoken language before the actual CI implant. In line with Geers (2004), Archbold et al. (2008) emphasise the importance of early implantation to reading achievement but they also point out that cochlear implants do not ultimately guarantee reading success. Similarly, Duchesne et al. (2009) conducted a study on receptive and expressive vocabulary and grammar achievement with 27 French speaking children aged three to eight years who had received a CI between the age of one and two and found out that early implantation does not grant that language abilities will be within the normal limits after up to six years of experience with the implant.

As far as reading comprehension is concerned, the results are also contradictory. On the one hand, Vermeulen et al. (2007) evaluated the reading comprehension and visual word recognition (WR) in 50 deaf children and adolescents with at least three years of CI use and compared it with reference data of 500 deaf children without CIs. They concluded that children with CIs had better reading comprehension than children without implants although they still lagged far behind children with normal hearing. As far as visual WR is concerned, there were no differences between primary school children with and without implants, indicating that other reading related skills contribute to the improved reading comprehension skills of deaf children with CIs. The overview offered by Marschark et al. (2007) also indicates that children with cochlear implants are better readers than children with hearing aids, but lag behind hearing children. However, further research is needed to determine what makes implanted children better readers. For example, research shows that generally implanted children with late onset hearing loss tend to be better readers, but this could be the result of the greater language skills acquired before implantation and not of the implant itself, as previously suggested by Geers (2003).

Despite the positive link between spoken language and cochlear implants, most children with cochlear implants function like hard of hearing children, according to the findings of Marschark et al. (2007). Research also suggests that children with implants who have access to both spoken and sign language are better readers (ibid.). Once again, more research is needed as the samples involved were not selected by taking into account the participants' age and their age of implantation. To get a more accurate picture of the situation, it needs to be determined whether the results achieved are due to (1) the use of simultaneous communication per se, (2) early access to language or (3) enhanced access to both spoken and sign language in the classroom.

There is an ethical dimension to cochlear implantation that is generally raised by deaf associations, as discussed earlier. Throughout the 1980s and the early 1990s, when cochlear implants started to become an option for deaf children, the Deaf community protested and objected to this development of technology on the basis that deaf people are not disabled but are instead members of a cultural and linguistic minority group. The position taken on the matter depends mainly on how deafness is understood by people. For example, the new name given to the old Royal National Institute for the Deaf (RNID), i.e. 'Action on Hearing Loss', speaks for itself. The logo of the organisation has the word 'loss' crossed out and the welcome message on their homepage (www.actiononhearingloss.org.uk) says: “We want a world where hearing loss doesn’t limit or label people, where tinnitus is silenced – and where people value and look after their hearing”. This clearly expresses a view of deafness as a disease that requires a cure, a concept that is totally rejected by those who identify themselves with the Deaf community, as explained by some authors that took an interest in the ethical dimension of cochlear implantation (Hyde and Power 2006; Sparrow 2005). Hyde and Power (ibid.) recommend that the informed consent for parents of deaf children considering cochlear implantation should not only be of a merely clinical nature but should be broadened to include the social, linguistic, and cultural characteristics associated with being Deaf. In doing so, parents are presented with two very different options. There is cochlear implantation, which attempts to 'normalise' deaf children and help them communicate and function in the hearing world, and there is also an alternative viable 'Deaf life'.

5.5 Hearing aids

A hearing aid is an electronic device that consists of a microphone, an amplifier, a loudspeaker and a battery. It maximises the use of residual hearing by increasing the volume of sound entering the ear. Hearing aids are programmed to match the child’s level of deafness and the ear conformation. An impression of the ear is taken by the audiologist so that the hearing aid fits perfectly.

Hearing aids can be analogue or digital. The latter allows the user to programme it to suit different environments depending on space, noise level, and the like. The different types of hearing aids include:

(1) *behind-the-ear (BTE)*, that is, an earmould is placed inside the ear and connects to the rest of the hearing aid which lies behind the ear;

(2) *receiver in-the-ear (RITE)*, similar to BTE but the receiver (loudspeaker) is located within the ear canal and connects to the rest of the hearing aid lying behind the ear with a wire;

(3) *in-the-ear (ITE)*, that is, an earmould fills the area outside the ear canal and the opening of the ear canal with the other working components inside it or located in a small compartment attached to it;

(4) *in-the-canal (ITC)*, filling the outer part of the ear canal;

(5) *completely in-the-canal (CIC)*, smaller and less visible than *ITE* and *ITC*;

(6) *body-worn (BW)*, which is a small box containing the microphone which is then clipped onto the clothes and connected via a lead to an earphone;

(7) *bone conduction hearing aids*, that is, hearing aids that instead of working through air conduction, work through vibration and are generally recommended to those affected by conductive hearing loss: the microphone picks up the sound, the part of the hearing aid that vibrates is placed against the mastoid bone behind the ear and sound travels to the cochlea via the mastoid bone;

(8) *bone anchored hearing aids (BAHA)*, which work similarly to *bone conduction hearing aids* but for which a minor operation is required to fix a screw to the skull on which the hearing aid can be clipped on and off.[30]

Hearing aids have a much longer history compared to cochlear implants. The first hearing aid, dating back to the 17th century, was an enormous ear trumpet with a

---

[30] For more details on different type of hearing aids, refer to www.nhs.uk/Conditions/Hearing-impairment/Pages/Treatment.aspx

tube that channelled the sound to the ear. In the late 19th century, the acoustic horn, eventually made to fit in the ear, replaced the ear trumpet. It was only at the beginning of the 20th century that hearing aids became electronic, following Alexander Graham Bell's invention of the electronically amplified sound for the telephone and Thomas Edison's invention of the carbon transmitter, which allowed for sounds to be converted into electrical signals, travel through wires and be converted into sounds again at the other end. The first electronic hearing aids were large desktop devices and, as nanotechnology progressed, they became more sophisticated and much smaller. In 1952, the introduction of transistors – switches with two settings for on or off – revolutionised hearing aid technology as the number of functions available increased and the size was reduced considerably by using silicon. In the 1990s, digital hearing aids were introduced allowing for a much more customised use to do with amplification, reduction, filtration and direction of sound. Today, the newest hearing aid can receive sound wirelessly from telephones, televisions, stereos and computers.[31]

About two million people in the UK have hearing aids, but only 1.4 million use them regularly (Action on Hearing Loss 2011b). An extra four million would potentially benefit from using hearing aids. According to McCormack and Fortnum (2013), these figures include a large number (80%) of adults aged 55 to 74. They conducted an international investigation (including Australia, Finland, Sweden, Switzerland, UK and USA) on the reasons behind the non-use of hearing aids and identified as the main cause the lack of benefit and comfort. Specifically, the study concerning the UK reported that only 17% of those who had abandoned the use of the hearing aid between eight and 16 years after fitting considered that the hearing aid did not improve their hearing, whereas 83% of subjects were more concerned with cosmetics, handling difficulties, irritation in the ear and acoustical feedback, which occurs when the amplified sound produced by the hearing aid is picked up again by the microphone creating a loud sound loop.

Unlike cochlear implants, hearing aids have not been a controversial subject, possibly because there is not an element of irreversibility surrounding their use whether by children or by adults.

---

[31] For a detailed account of the history of hearing aids, refer to Mills (2011).

5.6 Language and communication methods

Deaf children born to deaf parents will naturally have sign language (SL) as their first language and spoken language as their second language.[32] This is the case, however, of a very small percentage, as 90% of deaf children are born to hearing parents (NDCS 2014). For these children, the communication method is somehow and to a large extent chosen by the parents. Since all newborns in the UK are offered a neonatal hearing screening within a few days of birth, hearing loss can be detected early. Generally, for those affected by severe or profound permanent congenital hearing loss (PCHL), cochlear implantation soon becomes an option. As already discussed in Section 5.4, implantation is commonly performed between the age of one and two years (NDCS 2009).

Parents who choose cochlear implants for their children are generally opting for an auditory oral method of communication, where the spoken language is acquired through listening. The cochlear implant gives deaf children a sensation of hearing and ultimately, with training, children learn to detect and understand the meaning of sounds and to use the spoken language. The auditory oral pathway is not specific to implanted children as it can also be followed by non-implanted children using hearing aids. In the latter case, children can make use of any residual hearing they may have.

The core philosophy behind the auditory oral method of communication is that oral language better supports the development of reading and writing because written language is built on an understanding of the sounds and structure of the spoken language (NDCS 2011a). This approach coincides with the bottom-up (text based) reading comprehension theory (see Section 4.4), where the reading process starts at the bottom with letters and ends at the top with comprehension. There are two main auditory oral pathways: (1) the natural aural approach and (2) auditory verbal therapy (AVT). Both have the common goal of aiming at integrating the deaf child in a mainstream hearing setting. They only differ in the way in which they achieve this: the natural aural approach is based on everyday experiences, while AVT involves sessions with an audiologist and / or a speech and language

[32] For a parallel presentation of both, refer to Section 4.1.1.

therapist.[33]

Recent data from CRIDE (2013a; 2013b; 2013c; 2013d),[34] suggests that an average of over 91% of deaf children in the UK communicate exclusively using an auditory oral method.

The alternative to the oral auditory method is sign bilingualism, when the child uses both signed and spoken languages. If the parents are deaf, the child learns sign language naturally in the domestic environment.[35] As mentioned earlier, this is the case of a small proportion of deaf children. Deaf children of hearing parents become bilingual and use sign language as their predominant language when they are educated in a school for the deaf or in units (Pruvost 2003). This way the child has access to both Deaf and hearing communities. For a discussion on bilingualism, refer to Section 4.1.2. Fingerspelling is part of sign language and it is used to spell out letters and names or words that do not have an established sign. This method is sometimes used as part of total communication.

Total Communication (TC) is not a language in the way English and BSL are, but rather a method that uses all different modes of communication available: auditory, visual (through signs, pictures and objects) and tactile. Roy Holcomb originated the concept which was then developed by David Denton and adopted as an educational philosophy by his school – the Maryland School for the Deaf – in 1967 (Rotatori et al. 2011). In The UK, this approach is common in units and schools for the deaf (Pruvost 2003).[36] There are also three different manually coded English (MCE) methods used in the UK:

1. Signed Supported English (SSE). Often used as part of TC, it combines BSL signs with fingerspelling, following the word order of English.

---

[33] Cued speech is a sound based system that supports access to oral language, often used in an AVT environment. It consists of manual signals differing in (eight) hand shapes and in (four) locations representing sounds. It is particularly useful for sounds that cannot be easily lip-read. Its use is more widespread in countries like France and Spain. For more information refer to www.cuedspeech.co.uk.
[34] In England, 79% of deaf children use English and 12% use another spoken language (on its own or in combination with English). In Northern Ireland, 95% use English whilst in Wales, 81% use English only and 9% use Welsh only. In Scotland, 84% use English only and 7% use also another spoken language.
[35] Refer to Section 4.2 for a discussion about SL acquisition.
[36] For information about the education system in the UK, see Section 5.7.

2. Signed English (SE). It combines BSL signs and fingerspelling with signs and markers invented by hearing educators to represent manually spoken English.
3. Paget-Gorman Signed Speech. It uses 37 artificial basic signs and 21 standard hand postures to represent English words. It was used in deaf education from 1960s until 1980s, when it got replaced by SE.

On average, approximately 6% of deaf children in the UK are sign bilingual (CRIDE 2013a; 2013b; 2013c; 2013d), with the highest rate present in Scotland (12%) and the lowest in Northern Ireland (1%). In England, the percentage is approximately 6% whilst in Wales it drops to 3%. Some children communicate exclusively using sign language, an average of 3% in the UK. Of all deaf children, over 3% use sign language as the only method of communication in Scotland, 2% in Wales, 3% in England, and 3% in Northern Ireland.

The majority of deaf children (91%) only use a spoken language to communicate. Figure 19 below sums up the language used by deaf children in the UK, according to recent data collated by CRIDE (2013a; 2013b; 2013c; 2013d):

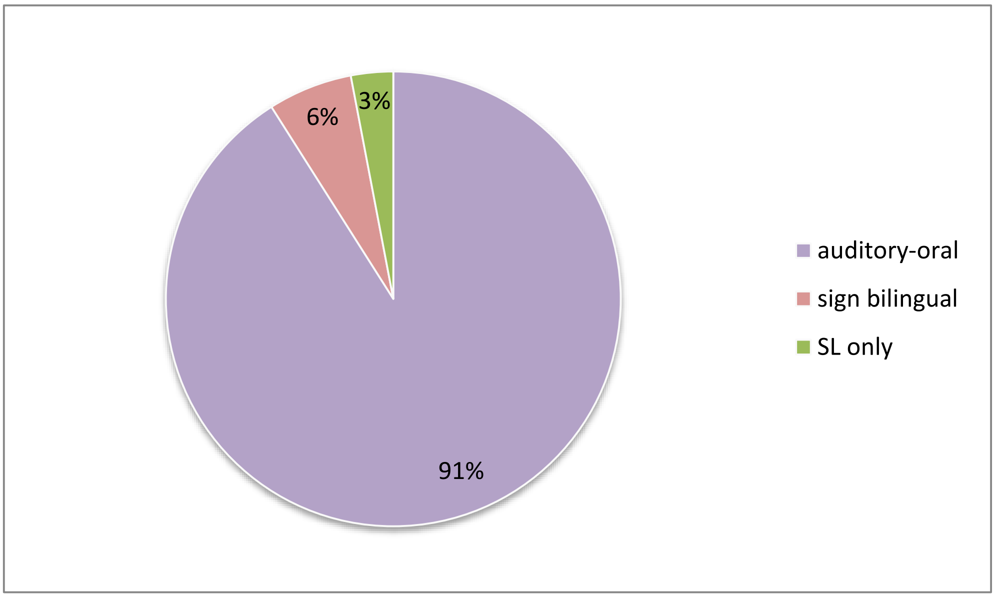


Figure 19: Communication methods used by deaf children

5.7 Deaf education

According to Winzer (1993), the first English work focused on the education of deaf children was produced by John Bulwer in 1648, entitled *Philocophus* [The deaf man's friend][37], who advocated the use of sign language in deaf education. Nothing happened for over a century, until 1760, when Thomas Braidwood set up Britain's first school for the deaf in Edinburgh. At first teaching was oral as Thomas Braidwood was not a signer, but BSL was eventually adopted following the introduction of gestures and signs by the children. The teaching method used in Braidwood's school combined reading / writing, lip-reading and sign language and nowadays is considered the precursor of total communication (discussed in Section 5.6). Sign language was predominantly used in the education of the deaf in Britain until 1860s.

In the meantime, in France, Charles Michel Abbé de l'Epée founded the first government sponsored school for the deaf in 1754 (Schick et al. 2005). He developed and used a system of methodical signs by adapting the French sign language to spoken French. He used visual cues to represent French grammar. A different doctrine emerged in Germany, where Samuel Heinicke established oralism as a method of education for deaf children, opening in 1778 the first German public school for the education of the deaf (Kaplan 1987). He used lip-reading and taught speech using touch and taste.

In the late 1700s, two schools of thought cohabited: (1) manualism, supporting the use of sign language in education, and (2) oralism, in favour of using speech and lip-reading in education. In Europe, Abbé de l'Epée and Heinicke were rivals who never reached an agreement on the education of the deaf. Similarly, in the USA, two prominent figures in deaf education, Edward Miner Gallaudet, advocate of manualism, and Alexander Graham Bell, supporter of oralism, had been debating over the effectiveness of the two different methods. The tensions between the two schools of thought culminated in The Congress of Milan in 1880 (Marschark and Spencer 2010), where 160 participants (against 4) voted for the German oral method

[37] A few years earlier, in 1620, Juan Pablo Bonet's book *Reducción de las letras y arte para enseñar a hablar a los mudos* [Summary of the letters and the art of teaching speech to the mute] had been published in Spain with the intent to further the oral and manual education of deaf people.

to become the official method of deaf education in schools. Paradoxically, deaf people were excluded from the vote. Eight resolutions were declared (Kinsey 1880), the first two stating:

> (1) The Congress, considering the incontestable superiority of speech over signs in restoring the deaf-mute to society, and in giving him a more perfect knowledge of language, declares that the Oral method ought to be preferred to that of signs for the education and instruction of the deaf and dumb.

> (2) The Congress, considering that the simultaneous use of speech and signs has the disadvantage of injuring speech, lip-reading and precision of ideas, declares that the Pure Oral method ought to be preferred.

The Royal Commission was set up in 1885 and confirmed the adoption of oralism with the Government Act of 1889. Hearing educators supported the use of speech and lip-reading and banished the use of sign language in the classroom and eventually in the playground. In 1921, the Newbolt Report *The Teaching of English in England* decreed that English was to be considered the only language taught in education and that the teaching of any subject was also a lesson in English. English was to be taught phonetically. Sign language was banned from most educational institutions and deaf teachers were replaced by hearing teachers. The report (Board of Education 1921: 348) stated that:

> Every teacher is a teacher of English because every teacher is a teacher in English, and the whole of the Times Table is therefore available for the teaching of English. Speech training must be undertaken from the outset and should be continued all through the period of schooling.

In 1944, the Education Act (1944) stated that the local authorities had to ensure "persons suffering from disability of mind and / or body" (deaf children appeared among the 11 identified categories) were educated in a mainstream setting using appropriate special methods, mainly oralism.[38] In the 1950s, oralism was supported by the introduction of new technologies and developments in audiology that culminated in the revolutionary introduction of modern hearing aids (see Section 5.5). Following a campaign by the National Institute for the Deaf, by 1952, all deaf children in the UK were provided with free hearing aids.

A couple of decades later, in 1978, the Warnock Report (DES 1978) was published, advocating the integration of deaf children into mainstream education.[39] This led to the closure of many residential schools for the deaf. Today there are 23 schools for deaf left in the UK (BATOD n.d.). In the whole country, only 2% of deaf children are enrolled in schools for the deaf, the highest rate being in England with over 3% and the lowest rate being in Wales with less than 1% (CRIDE 2013a; 2013b; 2013c; 2013d).

It was only recently, in 2010, that the 21st International Congress on the Education of the Deaf (Moores 2010), held in Vancouver, Canada, passed a resounding resolution that flatly rejected the notions passed by the Congress of Milan in 1880.

The current situation in the UK is summed up in Figure 20 below, showing that the majority of deaf children (79%) attend regular mainstream schools (CRIDE 2013a; 2013b; 2013c; 2013d),[40] while only 7% attend mainstream schools that have a resource provision in place, normally a specialist unit, base or centre catering for the needs of deaf children as an integral part of a mainstream school (NDCS 2011c). As for the rest, 12% attend other special schools, not specifically for deaf children, and only a very small 2% attend special schools for the deaf:

[38] Incidentally, the National Deaf Children's Society (NDCS) was established in 1944 by parents concerned with their children's education.
[39] In 1973, Mary Warnock was appointed by Margaret Thatcher, Education Secretary, "to review educational provision in England, Scotland and Wales for children and young people handicapped by disabilities of body or mind, taking account of the medical aspects of their needs, together with arrangements to prepare them for entry into employment; to consider the most effective use of resources for these purposes; and to make recommendations" (DES 1978: 1).
[40] Wales has the highest rate of children receiving mainstream provision, with nearly 85%, followed by nearly 79% in Scotland, 76% in England and 74% in Northern Ireland.

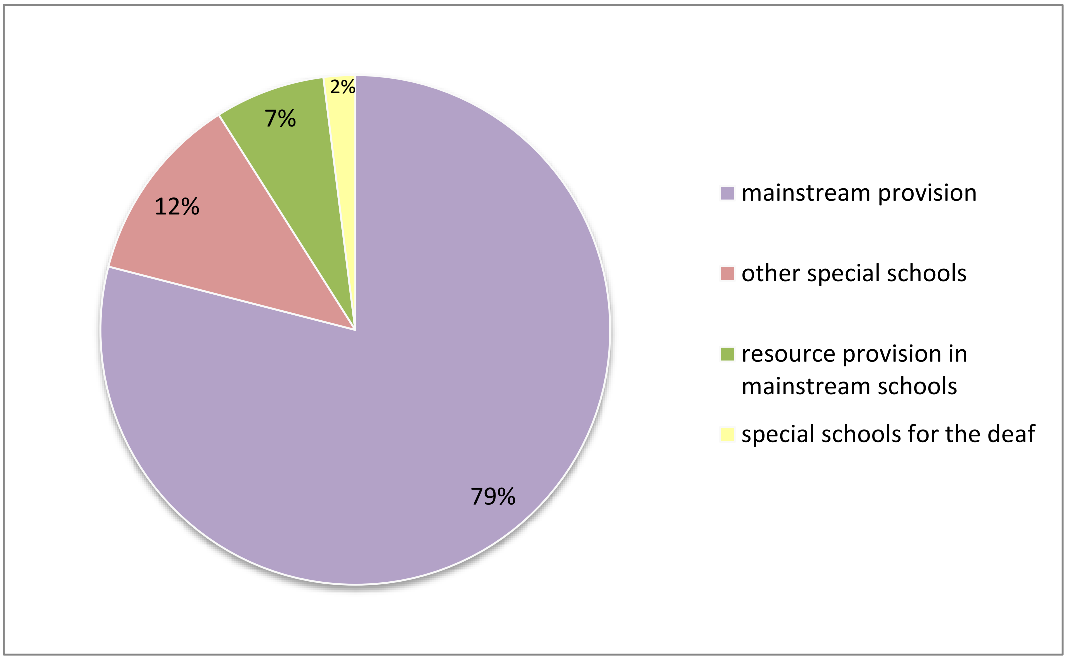


Figure 20: Educational setting in the UK

Between 2011 and 2013 the rate of deaf children receiving mainstream provision in the UK has increased by 2%, following a 3% rise in England (CRIDE 2011a) and a 4% rise in Wales (CRIDE 2011d). Reversely, there has been a decrease of over 2% in the rate of children enrolled to special schools for the deaf, while no changes have been noted in the number of children enrolled to mainstream schools with resource provision (CRIDE 2011a; 2011b; 2011c; 2011d). This data shows that more and more deaf children tend to be educated within a mainstream environment.

5.8 Additional needs

According to NDCS (2011b), 40% of all deaf children have some extra health, social or educational need ranging from asthma, colour blindness and dyslexia to severe learning and physical disabilities, often identified as additional needs. Looking at the causes of additional needs, McCracken and Pettitt (2011) distinguish between specific syndromes, a chromosome disorder and damage sustained during pregnancy, during delivery or following trauma in the early years of life. These causes can be divided into four categories: (1) prenatal onset (genetic syndromes, intrauterine infections – e.g. rubella – maternal illness); (2) perinatal onset (birth trauma, anoxia / asphyxia, kernicterus[41] and prematurity); (3) postnatal onset (trauma, infections, tumours); (4) unknown (Knoors and Vervloed 2003). The Special Educational Needs Code of Practice (DfES 2011: 6) states that:

> Children have special educational needs if they have a learning difficulty which calls for special educational provision to be made for them. Children have a learning difficulty if they:
>
> (a) have a significantly greater difficulty in learning than the majority of children of the same age;
>
> (b) have a disability which prevents or hinders them from making use of educational facilities of a kind generally provided for children of the same age in schools within the area of the local education authority;
>
> (c) are under compulsory school age and fall within the definition at (a) or (b) above or would so do if special educational provision was not made for them.

There is a clear attempt to destigmatise deafness, by excluding it from being a learning difficulty and emphasising in the code the fact that “children must not be regarded as having a learning difficulty solely because the language or form of language of their home is different from the language in which they will be taught” (DfES 2011: 6).

According to CRIDE (2012; 2013a; 2013b; 2013c; 2013d), 21% of deaf children in the UK have additional special educational needs (SEN), the highest rate of 24% is reported in Northern Ireland and the lowest rate of 16% is present in Wales. The higher percentage of children with additional needs compared to children with SEN is explained by the wider definition given to additional needs, which includes, for example, eczema and cerebral palsy (CRIDE 2013a).

The most common additional special educational need appears to be moderate learning difficulties, with the exception of Northern Ireland, where severe

[41] Anoxia is a condition characterised by an absence of oxygen supply to an organ or a tissue. Asphyxia, on the other hand, is a condition characterised by an extreme decrease in the amount of oxygen in the body accompanied by an increase of carbon dioxide leading to loss of consciousness. Kernicterus is a condition with severe neural symptoms, associated with high levels of bilirubin in the blood.

learning difficulties prevail. The other additional special educational needs reported by CRIDE (2013a; 2013b; 2013c; 2013d) are: (1) specific, profound and multiple learning difficulties; (2) behaviour, emotional and social difficulties; (3) speech, language and communications needs; (4) visual impairment; (5) multi-sensory impairment; (6) physical disability; (7) autistic spectrum disorder; (8) other difficulty / disability.

It becomes clear that special schools not specifically tailored for the deaf, attended by 12% of deaf children, as discussed in Section 5.7, might recruit well among the group of deaf children with additional extra health, social or educational needs, that is 40% of deaf children (NDCS 2011b).

The analysis and discussion presented in these last two chapters on how deaf children read and communicate constitute the foundations from which the empirical analysis presented in Part Three has been launched. Since research in the field of SDH is rather limited and outdated, particularly when it comes to children audiences, it proved useful to consider the world of deaf children in a holistic manner, that is by taking into account literature provided by other disciplines, namely Deaf Studies, and by looking at deaf children in their social and educational context, including current trends that follow medical and technological advances. The first two parts of this thesis have provided so far a solid basis to the empirical part and core of the project that is discussed in the following pages.

PART THREE

EMPIRICAL ANALYSIS

Chapter Six

Preliminary studies and main study

The present research has a strong empirical component that has led the way and given shape to the entire project. The traditional lack of hands-on work and direct observation in relation to the subtitling of programmes for deaf children – explained in Chapter Two – has been one of the main motivations behind this doctoral project. The literature review on research available on subtitling for the deaf and the hard of hearing (see Chapter Two) and the background information on how deaf children read (see Chapter Four) and communicate (see Chapter Five) constitute the main theoretical basis of the project. In order to make a meaningful contribution to the field of SDH for children, an empirical approach that relies on direct observation has been chosen to answer the two research questions formulated on visual word recognition (WR) and content comprehension (CC). As discussed in Chapter Two, since empirical research in the field of SDH (Baker et al. 1984; Baker 1985; Gregory and Sancho-Aldridge 1996; De Linde and Kay 1999) is limited and outdated, further and up-to-date research is needed and dictated by:

1. New medical solutions made available to deaf children (in particular cochlear implants, see Section 5.4) that are bound to have an impact on how deaf children acquire language and read, and eventually on the method of education chosen by the parents – i.e. it is more likely for children who have received a cochlear implant, compared to those who have not, to be mainstreamed at school and to be exposed to an aural auditory method of communication.

2. The general changes in lifestyles. For example, exposure to audiovisual products in the last decades has increased considerably, possibly affecting how children play and learn. As Prensky (2001: online) explains:

> [Today's students] have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. Today's average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives.

   Recent data (Metro 2012) more representative of the age group studied in this doctoral project, that is seven to 10 years, suggests that by the age of seven children have already spent a year sitting in front of screens and that an average of 6.1 hours a day is spent in front of a computer or TV set. Given this trend, it seems legitimate to assume that children are nowadays more conversant with the use of computers and / or videogames, which in turn makes them more agile when it comes to audiovisual literacy.

3. The general greater availability of subtitling services in these last decades and of new ways of transmitting audiovisual material, which means that exposure to these may be greater. For instance, the advent of digital technology, with its repercussions on television and the DVD industry, as well as the existence of fairly new services, such as video on demand (see Section 2.5) have had a considerable impact on watching and reading habits. This massive increase in the number of audiovisual programmes broadcast and distributed with SDH has led some scholars to talk about the commoditisation of subtitling (Díaz-Cintas 2013), where subtitles are considered a service commodity and audiences expect them to be always available.

The two preliminary studies (discussed in sections 6.2 and 6.3) and the main study (discussed in Section 6.5) constitute the core of the research and are certainly the most innovative part of it. While the preliminary studies are presented in the form of a discussion, the main study uses quantitative analysis in the attempt to offer an empirical analytical scientific approach that differs from the most common qualitative approach widely used in SDH (discussed in Chapter Two). It is clear that to investigate how to subtitle for deaf children in a way in which their reading needs will be catered for, research needs to move away from the use of questionnaires and surveys about stylistic preferences.[42] A more scientific approach is offered by eye tracking technology, which so far has been used mainly with adults (De Linde and Kay 1999; Jensema 2000; Jensema, Danturthi, and Burch 2000; Jensema, El Sharkawy, Danturthi, Burch, and Hsu 2000; Szarkowska et al. 2011; Verfaillie and d'Ydewalle 1987) and only very occasionally with children (Cambra et al. 2013; Jensema 2000; 2003). For this particular project, the use of eye tracking technology was initially contemplated but subsequently discharged as questionnaires were considered a more suitable methodology for the research questions formulated on WR and CC.

The preliminary studies follow the case study methodology advocated by Yin (2009; 2014), while the main study uses inferential statistics in the collection, categorisation, analysis, and presentation of numerical information. The statistical software Stata, version 10, was used for the analysis of the data, presented in combination with qualitative analysis, which has a complimentary function. After the completion of questionnaires, the participants' comments and / or questions about the activity were also recorded and this wealth of information has been analysed qualitatively. This is further discussed in Chapter Seven.

6.1 Aims and methodology

The empirical research has as its ultimate aim, in a broad sense, the study of how deaf children read and understand subtitles on television. The methodology used incorporates cases studies and statistical analysis into a holistic research design, as discussed respectively in sections 6.2 and 6.5.

[42] The use of questionnaires about stylistic preferences may well be a valuable tool to investigate certain aspects related to the aesthetics of subtitles but it is certainly not suitable for the purposes of this study.

The preliminary studies conducted prior to the main study rely heavily on Yin’s work (2009; 2014), which provides guidance on how to design a case study, analyse the data and present the findings.[43] Traditionally, the definition of case study is much less clear than that of experiment and is generally associated with qualitative research. Yin (ibid.) opposes this view by explaining that case studies can be based on any combination of quantitative and qualitative evidence. He also offers systematic procedures to follow when carrying out case studies so as to ensure that academic rigour is upheld, a condition which is often traditionally missing in case study research.

Yin (2009) explains that the strategy used in a research project will depend on the type of research question, familiarly categorised in *who*, *what*, *where*, *how* and *why* types. The *who*, *what* and *where* types are *exploratory*, whereas the *how* and *why* are *explanatory* and favour the use of case studies, experiments, or histories. The strategy to be adopted will depend on the following three conditions, which are carefully examined: (1) type of research question; (2) researcher’s extent of control over behavioural events; and (3) degree of focus on contemporary as opposed to historical events

The research question put forward in this doctoral thesis examines how deaf children read and understand subtitles on television and therefore (1) fully falls into the *how* category, suggesting that the purpose is *explanatory*.

Depending on the researcher’s extent of control over behavioural events, different strategies are applicable, namely history, case study and experiment. Case studies differ from experiments since the relevant behaviours cannot be manipulated as happens in a laboratory environment. In case studies, data about the subjects is collected through the use of questionnaires, direct observation, and examination of records about the subjects. The phenomenon, in this particular instance the study of how deaf children read subtitles on screen, is embedded within a given context. In

[43] Similarly to Yin (2009; 2014), Stake (1995) has also designed a protocol to conduct case studies, but the case is here seen as the object to be studied rather than as a methodological choice. Stake’s approach is also more interpretative and less structured than Yin’s. He introduced the concept of ‘naturalistic generalisation’ to indicate the process of transferring knowledge from a study sample to another population (from cases to a case), by comparing an actual problem situation with known cases. This procedure is different from hypothesis testing, adhered to by Yin, where a theory (hypothesis) is tested in a case, and validated or falsified, similarly to how generalisations are made in experiments Rolf Johansson, "Case Study Methodology" 2003)..

this respect, this study deliberately attempts to recreate a real life situation, that is, the children's recreational activity of watching television, which in this concrete case happens to take place in a school setting. Although it can be argued that children would normally watch television in the comfort of their houses, the change of setting is not deliberate but rather dictated by logistic reasons. However, if the environment is slightly different to the ideal one, the didactic use of videos (and subtitles) is commonplace in the classroom and should not prove to be an alienating factor. Traditionally, in experiments, the phenomenon is completely de-contextualised and transferred to a laboratory in an attempt to have total focus on one or two isolated variables. Since in this study there is a clear effort to recreate the same conditions present in a real-life context, without separating the study of the phenomenon from its contexts (as done in experiments), it can be concluded that (2) the control over behavioural events is non-existent. The main study in this project coincides with what Yin (2009) calls 'experiment', as the control of behavioural events, which was non-existent in the preliminary studies, became a requirement. The type of experiment conducted is identified as a *field experiment* as it did not take place in the artificial and controlled setting of a laboratory, but instead the two groups received two different treatments (broadcast and enhanced subtitles) in a natural setting, under actual use conditions.

After having explained the differences between case study and experiment, Yin (ibid.) also distinguishes between history and case study, explaining that while the former deals with the past and assumes that the subjects in question are not alive, (3) the case study examines contemporary events, as done in this particular project.

To sum up, in line with Yin's approach (1993: 59), the case study is here intended as an empirical inquiry that "investigates a contemporary phenomenon within its real-life context and addresses a situation in which the boundaries between phenomenon and context are not clearly evident".

6.2 Preliminary studies (or pilot case studies): conditions

Two preliminary studies were conducted with pupils in Years 3, 4, 5 and 6 recruited from a mainstream school based in central London that had a hearing impaired unit.

The selection of this type of school was justified by evidence that the majority of deaf children – around 86% – are enrolled in mainstream schools in the UK (NDCS 2011c). The purpose of the pilot studies was to help better design the children's questionnaires, which was the only tool used to measure the children's performances on both WR and CC, and to assess whether they were able to cope with the task. The two studies helped mainly in improving the design of the questionnaire and they also shed light on logistical issues that needed to be addressed before the main experiment, as discussed in Section 6.3. Pilot One was conducted with Years 3 and 4, whereas Pilot Two was conducted with Years 5 and 6 as a follow-up to the first pilot. The division of the two groups according to year of attendance was dictated by the school logistics and was not deliberate.

Pilot Two was designed with the results of Pilot One in mind and the necessary changes in the design of the questionnaire and in the procedure of the study were made, as discussed later in this chapter.

6.2.1 Data Collection Procedures

Prior to any contact with the children, the parents were sent a formal letter where the main aims of the project were explained and their consent was formally requested (see Appendix Two). They were also asked to complete a questionnaire on the child's background, regarding their degree of hearing loss, their most usual method of communication, the listening device they used, and the like (see Appendix Two).

For Pilot One, 17 children were recruited from Years 3 and 4 (ages seven to 10 years)[44], whereas for Pilot Two, 10 children were recruited from Years 5 and 6 (ages nine to 10 years). The parental consent form and questionnaire used for Pilot Two were identical to those used in Pilot One. The subtitled clip, however, had some minor changes (e.g. underline was used instead of italics to highlight the use of non-standard language; subtitles were slightly more edited down and segmented differently in an attempt to reduce the amount of text on screen), as illustrated later, in Section 6.2.3. As mentioned before, the questionnaire administered to the children

[44] Some children were out of the chronological year group.

in Pilot Two had been redesigned following the findings from the first pilot experience.

The children were simply told that the researcher was interested in finding out how deaf children read subtitles and they were instructed to watch the clip as they do at home in anticipation of a questionnaire that needed not be considered as a test. As with their parents, a consent form (see Appendix Three) was given to them prior to the screening of the clip.

A laptop, a data projector, a portable screen and speakers were used to play the video on site, in one of the classrooms in the school attended by the children. A semi-dark environment was created and the sound was adjusted at the beginning of the pilots and remained constant across sessions. Each session lasted 45 minutes. The screening of the 12 minute video was immediately followed by the completion of the questionnaire. The teacher stayed in the classroom and her / his role was not replaced by the researcher. The researcher and teacher occasionally assisted the children who found it hard to focus with the reading of the questionnaire.

6.2.2 Participants

A total of 27 deaf children in Years 3, 4, 5, 6 from a mainstream school with a hearing impairment unit participated in the two preliminary studies. Most children had severe or profound hearing loss and only three had moderate or mild loss. All children, except for two, were pre-lingually deaf. A total of 17 children wore cochlear implants, while 10 only had hearing aids. All children were between the ages of seven and 10 years and had developed some reading skills. Most children communicated exclusively using an auditory oral approach, whereas only five were also signers.

6.2.3 Materials

The clip. A 12 minute clip was selected from the Canadian cartoon *Mona the Vampire*, originally broadcast by CBBC in 2006. According to the broadcaster, the programme is tailored for school children aged between six and 12 years (BBC

2009a). The selected episode was entitled 'The Lost Pirates' and the length was considered to be suitable for the purpose of the study. While the duration of the clip needed to be as limited as possible in order to maintain the children's attention, the clip also needed to be self-contained and intended for the age group in question, that is deaf children aged seven to 10. The preliminary studies, unlike the main study, did not have the purpose of comparing broadcast and enhanced subtitles (prepared by the researcher), but the aim was rather to determine whether those elements introduced in the enhanced version of the subtitles, discussed below, were identifiable and efficient. The enhanced subtitles were prepared by the researcher with the help of the professional subtitling program WinCAPS (Multimedia Version 3.13.12).[45]

The subtitle file properties were set as follows: (1) maximum reading speed of 120 wpm;[46] (2) centred positioning of subtitles at the bottom of the screen; (3) a maximum of two lines per subtitle, and (4) a maximum of 39 characters per line.

The following are the four orthotypographical enhancements that were to be tested in the experiment:

1. Use of upper-case and repetition of difficult and / or new vocabulary, as shown in Figure 21 with the capitalised word 'GIGANTIC', that is also repeated in two consecutive subtitles.

[45] The subtitled clips for Pilot One and Pilot Two are available in the enclosed DVD inside the Preliminary Study folder.
[46] The maximum reading speed chosen for the pilot studies – i.e. 120 wpm – coincided with the lowest reading speed used for children (excluding pre-schoolers) on television programmes, as stated by subtitling companies (see Table 5 and Appendix One). This decision was partly influenced by the results of a survey conducted by NDCS (2006) suggesting that 30% of families feel that subtitles do not stay on the screen for long enough for their child and by the much lower reading speeds generally recommended by researchers and guidelines (see Section 3.3.4).

Figure 21: Use of repetition and upper-case for word recognition

2. Italics (in Pilot One) and underline (in Pilot Two) are used to identify the presence of non-standard language and wrong syntactical constructions, as shown in Figure 22 with the use of the verb ‘be’:

Figure 22: Use of italics and underline for non-standard language

The change of strategy in Pilot Two was triggered by the fact that the children did not understand the use of the italic enhancement in Pilot One. The use of underline was thought to be more immediate in highlighting errors, as children may be more familiar with this feature being used by teachers in the correction of homework. Note that the colloquialism 'hoagie' was purposefully not highlighted as it was considered that two enhancements in one subtitle could have created confusion.

3. Sound effects were indicated by use of labels written in upper-case within square brackets, usually on the top line, as shown in Figure 23:

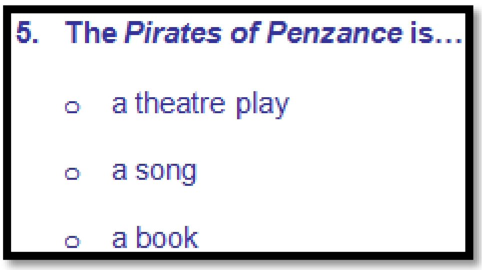
Figure 23: Use of upper-case within brackets for sound effects

4. The use of colours for speaker identification is very common in broadcast subtitles and unlike the other enhancements discussed earlier, it is not a new technique. In the attemp to find a more immediate and logical use of colour, speakers were allocated a colour that matched the colour of their clothes. For instance, the main character, Mona, was assigned the colour magenta throughout the entire episode as it is the colour that most closely matches her reddish jumper. Pilot Two, unlike Pilot One, included two questions aimed at assessing whether children were able to understand this convention. The screenshot in Figure 24 is found towards the end of the clip and the children were asked to identify the character who uttered the expression ‘The rift is closing’:

Figure 24: Colour matching clothes for speaker identification

The parental consent form and questionnaire. Given that the experiments were to be conducted with underage subjects, consent from the parents prior to the testing was required as part of the ethical approval procedure at Imperial College London (see Appendix Four). The parents were contacted directly by the school and asked to send back the completed parental consent form, compiled by the researcher, and the enclosed questionnaire (both included in Appendix Two) containing information about their child's deafness and their usual method of communication. Details of the ethical approval procedure follow in Section 6.4.

The children's questionnaire. To assess the children's reading comprehension of the subtitles, a multiple choice questionnaire was designed. The questionnaire used for Pilot One included 17 questions, whereas the questionnaire used for Pilot Two scaled them down and included only 13 questions (see Appendix Five). Both questionnaires contained colourful images in the form of screenshots from the actual audiovisual programme as support to some of the questions. The layout of the questionnaire was intended to be as appealing and uncluttered as possible. The language used followed simple structures and, where possible, sentence completion questions were favoured, as in the examples shown in figures 25 and 26:


5. The *Pirates of Penzance* is…

- a theatre play
- a song
- a book

Figure 25: Sentence completion question with three choices

Figure 26: Sentence completion question with two choices

Multiple choice closed questions were also used, as shown in Figure 27:

Figure 27: Multiple choice closed question

Only in the questionnaire for Pilot One, closed questions were used, where a 'yes' or 'no' reply was needed, as in Figure 28. This type of question disappeared in Pilot Two as the methodology used in the questionnaire became more defined and consistent, offering four options to choose from, with one of them being 'not sure', as discussed in Section 6.3.3.

Figure 28: Closed questions

The questions in all pilots tested primarily content comprehension (CC) of the subtitles and visual word recognition (WR). In Pilot One, other elements were also tested, such as the comprehension of figurative language (Figure 29) and the ability to recognise the use of non-standard language (Figure 30) in an attempt to ascertain whether the viewer took due notice of both picture and text or showed a marked preference for one over the other:

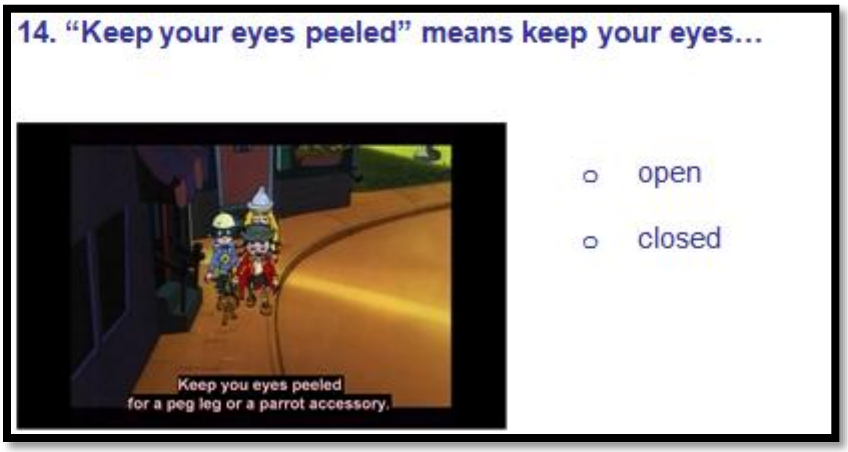


Figure 29: Figurative language

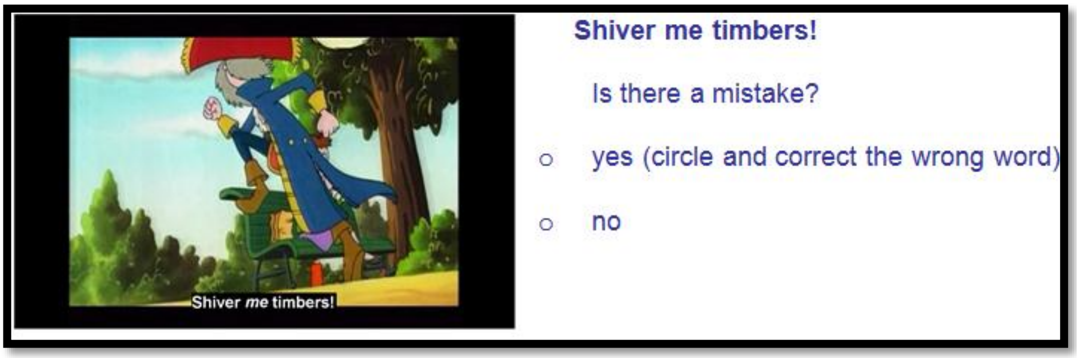


Figure 30: Non-standard language

In Pilot Two, apart from subtitle content comprehension and word recognition, the comprehension of typographical cues to call attention upon certain words and expressions was also tested (e.g. use of underline for non-standard language, use of colours for speaker identification, and use labels in upper-case within square brackets for sound effects). The questionnaire used for Pilot One was modified for Pilot Two (both included in Appendix Five) due to a number of deficiencies noted, which are fully discussed in Section 6.3.3.

6.2.4 Purpose

The subsequent main experiment was of a comparative nature and all candidates were assessed in their reading comprehension and word recognition performance when watching both broadcast and enhanced subtitles. In the pilot cases only enhanced subtitles were used because the purpose was not comparative, but was rather of definition of methodology. The focus was on the questionnaires design and only to an extent on the subtitle file, where the intent was to find out whether the elements introduced in the enhanced version, discussed earlier in this section, were identifiable and efficient for children. In terms of procedures, the following elements were tested during the piloting stage:

1. Do the participants cope with the length of the clip?
2. Is the classroom setting suitable for the activity?
3. Are the sessions of a suitable duration?

In terms of materials, the following questions were addressed:

1. Are the parental consent forms with enclosed questionnaire clear and informative?
2. Do the participants understand the questionnaires? Are the questions phrased in a clear and straightforward manner?
3. Do they understand the meaning of the orthotypographical enhancements of the subtitles?

6.3 Preliminary studies (or pilot case studies): findings

The findings of the two pilot studies were useful in addressing and testing important aspects of the main experiment. What follows is a discussion of the variables tested in the pilots: (1) suitability of the classroom as a setting for case studies; (2) the appropriateness of the procedure followed; (3) suitability of methodology in terms of the materials used, namely clips, parental consent form and questionnaire, and children questionnaires.

6.3.1 Test environment

It was acknowledged that the classroom worked well as a setting for conducting the studies. However, vigilance was needed so that all participants were present in the classroom at the start of the activity and there were no latecomers.

Occasionally, some participants would copy from their peers while completing the questionnaires. Explaining that the activity was not a test did not seem to be enough to appease their fears. A better arrangement of the desks was considered a helpful strategy, which was implemented during the main experiment.

6.3.2 Procedures

The 45 minute duration of the session was considered to be suitable in terms of holding the children's attention.

It was noticed that children were easily distracted and keen on interacting among themselves during the screening of the clip. The decision was taken that clear instructions should be given at the beginning of the proper experiment so that the children would understand that the activity consists of trying to follow the subtitles as much as possible.

The introduction and recording of an open and general discussion with all the children at the end of the questionnaires during the main experiment was advanced as it was noticed that some children seemed keen on expressing their opinions.

6.3.3 Test materials

The clip. During the two pilots it was discovered that the 12 minute length of the clips seemed to fit in well within the children's attention span.

In Pilot Two, however, it became clear from the children's reactions that further reduction of the amount of text on screen was needed, something that can be reached by spotting the text differently and, where necessary, by editing the original in a more substantial way. Children seemed to get discouraged when a full two liner appeared on screen as they intuitively felt that it meant more cognitive effort for them. This suggests that the use of three liners, which is common on British television, might need to be reconsidered in SDH for children. It became clear from the reactions of children that one liners were preferred, calling for further research in this area.

Another of the main findings at this stage was the need to use underline instead of italics to indicate the use of non-standard speech, as none of the children in Pilot One were able to identify the presence of non-standard speech via the use of italics. This issue will also be discussed in the next session as the outcome could depend on the way the question is actually formulated.

The parental consent form and questionnaire. The parental questionnaires were amended to include more information about the children's deafness. The following details were added:

1. If implanted, to identify date of implant and whether it is unilateral or bilateral.
2. To be more specific on the method of communication.
3. To include an extra question on communication disorders and / or learning disabilities.

The questionnaire for the children

Length: The questionnaire was the part of the initial material most heavily changed for the main experiment. The number of questions was reduced from 17 in Pilot One to 12 in Pilot Two as some children did not seem to cope well with the length of the questionnaires. Subsequently, 13 questions were used for the main experiment. The reasons for the change and the nature of the amendments are discussed below.

Questions about picture / text: Two questions (11 and 12) in Pilot One lent themselves to more than one possible answer because several variables were being tested at once. In particular, the main purpose of the questions was to identify whether the children favoured answers whose clues were embedded in the pictures, the subtitles or in both. The initial outcome from all the experiments seems to indicate that to reach concrete results more targeted, restricted questions are needed. The rather disappointing results obtained when using questionnaires in an attempt to look at the cognitive process of viewing and assimilating information via picture and / or text in Pilot One would suggest that other methodologies, namely eye tracking, may be more appropriate for the purpose, or else the entire study should be focused on the picture / text variable only. Given the logistics complication, it was therefore decided that the questions on picture / text viewing patterns were going to be excluded from the rest of questionnaires.

Questions about non-standard speech: None of the 17 children that took part in Pilot One answered correctly the last three questions centred on the use of non-standard speech. In response to this finding, two of the questions were completely eliminated, in order to reduce the total length of the questionnaire, and one was reformulated in Pilot Two and included as part of the comprehension of typographical cues, as shown in figures 31 and 32:

Figure 31: Use of italics

Figure 32: Use of underline

Results of Pilot Two showed that only three children out of 10 understood the underline enhancement, of whom two were the best performers of the group. In view of these results, it was decided not to test the use of non-standard language in the main experiment so that the children would not find the whole experience too overwhelming.

Questions on figurative language: This variable was only tested in Pilot One and then eliminated, a decision that was mainly dictated by the necessity to reduce the length of the questionnaire in favour of focus. Nonetheless, this is an aspect that could be analysed in the future by using this very same methodology although it would certainly require a larger number of questions.

Questions on typographical cues for sound effects: Pilot Two included one question that tested the comprehension of sound effects through the use of upper-case labels written within brackets. Eight out of 10 children answered correctly. However, this variable was not ultimately tested in the main experiment due to the need to restrict the total number of questions to enhance focalisation.

Questions on typographical cues for speaker identification: The use of different colours for speaker identification purposes seemed to be fairly well recognised by children in Pilot Two. Yet again, the decision was taken not to test this variable in the main experiment due to the overall necessary restriction on the number of questions.

The imperative need to limit the length of the main questionnaire so that it would not be too taxing on the cognitive effort of the children forced the issue of having a reduced number of variables to be tested. It is for this very reason that for the main experiment, only subtitle content comprehension and word recognition have been selected as the two main variables to be analysed (discussed thoroughly in Section 6.5).

Answers. With the feedback obtained from Pilot One, a more structured questionnaire was created for Pilot Two, and subsequently for the main experiment. In Pilot One, the number of options offered to the children varied from one question to another: some questions had the choice between two answers and some included an extra third option. This, apart from possibly undermining the results of the study, seemed to create some confusion among the children. Thus, for consistency, all questions in Pilot Two and in the main experiment presented four possible options, of which the last one was always ‘not sure’. This option, which was introduced to the children as having the same validity as any of the other options, was included to avoid that children would end up guessing the answers or leaving them incomplete.

Layout. The layout of the questionnaire was substantially modified in terms of presentation of the answers as Pilot One showed that Question 1 (Figure 33), where the four possible answers were presented in one same line following horizontal orientation, was skipped by some children:

Figure 33: Horizontal layout used in questionnaire for Pilot One

It was then decided that all answers in Pilot Two and in the main experiment would follow a vertical orientation, as shown in Figure 34:

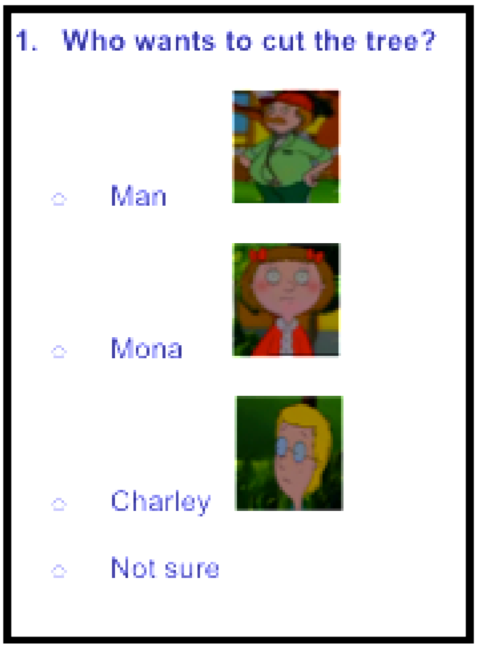


Figure 34: Vertical layout used in questionnaire for Pilot Two and main experiment

6.4 Ethical approval

The researcher, being registered at Imperial College at the time of piloting and main experiment, was required to obtain ethical approval for the proposed research. The procedure consisted of submitting the completed and signed Imperial College Research Ethics Committee (ICREC) Application Form (Appendix Four), a copy of the Parental Information Sheet and Consent Form (Appendix Two) drafted by the researcher, a copy of the Questionnaires used (Appendix Six), followed by a copy of the Protocol of the Main Experiment (Appendix Four), a sample of the videos used (see DVD) and a copy of the Children's Information Sheet and Consent Form (Appendix Three) also drafted by the researcher.

There is a precise international protocol to follow when conducting research with children, which has its origins in the Nuremberg Code (United States Government, International Military Tribunal 1949), introduced after the Nuremberg trials.[47] The code consists of 10 moral, ethical and legal principles relating to research involving human beings, the first one being about informed consent. This first code was followed in 1964 by the Declaration of Helsinki, which has been revised more recently (World Medical Association 2013). As it stands, the code is applicable to all human beings, adults and children, and is generally regarded as the foundation document on human research ethics. The declaration makes mention of vulnerable groups and individuals, without giving specific examples of who these are, but stating that they should be involved only if (1) the research is responsive to their priorities and (2) the research cannot be conducted with a non-vulnerable group.

This explains why after undergoing its first ICREC review at Imperial College London, it was decided that due to the vulnerable group of participants involved, the application needed to be considered by the full ICREC Committee at a scheduled date in January 2010. To better increase the chances of receiving full approval first time round, the researcher was required to produce an informed consent form specific to the child participants themselves in a simple format appropriate for children to understand (Appendix Four) and to provide evidence in

---

[47] The Nuremburg trials were held to prosecute members of the political, military, and economic leadership of Nazi Germany at the end of World War II. In these trials, doctors were convicted of the crimes committed during human experiments on concentration camp prisoners. The subsequent code attempted to regulate the practice of experiments involving human beings.

the form of a signed written letter or other correspondence that the Head Teacher of the school had also agreed to the research taking place. In addition, clarification regarding the participants' ages was required.

The research was granted provisional approval after the Committee meeting and the following points were raised:

1. Need for an appropriate sentence be inserted into the Children's Information Sheet stating that they can withdraw at any time and use of less complicated wording (avoid using words such as 'consists' and 'participation') and of a friendlier tone.
2. The Parental Consent Form should be amended to include space for the researcher's signature and date and to sound more personalised rather than scientific.
3. Information about the degree of hearing loss of the participants should be formally requested to the school as parents could be unaware of the formal definition of their child's hearing loss.
4. The researcher's password protected laptop does not give sufficient data security. Personal data should be destroyed, not just anonymised.

Following the revision of the Parental Information Sheet and Consent Form (Appendix Two) and of the Children's Information Sheet and Consent Form (Appendix Three), full approval was granted (Appendix Four) the following month.

6.5 Main study (or field experiment) design

Having identified the experiment as the most relevant research method, the study question needs to be analysed in its entirety. The rather general initial question enquiring about how deaf children read and understand subtitles on television, needs to be considered in greater detail and specific aspects involved in the process need to be identified. In doing this, the theoretical analysis – discussed in Part Two – and some key studies in the AVT field are closely examined in the following pages.

As already mentioned, the scope of the original study question was eventually restricted to assessing the visual recognition of new vocabulary (WR) and the content comprehension of the subtitles (CC). The main study moves away from the case study methodology in the analysis of the data, where statistics are used, but at the design stage, the study propositions or hypothesis, as intended by Yin (2014), are identified as follows:

(1) enhanced subtitles are a suitable tool for practicing visual word recognition (WR)

(2) the content comprehension (CC) of the subtitles can be explored and enhanced through the use of systematic techniques (such as text reduction, careful spotting and longer reading time)

The initial question was narrowed down to these two variables following the results obtained in four relevant studies conducted with hearing children, and discussed thoroughly in Section 2.9; three of them supporting the acquisition of new words through the use of subtitles (Koolstra et al. 1997; Koolstra and Beentjes 1999; Neuman and Koskinen 1992) and one supporting the visual acquisition of vocabulary with no or limited access to the auditory channel (d'Ydewalle and Van de Poel 1999). The two units of analysis (or variables) selected, namely WR and CC, are similar to those previously studied by other scholars and in this way previous literature in the field of AVT becomes a guide for defining the current study.

Having collected evidence that interlingual subtitles encouraged the acquisition of new vocabulary among hearing learners, the focus of this research shifted towards assessing whether the introduction of certain techniques, not currently used in broadcast intralingual subtitles, could facilitate the task of word recognition among deaf children. The orthotypographic techniques selected to introduce new words were chosen in accordance with evidence gathered by Ewoldt et al. (1992) who, as far as reading comprehension is concerned, establish that there are two contrastive views, namely the bottom-up model and the top-down model, already discussed in detail in Section 4.4. The immediacy of the subtitles and their rapid appearance and disappearance from the screen, suggest that they are unlikely to be used by readers as a tool of reflection on the actual linguistic makeup of the text. The decoding process required by the bottom-up model in order to associate sounds to letters is laborious and does not seem to go hand in hand with the reading of subtitles, while the shape and appearance of the words are more likely to be noticed in the subtitle reading process. This suggests that in the reading process of subtitles a top-down model might be applied, where importance is also given to the semiotic context and other variables, such as knowledge of the world, the characters and the images, all elements that are very present in an audiovisual context.

Part of the study question concerns the reading comprehension of subtitle content. Different linguistic techniques have been used in the enhanced subtitles with this purpose in mind of easing the understanding of the written text: repetition of certain words and expressions, application of lower reading speeds, and careful consideration given to spotting and line breaks. The choice of these particular techniques was made in line with good practices in subtitling as reported by Ivarsson and Carroll (1998) and De Linde and Kay (1999) and with the recommendations put forward by Ewoldt et al. (1992) about the importance of text style as a linguistic device that facilitates comprehension.

Two episodes from *Arthur*, the Canadian / American television series that follows the adventures of an eight-year-old aardvark, were chosen for the main experiment:

1. Video 1: "A Portrait of the Artist as a Young Tibble" follows the Tibble Twins as they set out on their new business venture, selling their pre-school art masterpieces to earn enough money to buy the coveted Krummy Kreepy Kastle. Their business takes off and so does their own appreciation for their art. They end up wondering if the Krummy Kreepy Kastle is really worth giving up their masterpieces for.
2. Video 2: "War of the Worms" follows Fern in her plan to teach Brain a lesson. Tired of Brain always taking the fun out of her storytelling by correcting her facts, she makes up a story that Brain cannot help but believe. But things get out of hand when Fern convinces Brain that there really are giant worms attacking Elwood City.

Like *Mona the Vampire*, the cartoon used in the two piloting case studies, *Arthur* is also broadcast on CBBC, which shows programmes aimed at children aged six to 12 years, as stated in their commissioning page (BBC 2009a). Episodes are approximately 12 minutes long, a duration that proved appropriate to the children's attention spans in the piloting. Since the piloting and the main experiment were conducted with children from the same school, some children recruited for the main experiment would have taken part in the piloting. The use of a new cartoon was needed to ensure that the children who participated in the piloting were not benefiting from the previous task, despite the two month gap between the pilot and the main experiment.

The same subtitle file properties set for the preliminary studies were used for the main study, with the exception of the maximum reading speed (originally set to 120 wpm): (1) maximum reading speed of 140 wpm;[48] (2) centred positioning of subtitles at the bottom of the screen; (3) a maximum of two lines per subtitle, and (4) a maximum of 39 characters per line.

As mentioned earlier, all the children were recruited from a mainstream school based in central London that had a hearing impaired unit. The selection of this type of school was justified by evidence that the majority of deaf children in the UK – around 86% – are enrolled in mainstream schools (NDCS 2011c; CRIDE 2013a; 2013b; 2013c; 2013d).

A total of 20 children were recruited from Year 3 to Year 6 and divided into two groups. Details of participants and division into the two groups are given later in Section 6.5.1. Group One saw Video 1 using broadcast subtitles first (Video 1B), followed by Video 2, in which enhanced subtitles (Video 2E) prepared with the help of the professional subtitling program WinCAPS (Multimedia version 3.13.12) were used. Group Two followed a reverse order and saw first Video 1 with enhanced

[48] The maximum reading speed was increased to be more in line with what is done in actual practice. As illustrated in Table 5, only one of the six companies involved in subtitling the children's programmes analysed in Chapter Three stated to use a maximum reading speed of 120 wpm. The same original guidelines (Ofcom 1999) of not exceeding a reading speed of 70-80 wpm for children's programmes was subsequently abandoned and no maximum reading speed is specified in more updated guidelines (Ofcom 2006b). It is clear that research on this matter is very much needed.

subtitles (Video 1E), followed by Video 2 using broadcast subtitles (Video 2B),[49] as illustrated below in Table 8:

Group One	Video 1B	Broadcast subtitles	Study One
	Video 2E	Enhanced subtitles	Study Two
Group Two	Video 1E	Enhanced subtitles	Study Three
	Video 2B	Broadcast subtitles	Study Four

Table 8: Explanatory table of the study

In his work, Yin (2014) distinguishes between single case and multiple case designs. In both types of designs, the real life context and the case are connected; the main difference lies in the design situation. The design of the main study coincides with the comparative multiple case design (Campbell 2010) that predicts theoretical replication,[50] that is, "contrasting results for anticipatable reasons" (Yin 2014). The comparison is between how performances for both WR and CC may be affected depending on whether broadcast or enhanced subtitles are being used. Since the units of analysis for each case study were two, WR and CC, the case study had a multiple case embedded design, as illustrated in Figure 35:

[49] The two versions, broadcast and enhanced, of both videos are available in the enclosed DVD inside the folder Main Study.
[50] As opposed to *literal replication,* which happens when similar results are predicted.

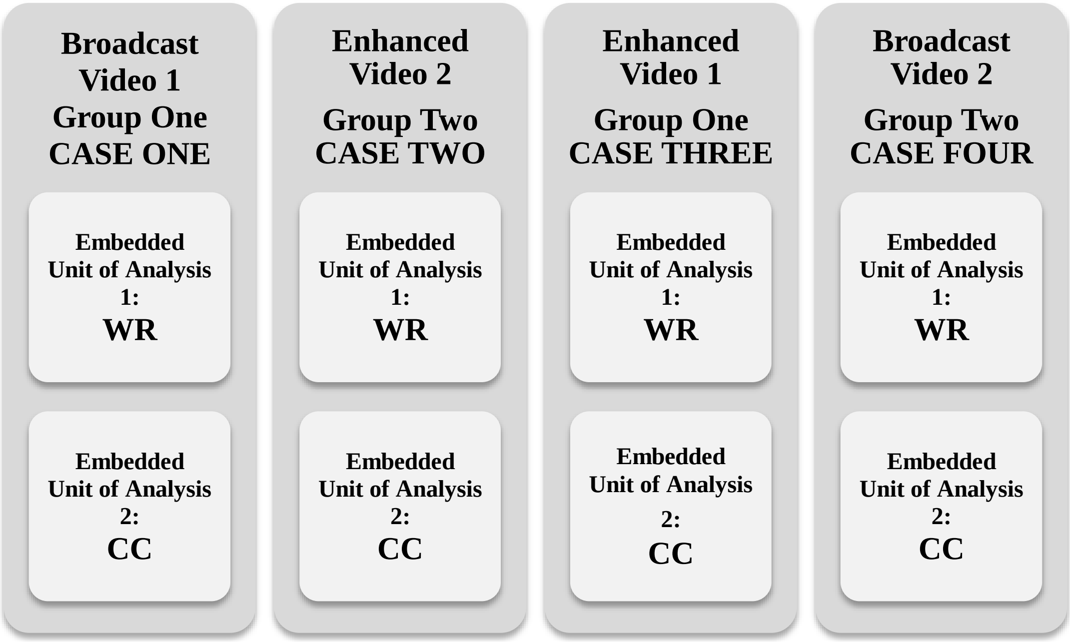


Figure 35: Multiple case design

The participants were divided into two groups so that the two tasks of watching broadcast and enhanced subtitles were counterbalanced, that is performed in reverse order. This counterbalancing measure was used in order to control for potential differences between videos and order effects. This way, the possibility of learning something in their first task that could help the participants to perform better in the second task is neutralised. The first task was inverted so that Group One watched broadcast subtitles, while Group Two watched enhanced subtitles. If the first task helped participants to perform better in the second task, Group One would have performed better in the enhanced task, while Group Two would have performed better in the broadcast task. Also, two different episodes of the same cartoon – *Arthur* – were chosen so that the participants were exposed to new content for each of the tasks and having already seen the first video clip was not at an advantage when performing the second task. The same cartoon was used in order to maintain equivalence between videos as much as possible.

The study was conducted with one main research question in mind: Do participants perform better in the tasks of word recognition (WR) and content comprehension (CC), when they watch an animation clip with enhanced subtitles or when they are exposed to a similar animation clip with broadcast subtitles?

Just before the study took place, the children were requested to read a simple consent form where the activity was explained and they were given the choice to decide whether or not they wanted to take part in it (Appendix Three). Each session started with a presentation of the subtitled clip from the cartoon *Arthur* where the participants were encouraged to identify the main characters. This could be done because *Arthur* was being regularly broadcast on British television and most participants would have known it. The introductory discussion was useful in providing some background information so that all participants had similar background information before the start of the activity. After this brief introductory session, the subtitled clip – of the duration of 12 minutes – was screened.

The children's comprehension of the subtitles and visual word recognition were assessed through a brief multiple choice questionnaire (Appendix Six) that they were asked to complete straight after the viewing. The researcher and teachers could assist the children in the reading of the questionnaire when necessary. The study's findings are interpreted using statistical analyses in an attempt to apply explicit criteria for interpretations and also to explore the application of a common research model used in other disciplines – namely Deaf Studies, Education and Psychology – to an AVT context.

After completion of the questionnaires, the children were encouraged to talk freely about the subtitles, ask questions and make comments. Their voices were recorded through the use of a Dictaphone and transcribed (Appendix Seven). For a discussion of this, refer to Chapter Seven.

6.5.1 Participants

As already mentioned, the participants were recruited from a mainstream school based in inner London, with a hearing impairment unit in place attended by approximately 70 deaf children (aged three to 11 years) that constitute one sixth of the entire school population. Due to the nature of the study, which aims at studying the subtitling reading skills of deaf children, children enrolled from Year 3 to Year 6 were considered. The children recruited had a chronological age that varied between seven and 10 years and had a reading age that varied between 64 and 126 months.

Children enrolled in years below Year 3 were not considered as they were less likely to be able to read in a significantly proficient way. Also, this choice took into consideration work conducted by Jensema (2000; 2003), who found that deaf children aged seven and younger ignored subtitles (see Section 2.8.1).

A total number of 30 candidates were recruited and parental consent forms were obtained. A number of questions were enclosed in the parental consent forms (Appendix Two) regarding the participant's acquisition of deafness, degree of hearing loss, use of listening device, main communication method, and any diagnosed communication disorders or learning disabilities that they may have. One of the main criteria of selection was that all participants had to have English as their main spoken language to ensure that they were being tested on their most proficient spoken language. The results would have been jeopardised if children with a different main spoken language were to be considered. All participants that on paper met the criteria were originally considered. Two of the 30 originally recruited participants could not be accepted to take part in the experiment as the information on paper, particularly regarding the participants' main spoken language, did not correspond to reality, and this was confirmed by the teachers.

The children were divided into two groups that overall had a similar level of literacy for the purposes of counterbalancing. The study had a repeated measures design where all subjects were exposed to both broadcast and enhanced subtitles. Therefore all subjects in both groups needed to attend two studies. Children who only attended one study were subsequently excluded from the sample. While it was a disadvantage for the sample size, this type of filtering of participants was used to remove individual differences between children as a potential confounding variable. The final sample included N = 11 for Group One and N= 9 for Group Two.

The division of children into two groups with similar literacy levels was supported by the Head of the Hearing Impairment Unit, who knew the participants closely and was able to identify their literacy levels. Two methods were in place in the school to assess the children's literacy, whether hearing or deaf children: (1) the Salford Sentence Reading Test[51] and (2) the Progress with Meaning (PM)

[51] The Salford Sentence Reading Test is a popular individual test of oral reading for five to 10 year olds. The test is performed orally on a one to one basis and can take as little as four minutes per pupil.

benchmark.[52] The children were administered the Salford Sentence Reading Test yearly and the PM benchmark every term. Through the use of these two tests, the children's reading ages were determined. Based on the results of these two tests, children were allocated to one of the two groups. The average reading age of children in Group One was 8 years and 3 months and 8 years and 7 months in Group Two. Tables 9 and 10 gather background information about each participant, respectively in Groups One and Two, specifically about:

(1) onset of hearing loss, which determines whether the child is pre-lingually (PRE) or post-lingually (POST) deaf;

(2) use of hearing aid (HA) or cochlear implant (CI), which can be either unilateral (UNI), i.e. implanted in one ear only, or bilateral (BI), i.e. implanted in both ears;

(3) the chronological age (CA) as well as the reading age (RA) are indicated and ages are indicated in years (Y) and months (M):

It is ideal for use with less able readers from about age six. For more details, consult Bookbinder et al. (2002).

[52] The PM Benchmark assesses students' instructional and independent reading levels using fiction and non-fiction texts ranging progressively from emergent levels to reading age 12. For more details, consult Nelley and Smith (2000).

NAME	SEX	YEAR	CA	RA	HEARING LOSS	ACQUISITION OF HEARING LOSS	LISTENING DEVICE	COMMUNICATION METHOD	PARENTS	OTHER
01	M	3	9 Y 1 M	5 Y 4 M	severe	PRE (not confirmed)	HA	English, Somali	hearing	learning difficulty (unspecified)
02	F	4	9 Y 11 M	7 Y 7 M	profound	PRE	CI (age 3)	English	hearing	language disorder
03	M	4	9 Y 8 M	8 Y 5 M	profound	PRE	HA	English, BSL	hearing	
04	M	3	8 Y 6 M	8 Y 8 M	profound	PRE + progressive	CI (age 4)	English	hearing	
05	F	5&6	10 Y 8 M	10 Y 6 M	severe / profound	PRE + progressive	HA	English	hearing	
06	M	3	8 Y 2M	10 Y 6 M	profound	PRE + progressive	HA + CI (age 3)	English	hearing	
07	F	5&6	9 Y 10 M	10 Y 6 M	severe	POST	HA	English	hearing	
08	F	3	8 Y 0 M	5 Y 8 M	profound	POST	HA + CI (age 4)	English	hearing	visual impairment in one eye
09	M	5&6	10Y 6M	8 Y 5 M	profound	PRE	CI b (UNI age 2, BI age 8)	English	hearing	learning difficulty (unspecified)
10	F	3	7 Y 11 M	5 Y 11 M	profound	PRE	CI (age 5)	English, Turkish	hearing	
11	F	3	7 Y 10 M	10 Y 6 M	severe / profound	PRE (not confirmed)	HA	English	hearing	ataxia (difficulty in focusing)

Table 9: Participant details for Group One

NAME	SEX	YEAR	CA	RA	HEARING LOSS	ACQUISITION OF HEARING LOSS	LISTENING DEVICE	COMMUNICATION METHOD	PARENTS	OTHER
12	F	4	9 Y 3 M	7 Y 7 M	fluctuating: moderate to profound in the left ear and mild to profound on the right.	PRE	HA	English	hearing	
13	F	5&6	11 Y 3 M	7 Y 11 M	profound	PRE + progressive	HA + CI (age 10)	English	hearing	
14	F	4	8 Y 11 M	7 Y 7 M	moderate	PRE	HA	English, BSL	deaf	
15	M	4	9 Y 1 M	7 Y 10 M	profound	PRE	HA + CI (age 6)	English	hearing	
16	M	5&6	11 Y 1 M	7 Y 11 M	profound	PRE	HA + CI (age 6)	English, BSL	hearing	learning difficulty (suspected)
17	F	4	9 Y 3 M	8 Y 1 M	moderate	PRE	HA	English	hearing	
18	M	5&6	10 Y 5 M	10 Y 6 M	severe	PRE	HA	English, BSL	hearing	
19	F	4	9 Y 2 M	10 Y 6 M	profound	PRE	CI b (UNI age 2, BI age 8)	English	hearing	
20	F	5&6	11 Y 1 M	10 Y 2 M	mild	PRE	HA	English	hearing	visual impairment

Table 10: Participant details for Group Two

Figure 36 below sums up the data concerning the different levels of deafness of the participants recruited:

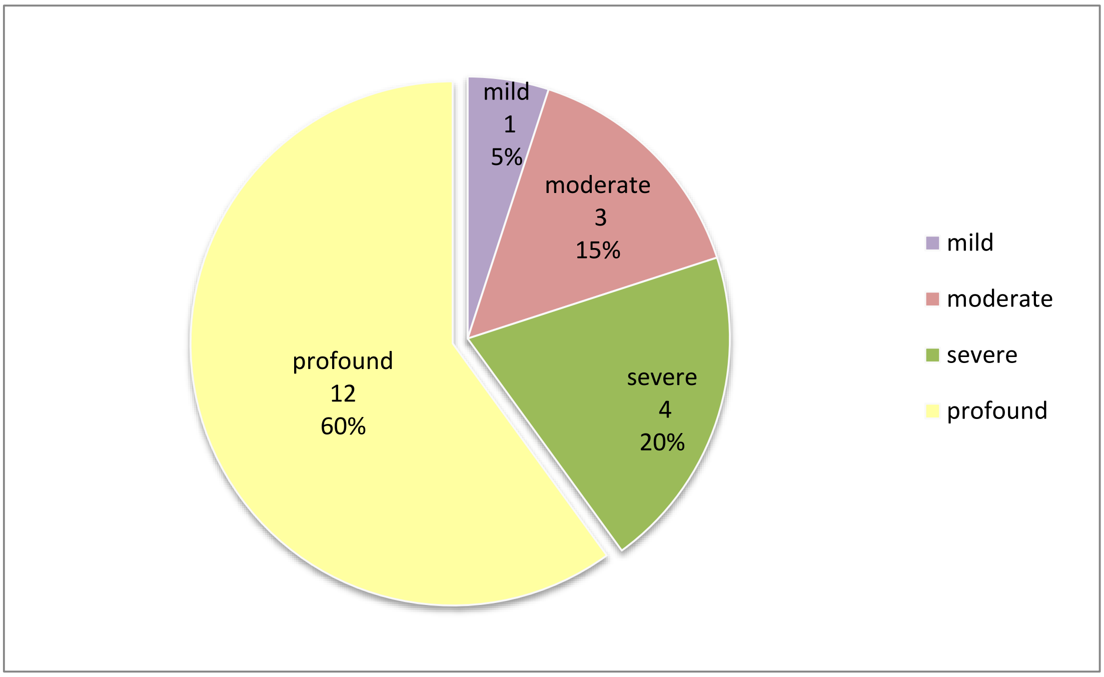


Figure 36: Participants' levels of deafness

Looking at the average levels of deafness of children in the UK, discussed in Section 5.2, the children recruited for this experiment had on average higher levels of deafness as the majority had either severe or profound hearing loss as opposed to moderate or mild hearing loss.

Possibly due to the high percentage (80%) of children with severe to profound hearing loss in the group, 50% of the children in the group had either a unilateral or bilateral CI. This percentage is slightly higher than the estimate of 43% obtained for the entire population of deaf children in the UK (see Section 5.4). Out of a total of 10 children with CIs, eight of them had been unilaterally implanted (and five also had one HA) and two had been bilaterally implanted. The remaining 10 in the group had HAs, as illustrated in Figure 37:

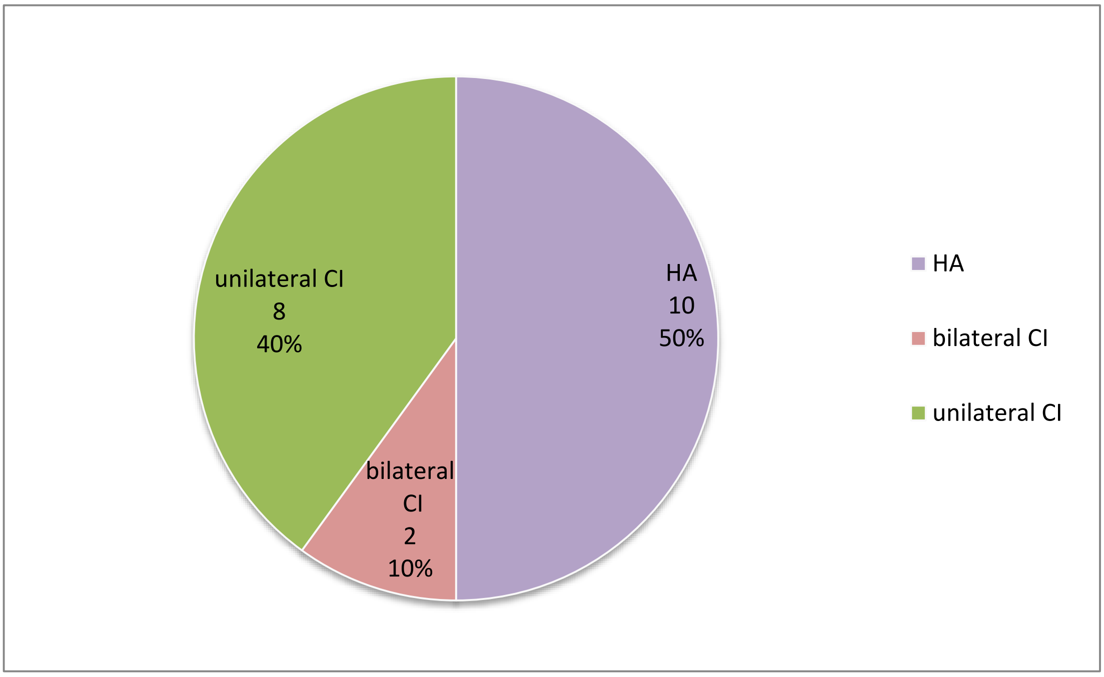


Figure 37: Participants' listening devices

As seen in Section 5.4, congenitally deaf children in the UK are likely to be cochlear implanted between the age of one and two years (NDCS 2009). None of the children recruited had been implanted before the age of three. This discrepancy is explained by the fact that all the participants recruited were born before 2004 and therefore they would not have been offered a hearing screen within a few days of birth as part of the NHS Newborn Hearing Screening Programme (NHSP), which was only introduced in 2006. This also elucidates on the two cases (participants 1 and 11) whose hearing loss is presumed – but not confirmed – to be pre-lingual. Also, four of the participants (4, 5, 6 and 13) had a pre-lingual progressive hearing loss that would have started as a mild loss and would have only later become severe or profound. In fact, three of them (participants 4, 6, and 13) received cochlear implants, but only at the age of 4, 3 and 10 respectively. Figure 38 shows that the majority of the participants – that is 90% – were pre-lingually deaf:

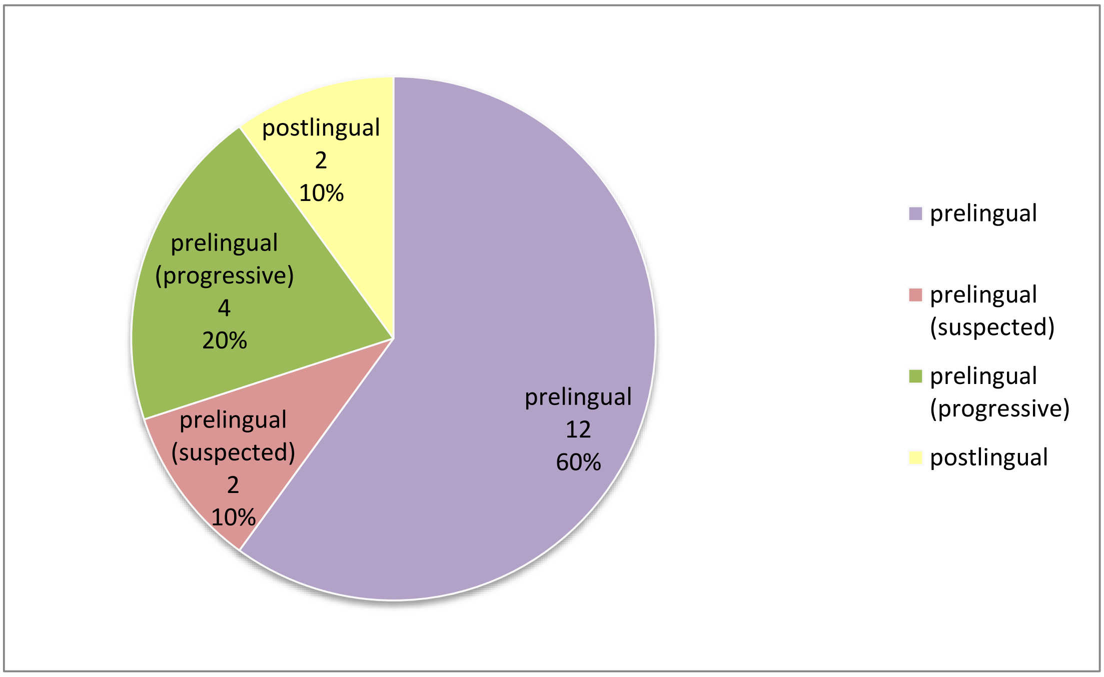


Figure 38: Participants' hearing loss onset

As shown in Figure 39, the majority of deaf children – 16 (80%) – used an auditory oral method of communication:

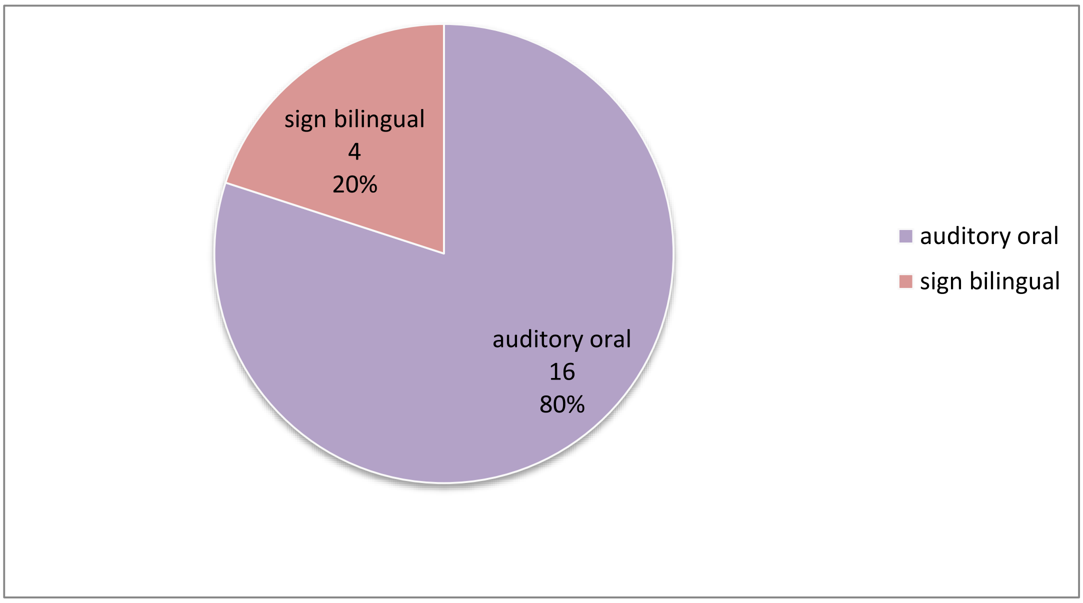


Figure 39: Participants' communication methods

As discussed previously, this is expected to be the case in a mainstream educational setting in the UK. Four of the participants also used sign language, while only one of them was born to deaf parents. This represents 5% of the entire sample and is in line with what has been discussed in Section 5.6, where it is reported that only 10% of deaf children in the UK are born to deaf parents (NDCS 2014).

Seven participants – that is 35% of the children in the sample – had some sort of additional need, as illustrated in Figure 40:

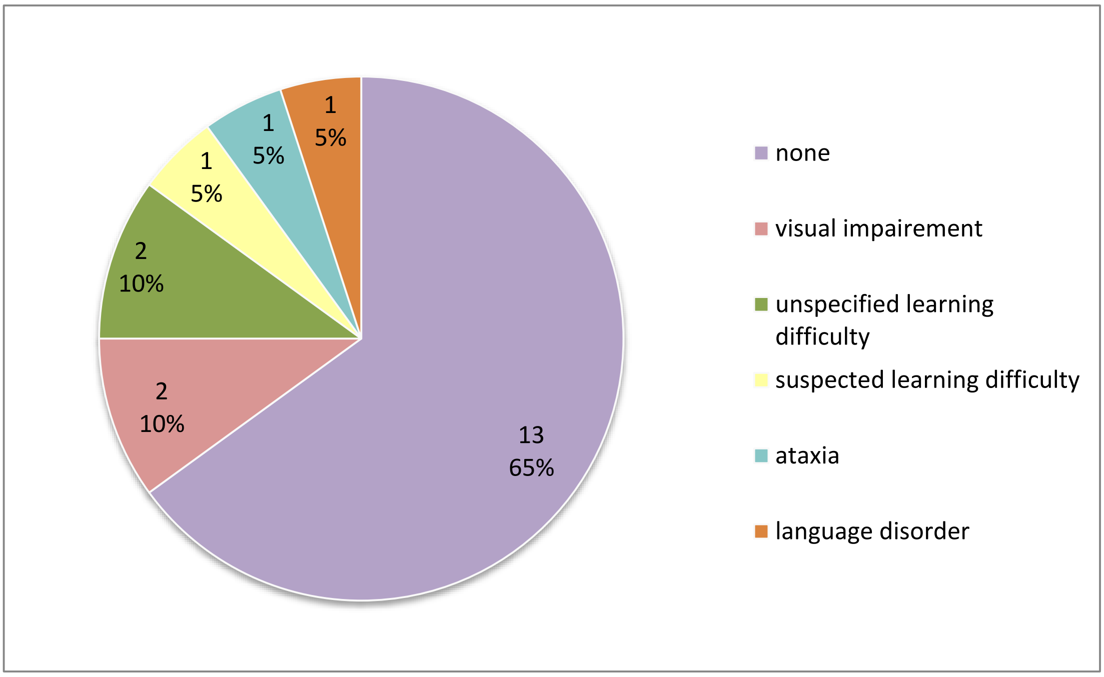


Figure 40: Participants' additional needs

Generally speaking, the population of deaf children is small in size. Out of 13 million children in the UK, there are more than 45,000 who are deaf (Action on Hearing Loss 2011b), which equals three in one thousand. Children with additional needs were not excluded from the sample on the basis that 40% of all deaf children have some extra health, social or educational need (NDCS 2011b), as discussed in Section 5.8.

Five of them – that is 25% – had special educational needs that varied from unspecified learning difficulties (participants 1 and 9), to speech, language and communication needs in the form of language disorder (participant 2) and visual impairment (participants 8 and 20) – corrected by the use of spectacles. Participant 16 had a suspected learning difficulty and Participant 11 had ataxia,[53] affecting her ability to focus.

6.5.2 Questionnaires

As already discussed, questionnaires were used as the evaluation method of the studies. Two questionnaires were designed, one for each of the two videos used (Appendix Six). They included thirteen questions each, nine of which were aimed at testing word recognition (WR) and four at testing content comprehension (CC) of the subtitles, and therefore of the programme. After having conducted the piloting, other aspects that were initially considered to be part of the research, such as the comprehension of figurative language and non-standard speech, were excluded due to the difficulties encountered in the pilot study (see Section 6.3).

In designing the final questionnaires, one of the major concerns was to make sure that they were going to be easy to understand by the children. In this sense, closed questions seemed to be suitable for the purposes of word recognition and content comprehension. The use of open ended questions would have required a reasonably good command of writing abilities and it would have constituted a major challenge to analyse, unnecessary for the purposes of this study. Multiple choice questions were preferred over yes / no questions. As mentioned before, the 'not sure' option was always an option offered to the children in order to discourage them from guessing the answer. It was explained to them that the activity was not a test and that the ‘not sure’ answer was as valid as any of the others.

All questions were given four possible answers and were accompanied by colourful screenshots to make the activity amusing and also to help the children contextualise the questions by associating them with the video. Below is an example

[53] Ataxia is an umbrella name a given to a group of neurological disorders that affect balance, coordination, and speech.

(Figure 41), from the questionnaire relating to Video 2, giving an idea of the layout used. The correct answer was ‘artists’ and two alternative nouns were randomly chosen:

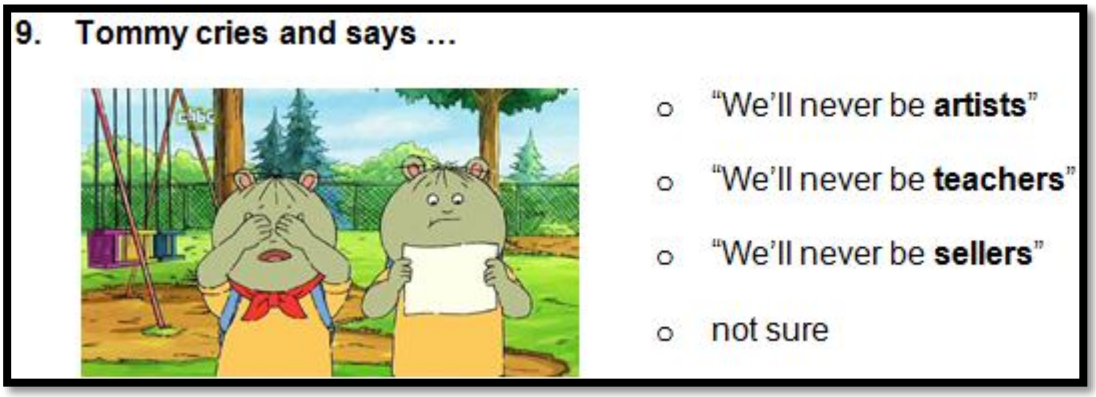


Figure 41: Question layout

In the following sections, the various techniques adopted in the enhanced subtitles are described in detail with examples.

6.5.3 Subtitle typefaces and sizes

A note on the choice of font used in the enhanced subtitles needs to be included. The font chosen is the sans-serif typeface Arial, size 30, as it is the closest – as confirmed by the publisher through personal correspondence – to a trademarked font developed by the independent publisher Barrington Stoke (www.barringtonstoke.co.uk) to make reading easier for reluctant readers. The use of sans-serif typefaces in printed material, be they books or newspapers, is rather unusual while, on the other hand, it is common on websites as it is believed that they work well on low resolution computer screens. Below is an example of Arial typeface:

a b c d e f g h i j k l m n o p q r s t u v w x y z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Whenever a word is highlighted in the subtitles to encourage word recognition, the typeface and size change in an attempt to call extra attention to the word. The slab-serif Lucida Fax, size 33, is used on these occasions, as recommended by Clark (n.d.a). The peculiarity of slab-serifs is that the serifs – the small features at the end of the strokes within letters – are long and sit at right angles to the underlying strokes. They work well in low-resolution environments, where the image lacks sharpness. Below is an example of Lucida Fax typeface:

a b c d e f g h i j k l m n o p q r s t u v w x y z
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

The typeface used on digital television in the UK, as recommended by Ofcom (1999), is the Tiresias Screenfont, specifically designed in 1998 for screen display, with characters that are easy to distinguish from each other. As it can be noted in the typefaces above, confusion can arise in Arial between lower-case “l” and upper-case “i”, for instance. The two episodes of *Arthur* with broadcast subtitles used in the main experiment were recorded from digital CBBC, which used Tiresias Screenfont. Below is an example of Tiresias Screenfont (www.tiresias.org/fonts/screenfont/view_screen.htm):

Figure 42: Tiresias Screenfont

This typeface was adopted following research conducted by Silver et al. (1998) with visually impaired subjects and hearing impaired subjects. The visually impaired people (N = 35; average age = 60) were presented with a sentence printed in (1) Standard AlphaMosaic, (2) Tiresias (first version), and (3) Times New Roman. The hearing impaired subjects (N = 48; average age 62) were presented with a short video using a later version of the Tiresias Screenfont typeface (with improvements to the kerning) in four sizes: A (30 lines); B (20 lines); C (24 lines) and D (26 lines). The subtitles appeared in white on a black strap at the bottom of the screen. The majority of visually impaired viewers expressed a preference for Tiresias Screenfont. The preferences expressed by the hearing impaired were unfortunately not reported. Despite being a popular font in the broadcasting arena, the research basis of Tiresias Screenfont's legibility claims have been called into question by authors like Clark (n.d.b).

In the end, the use of Tiresias Screenfont in the enhanced subtitles was not considered as it is particularly expensive to license and the use of two other typefaces (Arial and Lucida Fax) was researched, as discussed earlier, and both fonts implemented.

6.5.4 Selection of words for word recognition task

Word recognition (WR) is here intended as the ability to recognise a word by sight without needing to apply word analysis skills. The process of selecting which words to include in the word recognition task was based on the following two criteria: (1) word acquisition taken from the first 1,000 words (Fry and Kress 2002) and (2) a computerised database of printed word frequencies as read by children aged between five and nine (Masterson et al. 2002). In their work, a database of words which appear in books for children in the first two years of primary school was compiled and used to develop stimuli for experimental work investigating the literacy acquisition of young children. The authors (ibid.: 3) state that:

> for the first time researchers interested in the empirical investigation of the development of printed work recognition skills will have access to an up-to-date source of stimuli. This will allow stringent experimental control over variables such as word frequency, orthographic neighbourhood size and spelling-sound consistency at both grapheme-phoneme and rime levels. Teachers and other practitioners will be able to discover which words children need to know (and be taught) in order to read at a given level. The database will also allow the development of literature for children with reading difficulties with age-appropriate content presented in the highest frequency, earliest learnt vocabulary.

The clips were watched and a list of words likely to be new with some degree of complexity for deaf children aged between seven and 10 were selected from each episode. The number of words selected from each episode was dictated by the number of questions included in the test. Nine questions out of 13 were devoted to word recognition and the first question included two words as they appear in one same subtitle. The 10 words selected had very low frequency (ranging between 0 and 162 in a million words) and did not appear among the first 1,000 words acquired by children as compiled by Fry and Kress (2002). Since the literature (Caselli 1983; Gardner and Zorfass 1983; Schlesinger and Meadow-Orlans 1972; Stoloff and Dennis 1978) suggests that deaf children at the age of five have acquired 500 words as part of their vocabulary, the first 1,000 words acquired by children (Fry and Kress 2002) were excluded from the word recognition task, in order to ensure that the words considered were likely to be unknown by the children. Table 11 below presents the words selected from both videos for the word recognition task:

Video 1		**Video 2**	
Word	**Frequency (in a million words)**	**Word**	**Frequency (in a million words)**
hey	89	hey	89
wonderful	162	wonderful	162
artist	32	slime	19
educational	3	weird	8
cupcake	5	hoax	0
coins	5	scraps	5
painting	154	wings	141
unique	0	extraordinary	0
lemonade	27	tomatoes	27
tractor	30	squad	8

Table 11: Words selected for the word recognition task

The frequency of the words selected for Video 1 is slightly higher, with a total value = 507, than that of Video 2 (total value = 459). To compensate for this, Video 2, unlike Video 1, includes one word – *wings* – that appears among the first 1,000 words acquired. None of the other nine words selected appear among the first 1,000 words acquired since it was considered that the words introduced for the recognition task needed to be new words with some degree of complexity.

6.6 Word recognition enhancements

Having selected 10 words for recognition from each video, repetition and highlighting are the two main techniques specifically introduced for the word recognition task, alongside text reduction (omission), careful spotting (and line breaking) and longer reading times. Repetition occurs whenever the word is repeated in the soundtrack, while in the subtitled broadcast version the repetition of that word or expression is not always reflected in the subtitles. Highlighting is performed through the use of a font that presents a different typeface and size to the standard one used throughout the whole programme. The different techniques used to enhance the appearance of subtitles are presented below alongside some examples of each of them. In all the examples, the frame(s) containing the original broadcast subtitles (Video B) are presented on the left of the page and the frames containing the enhanced subtitles (Video E) are presented on the right.

6.6.1 Repetition

One of the techniques adopted in the enhanced subtitles is the repetition of specific words whenever they are also repeated in the soundtrack. Broadcast subtitles occasionally exclude a word that is repeated in the soundtrack, usually to allow for a lower reading speed and especially if it is not crucial in understanding the plot. For instance, the theme tune of the cartoon repeats ‘hey’ several times and sometimes the word is being sung by the character who appears on screen. The broadcast version occasionally leaves ‘hey’ out, while enhanced subtitles reflect all repetition, especially since the word ‘hey’ is among those selected for word recognition and the reading speed remains within appropriate levels.

Figure 43 below shows an example where ‘hey’, being sung by the character on screen on repeated occasions, has been omitted in the broadcast version, while the enhanced version makes sure all repetitions are conveyed. Besides giving visibility to the word, the enhanced subtitles also follow different spotting to the broadcast ones, and roughly the same amount of text is presented in two different subtitles. Synchrony has been preserved between soundtrack and subtitles and the shot change has been respected. The reading speed, however, is slightly higher but considered acceptable in this case since there is a constant visual repetition of the word ‘hey’ in the subtitles, and viewers are supposedly more likely to recognise or be able to read a word that has already appeared rather than a new or different word:

VIDEO 1B

00:00:52:09 – 00:00:57:23 103 wpm

VIDEO 1E

00:00:52:13 – 00:00:55:06 123 wpm

00:00:55:08 – 00:00:57:18 145 wpm

Figure 43: Enhancement: repetition over omission

Figure 44 shows how the broadcast subtitles use a descriptive label in the last screenshot to indicate the disagreement between the two characters, whereas the enhanced subtitles choose to subtitle the dialogue in a way that reflects the repetition of the word ‘tractor’, which is among the ones included in the word recognition task. In addition, the reading time has been increased where possible and, for instance, the last enhanced subtitle has a reading time of 51 wpm and stays on screen for 05:03 (5 seconds and 3 frames) whereas the last broadcast subtitle has a reading time of 61 wpm and stays on screen for only 01:19. Note that the use of a bigger font in the enhanced version will be discussed in further detail in Section 6.6.2. Also, in this specific example the padding expression ‘I think’, that appears in screenshots 1 and 2 of the broadcast version, has been sacrificed in order to allow for a calmer reading speed in the enhanced subtitles. Editing text, one of the various techniques used to gain reading time, is also employed for the purposes of word recognition and is fully discussed in Section 6.6.3:

VIDEO 1B

00:12:22:15 – 00:12:24:24 183 wpm

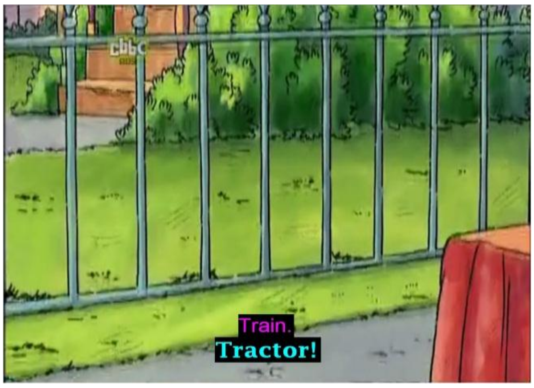
00:12:24:24 – 00:12:26:19 186 wpm

00:12:26:19 – 00:12:28:19 84 wpm

VIDEO 1E

00:12:22:13 – 00:12:25:13 120 wpm

00:12:25:15 – 00:12:27:20 120 wpm



00:12:27:22 – 00:12:29:11 107 wpm

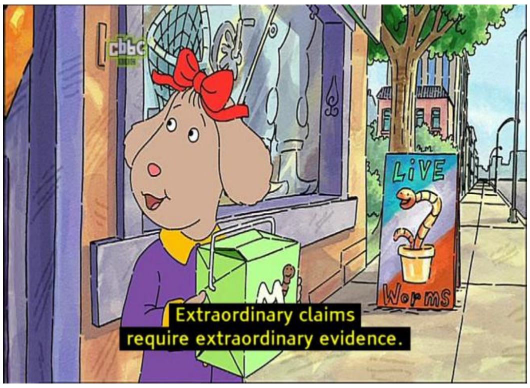
00:12:28:19 – 00:12:30:13 61wpm 00:12:29:13 – 00:12:34:16 51 wpm

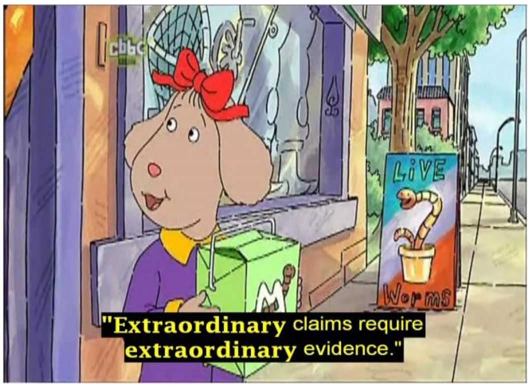
Figure 44: Enhancement: repetition over reformulation

Besides the change in font type and size, the linguistic expressions contained in the enhanced subtitles are presented in parallel whenever possible, i.e. following the same layout and syntactical distribution in the two lines, so as to reinforce the visual similarity and to facilitate the cognitive effort. The broadcast subtitles are compared with the enhanced subtitles in Figure 45 by way of illustration:

VIDEO 2B VIDEO 2E

00:04:15:01 – 00:04:19:02 148 wpm 00:04:17:12 – 00:04:21:19 140 wpm





00:04:38:12 – 00:04:42:02 160 wpm 00:04:39:03 – 00:04:42:23 157 wpm

Figure 45: Enhancement: visual repetition

Figure 46 shows another example where the visual similarity between two subsequent subtitles in the enhanced version is maintained, in fact they are identical, whereas the broadcast version opts for a full two liner. Besides the fact that the use of two subtitles helps to convey the repetition in a visual manner, the use of one subtitle requires a much larger amount of text in one go, whereas by segmenting the text in two subtitles, the reading process is eased for the younger audiences. The repetition of 'hey' is conveyed in the broadcast version, but this is not a consistent choice, as mentioned earlier (see Figure 43). Another difference between the two versions is that upper-case is used in the enhanced subtitles to convey loud speech, in this case uttered by several speakers, while the broadcast subtitles opt for the use of lower-case first, followed by upper-case, for unclear reasons as in both instances 'hey' sounds identical.

VIDEO 1B

00:00:57:24 – 00:01:03:18 120wpm

VIDEO 1E

00:00:57:20 – 00:01:00:11 127wpm

00:01:00:13 – 00:01:03:14 110wpm

Figure 46: Enhancement: visual repetition

6.6.2 Highlighting

Another technique used in the enhanced subtitles to support word recognition consists in highlighting the intended words. This is done in three different ways:

(1) employing a different typeface, which in this particular case is Lucida Fax instead of Arial;

(2) resorting to a bigger font size by increasing the font from size 30 to size 33; and

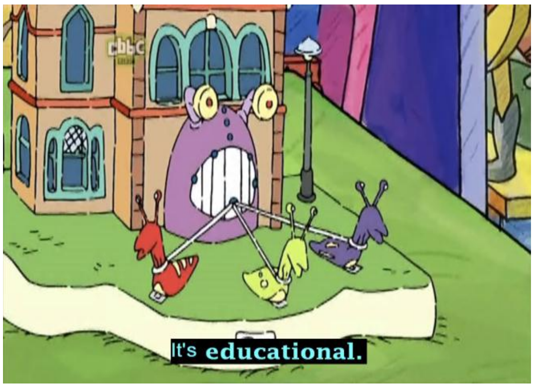
(3) using bold formatting for the word.

This technique is often accompanied by the use of longer reading times (see Section 6.6.3), which in the case shown in Figure 47 is of 32 wpm for the enhanced subtitle, made possible by leaving the subtitle on screen for the maximum duration normally implemented in the industry of six seconds. ‘Please’ in the enhanced version is not omitted, but included in the previous subtitle, as spotting is performed in a way that the subtitle with the word highlighted for word recognition contains as little as possible so that the focus is directed towards the enhancement.

VIDEO 1B

00:02:17:15 – 00:02:20:15 92 wpm

VIDEO 1E

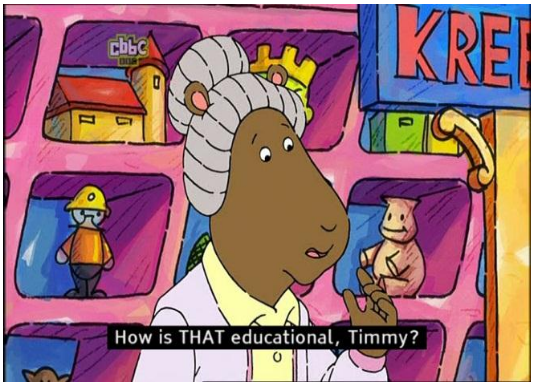


00:02:18:14 - 00:02:24:14 32 wpm

Figure 47: Enhancement: highlighting of words and longer reading time

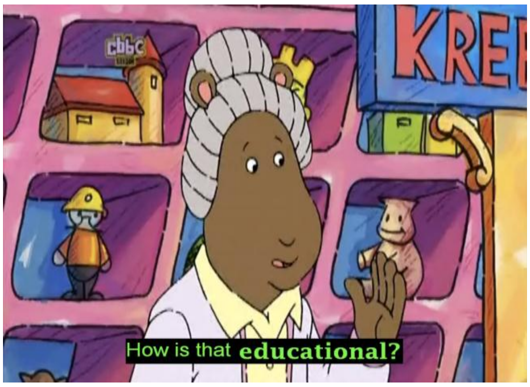
In the broadcast subtitle shown in Figure 48, the pronoun ‘that’ is emphasised through the use of upper-case as an indicator of unusual intonation. The indication of paralinguistic features has not been the focus of this research, but it is worth mentioning that in this specific case it was not considered necessary to emphasise the word ‘that’ as it does not make the subtitle any clearer and also does not add anything to the content. The enhanced version has omitted ‘Timmy’ so that more reading time is allowed for the purposes of word recognition:

VIDEO 1B



00:02:25:09 – 00:02:27:15 144 wpm

VIDEO 1E



00:02:25:06 - 00:02:24:14 110 wpm

Figure 48: Enhancement: highlighting of words and longer reading time

6.6.3 Careful spotting (and line breaking), text reduction (omission) and longer reading times

While highlighting is the only new enhancement introduced for word recognition, the clips are subtitled in their entirety following good practices in subtitling (Ivarsson and Carroll 1998; De Linde and Kay 1999; Ofcom 1999; BBC 2009b). As discussed in Section 6.6.1, the words selected for the WR task are also intentionally repeated in the subtitles if repetition occurs in the soundtrack and they are never omitted in the subtitles. This is the case for four of the words selected, as illustrated in Table 12 below and in Figure 48 above, which shows one such example. Some of the subtitles that contain the words selected for the WR task present a more careful and adequate spotting than that followed in the broadcast versions and / or longer reading times. Table 12 below quantifies all the enhancements introduced in both videos, that is the already discussed repetition and highlighting, as well as text reduction, careful spotting and use of longer reading times, further discussed in the examples that follow:

	Cases	Enhancements				
		Repetition	**Highlighting (change of font and size)**	**Text reduction**	**Careful spotting**	**Longer reading time**
WR	18	4	16	4	6	6
CC	8	-	-	7	6	7

Table 12: Enhancements

Also, in order to gain reading time for word recognition, some elements that are not necessary for understanding the content (Ivarsson and Carroll 1998; De Linde and Kay 1999; Ofcom 1999; BBC 2009b) are omitted in four occasions, as specified in Table 12. When discussing the concept of reduction in subtitling, Díaz-Cintas and Remael (2007) distinguish between partial reduction, achieved through condensation, and total reduction, achieved through omission of lexical items. Figure 49 shows an example of total reduction in the enhanced subtitle, where the coordinate conjunction ‘and’ and the adverb ‘very’ have been omitted in order to gain reading time in favour of the adjective ‘unique’, selected for the word recognition task and highlighted with bigger font and different type. The reading speed has also been reduced by lengthening the duration of the subtitle (from 02:10 in the broadcast subtitle to 03:07 in the enhanced version) with an earlier in-time and a later out-time:

VIDEO 1B

00:01:32:10 – 00:01:34:20 190 wpm

VIDEO 1E

00:01:31:24 – 00:01:35:06 113 wpm

Figure 49: Enhancement: omission and retiming to gain reading time

Broadcast subtitles tend to favour two full lines of text, as it can be observed for instance in Figure 46, while the enhanced subtitles opt for spotting in a manner that respects shot changes and maximises the semiotic value of visual repetition. In this respect, the two lines of a subtitle, or two consecutive subtitles, are presented, whenever possible, following the same layout and syntactical distribution as in the previous line (or subtitle) so as to reinforce their parallel constructions in a visual manner.

As mentioned, in the enhanced version, shot changes are normally respected whereas in the broadcast version, subtitles tend to go over the shot change even though this decision does not usually allow for more reading time.

As for the strategy of reduction of the original source text, the first screenshot in Figure 44 shows a typical example where 'I think' has been omitted to allow for longer reading time in favour of the recognition of the word 'painting'. Figure 50 illustrates another case of omission in an attempt to gain reading time. Even though the in-times and out-times are slightly shorter in the enhanced version, by omitting the initial 'He thinks', reading time is thus gained in favour of the recognition of the substantive 'artists'. The contraction 'we're' is deliberately not used in the enhanced version so as to decrease the difficulty of the subtitle and turn the focus on the highlighted word:

VIDEO 1B

00:05:05:04 – 00:05:07:24 124 wpm

VIDEO 1E

00:05:05:10 – 00:05:07:20 105 wpm

Figure 50: Enhancement: omission to gain reading time

In contrast, Figure 51 below shows a case where the strategy of omission has not been performed for several reasons. On the one hand, because the reading speed of the subtitle is acceptable and considerably lower (118 wpm) than the maximum set (140 wpm); and, on the other hand, because the only word that could have been omitted – the adverbial ‘never’ – is a repetition within the same subtitle. As discussed earlier in this section (see also Section 6.6.1), it is likely that viewers require less reading time when there is visual repetition, especially when this occurs in the same subtitle. Indeed, although the reading speed technically increases with the augmentation of the number of characters, it is important to consider that in this specific example the same word, ‘never’, is repeated in the same line of the same subtitle and although the reading time needed by the children may increase, it can be argued that this is possibly to a lesser extent than if any other word containing five characters was used:

VIDEO 1B

00:07:06:03 – 00:07:09:10 95 wpm

VIDEO 1E

00:07:06:08 – 00:07:08:24 118 wpm[54]

Figure 51: Enhancement: repetition versus omission

Figure 52 shows how the enhanced subtitle is kept on screen for longer by extending the out-time and allowing the text to go over the shot change in order to allow for a more relaxed reading speed (106 wpm) than the broadcast version (139 wpm).[55] In addition, a stronger relationship is fostered between the images and the written text as the substantive ‘lemonade’ remains onscreen when the drawing of a lemon appears:

[54] The in-time is delayed by five frames while the out-time is anticipated by 10 frames in the enhanced version so as to respect the maximum reading speed in the subtitle that precedes and in the one that follows the illustrated one.

[55] It has been generally avoided to keep the subtitle over shot changes unless this is necessary to allow for calmer reading speeds.

VIDEO 1B

00:07:54:02 – 00:07:56:06 139 wpm

VIDEO 1E

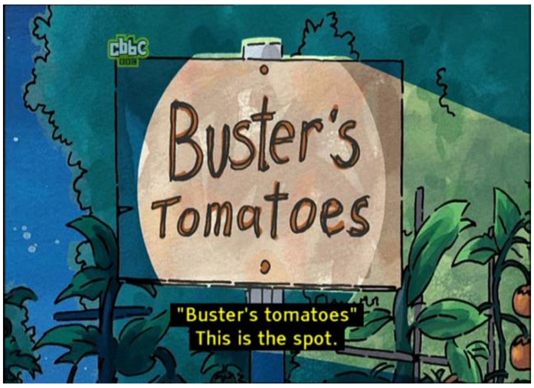
00:07:54:23 –

– 00:07:57:21 106 wpm

Figure 52: Enhancement: longer reading time

As shown in Figure 53 below, the enhanced version has opted for a different subtitle spotting and segmentation from the one used in the broadcast version:

VIDEO 2B



00:05:19:09 – 00:05:23:21 85 wpm

VIDEO 2E

00:05:19:23 – 00:05:21:14 139 wpm

00:05:21:16 – 00:05:23:05 107 wpm

00:05:29:21 – 00:05:34:19 139 wpm

00:05:30:18 – 00:05:35:14 128 wpm

Figure 53: Enhancement: spotting

Two reasons are at the base of this different spotting. Firstly, the word ‘tomatoes’, typographically highlighted with a different font type and size, is part of the list of words used for the recognition exercise and it was therefore considered that more attention would be drawn to the word if it were to stand relatively on its own. Secondly, the image in the first screenshot is already packed with verbal information inscribed in the featured mailbox, hence the attempt to keep the image as uncluttered as possible. In this particular instance, the enhanced subtitle favours a verbatim repetition of what is already written in the image. This redundancy is also present in the soundtrack, where the expression ‘Buster’s tomatoes’ is uttered, and therefore needs to be conveyed in the subtitle, especially for the benefit of part of the audience, those with residual hearing or cochlear implants, who will be able to perceive sound and therefore would expect the popping up of a subtitle on screen. A simple logical change in the line break illustrated in the last enhanced snapshots improves readability in the enhanced version, while broadcast subtitles split apart the adjective and the noun to which it refers.

6.7 Content comprehension enhancements

Word recognition has been chosen as the main focus of this pilot study, particularly because this variable, unlike content comprehension, has been identified by various researchers as the one from what viewers can benefit most when watching subtitled programmes (d'Ydewalle and Van de Poel 1999; Koolstra et al. 1997; Koolstra and Beentjes 1999; Neuman and Koskinen 1992). The strong rationale provided by extant literature in the field of word recognition has been one of the catalysts for the introduction of new techniques in the make-up of subtitles, as discussed earlier, to investigate their potential in relation to this variable. The case of content comprehension is different as there is no compelling evidence that subtitles can be used as a tool for comprehending text by hearing (and presumably deaf) audiences. Nevertheless, four questions out of a total of 13 were included in the questionnaires to investigate content comprehension, with the intent of exploring a methodology that could potentially be developed in future studies to further research on this aspect. To reiterate it, content comprehension is not achieved by the recognition of single words or isolated expressions but by the ability of making sense of what is being read. For this reason, in order to answer the questions correctly, the viewers cannot rely on single words but rather need to follow the content of the subtitle. Table 13 illustrates the various examples used to try and gauge the comprehension levels of the students. Note how the alternatives given are grammatically consistent. The content comprehension questions are mixed with the word recognition ones so that the activity develops in a logical way following the chronology of the video.

Video 1	**Video 2**
3. Timmy says that the toy teaches… ○ counting ○ singing ○ cooking ○ not sure	6. Fern wants to… ○ make up a story for Brain ○ listen to a story by Brain ○ read a story to Brain ○ not sure
7. Tommy and Timmy sell their paintings… ○ to buy a toy ○ to have fun ○ to become famous ○ not sure	7. A vermiculture box has… ○ a mummified platypus ○ designer shoes ○ worms ○ not sure

8. DW's grandma does not want to buy the painting with the boat because… ○ she does not have room for it ○ she does not have the money ○ she does not really like it ○ not sure	12. Worms eat… ○ soil ○ scraps ○ soil and scraps ○ not sure
11. Tommy and Timmy sell the toy to buy… ○ clothes ○ games ○ paints ○ not sure	13. Worms make… ○ soil ○ scraps ○ soil and scraps ○ not sure

Table 13: Content comprehension questions

For illustration purposes, screenshots from both broadcast and enhanced subtitles are presented in the following pages. In order to answer the questions correctly, the content conveyed by several subtitles needed to have been properly understood by the children and answers could only be given by reading and understanding the subtitles, as no clues were provided by the images alone.

In Figure 54, there are no major differences between the broadcast and the enhanced subtitles, apart from the minor deletion of the verb 'See?' in the second screenshot of the enhanced version to allow for more reading time and from the more syntactically logical line breaking in the enhanced version. Note that the enhanced version spells 'krummy kritters' differently from the broadcast version, in which 'crummy critters' is wrongly used instead. First of all, 'Krummy Kritters Kreepy Kastle' appears as verbal information in the video before the actual screenshot illustrated below, and therefore consistency with this is kept in the enhanced version. The broadcast version does not opt for consistency with the verbal information present in the video – since 'crummy critters' is used – or between the subtitles – in fact 'Krummy Kritters Kreepy Kastle' is later used (see Figure 55).

VIDEO 1B | VIDEO 1E

00:02:27:15 – 00:02:29:11 117 wpm

00:02:27:15 – 00:02:29:22 94 wpm

00:02:29:11 – 00:02:35:00 114 wpm

00:02:29:24 – 00:02:34:22 119 wpm

0:02:35:00 – 00:02:37:02 115 wpm

00:02:34:24 – 00:02:36:21 127 wpm

Figure 54: Enhancement: line breaks

Again, in Figure 55, some editing is performed and more attention is paid to line breaks so that the subtitles elucidate the syntactical structure of the source text more attuned to the professional subtitling conventions. The way in which the enhanced subtitles have been spotted is also slightly different to the broadcast version, so as to ensure that a reduced amount of text is included per subtitle and that the children are not discouraged from reading the subtitles, as discussed in Section 6.3.3.

VIDEO 1B

00:06:06:07 – 00:06:09:16 150 wpm

00:09:31:21 – 00:09:33:13 21 wpm

00:09:33:13 – 00:09:36:04 168 wpm

VIDEO 1E

00:06:06:06 – 00:06:09:12 137 wpm

00:09:32:11 – 00:09:34:15 111 wpm

00:09:34:17 – 00:09:36:17 120 wpm

00:09:36:04 – 00:09:39:12 148 wpm 00:09:36:19 – 00:09:40:04 120 wpm

Figure 55: Enhancement: spotting

The above screenshots contain only some of the subtitles that provide some of the clues needed to answer correctly the content question about why Tommy and Timmy sell their paintings. Firstly, it needs to be understood that the Krummy Kritters Kreepy Kastle is a toy. Then, a connection needs to be made between the determination to buy the toy and their lack of money. Only after it is understood that the lack of money is the cause that triggers the sale of the paintings, can the question be answered correctly.

As reported in Table 12, more careful spotting of subtitles is performed in six of the eight cases selected for content comprehension, with the other two following the same spotting as in the broadcast version. Figure 56 shows an example of careful spotting, where shot changes are respected in order to reinforce the switch from one character to the other. By using this technique, one of the most noticeable results is the fact that it becomes easier for the viewer to associate the subtitles with the actual character who is uttering the sentence. In addition to these cueing modifications, the expression 'who can guess' (first and second screenshots of the broadcast version) is omitted in the enhanced version in order to gain reading time:

VIDEO 2B

VIDEO 2E

00:03:24:10 –

00:03:28:05 – 00:03:28:03 129 wpm

– 00:03:29:01 134 wpm

00:03:28:05 – 00:03:29:21 139 wpm

00:03:29:01 –

00:03:29:23 – 00:03:31:06 127 wpm

– 00:03:31:18 89 wpm

00:03:31:08 – 00:03:32:13 60 wpm

00:03:31:18 – 00:03:36:01 91 wpm 00:03:32:15 – 00:03:36:19 95 wpm

Figure 56: Enhancement: spotting

In Figure 57 below, the idiom 'it's not my cup of tea' is uttered by the grandmother but not understood by Timmy and Tommy. This is made clear by the literal interpretation given by Timmy, who explains that the painting is not of tea but of a boat. Consequently, the grandmother explains the metaphorical meaning of the idiom in a case in which the function of the subtitles is clearly didactic and could be explored further. As recommended by general SDH sources (De Linde and Kay 1999; Ofcom 1999; BBC 2009b) and specifically by Ivarsson and Carroll (1998: 77), subtitle lines should be divided in such a way that "words intimately connected by logic, semantics or grammar are written on the same line wherever possible". In contrast with the broadcast version, the spotting and line breaking of the enhanced subtitles has been performed in a way that aims at presenting each utterance in a self-contained form:

VIDEO 1B VIDEO 1E

00:07:18:16 – 00:07:21:24 112 wpm 00:07:18:14 – 00:07:21:21 98 wpm

00:07:30:00 – 00:07:33:03 115 wpm

00:07:29:20 – 00:07:31:07 113 wpm

00:07:33:03 – 00:07:35:05 115 wpm

00:07:31:09 – 00:07:35:01 123 wpm

00:07:35:05 – 00:07:38:02 104 wpm

00:07:35:03 – 00:07:39:21 104 wpm

00:07:38:02 – 00:07:40:00 112 wpm

Figure 57: Enhancement: spotting

The last two comprehension questions in relation to Video 2 concern the recycling activity carried out by worms. Both the broadcast and the enhanced versions have performed some extent of editing, but of different elements. The following is the literal transcription of the soundtrack:

> Although perhaps not as exciting as Fern's story, the truth is worms are great recyclers. Their amazing digestive system makes soil out of scraps.

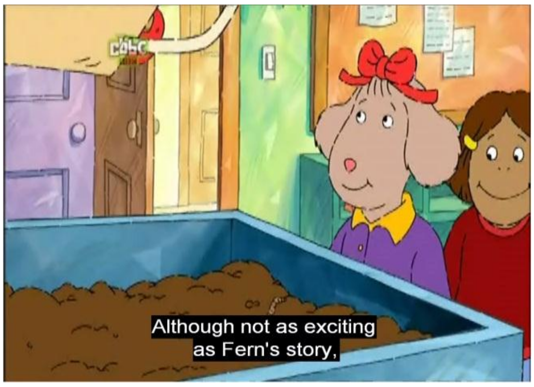
The decision was taken to have the substantive 'scraps' highlighted throughout this scene simply because it was also part of the word recognition task, but this was not an enhancement introduced for the content comprehension task. The example in Figure 58 below takes place towards the end of the clip and it does not represent the only clue given for comprehension, since earlier in the video other clues are also present, such as 'The worms eat the scraps and change it into soil' (in-time at 00:03:52:04 and out-time at 00:3:56:15) and 'When the worms eat the scraps, do they get bigger and bigger?' (in-time at 00:03:56:17 and out-time at 00:04:01:07). The enhanced version of this scene makes use of subtitles that are more literal than the broadcast one, where the expression 'worms are great recyclers' has been totally obliterated. Despite the fact that in the enhanced version some elements have also been omitted to gain reading time, the subtitles are quantitatively more faithful to the soundtrack than the ones used in the broadcast one:

VIDEO 2B

00:12:08:09 – 00:12:12:18 123 wpm

00:12:12:18 – 00:12:16:08 153 wpm

VIDEO 2E



00:12:09:06 – 00:12:12:06 140 wpm

00:12:12:08 – 00:12:14:10 132 wpm

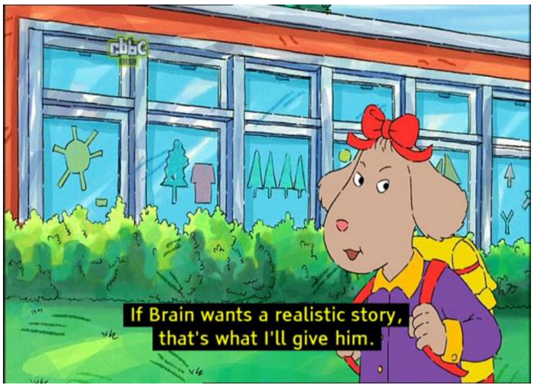
00:12:14:12 – 00:12:17:22 144 wpm

Figure 58: Enhancement: spotting and editing to gain reading time

The technique more often used in the enhanced subtitles in order to facilitate content comprehension has been text reduction in the form of, for instance, omission of interjections such as ‘hmm’ or ‘er’ or discourse markers like ‘I mean’. These omissions have been performed on the occasions when the speech rate is too high and goes over the reading speed set of 140 wpm or when there is a complex or new expression that will benefit from a longer reading time than the one set in the broadcast version.

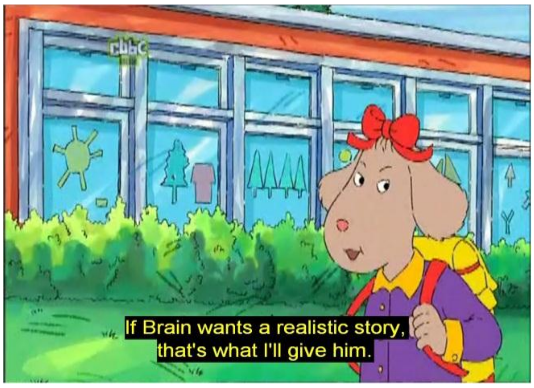
As reported in Table 12, seven of the eight cases selected for content comprehension present text reduction in the form of omission in the enhanced version. Generally speaking, the omission of lexical items triggers an immediate increase in reading time. In Figure 59 below there are no considerable differences between the broadcast and the enhanced subtitles except for the longer reading time made possible in the enhanced version by going over the shot change with the subtitle. In addition, the lexical items "hmm", "I mean" and "er" have been omitted also in an attempt to gain reading time:

VIDEO 2B

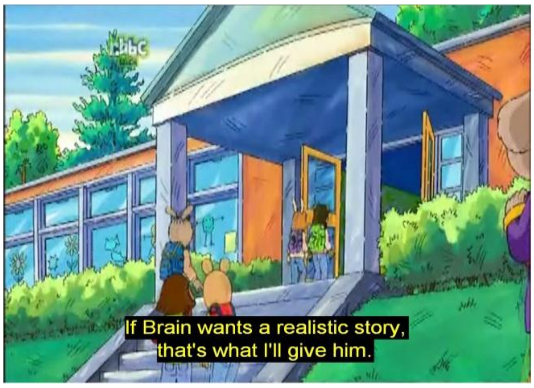


00:03:15:01 – 00:03:19:22 123 wpm

VIDEO 2E



00:03:17:00 –



– 00:03:21:16 129 wpm

00:03:19:23 – 00:03:22:19 118 wpm

00:03:21:18 – 00:03:24:18 96 wpm

00:11:37:22 – 00:11:43:13 119 wpm

00:11:40:09 – 00:11:45:00 121 wpm

00:11:43:13 – 00:11:46:13 80 wpm

00:11:45:02 – 00:11:47:09 89 wpm

00:11:46:13 – 00:11:51:04 137 wpm 00:11:47:11 – 00:11:52:10 113 wpm

Figure 59: Enhancement: editing to gain reading time

To conclude, this chapter has discussed and illustrated the main enhancements used in the subtitles of the experiment to help boost word recognition and content comprehension of the text. Text reduction, in the form of omission, careful spotting and allowing longer reading times whenever possible have been used for both word recognition and content comprehension, whereas repetition and highlighting have been specific strategies used to aid word recognition.

Chapter Seven presents and discusses the main findings of the study for both the word recognition and the content comprehension variables. The results are quantified and analysed by means of statistics (Zarate and Eliahoo 2014) and a discussion is also included a propos the oral feedback spontaneously given by the children after each of the experiments.

Chapter Seven

Main findings and discussion

In the analysis of the main findings of this study, a quantitative approach has been chosen as it has been considered that statistical scrutiny is a suitable one to be used to answer the following relevant research questions:

1. Do enhanced subtitles improve the subjects' performance as far as the word recognition (WR) task is concerned?
2. Do enhanced subtitles improve the subjects' performances as far as the content comprehension (CC) task is concerned?

As already mentioned, the main study was originally designed following a case study methodology (see Section 6.5), as advocated by Yin (2014). Subsequently, a statistical approach was considered particularly suitable in the analysis of the data in order to account for the differences observed in the children's performance scores between the two different conditions that were being assessed: Videos 1B and 2B with broadcast subtitles and Videos 1E and 2E with enhanced subtitles.

In his work, Yin (2014) does not exclude the application of statistical analyses as criteria for interpreting a study's findings, although he does offer an alternative approach, which consists of identifying and addressing rival explanations for the findings obtained.[56]

Inferential, as opposed to descriptive, statistical tests were used to compare the null hypothesis (H_0) – a theory that has been put forward but has not been proved – to the alternative hypothesis (H_1) – a statement of what a statistical hypothesis test is set up to establish. Statistical tests look for evidence to reject H_0 in favour of H_1.

The null hypotheses or theories put forward on the basis of the above mentioned research questions were as follows:

$H_{0(1)}$ Enhanced subtitles do not improve the subjects' WR performances.

$H_{0(2)}$ Enhanced subtitles do not improve the subjects' CC performances.

The alternative hypotheses (H_1) in this case are that enhanced subtitles improve respectively the subjects' WR performances and CC performances.

The statistical software Stata, version 10, was used for the analysis of the data, which was completed with the assistance of the statistical consultant Joseph Eliahoo, from the Statistical Advisory Service at Imperial College London. The statistical methods and results are included in Appendix Eight.

[56] Rival explanations are conceptualised by considering potential arguments from peers. The rivals, anticipated and explained at the design stage of the study, are addressed through rival analysis, a systematic examination of alternative propositions.

7.1 Order of presentation and clip effects

Since the participants were asked to perform similar tasks twice, the possibility existed that the order of presentation of the clips could have an effect on the two dependent variables (WR and CC). For example, the practice gained after the completion of the first task could have helped them perform better in the second task. In order to counteract any potential adverse impact derived from order effects, the study was counterbalanced and the two groups performed the two tasks in reverse order: Group One was first administered broadcast subtitles followed by enhanced subtitles, while Group Two was administered enhanced subtitles in the first instance followed by broadcast subtitles. As already discussed in Section 6.5, the experiment was carried out with two different clips of the same audiovisual programme.

The Mann-Whitney (two-sample Wilcoxon rank-sum) test (Easton and McColl 1997) was used to determine whether the order of presentation had an effect on the performance of the word recognition (WR) task by comparing the total WR scores for broadcast and enhanced subtitles. For this comparison, the total scores for WR were treated as numerical variables, with each correct answer being computed as one full mark; a value ranging from 1 to 9 was therefore possible, depending on the number of correct answers. This test, appropriate for analysing the data obtained from an independent measures design in which two conditions were tested, was used as two groups (Group One and Group Two), each containing different individuals, were exposed to both conditions (broadcast and enhanced) once, i.e. both groups were exposed to enhanced subtitles once and to broadcast subtitles once.

The following null hypothesis was tested:

H_0 = WR scores (for both broadcast and enhanced subtitles) are dependent on order of presentation.

The probability value (p-value) is the probability of getting a value of the test statistic as extreme as, or more extreme than, that observed by chance alone, if the null hypothesis, H_0, is true. By convention, a p-level of less than .05 demonstrates that observed differences are statistically significant. This coincides with rejecting a null hypothesis at the 5% significance level, reported as “$p < 0.05$”. The smaller the p-value is, the more convincing is the rejection of the null hypothesis.

No evidence of a difference in WR total broadcast scores between orders of presentation was noted, the p-value being 0.465, and only marginal evidence of a difference in WR was noted for total enhanced scores between orders of presentation ($p=0.094$).

Fisher's exact test (Cramer and Howitt 2004) was used to compare content comprehension (CC) results against order of presentation. On this occasion, due to the smaller number of questions on CC, that is four as opposed to nine for WR, the total scores for CC were treated as categorical variables: scores from 0 to 2 were combined and ranked as *low*, whereas scores 3 and 4 were ranked as *high*. Fisher's exact test is useful for the analysis of categorical data[57] that result from classifying objects in two different ways, in this particular case CC scores being classified as *low* or *high*. This test is generally used with small sample sizes to examine the significance of the association (contingency) between two kinds of classification, in this case between CC scores and order of presentation. It is called *exact* because the significance of the deviation from a null hypothesis (that is the p-value) can be calculated exactly.

The following null hypothesis was tested:

H_0 = CC scores (for both broadcast and enhanced subtitles) are dependent on order of presentation.

Yet again, there was no evidence of an association between CC total broadcast scores and order of presentation ($p=0.670$) or between CC total enhanced scores and order of presentation ($p=0.406$).

In view of the positive results obtained, the data for the two groups were merged and the focus set on differences between the children’s performances with broadcast and enhanced subtitles. The original four cases were merged and the two

[57] Variables can be categorical (qualitative) or numerical (quantitative).

experimental units, WR and CC, were analysed under two treatments, as illustrated in Figure 60:

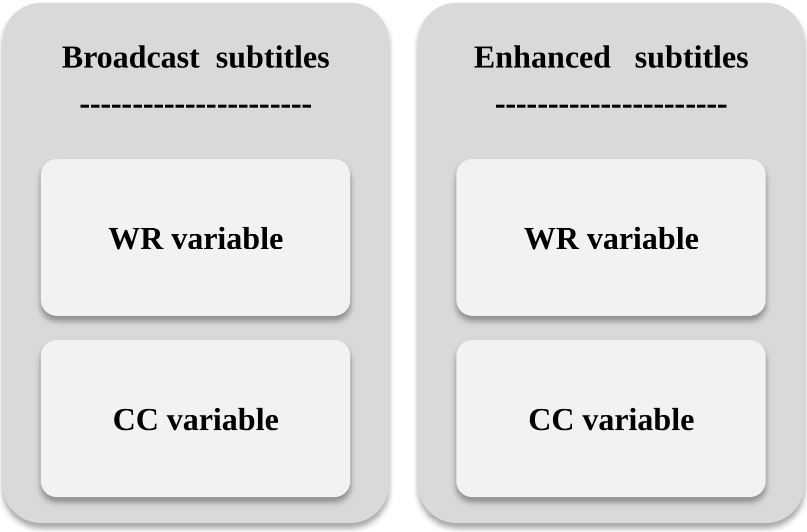


Figure 60: Final study design

7.2 Enhanced subtitles versus broadcast subtitles

The paired Sign test (Easton and McColl 1997) was used to compare potential differences between broadcast and enhanced subtitles total scores for WR. The Sign test is a non-parametric test based on differences and it is generally used when the assumption of normal distribution cannot be made. Its parametric counterpart is the paired t-test (ibid.).

The following null hypothesis was tested:

H_0 = the median difference between WR total broadcast scores and enhanced scores is zero.

The median WR total score for enhanced subtitles is 6.5 against 5.5 for broadcast subtitles; which means that the median difference between the two scores is 1. The 95% confidence interval for the median difference goes from -0.884 to 2. Since this confidence interval contains zero, we fail to reject the null hypothesis.

On this occasion, no evidence of a difference was found (p=0.238) but only a tendency for WR total scores obtained with the enhanced subtitles to be higher than those achieved with broadcast subtitles. This tendency is shown in the graph below, Figure 61, where the two sets of data are compared:

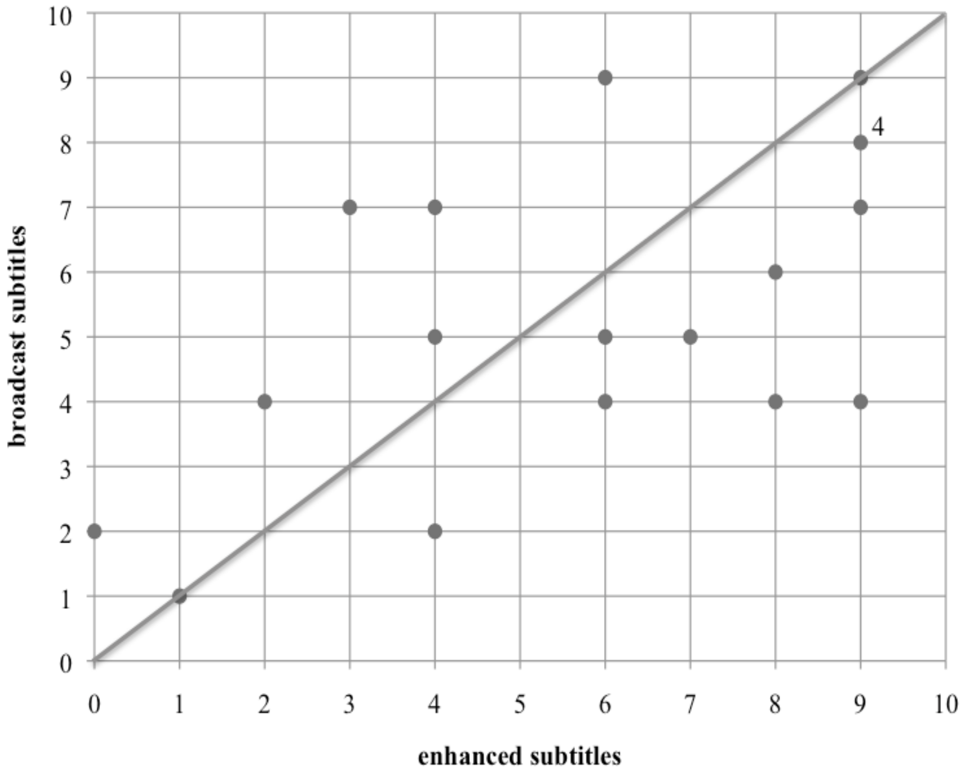


Figure 61: WR total scores

Each point on the graph shows the scores achieved in both tests by each of the 20 participants. Of these, four children achieved the same result (that is 9 on enhanced against 8 on broadcast subtitles), as indicated on the graph.

The line represents a situation where the results achieved with broadcast and enhanced subtitles are the same. Only two children had the same results on both tests. The six children above the line achieved higher results with broadcast subtitles, whereas the 12 children below the line achieved higher results when watching the enhanced subtitles version of the programme.

McNemar's test (Easton and McColl 1997) was used to look at differences between broadcast and enhanced subtitles total scores for CC. McNemar's test is used whenever the performance of the same individuals is measured twice. It is used with binary data, as opposed to the Sign test, which is used with continuous data.

The following null hypothesis was tested:

> H_0 = the two marginal probabilities, i.e. the probabilities of one variable taking a specific value irrespective of the values of the others, for each outcome are the same.

No evidence of a difference was found on this occasion between the CC total broadcast and enhanced scores, where the p-value is 0.375.

7.3 Reading ages versus performance scores

It was considered appropriate to look at whether there were any differences in the way children performed with broadcast and enhanced subtitles depending on their reading age. The main interest was to find out whether enhanced subtitles (and broadcast subtitles) favoured any particular age groups. For this purpose, reading age (RA) was considered to be a more meaningful variable than chronological age (CA). Figure 62 shows the CAs and RAs of all 20 participants:

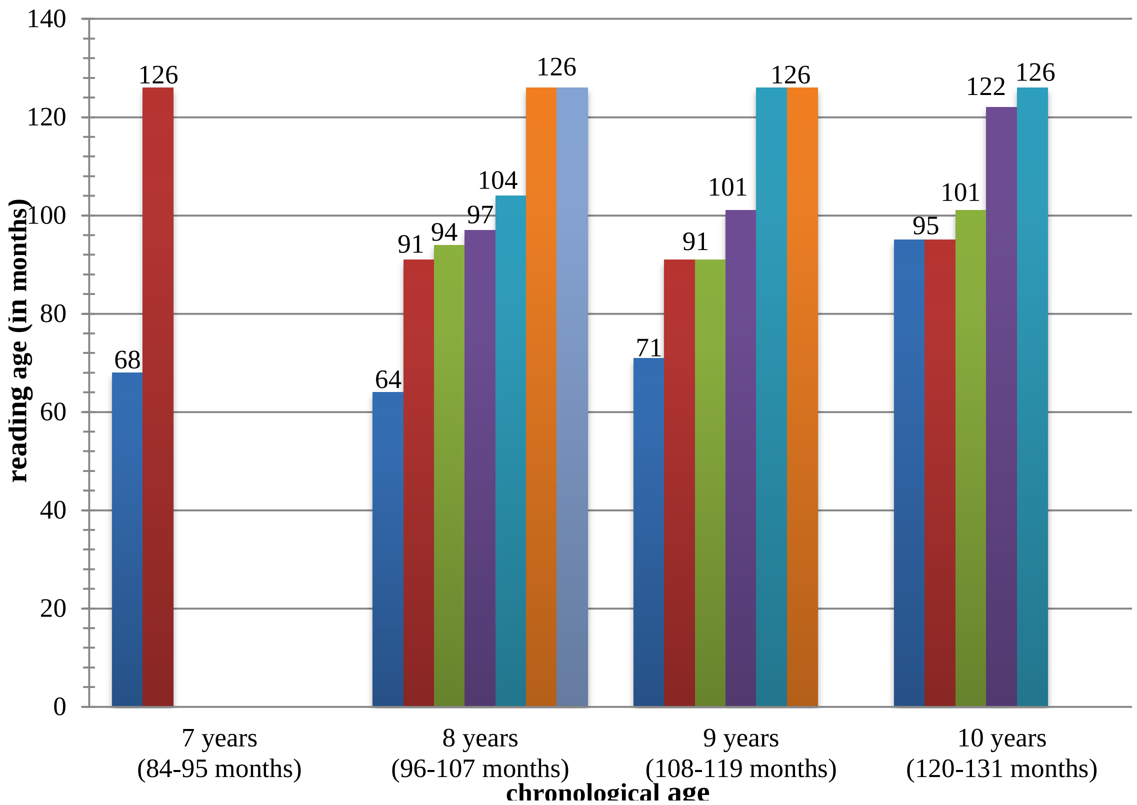


Figure 62: Reading age

It can be noted that although RA increased with CA, a reasonably expected outcome, there was a much more noticeable variation of RAs within the same CA. For example, children with a CA of 8 years, had a RA that ranged between 64 and 126 months (5 to 10 years), as shown in Figure 62. This reinforces the value of RA as an important variable to take into account. Table 14 sums up the averages of both CAs and RAs:

CA	**RA**
7 years	97 months (8 years)
8 years	100 months (8 years and 3 months)
9 years	101 months (8 years and 4 months)
10 years	108 months (9 years)

Table 14: Averages of chronological ages against reading ages

From this table, it can be seen that for children aged seven, the CA appears to be higher, that is eight years. However, this is the average which resulted from two children only, one of them unusually having a much higher RA (10 years) than her age.

The Spearman correlation (Easton and McColl 1997) was used to look at the relationships between the total WR scores obtained – including enhanced and broadcast subtitles – and the reading age of the children. The median reading age was 99 months (eight years) and the range went from 64 to 126 months (from five to ten)

There was strong evidence of a relationship between WR total broadcast scores and the reading age of the participants (r_s=0.705, p=0.0005) and between WR total enhanced scores and the reading age of the subjects (r_s =0.707, p=0.0005). r_s is the nonparametric Spearman correlation coefficient, which, the same as r, ranges from -1 to +1. A value of 0.7 indicates that the two variables – i.e. WR score and reading age – increase together, meaning that the higher the reading age of the child, the better her / his word recognition skills.

Since the correlation coefficients for WR total broadcast scores and WR total enhanced scores are almost identical, it can be concluded that both broadcast and enhanced subtitles showed the same strong positive relationship with reading age. This is represented in the scatter graphs below:

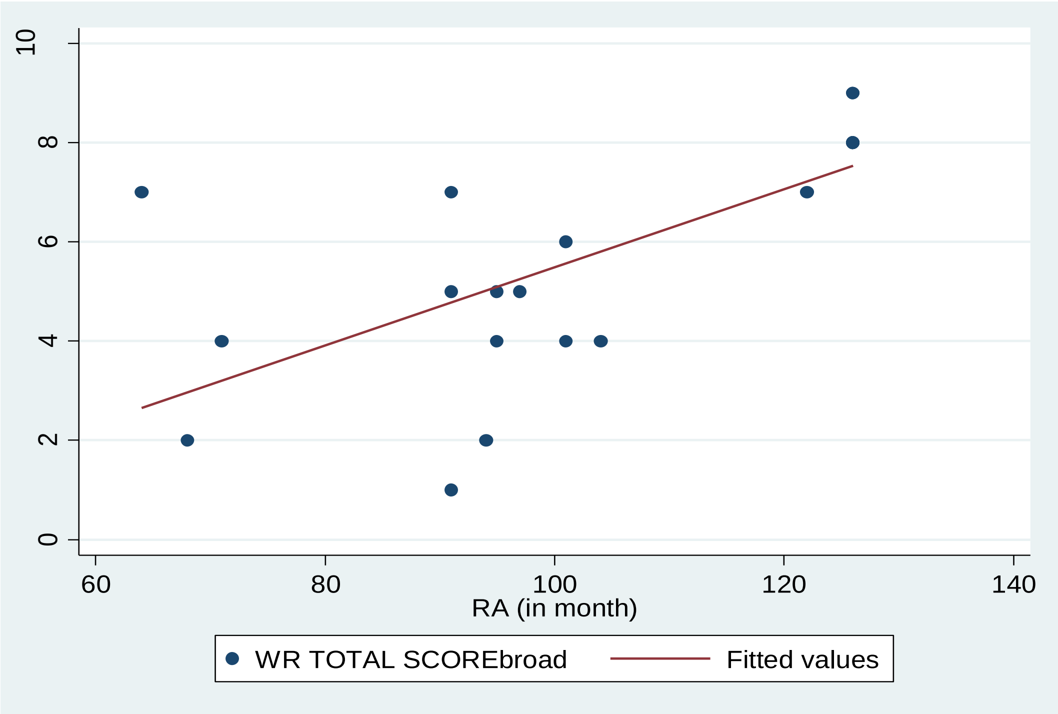


Figure 63: WR total scores, watching the broadcast subtitles, against reading age

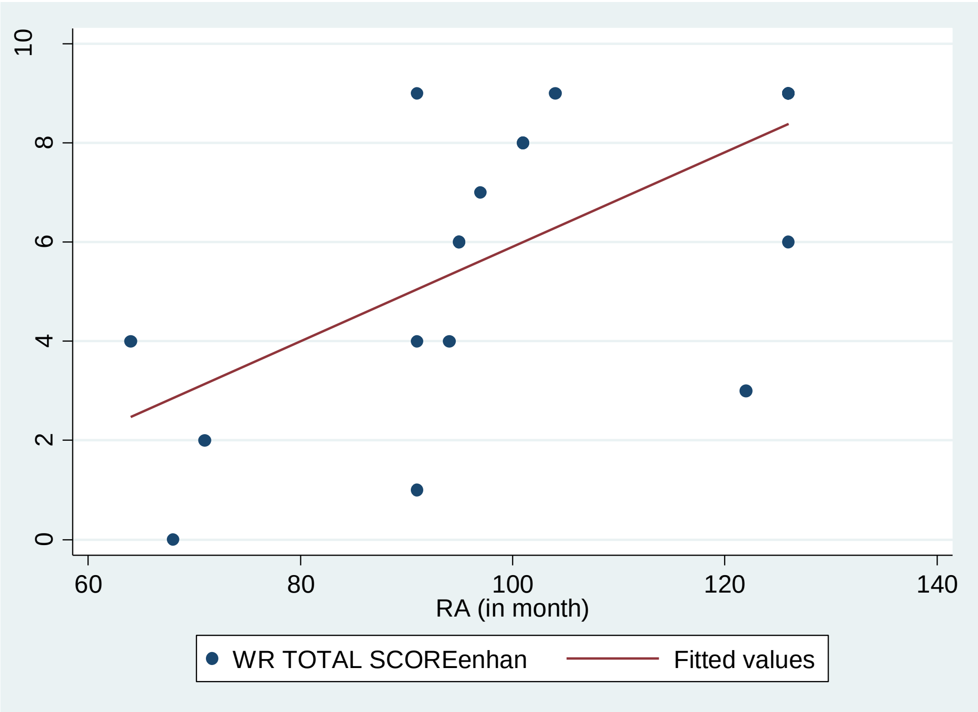


Figure 64: WR total scores, watching the enhanced subtitles, against reading age[58]

[58] *Fitted* (or predicted) *values* are values predicted by a model fitted to a set of data and generated by extending the model past known data points.

Similarly to the WR variable, content comprehension (CC) was also analysed against the reading ages of the participants. Since the data for this variable had been categorised, it was appropriate to use the two-sample Wilcoxon rank sum (Mann-Whitney), which had also been used in this experiment to determine whether the order of presentation of the two subtitled clips had an effect on the children's performance during the WR task.

Bearing in mind that the maximum achievable score for CC was 4, *low CC* refers to scores with a maximum value of 2, whereas *high CC* defines scores with a minimum value of 3. The analyses showed evidence of a difference between high and low CC total scores when watching the enhanced subtitles, with a p-value of 0.004, and strong evidence of a difference in reading age between high and low CC total scores when watching the broadcast subtitles (p=0.001). Table 15 below sums up the median reading ages of the participants under both conditions:

	Broadcast subtitles	**Enhanced subtitles**
Low	91	94
High	124	126

Table 15: Median reading ages for CC

7.4 Amplification device and language versus performance

It was considered appropriate to look at whether children performed differently depending on whether they had cochlear implants or wore hearing aids. The two-sample Wilcoxon rank sum (Mann-Whitney) test was used for these purposes.

A total of 10 children had implants and 10 children used hearing aids. A borderline evidence of a difference in the WR total scores when watching broadcast subtitles (p=0.079) was noted between implanted and non-implanted children (higher rank sum). However, no evidence of a difference was noted in WR total scores when reading enhanced subtitles (p=0.786) between implanted and non-implanted children. This finding suggests that enhanced subtitles catered similarly for all children, irrespective of the amplification device they were using.

As far as content comprehension is concerned, no evidence of an association was found between amplification device and low / high CC total broadcast scores (p=0.650) and low / high CC total enhanced scores (p=1.000).

The two-sample Wilcoxon rank sum (Mann-Whitney) test was used to assess whether the language used by the children affected their performances. Four children were bilingual and used spoken English and British Sign Language, while 16 of them had spoken language only as their means of communication. No evidence of a difference in the WR total scores achieved when watching the broadcast subtitles (p=0.774) and the WR total scores achieved when watching the enhanced subtitles (p=0.594) was found between the two groups. Similarly, no evidence of an association between the language used in the subtitles and the low / high CC total broadcast scores (p=1.000) or low / high CC total enhanced scores (p=0.591) was found.

7.5 Discussion

The original research questions intended to look at the role played by subtitles in relation to two main reading variables, namely word recognition (WR) and content comprehension (CC).

The research available on WR in a subtitling context is limited to the field of second language acquisition by hearing children and has been conducted by scholars like d'Ydewalle and Van de Poel (1999), Koolstra et al. (1997), Koolstra and Beentjes (1999), and Neuman and Koskinen (1992). However, their research approach can also, to a certain extent, be applicable to the case of deaf children on the grounds that the setting is the same – watching subtitles on a screen – and that the language, for different reasons, is somehow 'unfamiliar'. There is evidence that subtitles may facilitate the acquisition of new vocabulary (Neuman and Koskinen 1992) and help improve the development of word recognition (d'Ydewalle and Van de Poel 1999; Koolstra et al. 1997; Koolstra and Beentjes 1999). As Koolstra et al. (1997) explain, the evidence that subtitles benefit the acquisition of vocabulary cannot however be extended to the task of reading comprehension because subtitles do not provide practice in comprehending coherent texts. Reading subtitles is a substantially different task from conventional reading. The immediacy of the subtitles, their appearance and disappearance from the screen, the reading rate at which they have to be read, the usual incompleteness of some subtitles that need to be understood in conjunction with subsequent subtitles, and the segmentation of the text within lines and across subtitles are all elements that do not favour the comprehension of coherent texts. With these premises in mind, WR has been the main focus of the research presented in these pages but space has also be given to CC, where specific techniques with an orthotypographical and technical basis have been introduced to test hypotheses generated by previous research.

The expected strong evidence of a relationship between reading age and reading performance for both the WR and CC variable is applicable to both scenarios of watching broadcast and enhanced subtitles. Although there is no evidence that the scores obtained when watching the enhanced subtitles are higher than the ones achieved by children when watching the broadcast subtitles, a promising tendency is shown for the WR variable.

In order to fully understand the results and to contextualise the environment, it needs to be noted that while the participants had chances of having been exposed to broadcast subtitles previous to the study, as they are widely available on TV, their exposure to enhanced subtitles was a complete novelty. While some of the enhancements – repetition of words, use of longer reading times, careful spotting – were less noticeable, the highlighting of new or difficult words and the switch to a different typeset of bigger size, was a total innovation in the subtitling practice. With this in mind, it is not farfetched to suggest that this could have distracted the participants and could have, as a result, interfered with their WR and CC performances. With hindsight, one of the downsides of the experiment is that the participants were not given any prior training or information on what the various enhancements meant, so they were left to work them out for themselves. A potential consequence could be that the enhancements were in fact a distraction and so they did not contribute significantly positively to raising the children’s scores, despite a tendency shown in the findings for the enhanced scores to be higher than the broadcast scores for the WR variable. Had the participants been alerted to the significance of the enhancements, it would have been interesting to look at whether they would had made a better use of them in their reading performances. It would be useful in future studies to test whether, once the novelty factor is neutralised, the impact of the enhancements on the children's performances is greater.

This study is a first attempt at conducting empirical experimental research on subtitling for deaf children. The original sample size of 30 children was adjusted to 20, the reasons of this reduction in sample size being explained in Section 6.5.1. A smaller sample size inevitably decreases the power of the test as less information is collected and it is therefore more difficult to correctly reject the null hypothesis when one should.

A power analysis calculation was conducted in order to determine how much larger a sample would need to be for the results to be valid. The power of a statistical hypothesis test measures the test's ability to reject a false null hypothesis – i.e. the probability of not committing a type II error.[59] A type II error occurs when the null hypothesis is false and it is wrongly not rejected, a result which is often due to sample sizes being too small. Power analysis allows researchers to determine the minimum sample size required to detect the effect of a given size with a certain degree of confidence.

In this precise case, a sample size of 44 children would have 90% power to detect a difference in means of -1 (e.g. a First condition mean, m_1, of 5.5 and a Second condition mean, m_2, of 6.5), assuming a standard deviation of differences of 2, using a paired t-test with a 0.05 two-sided significance level.[60]

---

[59] In a power analysis calculation, having information about three of the following four elements, allows the investigator to determine the fourth one:
(1) sample size;
(2) effect size, calculated using:
    (a) difference in means (of -1, e.g. a First condition mean, m1, of 5.5 and a Second condition mean, m2, of 6.5)
    (b) assumed standard deviation of differences of 2 (the standard deviation of differences being a measure of the variability of the difference between conditions within each subject);
(3) significance level = a type I error. This is a fixed probability of a type I error, that is of wrongly rejecting the null hypothesis, if it is in fact true. The significance level is denoted by α (alpha).
(4) power = 1 – a type II error.

[60] Note that this study requires the use of a paired t-test as each subject belongs to both the treatment (enhanced subtitles) and the control group (broadcast subtitles). A two-sample t-test would not be appropriate in these circumstances because the independence assumption would not be valid.

7.6 Children's voices

As already mentioned, at the end of the study, the participants were invited to ask questions and make comments about the subtitles and the activity in general. Their voices were recorded through the use of a Dictaphone and are transcribed in Appendix 7.

Interestingly, the use of colours to identify speakers was one of the most discussed elements, despite it not being included in the questionnaires. Broadcast subtitles used all recommended colours (white, cyan, green, yellow) except for magenta,[61] whereas enhanced subtitles resorted to all five colours so as to match them to the characters' predominant clothes' colours. Tommy was wearing a red scarf and was allocated pink as the closest available colour, whereas cyan was allocated to Timmy, who was wearing a blue scarf. The children were supportive of the use of colours for speaker identification and one of them noticed the use of magenta in the enhanced subtitles:

> *"I liked the colours."*
>
> Profoundly deaf girl, 9 years, with CI, on broadcast subtitles.
>
> *"When two people are talking at once, they should have different colours."*
>
> Severely / profoundly deaf girl, 10 years, with HA, on broadcast subtitles.
>
> *"Last time* [broadcast subtitles session] *I said you could turn on the colours and you did."*
>
> Severely / profoundly deaf girl, 10 years, with HA, on enhanced subtitles.
>
> *"I like subtitles that use different colours when there's different people talking. They didn't have pink, red."*
>
> Profoundly deaf boy, 10 years, with CI, on enhanced subtitles.

Reading speed was another dimension raised by the children during the discussion. Again, this element was not among the ones studied in this project, although on the whole the enhanced subtitled version tended to have lower reading speeds than the

[61] The BBC (2009b) guidelines recommend the use of four colours only: white, cyan, green and yellow.

version with the broadcast subtitles. Without taking into account the subtitling of lyrics, some dialogue exchanges in the broadcast version reached reading speeds of 190 wpm, whereas the maximum reading speed reached in the enhanced version was of 157 wpm. The children commented on the use of fast reading speeds:

> "*Those* [broadcast] *subtitles are very quickly written."*
> Profoundly deaf boy, 10 years, RA 101 months, with CI.
>
> *"The* [broadcast] *subtitles were fast."*
> Profoundly deaf girl, 11years, RA 126 months, with CI.
>
> *"Slower is better, then you have some time to read it."*
> Profoundly deaf girl, 8 years, RA 126 months, with CI, on enhanced subtitles.
>
> *"I could read it because they were slower than last time* [pilot studies]*"*
> Deaf girl with mild hearing loss, 10 years, RA 122 months, with HA, on enhanced subtitles.

The children made comparisons between the subtitles they watched in the study and the ones usually seen at home, highlighting their preference for lower reading speeds and the appreciation for the use of colours for characters' identification. They contributed more comments after the enhanced subtitles viewing session, with the exception of the following two comments, which were recorded after the children had taken part in the broadcast session:

> *"No different from the ones I have at home."*
> Profoundly deaf boy, 8 years, RA 126 months, with CI.
>
> "*I could understand the* [broadcast] *subtitles. The ones I have at home are very slow, if there's someone saying something, then there's a different subtitle from the last one. It didn't happen here."*
>
> Severely deaf girl, 9 years, RA 126 months, with HA.

This last comment raised the issue of synchronisation between image / sound and subtitle, which was again discussed after the enhanced subtitles session, showing that the children were very aware of technical issues surrounding the transmission of subtitles:

> *"The subtitles at home sometimes go off."*
> Profoundly deaf boy, aged 10, RA 95 months, with CI.

All children voiced their agreement with this comment, and the discussion continued with remarks about the unavailability of subtitles on some broadcast and DVD programmes. The children were particularly vocal in their dissatisfaction with this state of affairs, as these two comments testify:

> *"Films sometimes don't have subtitles on television."*
> Profoundly deaf boy, aged 10, RA 126 months, with CI.
>
> *"Yes, they say 'no subtitles'. And some DVDs, they say 'no'. I don't like it."*
> Profoundly deaf girl, 8 years, RA 126 months, with CI, after enhanced subtitles session.

Children were also aware of linguistic matters like spelling, particularly in reference to broadcast subtitles watched at home. The following comments are an illustration of their concerns in these areas:

> *"Sometimes* [at home] *they don't spell it properly and they just leave gaps, and then you don't know what they are saying. It's boring."*
>
> *"At home they are hard because they don't type it properly."*
>
> *"At home they don't spell it properly."*
>
> Profoundly deaf girl, 8 years, RA 126 months, with CI, after enhanced subtitles session.

These recorded sessions were planned with an exploratory purpose in mind and, although firm conclusions from these comments cannot be drawn, they are useful in identifying the elements that most caught the children's attention. Also, the information gathered during these sessions has the potential of shedding further light on some of the issues being researched. In this sense, possible ways could be looked into including them as part of the methodology of experimental research in an attempt to complement quantitative studies. In this specific case, the recording of the children's voices at the end of each viewing session was triggered by a curiosity that arose as the study was being conducted. In the future, this type of qualitative study should be planned in advance while designing the study.

PART FOUR

CONCLUSIONS

Chapter Eight

Conclusions and future research

The current study was set out to make a contribution towards the practice of subtitling for deaf children, which has been contextualised within the wider field of Audiovisual Translation. Although the research has been conducted on SDH produced in the UK and tested on British children, it is hoped that the results will also be relevant in other countries in and outside Europe. Since the general theoretical literature on this subject is rather limited and outdated, research conducted with hearing children within the AVT field, particularly in interlingual subtitling, as well as relevant research from other disciplines, namely Deaf Studies, has also been considered to broaden horizons and find potential synergies.

The specific literature on SDH for children dates back to some three decades ago, when the effectiveness of subtitling strategies with British children in secondary schools for the deaf, in particular comprehension at various language levels and reading speeds, were investigated by authors such as Baker et al. (1984) and Baker (1985). Subsequently, deaf children's comprehension of subtitled television programmes was studied by Gregory and Sancho-Aldridge (1996), also in the UK. These studies contributed to the small section specifically devoted to deaf children that can be found in *The Guidance on Standards for Subtitling* (Ofcom 1999), which is generally adopted by broadcasters and subtitling companies in the UK. The lack of research in the field is acutely reflected in more recent publications (Ofcom 2006a; Ofcom 2012a), where there is no specific guidance on SDH for children but, instead, some crucial aspects of the subtitling – such as the maximum reading speed – are left to the judgement and common sense of practitioners. Curiously enough, guidelines in this very same point are indeed provided for the subtitling of programmes aimed at adults.

Relevant research conducted with hearing children identified subtitled TV – as opposed to watching TV programmes without subtitles, reading along and listening to the text, and textbook – as the format that most encouraged the acquisition of new vocabulary and concepts (Neuman and Koskinen 1992). These findings are in part supported by Koolstra et al. (1997), who, through a three-year panel study, identified vocabulary as the only sub-skill that profits from watching subtitled programmes, and by Koolstra and Beentjes (1999), who, having exposed Dutch hearing children to foreign programmes with and without Dutch subtitles, concluded that subtitles benefit the acquisition of foreign words. There is also evidence that visual acquisition of vocabulary occurs with no or limited access to the auditory channel (d'Ydewalle and Van de Poel 1999). Following this same train of thought, Paivio (2006) argues that beginner readers learn to read concrete words by sight much faster when the words are connected to images rather than paired only with their pronunciations. At the basis of this approach lies the dual coding theory (Paivio and Lambert 1981; Paivio 1991), which considers that receiving the same information through different channels promotes and facilitates the learning of a second or foreign language. This theory strongly suggests that subtitles can therefore be exploited as a tool for word recognition, arguably even in the case of pre-school children who are unable to read but may nevertheless be able to associate the shape of the word to the image on screen.

There are contrastive views as per whether English is a first or second language for deaf children. Some researchers (Quigley, Smith, and Wilbur 1974; Quigley, Wilbur, and Montanelli 1974) have found that deaf students acquire English in a qualitatively similar way, although quantitatively reduced, to that of hearing learners of English as their first language, while others (Charrow and Fletcher 1974; Charrow 1975) have shown that deaf students learning English perform some aspects in a very similar manner to that of hearing students learning English as a second language. The latter results somehow justify the application of research conducted with hearing children learning a second language to the case of deaf children. However, in this thesis it was considered appropriate to move beyond this debate as the portrayed views are based on research that is outdated, particularly since in these last decades there have been considerable changes in the lives of deaf children, mainly triggered by technological and medical advances. To mention a few:

1. With the introduction of the NHS Newborn Hearing Screening Programme (NHSP), deafness is likely to be detected at an earlier age than it was in the past.
2. Children's digital consumption (including time spent online, playing games, watching DVDs) and exposure to audiovisual materials has increased considerably and so has the number of audiovisual programmes broadcast and distributed with SDH, as discussed in Chapter Six.
3. The introduction of cochlear implants for deaf children in the 1980s has affected the way severely and profoundly deaf children communicate and learn the spoken language.
4. The education of deaf children has changed substantially in the UK as schools for the deaf have closed down leaving room to the implementation of mainstreaming policy.

These changes called for an updated analysis of deaf children's current realities that looked at their reading habits and their lives in a comprehensive and encompassing way. Aspects regarding the children’s communication method chosen have been discussed in relation with the advent of cochlear implantation, deaf children's upbringing (by hearing or deaf parent), and educational setting attended, whether schools for the deaf or mainstream schools with a resource provision in place, normally a specialist unit. This analysis, together with an overview of deaf children's linguistic difficulties, as provided by Deaf Studies, imparted useful knowledge that could be applied to the practice of SDH for children, ultimately guiding the design of the empirical part of the project.

Before proceeding to the actual empirical analysis, though, it was considered appropriate to observe and explore the subtitling practice on British television, to find out what SDH is being offered to deaf children on television. Having considered, in an interdisciplinary way, the literature conducted on reading and language acquisition that is applicable to deaf children and having also mapped out the subtitling panorama in the UK, the initial general research question which intended to look into the best way to produce subtitles that met the reading characteristics of deaf children was narrowed down into looking at whether enhanced subtitles could be considered as a suitable tool for practising visual recognition of new words and whether they could suggest systematic techniques to support content comprehension.

8.1 Empirical findings

Before embarking on the main empirical analysis two preliminary studies were conducted with the aim of testing procedures – that is, the appropriateness of the duration of the clip, the length of the session and the suitability of the setting – and materials – i.e. clarity of expression of the parental consent forms, full understanding by the children of the phrasing of the questionnaires and the value of the various orthotypographical enhancements. A case study methodology, as advocated by Yin (2009), was adopted. The findings, discussed in ample detail in Section 6.3, were useful in defining the methodology of the main study, which although initially designed following Yin's (2009) case study methodology, diverted to a more experimental approach as the data was analysed using statistics.

As far as the first main research question is concerned, that is, whether enhanced subtitles improve the subjects' performances of the word recognition task, a tendency was noticed for WR total scores obtained using enhanced subtitles to be higher than those achieved with broadcast subtitles. In the case of the second research question on content comprehension of subtitles, no difference was found between CC total scores obtained using enhanced subtitles and those achieved using broadcast subtitles.

During the analysis of the data, it seemed relevant to look at whether there was any difference in performances depending on the hearing device being used by the children: that is, hearing aid or cochlear implant. Interestingly, in the case of WR in the broadcast condition, borderline evidence of a difference in the total scores was noted between implanted and non-implanted children. The difference was in favour of the latter, suggesting that broadcast subtitles seem to cater more for children with hearing aids than for those with cochlear implants. No evidence of a difference was noted in WR total enhanced scores between implanted and non-implanted children, which leads to the conclusion that enhanced subtitles catered similarly for all children irrespective of the amplification device in use.

8.2 Theoretical implications

One of the most salient points of this project is that it is the first study ever to be conducted on word recognition in the context of subtitling for deaf children. Existing theories developed in the field of second language acquisition by hearing children provide evidence that subtitles may facilitate vocabulary (Neuman and Koskinen 1992) and improve the development of word recognition (d'Ydewalle and Van de Poel 1999; Koolstra et al. 1997; Koolstra and Beentjes 1999). These previous findings constitute the theoretical foundations at the base of the study for the WR variable. However, as far as content comprehension of subtitles is concerned, there is no compelling evidence that subtitles can be used as a tool for comprehending texts, in fact, among the researchers mentioned above, only Neuman and Koskinen (1992) observed that subtitles favoured the acquisition of concepts. This lack of previous evidence helps explain why the project has focused more on the WR variable than on the CC variable and has devoted the majority of the questions in the final questionnaire to the WR task.

Generally speaking, the findings of the current study are consistent with the existing theory on both fronts, i.e. WR and CC. Although there is no evidence ($p=0.238$) that the scores obtained by the children when watching the programme with enhanced subtitles are higher than when watching the broadcast ones, a slight tendency is shown when it comes to the WR variable in the enhanced subtitles. The following are the technical and orthotypographical enhancements which were introduced in the experimental subtitles and which are responsible for this observed tendency: (1) repetition of words whenever they were repeated in the soundtrack, specifically for the words tested in the WR task; (2) highlighting of new or difficult words through the use of a bigger and different typeface; (3) text reduction, especially by means of omission; (4) careful spotting across subtitles and line breaking inside subtitles; (5) application of longer reading times. Six children achieved higher results with broadcast subtitles, whereas 12 children achieved higher results with enhanced subtitle and two performed identically with both types.

To better appreciate the value of these findings, two main factors need to be taken into consideration. On the one hand, the children's exposure to enhanced subtitles was a complete novelty, which could have led to distraction in the children's attention and, consequently, to negative interference with the results. On the other hand, the rather small sample size of subjects inevitably decreased the power of the empirical test as less information was collected. It seems legitimate to assume that having had a larger sample of children, the yielded results may have been somewhat different.

8.3 Policy implication

The findings from this thesis could influence current SDH policy and, in particular, the recommendations published by the industry regulator (Ofcom 1999; Ofcom 2006a; Ofcom 2012a) if they were to be backed up by a larger study to verify whether by neutralising the novelty factor, the impact of the enhancements is greater on the children's performances. The tendency of the higher scores in the WR task, achieved by subjects who had watched the enhanced subtitled version of the programme, did not achieve full significance, but a power analysis showed that the sample size was too small and that a sample size of 44 children (rather than 20) would have been needed for the results to be valid. Taking this into account, this experiment can be considered a good pilot study for a project of a larger scale into a topic that up to now has been substantially under-researched.

A more immediate effect on policy is the confirmation, thanks to this study, that conducting experimental research with subjects is feasible and can yield very positive results that cannot be derived in any other way, particularly in the field of study that examines SDH for children. Indeed, experimental research seems to have been replaced in the last decades by the use of surveys, that is a non-experimental, descriptive research method, perhaps because the design and implementation of experiments can be too laborious and complex, particularly if compared with the use of surveys. The latter is a research tool that may be suitable for investigating preferences, but it is inappropriate for researching aspects related to the production of subtitles that cater for deaf children, taking into account their reading characteristics and the potential didactic function of the subtitles. At the time of writing, the last experimental project conducted with deaf children, the results of which are actually taken into consideration by the UK regulators, is that of Gregory and Sancho-Aldridge (1996).

Before discussing possible future research routes, some specific recommendations derived from this research project can be made for subtitling companies and broadcasters. Having looked specifically at word recognition, the following advice can be given:

1. New or difficult words should be introduced and highlighted by choosing a different typeface and font size from the standard one used throughout the programme.
2. Longer reading times should be allowed when new or difficult words are introduced. If necessary, interjections and / or discourse markers could be omitted and the subtitle could be left over the shot change (within the same scene only).
3. Repetition of new and difficult words present in the soundtrack should always be conveyed in the subtitle, ensuring visual similarity between subtitles where the soundtrack allows for it.

As general guidance, it is advisable not to have a large amount of text in one go but rather consider segmenting it in two (possibly one line) subtitles so as not to discourage children from reading. When editing the original text, it is preferable not to paraphrase as a mismatch between what is heard and what is written is undesirable since most deaf children, regardless of whether they use cochlear implants or hearing aids, will have access to sound (albeit in different ways and to different extents).

SDH for children offers a variety of topics to be researched (the ones connected to this project are being discussed in Section 8.4) but some of the matters related to easing the reading process for younger audiences, despite being dictated by common sense, are not always implemented in the subtitling practice. For instance, line breaks are not always used to reinforce the switch from one speaker to the other (or from sound effects to dialogues). Instead, it is common practice to have more than one speaker (or sound effects and dialogues) in the same line. Another example is that of sound effects, which are not always subtitled in a consistent way. Sound can be reproduced by using either onomatopoeias or descriptive labels. If a descriptive label is used to make an active statement by combining noun and verb (e.g. 'dog barks'), this same structure should be maintained, rather that introducing, for instance, the gerund (e.g. 'barking') later on.

Since there are not any specific exhaustive guidelines on SDH for children, providers do not seem to make a clear distinction between SDH for adults and for children. Further research involving deaf children will surely have an impact on the subtitling practice, but knowing more about the world of deaf children and thinking of subtitles for this target group in an educational way can certainly direct subtitlers' choices.

8.4 Recommendations for future research

It is clear that there is a need for more experimental research with deaf children in order to identify subtitling methods that suit their needs and then propose them as recommendations for practitioners working in this field. The findings of this study make for a good pilot and constitute a solid basis for conducting a larger scale study in order to assess whether different significant results would be achieved with a larger sample. The enhancements introduced in the subtitles for the WR task should be reassessed, possibly individually, in order to get a clearer picture of how each of them works with the children. As far as content comprehension is concerned, it is clear that a study specifically focused on this variable is needed; one which can be founded on the same methodology as the one applied to this project. Apart from the orthotypographical and technical enhancements introduced in this project, it would be interesting to look into how different levels of editing can affect comprehension, in a similar manner as to what Gregory and Sancho-Aldridge (1996) have done in the past.

Apart from increasing the sample size of the participants, the logistics of the studies could benefit from a reorganisation so that data is collected in a longitudinal axis by having the subtitling experiments possibly complimenting the school activities schedule throughout the entire year. Human involvement may be another issue to be considered as this whole project has been conducted by one single researcher with the punctual support of a statistician. It is clear that the scale of the project could be easily increased by initiating a concrete collaboration between academia and the industry, including broadcasters, subtitling companies and regulators. This would also certainly contribute to increasing the impact of the findings and raising the visibility of subtitling for deaf children. Setting up a team of collaborators coming from different disciplines, such as linguistics, psychology, child development and neuroscience of language, would help bridge the gap between disciplines that are connected but have traditionally worked separately, including Audiovisual Translation and Deaf Studies. Synergies of this nature would ultimately make a greater contribution to knowledge.

Beyond the two main areas that have been dealt with in the previous pages of this thesis, namely word recognition and content comprehension through the use of intralingual subtitles, the following are some other topics that have not been covered in this project but that are worth investigating in the future:

1. Application of appropriate reading speeds, a dimension that is not regulated currently despite its enormous importance. The use of eye tracking technology would be appropriate for the study of this specific variable.
2. The use of subtitles by pre-school children. Research by authors like Jensema (2000; 2003) shows that the activity of reading subtitles is dependent on the acquisition of reading skills and therefore deaf children start using subtitles when they have acquired the necessary reading skills to understand them (from seven years of age). However, in a society immersed in audiovisual communication, where the use of subtitles is nearly ubiquitous, there is potential to study whether young deaf children can establish a visual connection between the written word and the image without having developed any reading skills.
3. The use of subtitles by predominantly signing children. In this project, since the intention was to investigate the subtitling practice for the majority of deaf children, it was considered appropriate to recruit the participants from a

mainstream school, as this represents the educational setting most attended by deaf children. Therefore, it would be interesting to investigate strategies for fostering word recognition and content comprehension that would be applicable to the minority of deaf children that acquire sign language as their first language, as the difficulties encountered by the two groups of children are bound to be different.

4. To explore the potential offered by digital technology. In this respect, digital television and DVDs allow for a much more creative approach to subtitling, which has been documented by Díaz-Cintas (2010) in the case of interlingual subtitling for hearing audiences, while the research available in SDH is all based on analogue television. It would be interesting to see if word recognition, for example, can be supported by the use of animated subtitles.

This project has made an empirical contribution to the study of WR recognition in an audiovisual subtitling context and hopes to be useful in encouraging future research on the subject, possibly of a much larger scale and of a more interdisciplinary nature. The process of reading (static text) by deaf children and the difficulties they encounter have been discussed and analysed by exploring and presenting knowledge made available by other disciplines, namely Deaf Studies. This excursus into a ‘different’ discipline was initially triggered by the limited and outdated research specific to deaf children that had been conducted within Audiovisual Translation, but then proved particularly effective in constructing a comprehensive picture of deaf children's worlds. Although not all aspects are supported by the empirical part of the project, which has focussed mainly on word recognition and partly on content comprehension, the information provided on the lives of deaf children – their socio-cultural background, their preferred method of communication and their education involvement – constitutes a good starting point for subtitlers and practitioners willing to know more about the specific needs of this audience so that they can do their work ever so slightly better.

Bibliography

Action on Hearing Loss. n.d. *Cochlear Implants*, accessed June 17, 2014, www.actiononhearingloss.org.uk/your-hearing/about-deafness-and-hearing-loss/cochlear-implants.aspx

——— 2011a. *Access to DVDs and Computer Games for People with Hearing Loss. Policy Statement*, accessed August 7, 2014, www.actiononhearingloss.org.uk/~/media/Documents/Policy research and influencing/Policy/Consultation responses/Policy statements/Access to services/Access to dvds/Access to dvds October 2011 pdf.ashx

——— 2011b. *Facts and Figures on Hearing Loss and Tinnitus*, accessed August 7, 2014, www.actiononhearingloss.org.uk/your-hearing/about-deafness-and-hearing-loss/statistics/~/media/56697A2C7BE349618D336B41A12B85E3.ashx

——— 2011c. *Response to ATVOD's Consultation on Best Practice Guidelines for Access Services on Video on Demand Services*, accessed May 16, 2014, www.atvod.co.uk/uploads/files/RNID_response.pdf

——— 2009. *Deafness - the Facts*, accessed August 7, 2014, http://learn.coleggwent.ac.uk/pluginfile.php/69742/mod_folder/content/0/deafness-the-facts.pdf?forcedownload=1

——— 2006. *Response by RNID to Television Access Services: Review of the Code and Guidance*, accessed August 7, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/rnid.pdf

Adams, Marilyn Jager. 1990. *Beginning to Read: Thinking and Learning about Print*. Cambridge, MA: MIT Press.

ADPS. 2013. *ADPS: Home*, accessed April 13, 2014, www.adps.education.ed.ac.uk

AGENDA. n.d. *History of the United Nations Convention on the Rights of Persons with Disabilities*, accessed May 14, 2014, http://www2.agendaasia.org/index.php/articles/news/165-history-of-the-united-nations-convention-on-the-rights-of-persons-with-disabilities

Allen, Thomas E. 1986. "Patterns of Academic Achievement among Hearing Impaired Students: 1974 and 1983." In *Deaf Children in America*, edited by A. N. Schildroth and M. A. Karchmer, 161-206. San Diego, CA: College-Hill Press.

Archbold, Sue, Margaret Harris, Gerard O'Donoghue, Thomas Nikolopoulos, Alison White, and Hazel L. Richmond. 2008. "Reading Abilities After Cochlear Implantation: The Effect of Age at Implantation on Outcomes at 5 and 7 Years After Implantation." *International Journal of Pediatric Otorhinolaryngology* 72 (10): 1471-1478.

Arnáiz-Uzquiza, Verónica. 2010. "SUBSORDIG: The Need for a Deep Analysis of Data." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Ana Matamala and Pilar Orero, 163-174. Bern: Peter Lang.

ATVOD. 2012. *Video on Demand Access Services. Best Practice Guidelines for Service Providers*, accessed August 7, 2014, www.atvod.co.uk/uploads/files/Access_Services_best_practice_guidelines_FINAL_120912.pdf

——— 2011. *Consultation on Best Practice Guidelines for Access Services on Video on Demand Services*, accessed August 7, 2014, www.atvod.co.uk/uploads/files/Consultation_-_Guidelines_on_VOD_Access_Services_March_2011.pdf

AVMSD. 2010. *Directive (of the European Parliament and of the Council) 2010/13/EU of 10 March 2010 on the Coordination of Certain Provisions Laid Down by Law, Regulation Or Administrative Action in Member States Concerning the Provision of Audiovisual Media Services (Audiovisual Media Services Directive)*, Public Law OJ l95/1, 2010.

Baker, Mona and Gabriela Saldanha. 2009. *Routledge Encyclopedia of Translation Studies*. 2nd ed. London and New York: Routledge.

Baker, Robert G. 1985. *Subtitling Television for Deaf Children*. Media in Education Research 3. Southampton University: Department of Teaching Media.

——— 1982. *ORACLE Subtitling for the Deaf and Hard of Hearing*. Unpublished Final Report to IBA/ITCA.

——— 1981. *Guidelines for the Subtitling of Television Programmes for the Deaf and Hard of Hearing*. Southampton University: IBA/ITCA.

Baker, Robert G., Independent Broadcasting Authority, and Independent Television Companies Association. 1981. *Guidelines for the Subtitling of Television Programmes for the Deaf and Hard of Hearing*. Southampton University.

Baker, Robert G., Andrew D. Lambourne, and Guy Rowston. 1984. *Handbook for Television Subtitlers* (Revised Edition). Winchester: IBA Engineering Division.

Baker, Robert G., Andrew D. Lambourne, Guy Rowston, Independent Broadcasting Authority, and Independent Television Companies Association. 1982. *Handbook for Television Subtitlers*. Winchester: IBA.

Bartoll, Eduard and Anjana Martinez Tejerina. 2010. "The Positioning of Subtitles for Deaf and Hard of Hearing." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Anna Matamala and Pilar Orero, 69-87. Bern: Peter Lang.

BATOD. n.d. *Schools for Deaf Children in the UK*, accessed May 29, 2014, www.batod.org.uk/index.php?id=/links/deafschoolslink.htm

BBC. 2014. *BBC Access Services: Get Subtitled*, accessed May 29, 2014, www.bbc.co.uk/accessibility/on_the_bbc/subtitles.shtml

——— 2012. *Technical Standards for Delivery of Television Programmes to BBC*, accessed August 7, 2014. www.bbc.co.uk/guidelines/dq/pdf/tv/TechnicalDeliveryStandardsBBCv3.pdf

——— 2011. C*inema Subtitle Glasses Give Promise to Deaf Film Fans*, last modified August 25, 2011, accessed July 27, 2014, www.bbc.co.uk/news/technology-14654339

——— 2009a. *Commissioning – CBBC Strategy, Aims and Audience*, accessed May 29, 2014, www.bbc.co.uk/commissioning/tv/network/channels/cbbc.shtml

——— 2009b. *Online Subtitling Editorial Guidelines V1.1.*, accessed August 7, 2014, www.bbc.co.uk/guidelines/futuremedia/accessibility/subtitling_guides/online_sub_editorial_guidelines_vs1_1.pdf

——— 2006. *Response to Television Access Service Review*, accessed August 7, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/bbc.pdf

BCIG. 2012. *BCIG Annual Update on UK Cochlear Implant Provision (2011-2012)*, accessed August 7, 2014, www.bcig.org.uk/downloads/pdfs/Pie Charts for Number of Cochlear Implants 2011-2012.pdf

BDA. 2014. *About BSL*. British Deaf Association, accessed June 17, 2014, www.bda.org.uk/About BSL

BFI. n.d. *Digital Screen Network*, accessed July 27, 2014, www.bfi.org.uk/film-industry/lottery-funding-distribution/closed-award-schemes/digital-screen-network

Bitner-Glindzicz, Maria. 2002. "Hereditary Deafness and Phenotyping in Humans." *British Medical Bulletin* 63: 73-94.

Blackwell, Peter M., E. Engen, J. Fischgrund, and C. Zarcadoolas. 1978. *Sentences and Other Systems: A Language and Learning Curriculum for Hearing-*

Impaired Children. Washington, DC: Alexander Graham Bell Association for the Deaf.

Bloch, Bernard and George Leonard Trager. 1942. *Outline of Linguistic Analysis*. Baltimore: Linguistic Society of America at the Waverly Press.

Bloom, Lois and Margaret Lahey. 1978. *Language Development and Language Disorders*. New York: John Wiley & Sons.

Board of Education. 1921. *The Teaching of English in England (Newbolt Report)*, accessed August 7, 2014, www.educationengland.org.uk/documents/newbolt/newbolt1921.html

Boatner, Edmund B. 1950. "Captioned Films for the Deaf." *American Annals of the Deaf* 96 (3): 346-352.

Bookbinder, G. E., D. Vincent, and M. Crumpler. 2002. "Salford Sentence Reading Test (Revised)." London, UK: Hodder Education.

Brennan, Mary. 1997. *See what I Mean? Exploiting BSL Visual Encoding in Teaching and Learning*, accessed August 7, 2014, www.ssc.education.ed.ac.uk/resources/deaf/maryb.html

——— 1975. "Can Deaf Children Acquire Language? An Evaluation of Linguistic Principles in Deaf Education." *American Annals of the Deaf* 120 (5): 463-479.

Brentari, Diane. 1998. *A Prosodic Model of Sign Language Phonology*. Cambridge, MA: MIT Press.

Briel, Robert. 2014."Demand 5 TV App Now on Sony Smart TVs." *Broadband TV News*, last modified February 19, accessed May 31, 2014, www.broadbandtvnews.com/2014/02/19/demand-5-tv-app-now-on-sony-smart-tvs/

Caimi, Annamaria. 2006. "Audiovisual Translation and Language Learning: The Promotion of Intralingual Subtitles." *The Journal of Specialised Translation* 6: 85-98.

Cambra, Cristina, Aurora Leal, and Núria Silvestre. 2013. "The Interpretation and Visual Attention of Hearing Impaired Children when Watching a Subtitled Cartoon." *The Journal of Specialised Translation* 20: 134-146.

Cambridge Advanced Learner's Dictionary. Cambridge University Press, accessed January 7, 2013, http://dictionary.cambridge.org/dictionary/british

Campbell, Shelagh. 2010. *Encyclopedia of Case Study Research*, edited by M, Gabrielle Durepos and Elden Wiebe. Thousand Oaks, CA: SAGE.

Carson, Katy. 2014. Personal Communication: Answer to Enquiry about Altering Subtitles' Font Size on 4oD, Received by Email on 30 July.

Carver, Ronald P. 1990. *Reading Rate: A Review of Research and Theory.* San Dieso, CA: Academic Press.

Caselli, M. Cristina. 1983. "Communication to Language: Deaf Children's and Hearing Children's Development Compared." *Sign Language Studies* 38: 1-23.

CENELEC. 2003. *Standardisation Requirements for Access to Digital TV and Interactive Services by Disabled People*, accessed August 7, 2014, www.media-disability.org/documents/Interim Report TV for All doc v3.pdf

Channel 4. 2014. *Audio Description, Subtitles, Signing*, accessed May 29, 2014, www.channel4.com/4viewers/faq/name/channel-4s-100-commitment-to-subtitling/id/400289154

——— 2011. *Response to ATVOD Consultation on Best Practice Guidelines for Access Services on Video on Demand Services*, accessed May 16, 2014, www.atvod.co.uk/uploads/files/Channel_4_response.pdf

——— 2006. *Response to Television Access Services Review*, accessed June 17, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/channel4.pdf

Channel 5. 2014a. Personal Communication: Answer to Enquiry about Altering Subtitles' Font Size on Demand 5, Via Phone Call on 5 August.

——— 2014b. Personal Communication: Answer to Enquiry about Provision of Subtitles on Demand 5, Received by Email on 16 June.

——— 2006. *Response to Television Access Services Review*, accessed June 14, 2014. http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/channel5.pdf

Charrow, Veda R. 1975. "A Psycholinguistic Analysis of Deaf English." *Sign Language Studies* 7: 139-150.

Charrow, Veda R. and John D. Fletcher. 1974. "English as the Second Language of Deaf Children." *Developmental Psychology* 10 (4): 463-470.

Chase, Naomi F. 1992. "Chomsky Explores Origins of Language." *MIT Tech Talk* 12.

Civera, Clara and Pilar Orero. 2010. "Introducing Icons in Subtitles for the Deaf and Hard of Hearing: Optimising Reception?" In n *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Ana Matamala and Pilar Orero, 149-162. Bern: Peter Lang.

Clark, Joe. n.d.a. *All about Fonts for Captions and Subtitles*, accessed June 20, 2014, http://screenfont.ca

——— n.d.b. *What's Wrong with Tiresias*, accessed June 20, 2014, http://screenfont.ca/fonts/today/Tiresias.

Commission of the European Communities. 2009. *Facilitating the Release of the Digital Dividend in the European Union* (2009/848/EC).

Connor, Carol McDonald and Teresa A. Zwolan. 2004. "Examining Multiple Sources of Influence on the Reading Comprehension Skills of Children Who Use Cochlear Implants." *Journal of Speech, Language, and Hearing Research* 47 (3): 509-526.

Cramer, Duncan and Dennis Laurence Howitt. 2004. *The Sage Dictionary of Statistics: A Practical Resource for Students in the Social Sciences.* Thousand Oaks: SAGE Publications Inc.

Creswell, John W. and Vicki L. Plano Clark. 2007. *Designing and Conducting Mixed Methods Research*. Thousand Oaks: SAGE Publications Inc.

CRIDE. 2013a. *Report on 2013 Survey on Educational Provision for Deaf Children in England*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=8634

——— 2013b. *Report on 2013 Survey on Educational Provision for Deaf Children in Northern Ireland*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=8689

——— 2013c. *Report on 2013 Survey on Educational Provision for Deaf Children in Scotland*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=8704

——— 2013d. *Report on 2013 Survey on Educational Provision for Deaf Children in Wales*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=8701

——— 2012. *Report on 2012 Survey on Educational Provision for Deaf Children: UK-Wide Summary*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=7436

——— 2011a. *Report on 2011 Survey on Educational Provision for Deaf Children in England*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=6842

——— 2011b. *Report on 2011 Survey on Educational Provision for Deaf Children in Northern Ireland*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=6900

——— 2011c. *Report on 2011 Survey on Educational Provision for Deaf Children in Scotland*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=6899

——— 2011d. *Report on 2011 Survey on Educational Provision for Deaf Children in Wales*, accessed August 7, 2014, www.ndcs.org.uk/document.rm?id=6898

CRTC. 2012a. *Broadcasting Regulatory Policy CRTC 2011-741-1*, accessed August 7, 2014, www.crtc.gc.ca/eng/archive/2011/2011-741-1.pdf

——— 2012b. *Broadcasting Regulatory Policy CRTC 2012-362*, accessed August 7, 2014, www.crtc.gc.ca/eng/archive/2012/2012-362.pdf

CSA. 2011. *Charte Relative À La Qualité Du Sous-Titrage À Destination Des Personnes Sourdes Ou Malentendantes.* Paris: Conseil Supérieur de l'Audiovisuel. Accessed August 7, 2014, www.csa.fr/content/download/20043/334122/file/Chartesoustitrage122011.pdf

Danan, Martine. 2004. "Captioning and Subtitling: Undervalued Language Learning Strategies." *Meta* 49 (1): 67-77.

——— 1992. "Reversed Subtitling and Dual Coding Theory: New Directions for Foreign Language Instruction." *Language Learning* 42 (4): 497-527.

Davis, Kingsley. 1947. "Final Note on a Case of Extreme Isolation." *American Journal of Sociology* 52 (5): 432-437.

DCMP. 2011. *Caption Key. Guidelines and Preferred Techniques*. Spartanburg: The Described and Captioned Media Program. Accessed August 7, 2014, www.dcmp.org/captioningkey/captioning-key.pdf

De Linde, Zoé and Neil Kay. 1999. *The Semiotics of Subtitling*. Manchester, UK: St. Jerome Publishing.

De Saussure, Ferdinand. 1986. *Course in General Linguistics*. Illinois, US: Open Court Publishing Company.

De Villiers, Peter A. and Sarah B. Pomerantz. 1992. "Hearing-Impaired Students Learning New Words from Written Context." *Applied Psycholinguistics* 13 (04): 409-431.

Delabastita, Dirk. 1989. "Translation and Mass-Communication: Film and TV Translation as Evidence of Cultural Dynamics." *Babel* 35 (4): 193-218.

DES. 1978. *Special Educational Needs (Warnock Report)*. London: HMSO. Accessed August 7, 2014, http://webarchive.nationalarchives.gov.uk/20101021152907/http:/sen.ttrb.ac.uk/attachments/21739b8e-5245-4709-b433-c14b08365634.pdf

Dewulf, Bernard and Gunter Saerens. 2012. *Stijlboek T888. Teletekst Ondertiteling.* May. Brussels: VRT.

——— 2009. *Stijlboek T888. Teletekst Ondertiteling.* April. Brussels: VRT.

DfES. 2011. *The Special Educational Needs Code of Practice*. London: Department for Education and Skills. Accessed August 7, 2014, http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/eorderingdownload/dfes 0581 200mig2228.pdf

Díaz-Cintas, Jorge. 2013. "Sobre comunicación audiovisual, internet, ciberusuarios… y subtítulos." In *Reflexiones sobre la traducción audiovisual: tres espectros, tres momentos*, edited by Juan José Martínez Sierra, 93-107. Valencia: Universidad de Valencia.

——— 2010. "The Highs and Lows of Digital Subtitles." In *Translationswissenschaft—Stand Und Perspektiven*: Innsbrucker Ringvorlesungen zur Translationswissenschaft VI, edited by Lew N. Zybatow, 105-130. Frankfurt am Main: Peter Lang

——— 2004. "In Search of a Theoretical Framework for the Study of Audiovisual Translation." In *Topics in Audiovisual Translation*, edited by Pilar Orero, 21-34. Amsterdam and Philadelphia: John Benjamins.

——— 2003. *Teoría y Práctica de la Subtitulación: Inglés/Español.* Barcelona: Ariel.

——— 1997. *El Subtitulado en tanto que modalidad de traducción fílmica dentro del marco teórico de los Estudios sobre Traducción: Misterioso asesinato en Manhattan, Woody Allen, 1993*. Valencia: Universitat de València.

Díaz-Cintas, Jorge and Marco Fernández Cruz. 2008. "Using Subtitled Video Materials for Foreign Language Instruction." In *The Didactics of Audiovisual Translation*, edited by Jorge Díaz-Cintas, 201-214. Amsterdam and Philadelphia: John Benjamins.

Díaz-Cintas, Jorge, Josélia Neves, and Anna Matamala. 2010. *New Insights into Audiovisual Translation and Media Accessibility: Media for all 2.* Amsterdam: Rodopi.

Díaz-Cintas, Jorge and Aline Remael. 2007. *Audiovisual Translation: Subtitling.* Manchester: St. Jerome Publishing

Disabled World. 2014. *Cinema Subtitle System for the Hard of Hearing*, last modified January 27, 2014, accessed July 28, 2014, www.disabled-world.com/disability/investors/cinema-subtitles.php.

Duchesne, Louise, Anne Sutton, and François Bergeron. 2009. "Language Achievement in Children Who Received Cochlear Implants between 1 and 2 Years of Age: Group Trends and Individual Patterns." *Journal of Deaf Studies and Deaf Education* 14 (4): 465-485.

d'Ydewalle, Géry and Marijke Van de Poel. 1999. "Incidental Foreign-Language Acquisition by Children Watching Subtitled Television Programs." *Journal of Psycholinguistic Research* 28 (3): 227-244.

Easterbrooks, Susan R. and Sharon Baker. 2002. *Language Instruction of Students Who are Deaf and Hard of Hearing: Multiple Pathways*. Boston: Allyn & Bacon.

Easton, Valerie J. and McColl, John H. 1997. *Statistics Glossary*. STEPS, last modified September, 1997, accessed April 17, 2014, www.stats.gla.ac.uk/steps/glossary/index.html.

Education Act. (7&8 Geo. 6, C.31). 1944. London: HMSO.

EFHOH. 2011. *State of Subtitling Access in EU. 2011 Report*. Stockholm: EFHOH. Accessed May 5, 2014, http://ec.europa.eu/internal_market/consultations/2011/audiovisual/non-registered-organisations/european-federation-of-hard-of-hearing-people-efhoh-_en.pdf

EUD. 2013. *Cochlear Implant Position Paper*, accessed June 17, 2014, www.eud.eu/Cochlear_Implant_Position_Paper-i-681.html.

European Commission. 2007. *High Level Group on Multilingualism*. *Final Report.* Luxembourg: Office for Official Publications on the European Community. Accessed August 7, 2014, http://bookshop.europa.eu/en/high-level-group-on-multilingualism-pbNC7807451/downloads/NC-78-07-451-EN-C/NC7807451ENC_002.pdf;pgid=y8dIS7GUWMdSR0EAlMEUUsWb0000PxU660ZI;sid=aHVE8UCTSqdE9xDTpDLaViK2b6ZCIkdAbqY=?FileName=NC7807451ENC_002.pdf&SKU=NC7807451EN

Ewoldt, Carolyn. 1981. "A Psycholinguistic Description of Selected Deaf Children Reading in Sign Language." *Reading Research Quarterly* 17 (1): 58-89.

Ewoldt, Carolyn, Neita Israelite, and Ron Dodds. 1992. "The Ability of Deaf Students to Understand Text. A Comparison of the Perceptions of Teachers and Students." *American Annals of the Deaf* 137 (4): 351-361.

Farber, Alex. 2014. "4oD to Get Major Revamp." *Broadcast*, last modified May 8, accessed August 7, 2014, www.broadcastnow.co.uk/news/broadcasters/4od-to-get-major-revamp/5071456.article

FCC. 2012. *Consumer Guide. Closed Captioning on Television*, accessed June 11, 2014, http://transition.fcc.gov/cgb/consumerfacts/closedcaption.pdf.

Feldman, Heidi. 1975. "The Spontaneous Creation of Language by Deaf Children of Hearing Parents, Or, there is More to Language than Meets the Ear." Doctoral (Ph.D.) Thesis, University of Pennsylvania.

Fels, Deborah I., Daniel G. Lee, Carmen Branje, and Matthew Hornburg. 2005. "Emotive Captioning and Access to Television." *AMCIS 2005 Proceedings*. Paper 300. http://aisel.aisnet.org/amcis2005/300

Fortnum, Heather M., Adrian Q. Summerfield, David H. Marshall, Adrian C. Davis, and John M. Bamford. 2001. "Prevalence of Permanent Childhood Hearing Impairment in the United Kingdom and Implications for Universal Neonatal Hearing Screening: Questionnaire Based Ascertainment Study." *BMJ (Clinical Research Ed.)* 323 (7312): 536-540.

Fry, Edward B. and Jacqueline E. Kress. 2002. *Reading Teacher's Book of Lists*. 3rd Edition. San Francisco, CA: Jossey Bass.

Gallaudet University Library. n.d. *Sign Language. A Collection of Commonly-Asked Questions about Sign Languages, Particularly American Sign Language*, accessed June 17, 2014, http://libguides.gallaudet.edu/content.php?pid=114804&sid=997847.

Gardner, Judith and Judith Zorfass. 1983. "From Sign to Speech: The Language Development of a Hearing-Impaired Child." *American Annals of the Deaf* 128 (1): 20-24.

Geers, Ann E. 2004. "Speech, Language, and Reading Skills After Early Cochlear Implantation." *Archives of Otolaryngology–Head & Neck Surgery* 130 (5): 634-638.

——— 2003. "Predictors of Reading Skill Development in Children with Early Cochlear Implantation." *Ear and Hearing* 24 (1): 59S-68S.

——— 2002. "Factors Affecting the Development of Speech, Language, and Literacy in Children with Early Cochlear Implantation." *Language, Speech, and Hearing Services in Schools* 33 (3): 172-183.

Geffner, Donna S. and Lisa R. Freeman. 1980. "Assessment of Language Comprehension of 6-Year-Old Deaf Children." *Journal of Communication Disorders* 4: 98-110.

Gilman, Leslea A. and Michael J. M. Raffin. 1975. "Acquisition of Common Morphemes by Hearing Impaired Children Exposed to Seeing Essential English Sign System." Washington, DC, Paper presented at the American Speech and Hearing Association.

Goldin-Meadow, Susan and Heidi Feldman. 1977. "The Development of Language-Like Communication without a Language Model." *Science* 197: 401-403.

——— 1975. "The Creation of a Communication System: A Study of Deaf Children of Hearing Parents." *Sign Language Studies* 8: 225-234.

Goldin-Meadow, Susan and Carolyn Mylander. 1983. "Gestural Communication in Deaf Children: Non-Effect of Parental Input on Language Development." *Science* 221: 372-374.

Gormley, Kathleen A. and Anne McGill Franzen. 1978. "Why Can't the Deaf Read? Comments on Asking the Wrong Question." *American Annals of the Deaf* 123 (5): 542-547.

Gottlieb, Henrik. 1997. *Subtitles, Translation & Idioms.* Copenhagen: University of Copenhagen.

Gregory, Susan and Jane Sancho-Aldridge. 1996. *Dial 888: Subtitling for Deaf Children.* London: Independent Television Commission.

Hall, Robert Anderson. 1968. *An Essay on Language*. New York: Chilton Books/Educational Division.

Han, Zhaohong. 2004. *Fossilization in Adult Second Language Acquisition*. Clevedon: Multilingual Matters. [

Harkins, Judith E., Beth R. Singer, Ellie Korres, Barbara M. Virvan, and Yoon K. Lee. 1996. *Caption Features for Indicating Non-Speech Information: Guidelines for the Captioning Industry*. Washington, DC: Gallaudet Research Institute. Accessed August 7, 2014, www.dcmp.org/caai/nadh125.pdf

Hearing Link. 2012a. *What is Conductive Hearing Loss?*, accessed July 31, 2014, www.hearinglink.org/what-is-conductive-hearing-loss

——— 2012b. *What is Sensorineural Hearing Loss?*, accessed July 31, 2014, www.hearinglink.org/what-is-sensorineural-hearing-loss

——— 2006. *Response from Hearing Concern to the Ofcom Consultation on Television Access Services Review of the Code and Guidance*, accessed May 10, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/hearingconcern.pdf

Holmes, James S. 1988. *Translated!: Papers on Literary Translation and Translation Studies*. Amsterdam: Rodopi.

Hyde, Merv and Des Power. 2006. "Some Ethical Dimensions of Cochlear Implantation for Deaf Children and their Families." *Journal of Deaf Studies and Deaf Education* 11 (1): 102-111.

IMS. 2011. *Response to ATVOD's Consultation on Best Practice Guidelines for Access Services on Video on Demand Service*, accessed 15 June, 2014 www.atvod.co.uk/uploads/files/IMS_Response.pdf

ITFC. 2011. *Response to ATVOD's Consultation on Best Practice Guidelines for Access Services on Video on Demand Service*, accessed 15 June, 2015, www.atvod.co.uk/uploads/files/ITFC_response_for_publication.pdf

——— 2006. *Response to Television Access Services Review*, accessed 20 May, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/itfc.pdf

ITV. 2014a. Personal Communication: Answer to Enquiry about Altering Subtitles' Font Size on ITV Player, Via Phone Call on 29 July.

——— 2014b. Personal Communication: Answer to Enquiry about Provision of Subtitles on ITV Player, Received by Email on 1 June.

——— 2006. *Response to Television Access Services Review*, accessed May 15, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/itv.pdf

Ivarsson, Jan. 2004. *A Short Technical History of Subtitles in Europe*, accessed August 7, 2014, www.transedit.se/history.htm.

Ivarsson, Jan and Mary Carroll. 1998. *Subtitling*. Simrishamn: TransEdit.

Jakobson, Roman. 1959/2012. "On Linguistic Aspects of Translation." In *The Translation Studies Reader*, edited by Lawrence Venuti. Abingdon: Routledge. 113-118.

James, Deborah, Kaukab Rajput, Julie Brinton, and Usha Goswami. 2008. "Phonological Awareness, Vocabulary, and Word Reading in Children Who use Cochlear Implants: Does Age of Implantation Explain Individual Variability in Performance Outcomes and Growth?" *Journal of Deaf Studies and Deaf Education* 13 (1): 117-137.

Jelinek Lewis, Margaret S. and Dorothy W. Jackson. 2001. "Television Literacy: Comprehension of Programme Content using Closed Captions for the Deaf." *Journal of Deaf Studies and Deaf Education* 6 (1): 43-53.

Jensema, Carl. 2003. *The Relation between Eye Movement and Reading Captions and Print by School-Age Deaf Children*. Wheaton, MD: Department of Education. Accessed August 7, 2014, www.dcmp.org/caai/nadh134.pdf

——— 2000. *A Study of the Eye Movement Strategies used in Viewing Captioned Television.* Silver Spring, MD: Institute for Disability Research and Training. Accessed August 7, 2014, www.dcmp.org/caai/nadh130.pdf

——— 1998. "Viewer Reaction to Different Television Captioning Speeds." *American Annals of the Deaf* 143 (4): 318-324.

Jensema, Carl J. and Robb Burch. 1999. "Caption Speed and Viewer Comprehension of Television Programs. Final Report." Silver Spring, MD: Institute for Disability Research and Training. Accessed August 7, 2014, www.dcmp.org/caai/nadh135.pdf

Jensema, Carl J., Ramalinga Sarma Danturthi, and Robert Burch. 2000. "Time Spent Viewing Captions on Television Programs." *American Annals of the Deaf* 145 (5): 464-468.

Jensema, Carl J., Sameh El Sharkawy, Ramalinga Sarma Danturthi, Robert Burch, and David Hsu. 2000. "Eye Movement Patterns of Captioned Television Viewers." *American Annals of the Deaf* 145 (3): 275-285.

Johansson, Rolf. 2003. "Case Study Methodology." In *Methodologies in Housing Research.* Stockholm, 1-14.

Kaplan, Harriet. 1987. *Speechreading: A Way to Improve Understanding.* Washington, DC: Gallaudet University Press.

Karamitroglou, Fotios. 1998. "A Proposed Set of Subtitling Standards in Europe." *Translation Journal* 2 (2): 1-15.

Kelly, Leonard. 1996. "The Interaction of Syntactic Competence and Vocabulary during Reading by Deaf Students." *Journal of Deaf Studies and Deaf Education* 1 (1): 75-90.

Kinsey, Arthur A. 1880. *Report of the Proceeding of the International Congress on the Education of the Deaf*. London: H. Allen & Co.

Kluwin, Thomas N. 1982. "Deaf Adolescents' Comprehension of English Prepositions." *American Annals of the Deaf* 127 (7): 852-859.

Knoors, Harry and Mathijs PJ Vervloed. 2003. "Educational Programming for Deaf Children with Multiple Disabilities: Accommodating Special Needs." *Oxford Handbook of Deaf Studies, Language, and Education*: 82-94.

Koolstra, Cees M. and Jonannes WJ Beentjes. 1999. "Children's Vocabulary Acquisition in a Foreign Language through Watching Subtitled Television Programs at Home." *Educational Technology Research and Development* 47 (1): 51-60.

Koolstra, Cees M., Allerd L. Peeters, and Herman Spinhof. 2002. "The Pros and Cons of Dubbing and Subtitling." *European Journal of Communication* 17 (3): 325-354.

Koolstra, Cees M., Tom HA Voort, and Leo J. Th Kamp. 1997. "Television's Impact on Children's Reading Comprehension and Decoding Skills: A 3-Year Panel Study." *Reading Research Quarterly* 32 (2): 128-152.

Kothari, Brij, Avinash Pandey, and Amita R. Chudgar. 2004. "Reading Out of the Idiot Box: Same-Language Subtitling on Television in India." *Information Technologies and International Development* 2 (1): 23-44.

Kothari, Brij, Joe Takeda, Ashok Joshi, and Avinash Pandey. 2002. "Same Language Subtitling: A Butterfly for Literacy?" *International Journal of Lifelong Education* 21 (1): 55-66.

Kovalik, Gail L. 1992. ""Silent" Films Revisited: Captioned Films for the Deaf." *Library Trends* 41 (1): 100-117.

Kral, Andrej and Gerard M. O'Donoghue. 2010. "Profound Deafness in Childhood." *New England Journal of Medicine* 363 (15): 1438-1450.

Krashen, Stephen D. 1985. *The Input Hypothesis: Issues and Implications*. *Vol. 1*. London: Longman.

Krejtz, Izabela, Agnieszka Szarkowska, and Krzysztof Krejtz. 2013. "Effects of Shot Changes on Eye Movements in Subtitling." *Journal of Eye Movement Research* 6 (5): 1-12.

LaSasso, Carol J. 1993. "Reading Comprehension of Deaf Readers: The Impact of Too Many Or Too Few Questions." *American Annals of the Deaf* 138 (5): 435-441.

Lemley, Patricia Arthur. 1993. *Deaf readers and engagement in the story world : a study of strategies and stances.* Unpublished thesis. Ohio State University.

Lenneberg, Eric H. 1967. *Biological Foundations of Language*. New York: John Wiley and Sons.

Limbrick, E. A., S. McNaughton, and M. M. Clay. 1992. "Time Engaged in Reading: A Critical Factor in Reading Achievement." *American Annals of the Deaf* 137 (4): 309-314.

Lorenzo, Lourdes. 2010a. "Criteria for Elaborating Subtitles for Deaf and Hard of Hearing Children in Spain: A Guide of Good Practice." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Anna Matamala and Pilar Orero, 139-148. Bern: Peter Lang.

——— 2010b. "Subtitling for Deaf and Hard of Hearing Children in Spain. A Case Study." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Anna Matamala and Pilar Orero, 115-138. Bern: Peter Lang.

Luetke-Stahlman, Barbara. 1998. *Language Issues in Deaf Education*. Hillsboro: Butte Publications.

Marschark, Marc. 1997. *Raising and Education a Deaf Child: A Comprehensive Guide to the Choices, Controversies, and Decisions Faced by Parents and Educators.* New York: Oxford University Press.

——— 1993. *Psychological Development of Deaf Children*. New York: Oxford University Press.

Marschark, Marc, Harry G. Lang, and John Anthony Albertini. 2002. *Educating Deaf Students: From Research to Practice.* New York: Oxford University Press.

Marschark, Marc and Patricia Elizabeth Spencer. 2010. *The Oxford Handbook of Deaf Studies, Language, and Education*. *Vol. 2*. New York: Oxford University Press.

Marschark, Marc, Cathy Rhoten, and Megan Fabich. 2007. "Effects of Cochlear Implants on Children's Reading and Academic Achievement." *Journal of Deaf Studies and Deaf Education* 12 (3): 269-282.

Masterson, Jackie, Morag Stuart, Maureen Dixon, D. Lovejoy, and Sophie Lovejoy. 2002. *The Children's Printed Word Database*. Department of Psychology, University of Essex.

Matamala, Anna and Pilar Orero. 2010. *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*. Bern: Peter Lang.

McAnally, Patricia L., Susan Rose, and Stephen P. Quigley. 1994. *Language Learning Practices with Deaf Children*. Austin, TX: Pro-Ed.

McCormack, Abby and Heather Fortnum. 2013. "Why do People Fitted with Hearing Aids Not Wear them?" *International Journal of Audiology* 52 (5): 360-368.

McCracken, Wendy and Bridget Pettitt. 2011. *Complex Needs, Complex Challenges: A Report on Research into the Experiences of Families with Deaf Children with Additional Complex Needs*. London: National Deaf Children's Society.

McLaughlin, Barry. 1987. *Theories of Second-Language Learning.* London: Edward Arnold .

——— 1984. *Second-Language Acquisition in Childhood*. *Vol. 1: Preschool Children.* Hillsdale, N.J.: Lawrence Erlbaum Associates.

——— 1982. *Children's Second Language Learning*. Arlington, VA: Center for Applied Linguistics.

Metro. 2012. "Children 'spend One Year in Front of Screens by the Age of Seven'.". May 21. Accessed July 27, 2014, http://metro.co.uk/2012/05/21/children-spend-one-year-in-front-of-screens-by-the-age-of-seven-433743

Mills, Mara. 2011. "Hearing Aids and the History of Electronics Miniaturization." *Annals of the History of Computing, IEEE* 33 (2): 24-45.

Moores, Donald F. 2010. "Partners in Progress: The 21st International Congress on Education of the Deaf and the Repudiation of the 1880 Congress of Milan." *American Annals of the Deaf* 155 (3): 309-310.

Muller, Tia. Forthcoming. "The Viewer's Opinion of SDH in France." In *The Reception of SDH in Europe*, edited by Pablo Romero-Fresco. Berlin: Peter Lang.

——— 2012. "Subtitles for Deaf and Hard-of-Hearing People on French Television ." In *Audiovisual Translation Across Europe: An Ever-Changing Landscape*, edited by Silvia Bruti and Elena Di Giovanni. *New Trends in Translation Studies* 7, 257-274. Oxford: Peter Lang.

Naaijkens, Ton and Kitty M. van Leuven-Zwart. 1991. *Translation Studies: The State of the Art: Proceedings of the First James S Holmes Symposium on Translation Studies. Approaches to Translation Studies* 9. Amsterdam: Rodopi.

NAD. 2000. *Position Statement on Cochlear Implants.* National Association of the Deaf, accessed June 17, 2014, http://nad.org/issues/technology/assistive-listening/cochlear-implants.

NDCS. 2014. *About NDCS.* National Deaf Children's Society, accessed June 16, 2014, www.ndcs.org.uk/about_us/ndcs.

——— 2011a. *Communicating with Your Deaf Child*, accessed June 16, 2014, www.ndcs.org.uk/document.rm?id=762

——— 2011b. *Deaf Children with Additional Needs*, accessed June 16, 2014, www.ndcs.org.uk/family_support/audiology/deaf_children_with.html

——— 2011c. *Quality Standards: Resource Provisions for Deaf Children and Young People in Mainstream Schools*, accessed June 16, 2014, www.ndcs.org.uk/document.rm?id=5765

——— 2009. *Cochlear Implants Position Statement*, accessed June 16, 2014, www.ndcs.org.uk/about_us/position_statements/cochlear_implants.html

——— 2006. *Ofcom Review of the Code and Guidance on TV Access Services. A Response by the National Deaf Children's Society*, accessed April 7, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/responses/NDCS.pdf

——— 2005. *In their Own Words: Young Deaf People's Access to Television*, accessed June 16, 2014, www.ndcs.org.uk/document.rm?id=3192

Nelley, Elsie and Anne Smith. 2000. *PM Benchmark Kit Teacher's Notes*. Nelson Thornes.

Nelson, Katherine. 1973. "Structure and Strategy in Learning to Talk." *Monographs of the Society for Research in Child Development*: 1-135.

Neuman, Susan B. and Patricia Koskinen. 1992. "Captioned Television as Comprehensible Input: Effects of Incidental Word Learning from Context for Language Minority Students." *Reading Research Quarterly*: 95-106.

Neves, Josélia. 2013. Personal Communication via Email Dated 12 February.

——— 2008. "10 Fallacies about Subtitling for the D/Deaf and the Hard of Hearing." *The Journal of Specialised Translation* 10.

——— 2007. *Guia De Legendagem Para Surdos: Vozes Que Se Vêem*. Leiria: Instituto Politécnico de Leiria & Universidade de Aveiro.

——— 2005. "Audiovisual Translation: Subtitling for the Deaf and Hard-of-Hearing." PhD Thesis. London: Roehampton University.

NHS. 2013. *Causes of Hearing Loss*, accessed June 17, 2014, www.nhs.uk/Conditions/Hearing-impairment/Pages/Causes.aspx

Ofcom. 2014a. *Measuring Live Subtitling Quality. Results from the First Sampling Exercise*, accessed August 7, 2014 http://stakeholders.ofcom.org.uk/consultations/subtitling/sampling-results

——— 2014b. *Television Access Services 2013. Provision of Subtitling, Signing and Audiodescription*, accessed August 7, 2014, http://stakeholders.ofcom.org.uk/binaries/research/tv-research/access-service-reports/Access_services_report_2013_for_publication-_Final.pdf

——— 2013. *Television Access Services: Report for the First Six Months of 2013*, accessed August 7, 2014, http://stakeholders.ofcom.org.uk/market-data-research/market-data/tv-sector-data/tv-access-services-reports/access-q1q2-13

——— 2012a. *Ofcom's Code on Television Access Services*, accessed May 15, 2014 http://stakeholders.ofcom.org.uk/binaries/broadcast/other-codes/tv-access-services-2013.pdf

——— 2012b. *Review of the Ofcom Designation of the Authority for Television on Demand*, accessed April 12, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/on-demand/statement/statement.pdf

——— 2006a. *Television Access Services Review: Statement*, accessed April 8. 2014 http://stakeholders.ofcom.org.uk/binaries/broadcast/other-codes/ars.pdf

——— 2006b. *Television Access Services: Review of the Code and Guidance. Consultation*, accessed April 8, 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/accessservs/summary/access.pdf

——— 2005. *Subtitling - an Issue of Speed?*, accessed July12, 2014 http://stakeholders.ofcom.org.uk/binaries/research/tv-research/subt.pdf

——— 1999. *ITC Guidance on Standards for Subtitling*, accessed August 7, 2014 www.ofcom.org.uk/static/archive/itc/uploads/ITC_Guidance_on_Standards_for_Subtitling.doc

Padden, Carol and Claire Ramsey. 1998. "Reading Ability in Signing Deaf Children." *Topics in Language Disorders* 18 (4): 30-46.

Paivio, Allan. 2006. *Mind and its Evolution; A Dual Coding Theoretical Interpretation*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

——— 1991. "Dual Coding Theory: Retrospect and Current Status." *Canadian Journal of Psychology/Revue Canadienne De Psychologie* 45 (3): 255.

Paivio, Allan and Wallace Lambert. 1981. "Dual Coding and Bilingual Memory." *Journal of Verbal Learning and Verbal Behavior* 20 (5): 532-539.

Paul, Peter V. 2001. *Language and Deafness*. 3rd Edition. San Diego: Singular Thomson Learning.

——— 1998. *Literacy and Deafness: The Development of Reading, Writing, and Literate Thought.* Boston, MA: Allyn & Bacon.

Pereira, Ana. 2010. "Criteria for Elaborating Subtitles for Deaf and Hard of Hearing Adults in Spain: Description of a Case Study." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Anna Matamala and Pilar Orero, 87-102. Bern: Peter Lang.

Perfors, Amy. 2002. "Simulated Evolution of Language: A Review of the Field." *Journal of Artificial Societies and Social Simulation* 5 (2). http://jasss.soc.surrey.ac.uk/5/2/4.html

Petitto, Laura A. n.d. *How Children Acquire Language; A New Answer*, accessed August 1, 2014, www.crosscultured.com/documents/ELL ESL Website/HowChildrenAcquireLanguage.pdf

——— 2000. "On the Biological Foundations of Human."In *The Signs of Language Revisited: An Anthology to Honor Ursula Bellugi and Edward Klima*, edited by Karen Emmorey and Harlan L. Lane, 447-471. Mahwah, N.J.: LEA.

——— 1994. "Are Signed Languages "real" Languages? Evidence from American Sign Language and Langue Des Signes Québécoise." *Signpost (International Quarterly of the Sign Linguistics Association)* 7 (3): 1-10.

Petitto, Laura Ann, Marina Katerelos, Bronna G. Levy, Kristine Gauna, Karine Tétreault, and Vittoria Ferraro. 2001. "Bilingual Signed and Spoken Language Acquisition from Birth: Implications for the Mechanisms Underlying Early Bilingual Language Acquisition." *Journal of Child Language* 28 (2): 453-496.

Petitto, Laura Ann and Paula F. Marentette. 1991. "Babbling in the Manual Mode: Evidence for the Ontogeny of Language." *Science* 251 (5000): 1493-1496.

Power, Desmond John and Stephen P. Quigley. 1973. "Deaf Children's Acquisition of the Passive Voice." *Journal of Speech, Language, and Hearing Research* 16 (1): 5-11.

Powers, Stephen, Susan Gregory, Ernst D. Thoutenhoofd, and Great Britain. 1998. *The Educational Achievements of Deaf Children*. London: Department for Education and Employment London.

Prensky, Marc. 2001. "Digital Natives, Digital Immigrants Part 1." *On the Horizon* 9 (5): 1-6.

Pruvost, Elisa. 2003. *Making the Grade?* London: National Deaf Children's Society. Accessed August 8, 2014, www.deafchildworldwide.info/document.rm?id=211

Pym, Anthony. 1998. *Method in Translation History*. Manchester: St. Jerome Publishing.

Quigley, Stephen P., Ronnie B. Wilbur, Desmond J. Power, Dale S. Montanelli, and Marjorie W. Steinkamp. 1976. *Syntactic Structures in the Language of Deaf Children. Final Report*. Institute for Child Behavior and Development, University of Illinois at Urbana-Champaign: U.S. Department of Health, Education, and Welfare. National Institute of Education.

Quigley, Stephen P. and Peter V. Paul. 1984. *Language and Deafness.* San Diego: College-Hill Press.

Quigley, Stephen P., N. L. Smith, and Ronnie B. Wilbur. 1974. "Comprehension of Relativized Sentences by Deaf Students." *Journal of Speech, Language, and Hearing Research* 17 (3): 325-341.

Quigley, Stephen P., Ronnie B. Wilbur, and Dale S. Montanelli. 1974. "Question Formation in the Language of Deaf Students." *Journal of Speech and Hearing Research* 17 (4): 699-713.

Raad van State. 2008. *Mediabesluit 2008.* http://wetten.overheid.nl/BWBR0025036/geldigheidsdatum_21-10-2014

Raffin, Michael J. M., Julia M. Davis, and Leslea A. Gilman. 1978. "Comprehension of Inflectional Morphemes by Deaf Children Exposed to a Visual English Sign System." *Journal of Speech, Language, and Hearing Research* 21 (2): 387-400.

Raine, Chris. 2013. "Cochlear Implants in the United Kingdom: Awareness and Utilization." *Cochlear Implants International* 14 (S1): S32-S37.

Redmond, Dylan. 2014. Personal Communication: Answer to Enquiry about Provision of Subtitles on 4oD, sent via "Contact us" form, received on 30 May.

Remael, Aline. 2007. "Sampling Subtitling for the Deaf and the Hard-of-Hearing in Europe." In *Media for All: Subtitling for the Deaf, Audio Description, and*

Sign Language, edited by Jorge Díaz-Cintas, Pilar Orero, Aline Remael, 23-52. Amsterdam: Rodopi.

Remael, Aline, Annick De Houwer, and Reinhild Vandekerckhove. 2008. "Intralingual Open Subtitling in Flanders: Audiovisual Translation, Linguistic Variation and Audience Needs." *Journal of Specialized Translation* 10: 76-105.

Robbins, Nancy L. and Catherine W. Hatcher. 1981. "The Effects of Syntax on the Reading Comprehension of Hearing-Impaired Children." *Volta Review* 83 (2): 105-115.

Robertson, Lyn. 2000. *Literacy Learning for Children Who are Deaf Or Hard of Hearing.* Washington, DC: Alexander Graham Bell Association for the Deaf.

Romero-Fresco, Pablo. 2010. "D'Artagnan and the Seven Musketeers: SUBSORDIG Travels to Europe." In *Listening to Subtitles: Subtitles for the Deaf and Hard of Hearing*, edited by Ana Matamala and Pilar Orero, 175-190. Bern: Peter Lang.

Rotatori, Anthony F., Festus E. Obiakor, and Jeffrey P. Bakken. 2011. *History of Special Education*. *Vol. 21*. Bingley, UK: Emerald Group Publishing.

Saerens, G. 2013. Personal Communication via Email Dated 28 March.

Saldanha, Gabriela and Sharon O'Brien. 2014. *Research Methodologies in Translation Studies*. London and New York: Routledge.

Sapir, Edward. 1921. *Language: An Introduction to the Study of Speech.* New York: Harcourt, Brace.

Sarachan-Deily, Ann Beth and Russell J. Love. 1974. "Underlying Grammatical Rule Structure in the Deaf." *Journal of Speech, Language, and Hearing Research* 17 (4): 689-698.

Schäfer, D. and J. Lynch. 1980. "Emergent Language of Six Prelingually Deaf Children." *Teachers of the Deaf* (5): 94-111.

Schick, Brenda S., Marc Marschark, and Patricia E. Spencer. 2005. *Advances in the Sign Language Development of Deaf Children*. *Vol. 15*. New York: Oxford University Press.

Schlesinger, Hilde S. and Kathryn P. Meadow-Orlans. 1972. *Sound and Sign: Childhood Deafness and Mental Health*. Berkeley: University of California Press.

Senghas, Ann. "Where did Nicaraguan Sign Language Come from?", accessed June 15, 2014, www.columbia.edu/~as1038/L02-sign-language.html.

Sense. 2011. "Response to ATVOD's Consulation on Best Practice Guidelines for Access Services on Video on Deman Services.", accessed May 16, 2014, www.atvod.co.uk/uploads/files/Sense_response_for_publication.pdf

Shannan, Brian. 2010. *Audiology - A Curriculum for Excellence*. Edinburgh: Scottish Sensory Centre. Accessed August 7, 2014, www.ssc.education.ed.ac.uk/courses/deaf/dnov10i.html

Silver, Janet, John Gill, Christopher Sharville, James Slater, and Michael Martin. 1998. *A New Font for Digital Television Subtitles*, accessed October14, 2013, www.tiresias.org/fonts/screenfont/report_screen.htm

Silverman-Dresner, Toby and George R. Guilfoyle. 1972. *Vocabulary Norms for Deaf Children.* Washington, DC: Alexander Graham Bell Association for the Deaf.

———1970. *The Deaf Child's Knowledge of Words: Volume I. Final Report.* New York: Lexington School for the Deaf.

Simpson, Paul A., David R. Harrison, and Arabella Stuart. 1992. "The Reading Abilities of a Population of Hearing-Impaired Children." *Journal of the British Association of Teachers of the Deaf* 16 (2): 47-53.

Sparrow, Robert. 2005. "Defending Deaf Culture: The Case of Cochlear Implants*." *Journal of Political Philosophy* 13 (2): 135-152.

Spencer, Linda J., Bruce J. Gantz, and John F. Knutson. 2004. "Outcomes and Achievement of Students Who Grew Up with Access to Cochlear Implants." *The Laryngoscope* 114 (9): 1576-1581.

Spencer, Patricia Elizabeth. 1993. "The Expressive Communication of Hearing Mothers and Deaf Infants." *American Annals of the Deaf* 138 (3): 275-283.

Stake, Robert E. 1995. *The Art of Case Study Research*. Thousand Oaks: Sage.

Stern, Abram. 2001. "Deafness and Reading." *Literacy Today* 27.

Stewart, David Alan and Bryan R. Clarke. 2003. *Literacy and Your Deaf Child: What Every Parent should Know*. Washington, DC: Gallaudet University Press.

Stokoe, William C., Jr. 2005. "Sign Language Structure: An Outline of the Visual Communication Systems of the American Deaf. 1960." *Journal of Deaf Studies and Deaf Education* 10 (1): 3-37.

Stoloff, Lynn and Zona G. Dennis. 1978. "Matthew." *American Annals of the Deaf*. 123 (4): 442-447.

Streng, Alice H., Richard R. Kretschmer, and Laura W. Kretschmer. 1978. *Language, Learning, and Deafness: Theory, Application, and Classroom Management*. New York: Grune & Stratton.

Sun, Sanjun and Gregory M. Shreve. 2013. "Reconfiguring Translation Studies." *Translation Spaces* 2.

Svirsky, Mario A., Amy M. Robbins, Karen Iler Kirk, David B. Pisoni, and Richard T. Miyamoto. 2000. "Language Development in Profoundly Deaf Children with Cochlear Implants." *Psychological Science* 11 (2): 153-158.

Swan, Henny. 2014. Personal Communication: Answer to Enquiry about Altering Subtitles' Font Size on iPlayer, Received by Email on 4 August.

Sweeny, Anna. 2014. Personal Communication: Answer to Enquiry about Provision of Subtitles on iPlayer, Received by Email on 3 June.

Szarkowska, Agnieszka, Izabela Krejtz, Zuzanna Klyszejko, and Anna Wieczorek. 2011. "Verbatim, Standard, Or Edited?: Reading Patterns of Different Captioning Styles among Deaf, Hard of Hearing, and Hearing Viewers." *American Annals of the Deaf* 156 (4): 363-378.

Talaván, Noa. 2010. "Subtitling as a Task and Subtitles as Support: Pedagogical Applications." *Approaches to Translation Studies* 32: 285-299.

——— 2009. *Aplicaciones de la traducción audiovisual para mejorar la comprensión oral del inglés*. Madrid: Universidad Nacional de Educación a Distancia.

——— 2006. "Using Subtitles to Enhance Foreign Language Learning." *Porta Linguarum* 6: 41-52.

Taylor, Dan. 2014. *Introducing the New BBC iPlayer*, accessed August 8, 2014, www.bbc.co.uk/blogs/internet/posts/Introducing-the-new-BBC-iPlayer

Taylor, Stanford E. 1965. "Eye Movements in Reading: Facts and Fallacies." *American Educational Research Journal* 2 (4): 187.

Tidy, Colin. "Deafness in Children." EMIS, accessed June 17, 2014, www.patient.co.uk/doctor/childhood-deafness.htm.

Toury, Gideon. 2012. *Descriptive Translation Studies and Beyond. Revised Edition*. Amsterdam and Philadelphia: John Benjamins.

——— 1998. "A Handful of Paragraphs on 'Translation' and 'Norms'." *Current Issues in Language & Society* 5 (1-2): 10-32.

——— 1995. *Descriptive Translation Studies and Beyond*. Amsterdam and Philadelphia: John Benjamins.

———1985. "A Rationale for Descriptive Translation Studies [Second Version]." In *The Manipulation of Literature: Studies in Literary Translation*, edited by Theo Hermans, 16-41. London & Sydney: Croom Helm.

United Nations. 2006a. *Convention on the Rights of Persons with Disabilities,* accessed August 7, 2014, www.un.org/disabilities/documents/convention/convoptprot-e.pdf

———2006b. *Optional Protocol to the Convention on the Rights of Persons with Disabilities,* accessed August 7, 2014, www.un.org/disabilities/documents/convention/convoptprot-e.pdf

United States Government, International Military Tribunal. 1949. *Nuremberg Code: Directives for Human Experimentation*. Law no. 10. Vol. 2: 181-182.

Van Doorslaer, Luc. 2009. "Risking Conceptual Maps." *The Metalanguage of Translation* 20: 27.

Verfaillie, Karl and Géry d'Ydewalle. 1987. "Modality Preference and Message Comprehension in Deaf Youngsters Watching TV." *Psychological Reports* 70. Belgium: University of Leuven.

Vermeulen, Anneke M., Wim van Bon, Rob Schreuder, Harry Knoors, and Ad Snik. 2007. "Reading Comprehension of Deaf Children with Cochlear Implants." *Journal of Deaf Studies and Deaf Education* 12 (3): 283-302.

VRT. 2011. *De Beheersovereenkomst 2012-2016*, accessed August 7, 2014 www.vrt.be/sites/default/files/attachments/Beheersovereenkomst_VRT_2012-2016.pdf

Wald, Mike and Keith Bain. 2005. "Using Automatic Speech Recognition to Assist Communication and Learning." In *HCI International 2005: 11th International Conference on Human-Computer Interaction.* Las Vegas. Accessed May 15, 2014, http://eprints.soton.ac.uk/260730

Walker, L., J. Munro, and F. W. Rickards. 1998. "Literal and Inferential Reading Comprehension of Students Who are Deaf Or Hard of Hearing." *Volta Review* 100 (2): 87-103.

Webster, Alec and David Wood. 1989. *Special Needs in Ordinary Schools. Children with Hearing Difficulties*. London: Cassell.

West, Gillian. 2013. "ITV Player App for Apple Devices to Offer Ad-Free Subscription Option." *The Drum*, accessed August 8, 2014, www.thedrum.com/news/2013/06/12/itv-player-app-apple-devices-offer-ad-free-subscription-option

WGBH Media Access Group. 2012. *Captioning FAQ*, accessed August 7, 2014, http://main.wgbh.org/wgbh/pages/mag/services/captioning/faq/sugg-styles-conv-faq.html.

Wilbur, Ronnie B., Dale S. Montanelli, and Stephen P. Quigley. 1976. "Pronominalization in the Language of Deaf Students." *Journal of Speech, Language, and Hearing Research* 19 (1): 120-140.

Wilbur, Ronnie. 1982. "The Development of Morpheme Structure Constraints in Deaf Children." *The Volta Review* (84) 1: 7-16.

Wilbur, Ronnie B., Stephen P. Quigley, and Dale S. Montanelli. 1975. "Conjoined Structures in the Language of Deaf Students." *Journal of Speech, Language, and Hearing Research* 18 (2): 319-335.

Winzer, Margret A. 1993. *The History of Special Education: From Isolation to Integration*. Washington, DC: Gallaudet University Press.

World Medical Association. 2013. "World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects." *JAMA : The Journal of the American Medical Association* 310 (20): 2191-2194.

Yin, Robert K. 2014. *Case Study Research: Design and Methods*. 5th Edition. Thousand Oaks: SAGE Publications Inc.

——— 2009. *Case Study Research: Design and Methods*. 4th Edition. Los Angeles: SAGE Publications Inc.

——— 1993. "Application of Case Study Research." *Applied Social Research Methods Series* 32: 34-36.

Zárate, Soledad. 2010. "Bridging the Gap between Deaf Studies and AVT for Deaf Children." In *New Insights into Audiovisual Translation and Media Accessibility*, edited by Jorge Díaz Cintas, Anna Matamala, and Josélia Neves, 159-174. Amsterdam: Rodopi.

——— 2008. "Subtitling for Deaf Children on British Television." *The Sign Language Translator and Interpreter* 2 (1): 15-34.

Zárate, Soledad and Joseph Eliahoo. 2014. "Word Recognition and Content Comprehension of Subtitles for Television by Deaf Children." *The Journal of Specialised Translation* 21: 133-152.

PART FIVE

APPENDICES

Appendix One: Subtitling companies questionnaires

Questionnaire on the subtitling of Ebb and Flo and Funky Valley (Five) by IMS

1. Is the subtitling process based on any conventions or guidelines (e.g. ITC Guidelines on Standards for Subtitling)? If so, which ones?

IMS house style closely follows the rules set down in the document ITC Guidance on Standards for Subtitling.

2. Do you have any in-house stylistic choices?

While some companies position their subtitles on screen so that the subtitles appear under the speakers, IMS has always avoided doing this because if the speakers change position, or if there is a shot change and the action is viewed from a different angle, the positioning can be very confusing. To avoid this, IMS subtitles are generally positioned at the bottom/centre of the screen.

3. How do you normally represent on screen the narrator's voice (off-screen)?

A narrator is usually indicated by 'single quotes' which enclose each complete sentence, not each line of text, ie:

'Once upon a time

there was a wicked old witch.'

Not:

'Once upon a time

'there was a wicked old witch.'

If the narrator is anonymous, we simply use quotes, but if the narrator needs to be identified to the viewer, their name will appear (IN BRACKETS AND CAPITALS) at the start of the first line of narration.

4. Are the subtitles produced for a specific audience (age group, deaf and hard-of-hearing)? If so, please specify.

The subtitles for Ebb and Flo and Funky Valley are produced for a very young, deaf and hard of hearing audience.

5. Do you bear any age group in mind when producing the subtitles?

Yes. When subtitling for younger viewers, we reduce the reading speed, particularly when subtitling programmes aimed at very young viewers. We may also use more sound effects than usual, given that many children's programmes use sound effects for comic effect.

6. What is the reading speed?

For programmes for a mature audience, the maximum reading speed is normally 180 words per minute. When subtitling for children, the maximum reading speed is 140 words a minute and around 100 words a minute for programmes for very young viewers. Note that these are all maximum reading speeds – the majority of subtitles will normally have far lower reading speeds.

7. What is the minimum and maximum duration of subtitles on screen?

The absolute minimum duration is one second, although it's rare to have a subtitle on for such a short period. The maximum duration is eight seconds.

8. What are the criteria applied when editing is necessary due to time constraints (e.g. partial or total omission, rephrasing)?

Where possible, we use omission rather than rephrasing. Many viewers like to lip read as well as read the subtitles and find it disturbing if the dialogue has been rephrased or key words have been substituted. So we try to remove the less important phrases, but keep the syntax and vocabulary as close to the original as possible.

9. Is quality control part of the subtitling process? If so, how is it carried out?

All subtitlers undergo extensive training during which all of their output is checked by a team leader. Once fully trained, a percentage of a subtitler's work will be checked by a team leader to ensure that all staff are adhering to the IMS house style.

10. Do you get feedback from the audience? If so, please specify.

Viewers generally write to ask for more subtitled programmes and rarely comment on the actual subtitles themselves. As far as I am aware, we have not had any feedback from viewers about the subtitles for Ebb and Flo and Funky Valley.

11. Other comments…

Questionnaire on the subtitling of *The Hoobs* (Channel 4) by Claude Le Guyader, Intelfax

1. Was the subtitling process based on any conventions or guidelines (e.g. ITC Guidelines on Standards for Subtitling)? If so, which ones?

I don't know which episode, neither when it was broadcast. I am assuming Channel 4 quite a few years back. If that is the case, here are my replies:

ITC guidelines (as were all Channel 4 subtitles at the time)

2. Did you have to adhere to stylistic choices dictated by the client or did you have a certain extent of freedom?

Broadcasters don't normally impose stylistic choices in the UK. The subtitling house sticks to their house style throughout the contract. Things might have changed since.

3. Were the subtitles produced for a specific audience (age group, deaf and hard-of-hearing)? If so, please specify.

For the hard-of-hearing.

4. What is the reading speed?

I'm afraid I cannot recall now. This is a long time ago and things have changed. Something between 120-180 words a minute.

The reading speed might have been slower but I wouldn't be able to tell without looking at the file.

5. What is the minimum and maximum duration of subtitles on screen?

Again, things have changed. I would have thought 1 second 20 frame was the minimum then.

No maximum – as long as it takes someone to say something, but we tended to split subtitles if one line takes more than 3 seconds and two lines more than 6 seconds.

6. What are the criteria applied when editing is necessary due to time constraints (e.g. partial or total omission, rephrasing)?

First delete what you can without affecting meaning. If you have to, rephrase.

7. Was quality control part of the subtitling process? If so, how was it carried out?

Yes, all programmes were checked before transmission.

Someone (a checker) watched the programme through.

8. Have you ever had feedback from the audience? If so, please specify.

Every month, we were sent the relevant Channel 4 log. I wouldn't know if we had anything on this particular programme.

9. In several instances subtitles stay on screen for only 1, 2 or 3 frames. Any comments?

They (subtitles) would have been reviewed and software detects such short times. The problem would be at the point of broadcast, I suspect.

10. Other comments…

It might be more useful to work on more recent programming. All my comments relate to Channel4 subtitling a few years ago.

Questionnaire on the subtitling of *Arthur* (BBC2), *Louie* (CITV) and *Sponge Bob Square Pants* (CITV) by Neal Rattee, ITFC

1. Is the subtitling process based on any conventions or guidelines (e.g. ITC Guidelines on Standards for Subtitling)? If so, which ones?

There are statutory requirements relating to particular TV companies as to the percentage of programming which has to be subtitled. Having to provide subtitling more competitively, due to the greater proliferation of TV stations and cheaper programming, has led to a degree of homogenisation as far as house styles go. The main statutory requirement is that of reading speed. We currently subtitle at 900 characters per minute (cpm) for broadcast, and this is considerably faster than was permissible just a few years back. Other matters, like colours used, number of lines permitted, are governed both by house style and the requirements of the client. So, we use four colours for subtitling for most clients, keeping to those which are most legible on screen (yellow and white) whenever possible, and using no more than three lines. We centre captions now, although in the past they were positioned relative to the speaker.

2. Do you have to adhere to stylistic choices dictated by the client or do you have a certain extent of freedom? (How relevant is it in the subtitling process that Arthur is for BBC2 whereas Louie and SpongeBob SquarePants are for ITV?)

Yes, we provide what the client requires, but what they request may be governed by their own considerations of cost. Some clients may require us to provide only white on black captions and some may require no more than two-line captions. The BBC traditionally had a different subtitling style to ITV; different colour and positioning for sound effect captions.

3. Louie and SpongeBob SquarePants are broadcast both by the analogue (ITV) and the digital (CITV) channels. How relevant is this from a subtitling perspective?

I don’t recall the programme Louie, I’m afraid, so I can’t refer to that specifically. Being either analogue or digital does not effect us at all at the subtitling level. The subtitling file is produced in exactly the same way, although the viewer-received quality may differ between analogue and digital broadcasts.

4. Are the subtitles produced for a specific audience (age group, deaf and hard-of-hearing)? If so, please specify for each of the cartoons.

Yes, we are bearing the target audience in mind as we subtitle, so we’re trying to follow the programme makers intentions as to style and vocabulary. But there are no hard and fast rules with regard to this; Arthur is a fairly traditional children’s cartoon, whereas Spongebob has something of a crossover appeal, with the dialogue reflecting this. We are mindful of both the hard of hearing, who may be using the subtitles as an adjunct, as well as the profoundly deaf, who may wish to lip read and therefore require us not to cover the mouths of speakers with out captions.

5. Do you bear any age group in mind when producing the subtitles? Please specify if different for each of the cartoons.

We take our lead from the programme maker; we are addressing the same audience, so we should have in mind the same age group in mind as did the programme makers.

6. What is the reading speed? Please specify if different for each of the cartoons.

As children's programmes, there wouldn't have been a different reading speed applied to these programmes (I assume they are both for children; I still don't remember Louie) In the past programmes were subtitled at 550cpm, for children and adults. Adult reading speed was then raised to 690cpm and the trend has been for reading speeds to get faster. We currently subtitle at 900cpm almost right across the whole range of programmes. A greater degree of ease with subtitles is now assumed with regard to both adult and child deaf viewers and children's programmes are often more verbally sophisticated and faster than in the past.

7. What are the minimum and maximum duration of subtitles on screen and the minimum gap between subtitles? Please specify if different for each of the cartoons.

The traditional minimum caption duration is 2.00 seconds, but now durations below this are commonly used provided the caption is fairly concise; a short, easily understood phrase, "I don't know", for example, may get just 1:07. There is no set maximum duration, although if subtitling a very slowly delivered speech it may be better to split into separate captions rather than having one on screen for what looks like forever. Minimum gaps between captions may be governed by the requirements of the broadcasting technology, which may differ from company to company. Our subtitles require to be prepared with a minimum one-frame gap or they won't broadcast but subtitle files from other companies often have one caption ending and the next one starting on the same frame.

8. What are the criteria applied when editing is necessary due to time constraints (e.g. partial or total omission, rephrasing)? Please specify if different for each of the cartoons.

The editing required nowadays is less brutal because of the higher reading speeds allowed, but the same approach is used, aiming to reflect the style of the programme, and the character speaking. Rephrasing occurs when time constraints necessitate it, but an original word order is always preferable if it can be maintained. Some speech may have to be lost. Obviously, vital pieces of information are privileged; if one has removed a seemingly unimportant phrase which is later revealed as crucial, it has to be reinstated.

9. When it comes to songs, are the editing guidelines any different from the ones applied to dialogues?

Yes, song lyrics have always been allowed to exceed reading speeds in order to try and reflect the rhythm and pace of a song.

10. Semi-lexical utterances are generally phonetically represented (e.g. aye, whoaaaa, aaaah, ow). Any particular reasons for this?

Again, we wish to reflect the style of the programme with regard to this. Some programmes might require a more formal expression of, say, laughter or screaming, than the likes of a child's cartoon or a comedy programme. We are also trying to reflect the way a certain sound is uttered.

11. Paralinguistic features are sometimes represented by labels (LAUGHS) and sometimes by their onomatopoeic form (ha-ha-ha)? Any particular reasons for this?

See above answer on this one.

12. Is quality control part of the subtitling process? If so, how is it carried out?

In the past, quite a rigid checking process was maintained, whereby every programme was exhaustively checked by another subtitler. It is now more usual for individual subtitlers to be fully responsible for the accuracy of their own subtitle file, though more peak-time or prestigious programmes will normally still be checked, as will DVD subtitles, which, unlike the more ephemeral TV broadcasts, run the risk of having mistakes enshrined for ever.

13. Do you get feedback from the audience? If so, please specify.

Not too much, unless something catastrophic has occurred, like the subtitles failing to transmit, or being beset by technical glitches, which are often not the fault of either the subtitler or the subtitling house itself.

Factual inaccuracies understandably upset viewers on occasions and although we make every effort to check facts, there are often quite stringent time constraints which can affect how long we can spend attempting to verify something.

14. Is ITFC responsible for the subtitling of all episodes of Louie?

Episodes of a certain series will be subtitled by the TV company showing it at that time. If a series later changes channels it might be resubtitled or the previous subtitle file may be bought in and "re-jigged" as necessary

15. Are opening songs subtitled for each episode or does ITFC have one version that is used for all the episodes?

When the same sequence of captions appear in a programme, whether it is a song or not, it would normally be subtitled and checked and then stored in our library.

16. When do you use add-ons or cumulative subtitles (present in Arthur, for instance)?

We abandoned the use of add-ons when our house style was brought more up to date some years ago. A cleaner, more modern look was sought for the captions, although in some circumstances the use of an add-on was a useful additional tool, in the timed delivering of punch-line, for instance.

17. If complicated words are introduced in dialogues, does ITFC adopt any strategies?

The hard of hearing viewer has a right to be presented with as near as possible the same information as the normally-hearing viewer, so that if complicated words are spoken, they should be in the caption. I know that some viewers with normal hearing use the subtitles for further clarification of what is being said, whether it is to see the name of a complicated medical condition, or a piece of street slang from a US police drama.

18. How important is synchronising subtitles to image and sound? Any acceptable tolerance?

It's the ideal. Sometimes the rules get bent a little due to the time constraints of the reading speed and sometimes one wants to avoid the transition from one caption being followed at an awkward, jarring, distance from a shot change, which can be uncomfortable, in terms of visual and verbal processing, to the viewer.

19. How is line-breaking performed?

At one time it was possible to apply more care to this, ensuring the line break came at a logical point, according to the sense of the sentence, and not leaving a definite article 'orphaned' at the end of a line, for example. Now, with time and cost constraints due to a great deal of our subtitling being for programme makers without the budget to pay for more expensive subtitling, I'm afraid it isn't such a priority.

20. Other comments…

I hope this will be useful to you. Sorry again for not being able to recall or track down Louie and so having had to make my comments more generalised.

Questionnaire on the subtitling of *Mona the Vampire* (BBC1) by Ant Purvis, Nickelodeon UK.

1. Is the subtitling process based on any conventions or guidelines (e.g. ITC Guidelines on Standards for Subtitling)? If so, which ones?

We base our process on the generally accepted standards for subtitling, including the ITC Guidelines and our own in-house standards for style, content and presentation.

2. Do you have to adhere to stylistic choices dictated by the client or do you have a certain extent of freedom?

In the case of 'Mona The Vampire', this programme was in fact subtitled for transmission on our own channel, Nickelodeon UK, and therefore the subtitles were created in our own house style. When the BBC subsequently transmitted the programme, they purchased the subtitles which we had produced. We took the opportunity to make some minor changes to the subtitles to match the BBC style, but in general since our styles are very similar, the differences are very few and quite subtle.

3. Are the subtitles produced for a specific audience (age group, deaf and hard-of-hearing)? If so, please specify.

Nickelodeon UK is a kids channel, so our primary consideration when creating subtitles is to make sure that they will be appropriate and usable by the kids who will be watching. Every programme is different – some programmes (e.g. Sabrina The Teenage Witch) are watched by much older children than others (e.g. Rugrats, Mona The Vampire, The Wild Thornberrys, etc.) and as a result we try to tailor the style and presentation of subtitles (including word/character count) to the likely audience of an individual show.

4. Do you bear any age group in mind when producing the subtitles?

This varies with the show. We subtitle all kinds of material, from pre-school shows on our 'Nick Jr.' channel (e.g. Maisy, King Rollo), all the way up to older teenage shows. (e.g. Instant Star, The Gilmore Girls) We always try to bear in mind the intended audience of the show and subtitle to best meet that need.

5. What is the reading speed?

The reading speed we select is very dependent on the show itself. We may subtitle pre-school shows at an exceptionally slow rate (below 60 words per minute), mid-range shows at around 90-120 words per minute, and at the most extreme end of the spectrum, fast-paced shows such as 'The Gilmore Girls' can come close to 180 words per minute. This is at the upper limits of what we consider acceptable, but is not out of step with the subtitles on shows transmitted by other channels, such as 'Neighbours' and 'Home And Away', which will have a very similar audience.

Generally we base reading speed more on ‘characters per second’ than words per minute – a recognition that short words take less time to read than long ones, and vice versa. Mid-age-range shows like ‘Mona The Vampire’, and other shows which were purchased by the BBC such as ‘Rugrats’, were subtitled to a guideline of around 9 characters per second, which came out at around 105 words per minute across the series.

6. What are the minimum and maximum duration of subtitles on screen and the minimum gap between subtitles?

We consider one second to be the realistic minimum for a subtitle – generally these would only ever be one or two word subtitles - and we certainly prefer a longer duration than that wherever possible. The maximum duration would depend very much on considerations of presentation – a three-line subtitle with lots of text might be appropriate to stay on screen for as long as nine or ten seconds, but generally speaking it would be very rare to exceed that unless it was appropriate to the programme.

7. What are the criteria applied when editing is necessary due to time constraints (e.g. partial or total omission, rephrasing)?

We lean towards a rule of partial omission, trying to present as much of the original dialogue as possible, but removing redundant words or phrases, while still trying to maintain the flavour of the language that is used. In some cases where dialogue is fast, entire sentences may be omitted as long as we can satisfy ourselves that they are not crucial to the plot of the show, or where they may be referred to later on. We try to avoid rephrasing unless there is no alternative.

8. When it comes to songs, are the editing guidelines any different from the ones applied to dialogues?

Our policy at Nickelodeon is not to edit the lyrics to songs. This is for a number of reasons, but in the main because we’ve never been entirely satisfied by the results when we’ve seen other broadcasters do it. We believe it compromises the integrity of the original to too great an extent, so on balance we allow lyrics to be presented more rapidly than would otherwise be allowed for general dialogue.

9. Semi-lexical utterances are generally phonetically represented (e.g. arghh!!!, aah!). Any comments on this?

We do this to try to maintain a coherent flow, rather than constantly breaking the viewer out of taking in the dialogue by using hard cues such as “SHE SCREAMS”, “HE WAILS”, etc.

One of our favourite examples of this is from the first episode of the show “CatDog”, which has a 20 second sequence containing the subtitles: “Ahyahyahyahyah! Ugh! Ah! D'oh! Aaagh! Aaaaaaaaagggh! Yiyiyiyiyiyiyiyi! Yeoowwww!!!! Ooh! Ubwa! Ugh! Hua! Aaaaaaaaagh! Uhuhuhuhuhuh!” – We actually spent quite some time getting this right!

10. Is quality control part of the subtitling process? If so, how is it carried out?

Quality is a key concern for us. All our subtitles are reviewed a number of times by the original subtitler, and again by a second member of staff, before transmission.

11. Do you get feedback from the audience? If so, please specify.

We do encourage feedback but generally speaking it is quite rare. We have been providing subtitles across our channels for almost ten years now, and in our early days, the feedback was generally along the lines of "I am glad you have put subtitles on Kenan and Kel, but I do not like this show. Please take the subtitles off Kenan and Kel and put them on Sister Sister." – Happily it was not long before we were able to please fans of both shows. We do place a high degree of store in any feedback which we do get, and indeed have been able to satisfy a number of requests (e.g. for subtitles on new programmes) in a short period of time.

12. If complicated words are introduced in dialogues, does Nickelodeon adopt any strategies?

We take a general view that if the word is present in the soundtrack for hearing viewers, then it should be represented in the subtitles for deaf viewers. While long and complex words might be the first to go as part of the process of editing for reading speed, this would only occur if the words were genuinely superfluous – generally, we try to be sensitive to the flavour of the show and find a way to represent that flavour in a textual format.

13. How important is synchronising subtitles to image and sound? Any acceptable tolerance?

We do believe that this is very important, as there are certainly many ways in which it's easy to get it wrong. Generally, subtitles are synchronised with shot changes, although if reading speed is a particular issue then subtitles could be brought in early over a preceding shot (as long as it is not obvious from that shot that the character is NOT talking), or may be left on screen for a longer period of time into a subsequent shot. It is always a matter of balance, and each show is its own unique challenge.

14. How is line-breaking performed?

We try to break lines at a point which would seem 'natural'. The technicalities of subtitling and the restrictions of line length do not always make this entirely possible, but the aim is always to try to produce something which is naturally readable, such that you just don't notice the line breaks.

We do certainly try to avoid subtitles with very long first lines, and then maybe only one or two words on the second line (a common failure of the 'automated' subtitling which is increasingly used throughout the industry these days) and we do try to avoid breaking lines on or near very short words.

If we're doing it right, we won't notice the line breaks ourselves. If they jump out at us, we know we need to change something.

15. Other comments…

Many thanks for the opportunity to answer your questions, and please don't hesitate to let us know if there's anything else we can help with! You can also find out more about our full range of access services at www.nick.co.uk/access

Questionnaire on the subtitling of *Inuk* (Channel 4), *Maya and Miguel* (BBC2) and *Mona the Vampire* (BBC1) by Helene McGowan, Red Bee Media

1. Is the subtitling process based on any convention or guidelines (e.g. ITC guidelines on Standards for Subtitling)? If so, which ones.

We have our own guidelines and style guide for our different clients – e.g. BBC, Channel 4 – all of which adhere to the wider ITC guidelines. The guidelines for children's television differ slightly from adult guidelines, mostly in the area of clarity and timings of the subtitles.

2. Do you have to adhere to stylistic choices dictated by the client or do you have a certain extent of freedom?

Different clients have their own established styles as to the layout and appearance of the subtitles. For example, for Channel 4, there must be only speaker per subtitle and the subtitles are centred but aligned to the left, and there should only rarely be more than two lines. However, the use of cumulatives – where one speaker's words are then added to by another – is encouraged in Channel 4 style.

This differs to the BBC style where subtitles are wholly centred, the convention is that each speaker has a colour and there can be more than one speaker per subtitle. For children's programmes on the BBC, the notes for subtitlers suggest that it is good not to have more than two lines per subtitle for ease of reading.

3. Do you bear any age group in mind when producing the subtitles? Please specify for each cartoon.

Yes. I have only worked on Maya And Miguel and I know from information on the website and the time the cartoon is on that the programme is aimed at six to nine-year-olds. This affects the timings of the subtitles (how long they are on screen).

4. What is the reading speed? Specify if different for each cartoon.

We use a software called Swift which has a Preferences option which allows the user to change various settings for subtitling. The timings for words/characters per minute for children's television are 180 words per minute and 750 characters per minute. When preparing subtitling files for children's programmes we have an option to set these as maximum reading speeds.

5. What are the maximum and minimum duration of subtitles on screen and the minimum gap between subtitles?

The suggested minimum gap between subtitles that we originate for adult and children's television programmes is one second.

The minimum a subtitle should be on screen would also be a second and the maximum, for children's programmes, would be between six and seven seconds for two lines and between three and three and a half seconds for one line.

But these are only guidelines and there are no hard and fast rules, particularly for cartoons where the aim is to capture the humour and speed of the action as well as possible.

6. What are the criteria applied when editing is necessary due to time constraints (e.g. partial or total omission, rephrasing)?

The only real criteria would be to capture the meaning of what is being said or heard as clearly as possible for the hearing-impaired viewer, and that any editing should not detract from that, while always bearing in mind there should be sufficient time to read the subtitles.

Rephrasing or rearranging of words are best avoided and we try to include what is being said on screen – i.e. speech that is clearly visible. It is sometimes necessary change a word due to time constraints – substitute a long word for a short word – but where possible, this is avoided. It is often possible to omit hesitation or repetition to save time and keep within time constraints.

7. Are the editing guidelines applied to songs any different from the ones applied to dialogue?

Yes, the timings guidelines are different for songs because the aim is to try to represent the beat and rhythm of the song with the lyrics as clearly, without music, this is the only way to accomplish this. The gaps between subtitles can be much shorter and the editing around shot changes can be much looser.

8. Paralinguistic features are normally described by labels – CHILDREN LAUGH AND SHOUT, MORE LAUGHTER – rather than by an onomatopoeic form. Any particular reasons for this?

We try to describe the sounds as plainly and simply as possible, hence labels such as CHILDREN SHOUT etc.

However, sounds within cartoons can play an integral part of the humour and action so onomatopoeic words such as KERPLAT! or SPLAT! would be used.

9. Particular attention is given to emphasised words, especially in Maya And Miguel, which are displayed in capital letters. If emphasis can be perceived by the image, would caps still be used as a way to reinforce the image or would the emphasis rather not be represented in the subtitle?

Maya And Miguel is a fun cartoon for young children but it has specific educational goals. It is made by PBS in conjunction with the Ready To Learn programme of the US State Department of Education.

The programme aims to foster better understanding of different cultures and to encourage children in their language skills and knowledge of vocabulary. Therefore, certain words are repeated and emphasised – sometimes in capitals, sometimes visually – within each episode. We would try to reflect this emphasis in the subtitles.

10. How influential are shot changes in the subtitling process?

Swift, the software system we use to produce subtitles, automatically hits the shot changes as we subtitle programmes. Although there is less emphasis on hitting all the shot changes now than in the past, most subtitlers still stick to the general rule of trying to synchronise shot changes to subtitles, as this is generally easier on the eye for subtitle readers.

11. How important is synchronising subtitles to image and sound? Any acceptable tolerance?

Subtitlers aim to keep speech and sound labels pretty much in sequence with the images on screen. This is particularly important in drama, comedy and cartoons so that the audience can keep up with the dramatic meaning of what is happening and with the narrative. Also, we are aware that many people in the hearing-impaired audience can lip-read, so it would be especially annoying for them for if the synchronisation between image and sound lapsed.

12. In Maya And Miguel, the Spanish language is kept as such but special characters in some words (señor, señora, mission, inglés), are avoided and transcribed using the closest English character (senor, senora, mission, ingles). Is this due to technical matters or is it an attempt to simplify the language?

This is all to do with the font in which the subtitles are broadcast. In the teletext font we are not able to show special characters or accents. So, for instance, we have no choice but to write *cafe* rather than *café*.

13. In Maya And Miguel, the Spanish word “caramba” is transcribed as “carumba”. Is this an attempt to represent the word in a way that is phonetically closer to the English language?

As far as I am aware, this has happened by accident and we need to go back and correct it. I can’t think of a logical reason why the word would be changed in this way, other than by a mishearing or misspelling of the word.

14. Is quality control part of the subtitling process? If so, how is it carried out?

Experienced subtitlers do not have their work reviewed by other people, but it is proof-read by others before being sent to transmission. Also, considerable emphasis is placed on individuals taking responsibility for spell-checking and reviewing their own work, and for checking spellings and researching names.

For the first six months to a year of subtitling, trainees have their work reviewed by others as part of the training process.

15. Do you get feedback from the audience? If so, please specify.

At the end of BBC programmes, we include an e-mail address to encourage feedback from the audience about our subtitles. Also, people phone into the BBC with their views and all comments regarding subtitles are picked up on by the department. Similarly, other clients have their own ways of keeping in touch with their audiences and feeding back to us.

Red Bee itself has regular contact with a range of lobby groups who share with us their views of our work and output.

16. Other comments…

Questionnaire on the subtitling of *Arthur* (BBC2) by Greig Forbes, Subtext

1. Was the subtitling process based on any conventions or guidelines (e.g. ITC Guidelines on Standards for Subtitling)? If so, which ones?

BBC Subtitling Style Guide, specifically for children's programmes.

2. Did you have to adhere to stylistic choices dictated by the client or did you have a certain extent of freedom?

We had to generally adhere to stylistic guidelines as above.

3. Were the subtitles produced for a specific audience (age group, deaf and hard-of-hearing)? If so, please specify.

Deaf and hard-of-hearing for younger children.

4. Did you bear any age group in mind when producing the subtitles? Please specify.

Children aged 5 to 8 approximately, while bearing in mind often programmes for younger children are watched by parents as well.

5. What was the reading speed?

Considering the slower reading speed of this age group, approximately 2.5 to 3 seconds per line of subtitle.

6. What were the minimum and maximum duration of subtitles on screen and the minimum gap between subtitles?

Minimum duration – approximately 2 seconds

Maximum duration – approximately 6 seconds

Gap between continuous subtitles is always one frame. If there is a pause in the dialogue, a minimum gap of one second is desirable.

7. What were the criteria applied when editing was necessary due to time constraints (e.g. partial or total omission, rephrasing)?

Either omission or rephrasing can be used as long as general sense and flavour of dialogue is retained. For children's programmes, keeping simple sentence forms is preferable.

8. Were the editing guidelines applied to songs any different from the ones applied to dialogues?

If it is a known song, there should be no editing. Generally with a song, where rhyme and rhythm is important, you like to keep editing to a minimum, so the guidelines are slightly different from general dialogue.

9. Interjections are generally subtitled with the same phonetics they appear on any dictionary of the English language. It is rare that semi-lexical utterances are transcribed as such (exceptions: ‘aah’, ‘a-ha’). Any particular reasons for this?

Paralinguistic features are normally represented by labels (SNORING) rather than by an onomatopoeic form. Any particular reasons for this?

In children’s programmes it is preferable to use forms such as “aah”, rather than a label (SCREAMS), becaus younger children understand that better. However, sometimes these labels are unavoidable, for instance it is difficult to represent “SNORING” in onomatopoeic form in a way that would be readily understood.

10. How influential were shot changes in the subtitling process?

Keeping to shot changes is always desirable for neatness and for ease of reading subtitles, though crossing shots is sometimes essential, particularly in programmes where shots change constantly.

11. Was quality control part of the subtitling process? If so, how was it carried out?

Yes, programmes are always reviewed thoroughly, spellchecked and researched for spellings of names etc.

12. Did you get feedback from the audience? If so, please specify.

For this programme, no.

13. How important was synchronising subtitles to image and sound? Any acceptable tolerance?

Synchronising subtitles to image and sound is very important, particularly in a drama series, to follow the story and pace of a programme. (In a documentary, for instance, there is more tolerance for going slightly out of synch with an unseen narrator as long as the subtitles relate to the image on screen.) However, sometimes starting or ending subtitles on a shot change for neatness may mean being slightly out of synch.

14. Other comments…

Appendix Two: Parental consent form and questionnaire

Name of project:	Subtitling for deaf children
Name of researcher:	Soledad Zárate
Contact Number:	07963842363

13th May 2010

Dear Parent/guardian,

My name is Soledad Zárate and I am a PhD student at Imperial College London and also a translator for the deaf and hard-of-hearing. My main interest is subtitling for deaf children in the UK. In particular, I am exploring ways of using subtitles to help deaf children develop their language and literacy skills in English. The project involves the screening of a number of subtitled clips (mainly cartoons) and its main objective is to assess the children's comprehension of the subtitles through brief questionnaires.

All information collected will be treated confidentially and no real names will be used.

Children will take part in the study only after completion of a consent form (see below) by a parent or guardian. The parent/guardian can decide against the participation of the child to the screening and questionnaire session, which will last approximately 45 minutes.

The participants' parent/guardian will be entitled to a copy of a project summary on request and may make any comments if they so wish.

If you require further information or have any concerns on any of the issues outlined in this letter, please leave your details at the above number and you will be contacted as soon as possible.

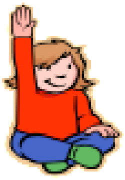
Thank you for your collaboration!

Soledad Zárate

Dr Jorge Díaz Cintas

Subtitler for the deaf and hard of hearing
PhD student

Project supervisor



PARENTAL CONSENT FOR CHILDREN TAKING PART IN PROJECT:
Subtitling for deaf children

Please read and tick those that apply:

I have been informed of the nature of the project, what information is required from my child and received a clear explanation of how my child's contribution will help with this project. ☐

I give permission for my child to take part in the study which includes the screening of subtitled clips, followed by a questionnaire session, for the purpose of collecting information about children's comprehension of subtitles. ☐

I understand that all the material will be stored safely and only used for the purpose stated above. ☐

Signature of Parent/Guardian: ______________________Date signed: ___/__ /____

Child's name:_________________________Surname:___________________________

Date of child's birth:___________________Male/female:___________________

Parents: deaf ☐ hearing ☐
Child: born deaf? yes ☐ no ☐ deaf from the age of ____________

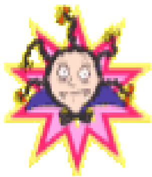
Degree of hearing loss:
mild (18 to 40 dB) ☐
moderate (40 to 60 dB) ☐
severe (60 to 90dB) ☐
profound (over 90 dB) ☐

Listening device:
none ☐
hearing aid ☐
cochlear implant in <u>one ear</u> ☐ at the age of ____
cochlear implant in <u>both ears</u> ☐ at the age of ____

Communication method:
only English ☐
only British sign language ☐
both English and British sign language ☐
other spoken or sign language ☐ Please specify______________________

Any communication disorders and/or learning disabilities?
yes ☐ Please specify____
no ☐

Appendix Three: Children's consent forms



Hello!

You will be watching a subtitled episode from the cartoon *Mona the Vampire.*

I will ask you to complete a brief questionnaire. Very important: This is not a test and please do not worry if you do not know the answers to the questions.

Why? I want to know more about how children read and understand subtitles.

If you are happy to help me with this, enjoy the cartoon and remember to read the subtitles! If not, feel free to let me know at any point.

Thank you,

Soledad

Hello!

You will be watching a subtitled episode from the cartoon *Arthur*.

I will ask you to complete a brief questionnaire. Very important: This is not a test and please do not worry if you do not know the answers to the questions.

Why? I want to know more about how children read and understand subtitles.

If you are happy to help me with this, enjoy the cartoon and remember to read the subtitles! If not, feel free to let me know at any point.

Thank you,

Soledad

Appendix Four: Ethical approval documents

Imperial College London

Imperial College Research Ethics Committee [ICREC] Application Form

Section One - Details of Principal Investigator

If the application is a student project, please name the student's supervisor as the Principal Investigator. Please add the student's name and details of all other co-investigators or collaborators in Section Six.

Name:	Dr Jorge Díaz Cintas
Position:	Senior Lecturer in Audiovisual Translation
Address:	Department of Humanities Sherfield Building, Room S310 South Kensington Campus
Telephone:	020 7594 8747
Email:	j.diaz-cintas@imperial.ac.uk
Fax:	020 7594 8759
Summary of skills and experience relevant to this study:	Work on accessibility to the media is one of my main fields of expertise.
Previous experience in any procedures to be used. *(Including involvement with vulnerable participants if relevant):*	At my previous university, we conducted a couple of experiments with deaf and hard-of-hearing children

Section Two – Project Summary

Full title of study:	Subtitling for deaf children
InfoEd proposal number (if applicable)	
Proposed Start Date:	January 2010
Proposed End Date:	July 2010

Does the study involve any of the following:

Drugs/medication	Y	**N**	*If yes, please attach the SmPc.*
Ionising radioactive substances/x-rays	Y	**N**	*If yes, please also complete appendix one*
Genetically modified materials	Y	**N**	*If yes, please also complete appendix two and attach the GM Safety Committee letter*

2.a Project Summary

Please provide a summary of the project , including the expected outcomes, in LAY terms (max 350 words)

The project consist of 30 minutes sessions with classes of deaf children from [illegible] Primary School in London. The sessions are organised to fit in with the school timetable and take place between 1.30 pm and 2 pm, as arranged with the Head of the Hearing Impaired Unit. Teachers stay in the classroom and their role is not replaced by the researcher. Three sessions per term have been scheduled.

ICREC application form, Version 2.0, March 2008

The session starts with a presentation of the subtitled clip (mainly cartoons) where the children are encouraged to identify the main characters and discuss the plot.

It is followed by a screening of the (10 minutes) subtitled clip.

The comprehension of the subtitles and the strategies used (for instance, to introduce new vocabulary) are assessed through brief multiple choice questionnaires that the children are asked to complete after the viewing. The researcher and teachers may assist the children in the reading of the questionnaire.

The expected outcome is the development of a set of recommendations for good practice in subtitling audiovisual material for deaf children.

2.b Ethical Summary

Please provide details of what you consider to be the ethical issues surrounding this project in LAY terms. (max 500 words)

Before the children participate in any of the case studies, the parents are asked to complete a parental consent form which is enclosed to a letter that states what the nature of the project is, what information is required from the children and clearly explains how the children's contribution will help with the project. The letter also states that all the material collected will be stored safely and only used for the purpose of collecting information about children' comprehension of subtitles.

The parents are asked to sign and return the parental consent form, which includes all the points stated above.

Section Three- Project Details

3.a Protocol

Please provide details of the scientific justification for the study, and the research methodology to be used in LAY terms (max 750 words).

Please attach the protocol and any questionnaires that will be used.

The study will be conducted with deaf children from a mainstream school that has a hearing impaired unit. This group is very representative since the majority of deaf children – 80% - are enrolled in oralist mainstream schools - i.e. where English as opposed to sign language is the method of communication used for teaching.

The research method is the case study, where the screening of a subtitled clip is followed by a multiple choice questionnaire to be completed by the children individually. Teachers and the research may assist the children in understanding the questionnaire, if required.

There are two stages of the research: the first one is the piloting, followed by the second one, which is the main experiment.

Three pilot studies will be conducted (respectively with Year 3, Year 4, and Year 5 and 6) - useful to design the questionnaire methodology. In particular, I am interested in finding out whether the children of different ages are able to cope with the task (can they follow the subtitles?, can they understand the questionnaire?, what are their reading abilities?, do they understand the types of enhancements introduced in the subtitles - namely use of upper case for introduction of new vocabulary, use of italics for ungrammatical speech, use of colour for identification of speakers?).

The main experiment will be conducted with two groups and two episodes from same cartoon (for counterbalancing purposes). Group A and Group B will be similar in age and literacy levels. Video A1 and B1 consist of broadcast subtitles (On British television), Video A2 and B2 consists of enhanced / edited subtitles. Group A will view Video A1 and B2, group B will view Video A2 and B1.

Minimum number of participants per group (having excluded those whose first spoken language is not English): 6.

The children after the viewing will do a word recognition task. They will be presented with a list of words and will be asked to highlight those found in the subtitles. Those words will be highlighted in the subtitled through the use of upper-case and repeated where possible.

Before the case studies take place, the parents are sent a letter where the project is explained and their consent is

ICREC application form, Version 2.0, March 2008 2

formally required. They are also asked to complete a questionnaire on the child's background (degree of hearing loss, method of communication, listening device used, etc). Questionnaire, letter and parental consent form (including brief questionnaire on child's background) are enclosed.

3.b Value Please state the intended value of the project (in terms of the expected outcomes) in LAY terms (max 500 words).
The project is aimed at collecting information on how deaf children read subtitles by experimenting different subtitling strategies and finding the most suitable for deaf children. The subtitling practice will benefit from the data collected as the findings will be communicated to practitioners, regulators and academics. Deaf children will ultimately benefit from this project as a set of recommendations on the subtitling practice for deaf children will be put forward by the researcher to ensure that the needs of deaf children are taken into account by the professionals.

3.c Location Please state where the study will take place. *If part or all of the study will take place abroad, please state any steps that have been taken to ensure compliance with research and ethical rules in those countries.*

3.d Dissemination Please state how and to whom the results of this study will be disseminated, including the communication of results to the research participants.
The results of this study will be disseminated to: - OfCom – the communication office that regulates access services (including subtitling practice) in the UK - the subtitling companies that subtitle for television broadcast - academics (lecturers and researchers) The dissemination of results will be achieved through personal communications, presentations in relevant conferences (Media for All 4, London 2010), and publications in journals (*The Sign Language Translator and Interpreter*). The finding will be communicated to the school and to the parents who request it.

***3.e* Previous ethical approval**		
Has any part of this proposal received prior ethical approval?	Yes	**No**
Has any part of this proposal previously been rejected by an ethics committee?	Yes	**No**
If yes to either of the above, please give details:		

Please attach the relevant documentation

3.f Funding		
Has this project received funding, or is in the process of receiving funding?	Yes	**No**

If yes, please provide details:	

3. g Insurance and Indemnity Cover		
Have you applied to the Clinical Research Governance Office (CRGO) for indemnity cover?	Yes	**No**
If no, please state when you intend to apply:	November 2009	
If you do not intend to apply, please give reasons:	Not sure whether a CRGO is needed.	

If yes, please attach email from the Research Facilitator confirming insurance cover.

Section Four – Participants

4.a Study population

Please state the number of research participants to be recruited, including the inclusion and exclusion criteria for recruitment.

Deaf children whose first spoken language is English in Year 3, Year 4, Year 5-6. Total number of participants: between 21 and 25.

4. b Vulnerable groups

Please give details of any vulnerable groups to be used in the study (eg those under 18, prisoners, those in a dependent relationship, the mentally ill), and give reasons for their inclusion.

Deaf children attending Primary School (and probably other schools if the number of participants requested cannot be reached) are recruited as the project concerns the subtitling practice of children's programmes having this group as the target audience.

4.c Recruitment process

Please explain how you will recruit participants to the study. Please include any incentives (such as financial reimbursement).

If advertising is to be used, please attach a copy of the advert. If you are planning to recruit via email, please include a copy of the email.

The participants will be recruited from Primary school through the head of the Impaired Hearing Unit.

4.d Informed Consent

i. Please detail your process for ensuring the informed consent of all research participants.
ii. If vulnerable persons are to be used in the study, please give separate specific information on how you will ensure informed consent.
iii. If participants whose first language is not English are to be recruited, please state how the details of the study will be explained and the informed consent process will be handled.

Please attach a copy of the consent form and participant information sheet and any additional forms/information if appropriate.

A letter is sent to the parents / guardians through the school to inform them about the nature of the project and they are asked to return the parental consent forms. The consent forms are a prerequisite for the participation of the children to any of the studies (including pilot ones).

4.e Withdrawal

Please state procedures for the withdrawal of participants from the study.

ICREC application form, Version 2.0, March 2008 4

If after receiving the parental consent form, the parents or guardians decide that they want to withdraw their child from the study, it will be done. As for the data already collected, the parents / guardians can decide whether it should be kept or destroyed.

4.f Confidentiality

Please state the measures you have taken to ensure the confidentiality of the research participants and the data collected, including who will have access to the data. Please include information on any process to anonymise participants and their data.

All the data collected is stored in the researcher's personal laptop, which is protected by password. Participant's information will be anonymised as their names will not be used at any point. .

Section Five – Risks And Benefits

5.a Risks	
Please state in LAY terms any potential risks/hazards, medical or non-medical, including mechanisms to minimise them.	
i. Research participants	No risks are identified since the study will be conducted within the school with no different set up.
ii. Researchers	No risks are identified.
iii. Others (eg. Imperial College, industry funders)	No risks are identified.

5.b Benefits	
Please give, in LAY terms, details of any potential benefits to:	
i. Research participants	In the short term, they will perform an extracurricular activity which may also have a didactic dimension (they may for instance incidentally learn some new vocabulary or might be stimulated to do so). In the long term, their access to children's programmes will be ensured since the finding from empirical research will be published and communicated to all practitioners.
ii. Researchers	The study will contribute extensively to the researchers' growth of expertise.
iii. Others (eg. Imperial College, industry funders)	Imperial College's reputation will be enhanced by the publication of groundbreaking research in humanities. Subtitling companies and regulators will benefit from the research as evidence of deaf children's needs and abilities will be provided.

Section 6 – Co-Investigators/Collaborators

If there are more than 2 co-investigators, please use a separate sheet and follow the format below.

Name:	Soledad Zárate
Position:	student
Address:	11A Tabor Road London W6 0BN

Telephone:	07963842363
Email:	s.zarate08@imperial.ac.uk
Fax:	
Summary of skills and experience relevant to this study:	Publications: Zárate, Soledad (2008) "Subtitling for Deaf Children on British Television". *The Sign Language Translator and Interpreter*. Vol. 2, No. 1: 15-34. (ISSN 1750-3981) Zárate, Soledad (2007) "Telling a better story with children's TV subtitles". *NDCS Magazine*, Winter / Spring, Issue 4: 29. Forthcoming publications: Zárate, Soledad. "Subtitling for Deaf Children", in Łuckasz Bogucki (ed.) *Intermedia*. Frankfurt am Main: Peter Lang. Zárate, Soledad. "Bridging the Gap between Deaf Studies and AVT for Deaf Children", in Jorge Díaz Cintas, Anna Matamala and Josélia Neves (eds.) *Media for All* (working title). Zárate, Soledad. "Review of *The Sign Language Translator and Interpreter*. Vols. 2(1) and 2(2), 2008." *The Journal of Specialised Translation* (www.jostrans.org).
	She is a qualified subtitler and has initiated a surtitling service for children at the Puppet Theatre Barge, London.
Previous experience in any procedures to be used. *(Including involvement with vulnerable participants if relevant):*	The student has already worked with groups of deaf children in schools and children's societies.

Name:	
Position:	
Address:	
Telephone:	
Email:	
Fax:	
Summary of skills and experience relevant to this study:	
Previous experience in any procedures to be used. *(Including involvement with vulnerable participants if relevant):*	

PI Declaration

I declare that:

ICREC application form, Version 2.0, March 2008 6

- I undertake to abide by the ethical principles underlying the Declaration of Helsinki (1964) and subsequent amendments and good practice guidelines on the proper conduct of research.
- I undertake to abide by the Data Protection Act 1998 and any applicable local laws.
- I undertake to abide by all local rules for non-UK research.
- I will report any adverse or unforeseen events which occur to ICREC within 7 days.
- I will provide an annual progress report of the project until the end of the study.
- I will provide notification of the end or early termination of the research project.
- I will inform the ICREC if there are any changes to the research protocol or personnel which affect the ethical aspects of the project.
- I will assist ICREC in any continuing review of the project deemed necessary by the Committee or Faculty members.
- I will re-apply for ethical approval after 5 years.
- All information on this form is correct.

Name: Dr Jorge Díaz-Cintas

Signature:

Date: 19th November 2009

Would you be willing to attend the ICREC meeting to answer any questions about your proposal?
Yes ☒
No ☐

Any attendance must be by the PI named in the section one of this application form. If this is a student application, the student may attend only if the supervisor is present. In addition, it is also possible for other relevant people to attend if necessary.

Head of Department decision	
Please indicate below your decision and the reasons for it -	
Approval	☐
Referral to ICREC	☐
Reasons:	
Signed:	
Printed Name:	
Date:	

Clinical Research Governance Office, or other relevant body, decision	
Please indicate below your decision and the reasons for it -	
Approval	☐
Referral to ICREC	☐
Reasons:	
Signed:	
Printed Name:	
Date:	

ICREC Subtitling for deaf children – Applicant: Dr Jorge Díaz Cintas –
Main experiment protocol

Protocol of main experiment at [redacted] Primary School

Aim: to assess the comprehension of the video clip and the recognition of new vocabulary.

Material: two episodes (**Video A** and **Video B**) of the cartoon *Arthur,* recorded from CBBC. Length: 12 minutes each. www.bbc.co.uk/cbbc/shows/arthur

Participants: Deaf children recruited from Year 3 & 4, Year 5 & 6. Only those children whose first spoken language is English and for whom the parents have completed and returned the consent forms will be considered in this study.

Procedure:

- Division of two groups (**Group A** = Year 3 & 4, **Group B** = Year 5 & 6) into two smaller groups (respectively **Group A1** and **Group A2**, and **Group B1** and **Group B2**), which will be similar in age and literacy levels.

- **Video A** will be available with broadcast subtitles (**Video A1**) and with enhanced / edited subtitles (**Video A2**); the same applies to **Video B** (**Video B1**, **Video B2**).

- **Group A1** and **Group B1** will view **Video A1** and **Video B2**. **Group A2** and **Group B2** will view **Video A2** and **Video B1**.

Planned schedule: Session of 45 minutes for each viewing, scheduled to take place in May, June and July 2010.

Before the viewings:
The video clip will be contextualized so that the children share a similar knowledge about the main characters and the plot.

After the viewings:
The children will do a word recognition task, that is they will be presented with a list of words and will be asked to highlight those found in the subtitles. They will be also asked to complete a multiple choice questionnaire aimed at assessing their comprehension.

Appendix Five: Pilot questionnaires

Your name:..

Questionnaire *Mona the Vampire: The Lost Pirates*

1. **Who wants to cut the tree? Circle the picture.**


Man


Mona


Charley


Lily

2. **Why cutting the tree?**
   - to stop the water damage
   - to build a boat

3. **The tree is…**
   - old
   - young

4. **The captain is…**
   - big
   - small

5. **The *Pirates of Penzance* is…**
   - a theatre play
   - a song
   - a book

6. Reverend Gregory…

- ○ is a real pirate
- ○ is not a real pirate

---

7. The pirate captain is…

- ○ homesick
- ○ seasick

---

8. If you are "homesick" or "seasick", you are…

- ○ sad
- ○ happy

---

9. The Zapperama…

- ○ makes people smaller
- ○ makes people bigger
- ○ makes people laugh

---

10. The pirates have to go because…

- ○ it is dark
- ○ the rift and gateway are closing

11. The woman is…

- singing
- humming
- praying
- watering plants

---

12. Mona…

- sits on the floor
- tells Fang to go away
- tells Fang to sit down

---

13. Who says "walk the plank, matey"?

- pirates
- actors
- teachers

---

14. "Keep your eyes peeled" means keep your eyes…

- open
- closed

15.

This be a fine hoagie!

Is there a mistake?

- ○ yes (circle and correct the wrong word)
- ○ no

....

Shiver me timbers!

Is there a mistake?

- ○ yes (circle and correct the wrong word)
- ○ no

....

I've lost me appetite.

Is there a mistake?

- ○ yes (circle and correct the wrong word)
- ○ no

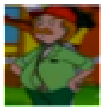
....

Your name:.............................

Questionnaire *Mona the Vampire: The Lost Pirates*

One answer per question, cross your answer like this: **X**

1. Who wants to cut the tree?



- ○ Man

- ○ Mona

- ○ Charley
- ○ Not sure

---

2. Why cutting the tree?

- ○ to stop the water damage
- ○ to build a boat
- ○ to light a fire
- ○ not sure

---

3. The tree is…

- ○ young
- ○ ill
- ○ old
- ○ not sure

---

4. The captain is…

- ○ BLONDE
- ○ LITTLE
- ○ GIGANTIC
- ○ NOT SURE

1

5. **The *Pirates of Penzance* is…**
   - AN OPERA
   - A SONG
   - A BOOK
   - NOT SURE

---

6. **Reverend Gregory is…**
   - a real pirate
   - a real teacher
   - not a real pirate
   - not sure

---

7. **The pirate captain is…**
   - HOMESICK
   - SEASICK
   - BORED
   - NOT SURE

---

8. **The pirates have to go because…**
   - it is raining
   - the rift and gateway are closing
   - it is getting dark
   - not sure

---

9. **[BEEP] is…**

- the character
- the sound of the watch
- the sound of the telephone
- not sure

10. "I've lost me appetite." "Me" is underlined because it is…

- ○ a wrong word
- ○ a short word
- ○ an important word
- ○ not sure

---

11. Who says One minute! ?

- ○ Mona 
- ○ Charley 
- ○ Lily 
- ○ not sure

---

12. Who says The rift is closing! ?

- ○ Mona 
- ○ Charley 
- ○ Lily 
- ○ not sure

Appendix Six: Main study questionnaires

Your name:...

Questionnaire

Arthur: A Portrait of the Artist as a Young Tibble

One answer per question, cross your answer like this: **X**

1. The opening song of Arthur says…

- "**Wow!** What a **wonderful** kind of day!"
- "**Hey!** What a **fantastic** kind of day!"
- "**Wow!** What a **fantastic** kind of day!"
- "**Hey!** What a **wonderful** kind of day!"
- not sure

2. Timmy says that the toy is…

- practical
- educational
- inventive
- not sure

3. Timmy says that the toy teaches…

- counting
- singing
- cooking
- not sure

1

4. Tommy says that Timmy ate his…

- ice-cream
- cupcake
- candy
- not sure

5. Tommy and Timmy collected…

- diamonds
- coins
- stones
- not sure

6. Mr Ratburn says that the painting is very…

- unique
- unusual
- rare
- not sure

7. Tommy and Timmy sell their paintings…

- to buy a toy
- to have fun
- to become famous
- not sure

2

8. DW's grandma does not want to buy the painting with the boat because…

- she does not have room for it
- she does not have the money
- she does not really like it
- not sure

9. Tommy cries and says …

- "We'll never be **artists**"
- "We'll never be **teachers**"
- "We'll never be **sellers**"
- not sure

10. Timmy makes a…

- **lemon** sign
- **lemonade** sign
- **lime** sign
- not sure

11. Tommy and Timmy sell the toy to buy…

- clothes
- games
- paints
- not sure

12. **Tommy and Timmy talk about their next…**

- painting
- toy
- game
- not sure

13. **Tommy wants a train, Timmy wants…**

- a plane
- a car
- a tractor
- not sure

4

Your name:………………………………………

Questionnaire

Arthur: War of the Worms

One answer per question, cross your answer like this: **X**

1. The opening song of Arthur says…

- ○ "**Wow!** What a **wonderful** kind of day!"
- ○ "**Hey!** What a **fantastic** kind of day!"
- ○ "**Wow!** What a **fantastic** kind of day!"
- ○ "**Hey!** What a **wonderful** kind of day!"
- ○ not sure

2. Arthur says that goats do not have…

- ○ arms
- ○ wings
- ○ fingers
- ○ not sure

3. Worms eat…

- ○ scraps
- ○ shrimps
- ○ insects
- ○ not sure

4. **Mr Ratburn says…**

- **Exceptional** claims require **exceptional** evidence
- **Extraordinary** claims require **extraordinary** evidence
- **Sensational** claims require **sensational** evidence
- not sure

5. **Binky helps Fern with the…**

- game
- homework
- hoax
- not sure

6. **Fern wants to …**

- make up a story for Brain
- listen to a story by Brain
- read a story to Brain
- not sure

7. **A vermiculture box has…**

- a mummified platypus
- designer shoes
- worms
- not sure

8. **Fern asks Buster for fresh…**

- potatoes
- tomatoes
- beans
- not sure

9. **Francine and Brain say that the holes are…**

- weird
- unusual
- mysterious
- not sure

10. **Brian says…**

- What's all this green **slime**?
- What's all this green **liquid**?
- What's all this green **mud**?
- not sure

11. **Brian reads the letter by the…**

- National Secret Anti-Worm **Team**
- National Secret Anti-Worm **Squad**
- National Secret Anti-Worm **Society**
- not sure

12. Worms eat…

- soil
- scraps
- soil and scraps
- not sure

13. Worms make…

- soil
- scraps
- soil and scraps
- not sure

4

Appendix Seven: Children's feedback

After Video 1B viewing

Child One: I could understand the subtitles. The ones I have at home are very slow, if there's someone saying something, then there's a different subtitle from the last one. It didn't happen here.

Child Two: I liked the subtitles.

Child Three: They are always fighting. Pretty fantastic. I liked it and the colours. I watch Arthur every morning when I wake up.

Child Four: The subtitles are well written, but maybe when two people are talking at once, they should have different colours, right? At home I have subtitles on Sky, when there's loads of people talking, they have different colours.

Child Five: Those subtitles are very quickly written.

Child Six: Excellent.

Child Seven: The writing was nice and big.

Child Eight: I couldn't see because there was people in front of me.

Child Nine: No different from the ones I have at home.

Child Ten: It was easy. Just like Child Seven said, they were big and they could stand out.

After Video 2B viewing

Child Eleven: The subtitles were fast.

Child Twelve: I quite like them, but they were a little bit too slow. Normally at my house they are quite fast. I'm used to fast.

After Video 1E viewing

Child Twelve: Easy. At home they are hard because they don't type it properly.

Child Thirteen: Good, but they didn't have like different colours, they didn't have pink, red.

Child Twelve: The ones I have at home, they don't spell it properly.

Child Thirteen: I like subtitles that use different colours when there's different people talking.

Child Fourteen: Ok. It was good. I can read it properly. I could read it because they were slower than last time (pilot study).

Child Twelve: Slower is better, then you have some time to read it. Sometimes they don't spell it properly and they just leave gaps, and then you don't know what they are saying. It's boring.

Child Fifteen: When it's too fast you can read the beginning. That was okay.

Child Sixteen: I could read it because it was easy to see.

Child Seventeen: Fine. The subtitles at home sometimes go off.

All children: Yes!

Child Eighteen: I could read them.

Child Thirteen: Films sometimes don't have subtitles on television.

Child Twelve: Yes, the say "no subtitles". And some DVDs, they say "no". I don't like it.

After Video 2E viewing

Child Four: Last time I said you could turn on the colours and you did.

Child Two: If your hear is not working, then you can't hear. You can't hear what they are talking about. If you're deaf, you need subtitles.

Child Nineteen: The writing was very good. And then, that's a good story.

Appendix Eight: Statistical methods and results

Statistical methods

The median and range was used to summarise continuous data.
The paired Sign test was used to compare differences between broadcast and enhanced subtitles total scores for word recognition.
McNemar's test was used to look at differences between the videos for content comprehension.
The Mann-Whitney test was used to compare the total word recognition scores by order of presentation as well as hearing loss, amplification device and language.
Fisher's exact test was used to compare content comprehension results against the other categorical variables.
Spearman correlation was used to look at relationships between the total word recognition scores and the reading age.
Stata version 10 was used for analysis.

Results

***1. Analyse the data looking at order of presentation and type of video. Column M (SUBTITLES) versus Column AF (WR TOTAL SCOREbroad), Column AG (WR TOTAL SCOREenhan), Column AP (C TOTAL SCOREbroad), Column AQ (C TOTAL SCOREenhan).**

SUBTTILE	Freq.	Percent	Cum.
1	11	55.00	55.00
2	9	45.00	100.00
Total	20	100.00	

9/20 (45%) are enhanced first.

WR TOTAL SCOREbroad

	Percentiles	Smallest		
1%	1	1		
5%	1.5	2		
10%	2	2	Obs	20
25%	4	4	Sum of Wgt.	20
50%	5.5		Mean	5.65
		Largest	Std. Dev.	2.41214
75%	8	8		
90%	8.5	8	Variance	5.818421
95%	9	9	Skewness	-.3157438
99%	9	9	Kurtosis	2.023605

The median WR total score for broadcast is 5.5.
The range goes from 1 to 9.

```
                    WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%           .5              1
10%          1.5              2       Obs                  20
25%            4              3       Sum of Wgt.          20

50%          6.5                      Mean                6.1
                        Largest       Std. Dev.      2.989455
75%            9              9
90%            9              9       Variance       8.936842
95%            9              9       Skewness      -.6082992
99%            9              9       Kurtosis       2.092252
```

The median WR total score for enhanced is 6.5.
The range goes from 0 to 9.

```
-> tabulation of ctotalscorebroad

    C TOTAL |
 SCOREbroad |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |          1        5.00        5.00
          1 |          3       15.00       20.00
          2 |          4       20.00       40.00
          3 |          6       30.00       70.00
          4 |          6       30.00      100.00
------------+-----------------------------------
      Total |         20      100.00

-> tabulation of ctotalscoreenhan

    C TOTAL |
 SCOREenhan |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |          5       25.00       25.00
          2 |          6       30.00       55.00
          3 |          3       15.00       70.00
          4 |          6       30.00      100.00
------------+-----------------------------------
      Total |         20      100.00

-> tabulation of ctotbroad

  ctotbroad |      Freq.     Percent        Cum.
------------+-----------------------------------
        Low |          8       40.00       40.00
       High |         12       60.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

12/20 (60%) have high scores (3+) for C total broadcast.

```
-> tabulation of ctotenhan

  ctotenhan |      Freq.     Percent        Cum.
------------+-----------------------------------
        Low |         11       55.00       55.00
       High |          9       45.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

9/20 (45%) have high scores (3+) for C total enhanced.

```
--------------------------------------------------------------------------------------
------
-> subttile = 1

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%          2              2
 5%          2              4
10%          4              4       Obs                  11
25%          4              4       Sum of Wgt.          11

50%          7                      Mean           6.090909
                        Largest     Std. Dev.      2.256304
75%          8              8
90%          8              8       Variance       5.090909
95%          9              8       Skewness      -.4464226
99%          9              9       Kurtosis       1.910995
```

The median WR total broadcast score for broadcast video first is 7. The range goes from 2 to 9.

```
--------------------------------------------------------------------------------------
------
-> subttile = 2

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%          1              1
 5%          1              2
10%          1              4       Obs                   9
25%          4              5       Sum of Wgt.           9

50%          5                      Mean           5.111111
                        Largest     Std. Dev.      2.619372
75%          7              5
90%          9              7       Variance       6.861111
95%          9              8       Skewness      -.0834267
99%          9              9       Kurtosis       2.067064
```

The median WR total broadcast score for enhanced video first is 5. The range goes from 1 to 9.

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

    subttile |      obs    rank sum    expected
-------------+---------------------------------
           1 |       11         125       115.5
           2 |        9          85        94.5
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      173.25
adjustment for ties       -3.91
                     ----------
adjusted variance        169.34

Ho: wrtota~d(subttile==1) = wrtota~d(subttile==2)
             z =   0.730
    Prob > |z| =   0.4654
```

There is no evidence of a difference in WR total broadcast score between order of presentation (p=0.465).

```
------------------------------------------------------------------------------------
------
-> subttile = 1

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |      11          50            7               4           8
```

The median WR total broadcast score for broadcast video first is 7.
The 95% confidence interval for the median goes from 4 to 8.

```
------------------------------------------------------------------------------------
------
-> subttile = 2

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |       9          50            5        2.155556    7.922222
```

The median WR total broadcast score for enhanced video first is 5.
The 95% confidence interval for the median goes from 2.156 to 7.922.

```
------------------------------------------------------------------------------------------
------
-> subttile = 1

                      WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              2
10%            2              4       Obs                  11
25%            4              8       Sum of Wgt.          11

50%            9                      Mean           6.909091
                        Largest       Std. Dev.      3.300138
75%            9              9
90%            9              9       Variance       10.89091
95%            9              9       Skewness      -1.211856
99%            9              9       Kurtosis        2.82724
```

The median WR total enhanced score for broadcast video first is 9.
The range goes from 0 to 9.

```
------------------------------------------------------------------------------------------
------
-> subttile = 2

                      WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              3
10%            1              4       Obs                   9
25%            4              4       Sum of Wgt.           9

50%            6                      Mean           5.111111
                        Largest       Std. Dev.      2.368778
75%            6              6
90%            9              6       Variance       5.611111
95%            9              7       Skewness      -.1394037
99%            9              9       Kurtosis       2.464979
```

The median WR total enhanced score for enhanced video first is 6.
The range goes from 1 to 9.

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

    subttile |      obs    rank sum    expected
-------------+---------------------------------
           1 |       11         137       115.5
           2 |        9          73        94.5
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      173.25
adjustment for ties       -8.47
                     ----------
adjusted variance        164.78

Ho: wrtota~n(subttile==1) = wrtota~n(subttile==2)
             z =   1.675
    Prob > |z| =   0.0940
```

There is marginal evidence of a difference in WR total enhanced score between order of presentation (p=0.094).

```
-------------------------------------------------------------------------------------
------
-> subttile = 1

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |      11          50            9         3.425455           9
```

The median WR total enhanced score for broadcast video first is 9.
The 95% confidence interval for the median goes from 3.425 to 9.

```
-------------------------------------------------------------------------------------
------
-> subttile = 2

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |       9          50            6         3.077778    6.922222
```

The median WR total enhanced score for enhanced video first is 6.
The 95% confidence interval for the median goes from 3.078 to 6.922.

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

           |       ctotbroad
  SUBTTILE |       Low       High |     Total
-----------+----------------------+----------
         1 |         5          6 |        11
           |       4.4        6.6 |      11.0
           |     45.45      54.55 |    100.00
-----------+----------------------+----------
         2 |         3          6 |         9
           |       3.6        5.4 |       9.0
           |     33.33      66.67 |    100.00
-----------+----------------------+----------
     Total |         8         12 |        20
           |       8.0       12.0 |      20.0
           |     40.00      60.00 |    100.00

          Pearson chi2(1) =   0.3030   Pr = 0.582
           Fisher's exact =                 0.670
   1-sided Fisher's exact =                 0.465
```

6/11 (54.6%) of broadcast first have high (3+) C total broadcast scores.
6/9 (66.7%) of enhanced first have high C total broadcast scores.
There is no evidence of an association between C total broadcast scores and order of presentation (p=0.670).

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

           |       ctotenhan
  SUBTTILE |       Low       High |     Total
-----------+----------------------+----------
         1 |         5          6 |        11
           |       6.0        5.0 |      11.0
           |     45.45      54.55 |    100.00
-----------+----------------------+----------
         2 |         6          3 |         9
           |       5.0        4.0 |       9.0
           |     66.67      33.33 |    100.00
-----------+----------------------+----------
     Total |        11          9 |        20
           |      11.0        9.0 |      20.0
           |     55.00      45.00 |    100.00

          Pearson chi2(1) =   0.8999   Pr = 0.343
           Fisher's exact =                 0.406
   1-sided Fisher's exact =                 0.311
```

6/11 (54.6%) of broadcast first have high (3+) C total enhanced scores.
3/9 (33.3%) of enhanced first have high C total enhanced scores.
There is no evidence of an association between C total enhanced scores and order of presentation (p=0.406).

***2. Do enhanced subtitles improve the subjects' performances as far as the word recognition task is concerned?Column M (SUBTITLES) versus Column AF (WR TOTAL SCOREbroad) and Column AG (WR TOTAL SCOREenhan)**

```
Sign test

        sign |    observed    expected
-------------+------------------------
    positive |           6           9
    negative |          12           9
        zero |           2           2
-------------+------------------------
         all |          20          20

One-sided tests:
  Ho: median of wrtotals~d - wrtotalscoreenhan = 0 vs.
  Ha: median of wrtotals~d - wrtotalscoreenhan > 0
      Pr(#positive >= 6) =
         Binomial(n = 18, x >= 6, p = 0.5) =  0.9519

  Ho: median of wrtotals~d - wrtotalscoreenhan = 0 vs.
  Ha: median of wrtotals~d - wrtotalscoreenhan < 0
      Pr(#negative >= 12) =
         Binomial(n = 18, x >= 12, p = 0.5) =  0.1189

Two-sided test:
  Ho: median of wrtotals~d - wrtotalscoreenhan = 0 vs.
  Ha: median of wrtotals~d - wrtotalscoreenhan != 0
      Pr(#positive >= 12 or #negative >= 12) =
         min(1, 2*Binomial(n = 18, x >= 12, p = 0.5)) =  0.2379
```

There is no evidence of a difference between the WR total broadcast and enhanced scores (p=0.238).

```
                                                          -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
      diffwr |       20         50            1       -.8835294           2
```

The median difference (enhanced-broadcast) between the two scores is 1. The 95% confidence interval for the median difference goes from -0.884 to 2.

***3. Do enhanced subtitles improve the subjects' performances as far as the content comprehension task is concerned? Column M (SUBTITLES) versus Column AP (C TOTAL SCOREbroad) and Column AQ (C TOTAL SCOREenhan)**

C TOTAL SCOREbroad	C TOTAL SCOREenhan 1	2	3	4	Total
0	0	1	0	0	1
1	2	1	0	0	3
2	2	1	1	0	4
3	1	3	1	1	6
4	0	0	1	5	6
Total	5	6	3	6	20

ctotbroad	ctotenhan Low	High	Total
Low	7	1	8
High	4	8	12
Total	11	9	20

Cases	Controls Exposed	Unexposed	Total
Exposed	8	4	12
Unexposed	1	7	8
Total	9	11	20

McNemar's chi2(1) = 1.80 Prob > chi2 = 0.1797
Exact McNemar significance probability = **0.3750**

Proportion with factor

		[95% Conf. Interval]		
Cases	.6			
Controls	.45			
difference	.15	-.1090373	.4090373	
ratio	1.333333	.8745594	2.03277	
rel. diff.	.2727273	-.0670459	.6125004	
odds ratio	4	.3958333	196.9899	(exact)

There is no evidence of a difference between the C total broadcast and enhanced scores (p=0.375).

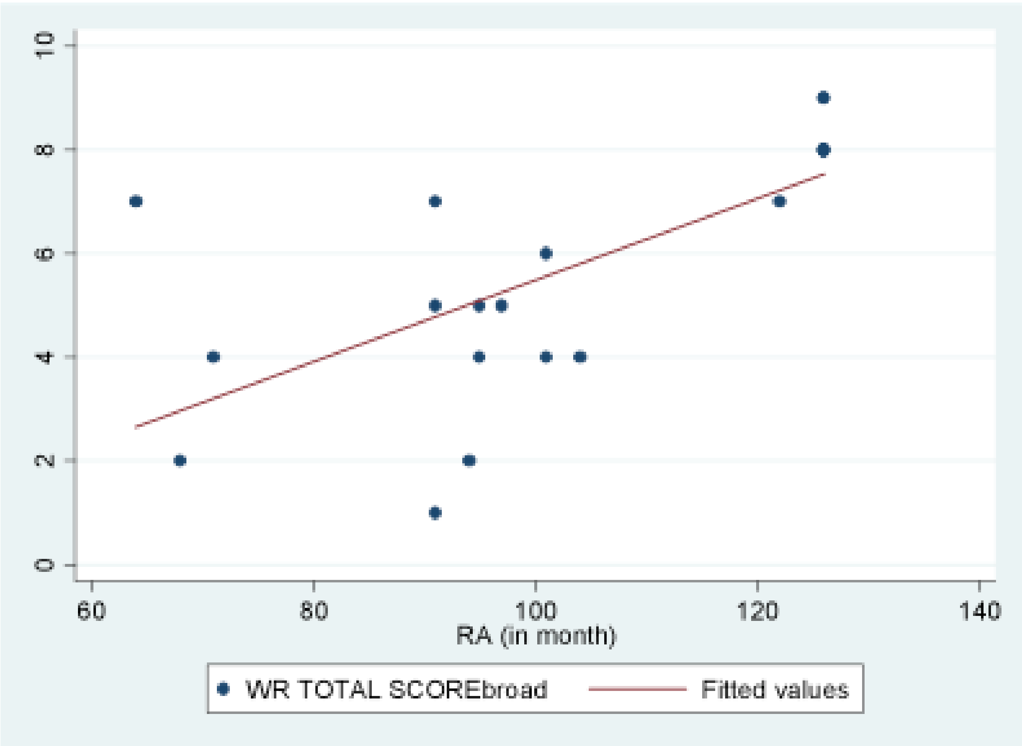
***4.   Taking into account the subtitle condition (broadcast versus enhanced), how does reading age affect the performance? Can this data be presented graphically – maybe as a scattergram? Column F (RA) versus Column AF (WR TOTAL SCOREbroad) + AG (WR TOTAL SCOREenhan) and Column AP (C TOTAL SCOREbroad) + AQ (C TOTAL SCOREenhan)**

```
                        RA (in month)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           64             64
 5%           66             68
10%         69.5             71       Obs                  20
25%           91             91       Sum of Wgt.          20

50%           99                      Mean             102.05
                        Largest       Std. Dev.      20.48485
75%          126            126
90%          126            126       Variance       419.6289
95%          126            126       Skewness      -.2483143
99%          126            126       Kurtosis       2.062958
```

The median reading age is 99 months.
The range goes from 64 to 126.

<u>Scatter graph of WR total broadcast scores against reading age</u>

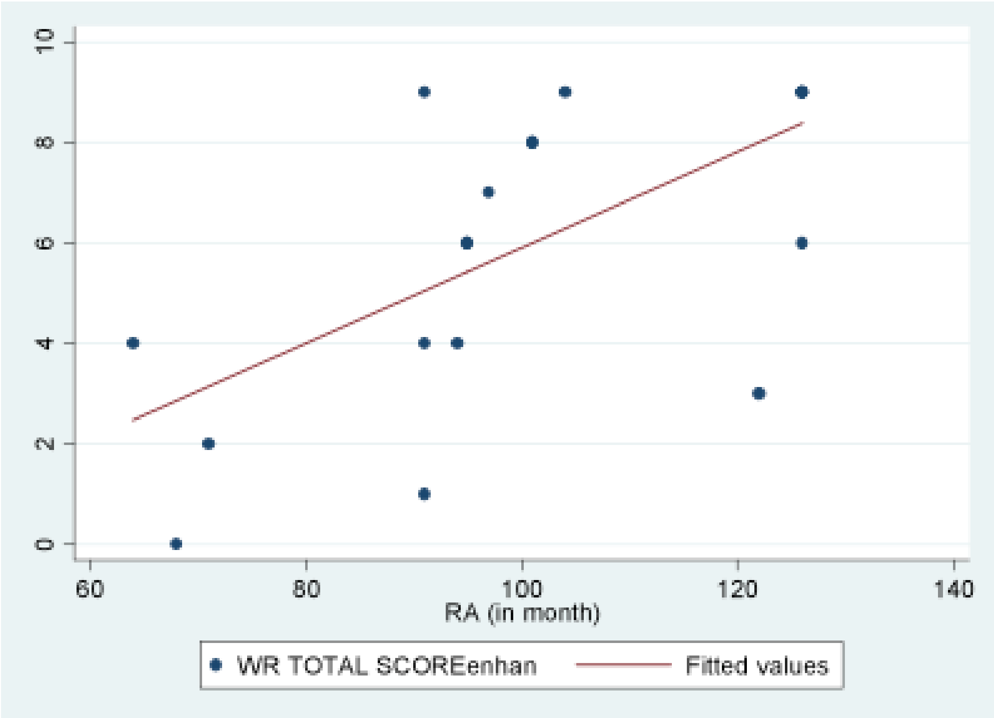



```
 Number of obs =       20
Spearman's rho =       0.7045

Test of Ho: wrtotalscorebroad and rainmonth are independent
    Prob > |t| =       0.0005
```

There is strong evidence of a relationship between WR total broadcast scores and reading age (r_s=0.705, p=0.0005).

Scatter graph of WR total enhanced scores against reading age




```
 Number of obs =       20
Spearman's rho =        0.7072

Test of Ho: wrtotalscoreenhan and rainmonth are independent
    Prob > |t| =        0.0005
```

There is strong evidence of a relationship between WR total enhanced scores and reading age (r_s=0.707, p=0.0005).

```
-----------------------------------------------------------------------------------------
------
-> ctotbroad = Low

                        RA (in month)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           64             64
 5%           64             68
10%           64             71       Obs                   8
25%         69.5             91       Sum of Wgt.           8

50%           91                      Mean             84.375
                        Largest       Std. Dev.       14.5988
75%           93             91
90%          104             91       Variance        213.125
95%          104             95       Skewness      -.2754527
99%          104            104       Kurtosis       1.592673
```

The median reading age is 91 for low C total broadcast scores.
The range goes from 64 to 104.

```
-----------------------------------------------------------------------------------------
------
-> ctotbroad = High

                        RA (in month)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           94             94
 5%           94             95
10%           95             97       Obs                  12
25%           99            101       Sum of Wgt.          12

50%          124                      Mean           113.8333
                        Largest       Std. Dev.      14.50914
75%          126            126
90%          126            126       Variance       210.5152
95%          126            126       Skewness      -.3770246
99%          126            126       Kurtosis       1.233061
```

The median reading age is 124 for high C total broadcast scores.
The range goes from 94 to 126.

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

   ctotbroad |      obs    rank sum    expected
-------------+---------------------------------
         Low |        8        42.5          84
        High |       12       167.5         126
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance       168.00
adjustment for ties        -5.18
                      ----------
adjusted variance         162.82

Ho: rainmo~h(ctotbr~d==Low) = rainmo~h(ctotbr~d==High)
             z =  -3.252
    Prob > |z| =   0.0011
```

There is strong evidence of a difference in reading age between high and low C total broadcast scores (p=0.001).

```
--------------------------------------------------------------------------------------
------
-> ctotbroad = Low

                                                         -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
   rainmonth |       8         50            91             66.7      97.925
```

The median reading age is 91 for low C total broadcast scores.
The 95% confidence interval for the median goes from 66.7 to 97.925.

```
--------------------------------------------------------------------------------------
------
-> ctotbroad = High

                                                         -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
   rainmonth |      12         50           124         97.42545         126
```

The median reading age is 124 for high C total broadcast scores.
The 95% confidence interval for the median goes from 97.425 to 126.

```
------------------------------------------------------------------------------------------
------
-> ctotenhan = Low

                         RA (in month)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           64             64
 5%           64             68
10%           68             71       Obs                  11
25%           71             91       Sum of Wgt.          11

50%           94                      Mean           90.54545
                        Largest       Std. Dev.      17.10768
75%          101             95
90%          104            101       Variance       292.6727
95%          122            104       Skewness      -.0568707
99%          122            122       Kurtosis       2.472563
```

The median reading age is 94 for low C total enhanced scores.
The range goes from 64 to 122.

```
------------------------------------------------------------------------------------------
------
-> ctotenhan = High

                         RA (in month)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           91             91
 5%           91             97
10%           91            101       Obs                   9
25%          101            126       Sum of Wgt.           9

50%          126                      Mean           116.1111
                        Largest       Std. Dev.       15.0453
75%          126            126
90%          126            126       Variance       226.3611
95%          126            126       Skewness      -.7966091
99%          126            126       Kurtosis       1.757921
```

The median reading age is 126 for high C total enhanced scores.
The range goes from 91 to 126.

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

   ctotenhan |      obs    rank sum    expected
-------------+---------------------------------
         Low |       11        78.5       115.5
        High |        9       131.5        94.5
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      173.25
adjustment for ties       -5.34
                     ----------
adjusted variance        167.91

Ho: rainmo~h(ctoten~n==Low) = rainmo~h(ctoten~n==High)
             z =  -2.855
    Prob > |z| =   0.0043
```

There is evidence of a difference in reading age between high and low C total enhanced scores (p=0.004).

```
-------------------------------------------------------------------------------------
------
-> ctotenhan = Low

                                                        -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
   rainmonth |      11          50           94        70.13818    101.8618
```

The median reading age is 94 for low C total enhanced scores.
The 95% confidence interval for the median goes from 70.138 to 101.862.

```
-------------------------------------------------------------------------------------
------
-> ctotenhan = High

                                                        -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
   rainmonth |       9          50          126        97.31111         126
```

The median reading age is 126 for high C total enhanced scores.
The 95% confidence interval for the median goes from 97.311 to 126.

***5. Taking into account the subtitle condition (broadcast versus enhanced), how does the degree of hearing loss affect the performance? Column G (HEARING LOSS) versus Column AF (WR TOTAL SCOREbroad) + AG (WR TOTAL SCOREenhan) and Column AP (C TOTAL SCOREbroad) + AQ (C TOTAL SCOREenhan)**

HEARING LOSS	Freq.	Percent	Cum.
0	17	85.00	85.00
1	3	15.00	100.00
Total	20	100.00	

17/20(85%) have profound or severe hearing loss.

```
------------------------------------------------------------------------------------------
------
-> hearingloss = 0

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              2
10%            2              2       Obs                  17
25%            4              4       Sum of Wgt.          17

50%            6                      Mean           5.647059
                        Largest       Std. Dev.      2.596661
75%            8              8
90%            9              8       Variance       6.742647
95%            9              9       Skewness      -.3054947
99%            9              9       Kurtosis       1.799374

------------------------------------------------------------------------------------------
------
-> hearingloss = 1

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            5              5
 5%            5              5
10%            5              7       Obs                   3
25%            5              .       Sum of Wgt.           3

50%            5                      Mean           5.666667
                        Largest       Std. Dev.      1.154701
75%            7              .
90%            7              5       Variance       1.333333
95%            7              5       Skewness       .7071068
99%            7              7       Kurtosis            1.5
```

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

 hearingloss |      obs    rank sum    expected
-------------+---------------------------------
           0 |       17         179       178.5
           1 |        3          31        31.5
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance       89.25
adjustment for ties       -2.01
                     ----------
adjusted variance         87.24

Ho: wrtota~d(hearin~s==0) = wrtota~d(hearin~s==1)
             z =   0.054
    Prob > |z| =   0.9573
```

There is no evidence of a difference in WR total broadcast scores between mild/moderate and profound/severe hearing loss (p=0.957).

```
-------------------------------------------------------------------------------------
------
-> hearingloss = 0

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |      17         50             6               4           8

-------------------------------------------------------------------------------------
------
-> hearingloss = 1

                                                          -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |       3         50             5               5           7*

* Lower (upper) confidence limit held at minimum (maximum) of sample
```

```
-------------------------------------------------------------------------------------
------
-> hearingloss = 0

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              1
10%            1              2       Obs                  17
25%            4              4       Sum of Wgt.          17

50%            8                      Mean           6.352941
                        Largest       Std. Dev.      3.101233
75%            9              9
90%            9              9       Variance       9.617647
95%            9              9       Skewness      -.8200887
99%            9              9       Kurtosis       2.317955

-------------------------------------------------------------------------------------
------
-> hearingloss = 1

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            3              3
 5%            3              4
10%            3              7       Obs                   3
25%            3              .       Sum of Wgt.           3

50%            4                      Mean           4.666667
                        Largest       Std. Dev.      2.081666
75%            7              .
90%            7              3       Variance       4.333333
95%            7              4       Skewness        .528005
99%            7              7       Kurtosis            1.5
```

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

 hearingloss |      obs    rank sum    expected
-------------+---------------------------------
           0 |       17         189       178.5
           1 |        3          21        31.5
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance       89.25
adjustment for ties       -4.36
                     ----------
adjusted variance         84.89

Ho: wrtota~n(hearin~s==0) = wrtota~n(hearin~s==1)
             z =   1.140
    Prob > |z| =   0.2544
```

There is no evidence of a difference in WR total enhanced scores between mild/moderate and profound/severe hearing loss (p=0.254).

```
--------------------------------------------------------------------------------------
------
-> hearingloss = 0

                                                       -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |      17         50             8        4.020297           9

--------------------------------------------------------------------------------------
------
-> hearingloss = 1

                                                       -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |       3         50             4               3          7*

* Lower (upper) confidence limit held at minimum (maximum) of sample
```

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

   HEARING |       ctotbroad
      LOSS |       Low       High |     Total
-----------+----------------------+----------
         0 |         7         10 |        17
           |       6.8       10.2 |      17.0
           |     41.18      58.82 |    100.00
-----------+----------------------+----------
         1 |         1          2 |         3
           |       1.2        1.8 |       3.0
           |     33.33      66.67 |    100.00
-----------+----------------------+----------
     Total |         8         12 |        20
           |       8.0       12.0 |      20.0
           |     40.00      60.00 |    100.00

          Pearson chi2(1) =   0.0654   Pr = 0.798
           Fisher's exact =                 1.000
   1-sided Fisher's exact =                 0.656
```

There is no evidence of an association between hearing loss and low/high C total broadcast scores (p=1.000).

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

   HEARING |       ctotenhan
      LOSS |       Low       High |     Total
-----------+----------------------+----------
         0 |         9          8 |        17
           |       9.3        7.7 |      17.0
           |     52.94      47.06 |    100.00
-----------+----------------------+----------
         1 |         2          1 |         3
           |       1.6        1.4 |       3.0
           |     66.67      33.33 |    100.00
-----------+----------------------+----------
     Total |        11          9 |        20
           |      11.0        9.0 |      20.0
           |     55.00      45.00 |    100.00

          Pearson chi2(1) =   0.1941   Pr = 0.660
           Fisher's exact =                 1.000
   1-sided Fisher's exact =                 0.579
```

There is no evidence of an association between hearing loss and low/high C total enhanced scores (p=1.000).

<u>*6.   Taking into account the subtitle condition (broadcast versus enhanced), how does the amplification device used affect the performance? Column I (AMPLIFICATION DEVICE) versus Column AF (WR TOTAL SCOREbroad) + AG (WR TOTAL SCOREenhan) and Column AP (C TOTAL SCOREbroad) + AQ (C TOTAL SCOREenhan)</u>

```
AMPLIFICATI |
  ON DEVICE |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         10       50.00       50.00
          1 |         10       50.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

10/20(50%) have an implant and 10 have a hearing aid.

```
-----------------------------------------------------------------------------------------
------
-> amplificationdevice = 0

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            2              2
 5%            2              2
10%            2              4       Obs                  10
25%            4              4       Sum of Wgt.          10

50%            4                      Mean                4.8
                        Largest       Std. Dev.       2.20101
75%            7              5
90%            8              7       Variance       4.844444
95%            8              8       Skewness       .3321636
99%            8              8       Kurtosis       1.881744

-----------------------------------------------------------------------------------------
------
-> amplificationdevice = 1

                     WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              5
10%            3              5       Obs                  10
25%            5              6       Sum of Wgt.          10

50%            7                      Mean                6.5
                        Largest       Std. Dev.      2.415229
75%            8              8
90%            9              8       Variance       5.833333
95%            9              9       Skewness      -1.122263
99%            9              9       Kurtosis       3.677551
```

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

amplificat~e |      obs    rank sum    expected
-------------+---------------------------------
           0 |       10          82         105
           1 |       10         128         105
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      175.00
adjustment for ties       -3.95
                     ----------
adjusted variance        171.05

Ho: wrtota~d(amplif~e==0) = wrtota~d(amplif~e==1)
             z =  -1.759
    Prob > |z| =   0.0786
```

There is borderline evidence of a difference in WR total broadcast scores between implant and hearing aid (p=0.079).

```
-----------------------------------------------------------------------------------------
------
-> amplificationdevice = 0

                                                           -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |      10         50             4        2.648889    7.675556

-----------------------------------------------------------------------------------------
------
-> amplificationdevice = 1

                                                           -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~d |      10         50             7               5    8.675556
```

```
------------------------------------------------------------------------------------------
------
-> amplificationdevice = 0

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              2
10%            1              4       Obs                  10
25%            4              6       Sum of Wgt.          10

50%            7                      Mean                6.2
                        Largest       Std. Dev.      3.259175
75%            9              9
90%            9              9       Variance       10.62222
95%            9              9       Skewness      -.7762155
99%            9              9       Kurtosis       2.263388

------------------------------------------------------------------------------------------
------
-> amplificationdevice = 1

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              3
10%            2              4       Obs                  10
25%            4              4       Sum of Wgt.          10

50%          6.5                      Mean                  6
                        Largest       Std. Dev.      2.867442
75%            9              8
90%            9              9       Variance       8.222222
95%            9              9       Skewness      -.387478
99%            9              9       Kurtosis       1.822498
```

```
-------------------------------------------------------------------------------------------
------
-> amplificationdevice = 0

                      WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              2
10%            1              4       Obs                  10
25%            4              6       Sum of Wgt.          10

50%            7                      Mean                6.2
                        Largest       Std. Dev.      3.259175
75%            9              9
90%            9              9       Variance       10.62222
95%            9              9       Skewness      -.7762155
99%            9              9       Kurtosis       2.263388

-------------------------------------------------------------------------------------------
------
-> amplificationdevice = 1

                      WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              3
10%            2              4       Obs                  10
25%            4              4       Sum of Wgt.          10

50%          6.5                      Mean                  6
                        Largest       Std. Dev.      2.867442
75%            9              8
90%            9              9       Variance       8.222222
95%            9              9       Skewness       -.387478
99%            9              9       Kurtosis       1.822498
```

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

AMPLIFICAT |       ctotbroad
ION DEVICE |       Low       High |     Total
-----------+----------------------+----------
         0 |         5          5 |        10
           |       4.0        6.0 |      10.0
           |     50.00      50.00 |    100.00
-----------+----------------------+----------
         1 |         3          7 |        10
           |       4.0        6.0 |      10.0
           |     30.00      70.00 |    100.00
-----------+----------------------+----------
     Total |         8         12 |        20
           |       8.0       12.0 |      20.0
           |     40.00      60.00 |    100.00

          Pearson chi2(1) =   0.8333   Pr = 0.361
           Fisher's exact =                 0.650
   1-sided Fisher's exact =                 0.325
```

There is no evidence of an association between amplification device and low/high C total broadcast scores (p=0.650).

```
+--------------------+
| Key                |
|--------------------|
|     frequency      |
| expected frequency |
|   row percentage   |
+--------------------+

AMPLIFICAT |       ctotenhan
ION DEVICE |       Low       High |     Total
-----------+----------------------+----------
         0 |         6          4 |        10
           |       5.5        4.5 |      10.0
           |     60.00      40.00 |    100.00
-----------+----------------------+----------
         1 |         5          5 |        10
           |       5.5        4.5 |      10.0
           |     50.00      50.00 |    100.00
-----------+----------------------+----------
     Total |        11          9 |        20
           |      11.0        9.0 |      20.0
           |     55.00      45.00 |    100.00

          Pearson chi2(1) =   0.2020   Pr = 0.653
           Fisher's exact =                 1.000
   1-sided Fisher's exact =                 0.500
```

There is no evidence of an association between amplification device and low/high C total enhanced scores (p=1.000).

***7. Taking into account the subtitle condition (broadcast versus enhanced), how does the language used affect the performance? Column J (LANGUAGE) versus Column AF (WR TOTAL SCOREbroad) + AG (WR TOTAL SCOREenhan) and Column AP (C TOTAL SCOREbroad) + AQ (C TOTAL SCOREenhan)**

```
   LANGUAGE |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         16       80.00       80.00
          1 |          4       20.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

4/20(20%) are also sign language.

```
--------------------------------------------------------------------------------------
------
-> language = 0

                    WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            1              1
 5%            1              2
10%            2              2       Obs                  16
25%            4              4       Sum of Wgt.          16

50%            6                      Mean             5.5625
                        Largest       Std. Dev.      2.528998
75%            8              8
90%            8              8       Variance       6.395833
95%            9              8       Skewness      -.3820094
99%            9              9       Kurtosis        1.85517

--------------------------------------------------------------------------------------
------
-> language = 1

                    WR TOTAL SCOREbroad
-------------------------------------------------------------
      Percentiles      Smallest
 1%            4              4
 5%            4              5
10%            4              6       Obs                   4
25%          4.5              9       Sum of Wgt.           4

50%          5.5                      Mean                  6
                        Largest       Std. Dev.      2.160247
75%          7.5              4
90%            9              5       Variance       4.666667
95%            9              6       Skewness       .6872432
99%            9              9       Kurtosis              2
```

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

    language |      obs    rank sum    expected
-------------+---------------------------------
           0 |       16         165         168
           1 |        4          45          42
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      112.00
adjustment for ties       -2.53
                     ----------
adjusted variance        109.47

Ho: wrtota~d(language==0) = wrtota~d(language==1)
             z =  -0.287
    Prob > |z| =   0.7743
```

There is no evidence of a difference in WR total broadcast scores between English and also sign language (p=0.774).

```
---------------------------------------------------------------------------------------
------
-> language = 0

                                                           -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-----------------------------------------------------------------
wrtotalsco~d |      16         50             6               4           8

---------------------------------------------------------------------------------------
------
-> language = 1

                                                           -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-----------------------------------------------------------------
wrtotalsco~d |       4         50           5.5               4          9*

* Lower (upper) confidence limit held at minimum (maximum) of sample
```

```
-------------------------------------------------------------------------------------------
------
-> language = 0

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              1
10%            1              2       Obs                  16
25%          3.5              3       Sum of Wgt.          16

50%          7.5                      Mean              6.125
                        Largest       Std. Dev.      3.283799
75%            9              9
90%            9              9       Variance       10.78333
95%            9              9       Skewness      -.6041118
99%            9              9       Kurtosis       1.843317

-------------------------------------------------------------------------------------------
------
-> language = 1

                     WR TOTAL SCOREenhan
-------------------------------------------------------------
      Percentiles      Smallest
 1%            4              4
 5%            4              6
10%            4              6       Obs                   4
25%            5              8       Sum of Wgt.           4

50%            6                      Mean                  6
                        Largest       Std. Dev.      1.632993
75%            7              4
90%            8              6       Variance       2.666667
95%            8              6       Skewness              0
99%            8              8       Kurtosis              2
```

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

    language |      obs    rank sum    expected
-------------+---------------------------------
           0 |       16       173.5         168
           1 |        4        36.5          42
-------------+---------------------------------
    combined |       20         210         210

unadjusted variance      112.00
adjustment for ties       -5.47
                     ----------
adjusted variance        106.53

Ho: wrtota~n(language==0) = wrtota~n(language==1)
             z =   0.533
    Prob > |z| =   0.5941
```

There is no evidence of a difference in WR total enhanced scores between English and also sign language (p=0.594).

```
-------------------------------------------------------------------------------------
------
-> language = 0

                                                       -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |      16         50           7.5        3.517253           9

-------------------------------------------------------------------------------------
------
-> language = 1

                                                       -- Binom. Interp. --
    Variable |     Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
wrtotalsco~n |       4         50             6               4          8*

* Lower (upper) confidence limit held at minimum (maximum) of sample
```

```
+-------------------+
| Key               |
|-------------------|
|     frequency     |
| expected frequency |
|   row percentage  |
+-------------------+

           |        ctotbroad
  LANGUAGE |       Low       High |     Total
-----------+----------------------+----------
         0 |         6         10 |        16
           |       6.4        9.6 |      16.0
           |     37.50      62.50 |    100.00
-----------+----------------------+----------
         1 |         2          2 |         4
           |       1.6        2.4 |       4.0
           |     50.00      50.00 |    100.00
-----------+----------------------+----------
     Total |         8         12 |        20
           |       8.0       12.0 |      20.0
           |     40.00      60.00 |    100.00

          Pearson chi2(1) =   0.2083   Pr = 0.648
           Fisher's exact =                 1.000
   1-sided Fisher's exact =                 0.535
```

There is no evidence of an association between language and low/high C total broadcast scores (p=1.000).

```
+-------------------+
| Key               |
|-------------------|
|     frequency     |
| expected frequency |
|   row percentage  |
+-------------------+

           |        ctotenhan
  LANGUAGE |       Low       High |     Total
-----------+----------------------+----------
         0 |         8          8 |        16
           |       8.8        7.2 |      16.0
           |     50.00      50.00 |    100.00
-----------+----------------------+----------
         1 |         3          1 |         4
           |       2.2        1.8 |       4.0
           |     75.00      25.00 |    100.00
-----------+----------------------+----------
     Total |        11          9 |        20
           |      11.0        9.0 |      20.0
           |     55.00      45.00 |    100.00

          Pearson chi2(1) =   0.8081   Pr = 0.369
           Fisher's exact =                 0.591
   1-sided Fisher's exact =                 0.375
```

There is no evidence of an association between language and low/high C total enhanced scores (p=0.591).