Universitat Autònoma de Barcelona

THE RECEPTION OF SUBTITLING FOR THE DEAF AND HARD OF HEARING: Viewers' hearing and communication profile & Subtitling speed of exposure

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DOCTORAL THESIS
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PHD Thesis

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Abstract

Viewers with a hearing loss need to assimilate, process and integrate the information conveyed by the subtitles and the images in order to gain full access to audiovisual content. This process involves a set of complex cognitive mechanisms and the extent of factors that may affect it is large and varied.

This study investigates the reception of subtitles for the deaf and hard of hearing among three types of viewers with a different hearing and communication profile: hearing, deaf-sign language users and deaf-spoken language users. The main objective was to investigate whether and how participants' profile and subtitling speed of exposure affect reception. Three versions of subtitles were analyzed according to its speed of exposure: high (with an average duration of between one and two seconds), medium (between two to four seconds) and low (between four to six seconds); with a different number of subtitles and segmentation and displayed at a rate of 15 characters per second. The analysis was divided into three stages and 72 participants took part in it by watching two videos and answering a set of questions. Participants' eye movements were tracked and analyzed in terms of attention distribution between the subtitles and the image in order to identify patterns in their reading and viewing behavior (response). Their ability to understand and infer the narrative and to recall and process the verbal and the visual information was analyzed through questionnaires (reaction), as well as their self-assessment on the time and ease of reading the subtitles and viewing the image (repercussion). Background information was obtained through a set of prior and post questionnaires: the former collected data about participants' hearing, education, language and communication aspects and reading and viewing habits –this part included a test to evaluate their reading skills— that allowed them to be allocated to a profile; the latter collected the opinion and preferences on current practices in subtitling, including speed. The two videos were selected from fiction films and showed different degrees of interaction between the verbal and the visual codes: they had a relatively high load of verbal content (continuous dialogue) but a different load of visual action (number and type of shots). The aim here was to explore how the different combination of verbal and visual information was processed and prioritized.

The results obtained in this study confirm that the viewers' profile affected all the stages of reception. Surprisingly, more differences were observed between the two groups with hearing loss than between them and the hearing group. The use of generalized linear models in the statistical analysis allowed the inclusion of the variable of adjustment "reading skills", which turned out to play a crucial role on the overall process of reception. Results indicate that differences between profiles might be more due to reading-related factors than to hearing, language and communication aspects. The subtitling speed of exposure influenced the distribution of attention between the subtitles and the image but did not affect significantly reaction and repercussion. Differences in the reception of the two videos were observed in the three profiles and in the three stages of reception, suggesting that reception is highly dependent on the type of audiovisual content used.

Keywords: Audiovisual translation; Subtitling for the deaf and hard of hearing; Subtitling speed; Reception; Eye tracking

Resumen

Para acceder al contenido audiovisual los espectadores con sordera deben asimilar e integrar la información que transmiten los subtítulos y la imagen. Este proceso implica una serie de complejos mecanismos cognitivos y los factores que pueden influir en él son muchos y variados.

En este estudio se analiza la recepción de subtítulos para personas sordas y con déficit auditivo entre tres tipos de espectadores con un perfil auditivo y comunicativo diferente: oyentes, sordos usuarios de la lengua oral y sordos usuarios de la lengua de signos. El objetivo principal es investigar cómo el perfil de los espectadores y la velocidad de exposición de los subtítulos afectan al proceso de recepción. Se analizaron tres tipos de subtítulos con diferentes velocidades de exposición: alta (con una duración de entre uno y dos segundos), media (entre dos y cuatro segundos) y baja (entre cuatro y seis segundos); expuestos a un ritmo de 15 caracteres por segundo pero con diferente segmentación. 72 personas participaron en el estudio, viendo dos clips de video y contestando a una serie de preguntas. El análisis se dividió en tres fases. Mediante *eye tracking*, se registraron los movimientos oculares de los participantes y se analizó la distribución de atención entre los subtítulos y la imagen con el objetivo de identificar los patrones de lectura e inspección de la imagen (respuesta). Mediante el uso de cuestionarios, se analizó su habilidad para comprender y deducir la narrativa y para recordar y procesar la información verbal y visual (reacción), así como su autoevaluación en torno a la facilidad y el tiempo de lectura y de inspección de la imagen (repercusión). También se obtuvo información adicional sobre la muestra de participantes: un cuestionario previo recogió información sobre aspectos auditivos, educativos, lingüísticos y comunicativos así como sobre hábitos de lectura y consumo audiovisual –incluyendo un test de comprensión lectora- que permitió asignarles un perfil; y un cuestionario posterior, sobre su opinión y sus preferencias en relación con las prácticas actuales en subtitulación, incluyendo la velocidad. Los clips de video eran fragmentos de películas de ficción con diferentes grados de interacción entre el código verbal y el visual. Con el objetivo de explorar cómo los espectadores procesan y priorizan la información en diferentes tipos de contenido audiovisual, ambos clips presentaban una carga relativamente alta de contenido verbal (diálogo continuo) y una carga de acción diferente en la imagen (número y tipo de planos).

Los resultados confirman que el perfil de los espectadores afecta a todas las fases de recepción. Sorprendentemente, las diferencias observadas entre los dos grupos con déficit auditivo son mayores que las diferencias entre ambos y el grupo oyente. El uso de modelos lineales generalizados en el análisis estadístico permitió incluir la variable de ajuste «nivel de comprensión lectora», que desempeñó un papel crucial en el proceso de recepción. Los resultados indican que las diferencias entre perfiles, más que a factores auditivos, lingüísticos y comunicativos, podrían deberse a su nivel de comprensión lectora. La velocidad de exposición de los subtítulos influyó en la distribución de atención entre los subtítulos y la imagen (fase de respuesta) pero no en las fases de reacción y repercusión. Las diferencias observadas en la recepción de los dos clips -por parte de los tres perfiles y en todas las fases del análisis- sugieren que la recepción depende en gran medida del tipo de contenido audiovisual que se analice.

Palabras clave: Traducción audiovisual; Subtitulación para personas sordas y con pérdida auditiva; Velocidad de subtitulación; Recepción; *Eye tracking*

Resum

Per accedir al contingut audiovisual els espectadors amb sordesa han d'assimilar i integrar la informació que transmeten els subtítols i la imatge. Aquest procés implica una sèrie de complexos mecanismes cognitius i els factors que poden influir en ell són molts i variats.

En aquest estudi s'analitza la recepció de subtítols per a persones amb sordesa i dèficit auditiu entre tres tipus d'espectadors amb un perfil auditiu i comunicatiu diferent: oïdors, sords usuaris de la llengua oral i sords usuaris de la llengua de signes. L'objectiu principal és investigar com el perfil dels espectadors i la velocitat d'exposició dels subtítols afecten al procés de recepció. Es van analitzar tres tipus de subtítols amb diferents velocitats d'exposició: alta (amb una durada d'entre un i dos segons), mitjana (entre dos i quatre segons) i baixa (entre quatre i sis segons); exposats a un ritme de 15 caràcters per segon però amb una segmentació diferent. 72 persones van participar en l'estudi, veient dos clips de vídeo i contestant a una sèrie de preguntes. L'anàlisi es va dividir en tres fases. Mitjançant *eye tracking*, es van registrar els moviments oculars dels participants i es va analitzar la distribució d'atenció entre els subtítols i la imatge amb l'objectiu d'identificar els patrons de lectura i inspecció de la imatge (resposta). Mitjançant l'ús de qüestionaris, es va analitzar la seva habilitat per comprendre i deduir la narrativa i per recordar i processar la informació verbal i visual (reacció), així com la seva autoevaluació en referència a la facilitat i el temps de lectura i d'inspecció de la imatge (repercussió). També es va obtenir informació addicional sobre la mostra de participants: un qüestionari previ va recollir informació sobre aspectes auditius, educatius, lingüístics i comunicatius així com sobre hàbits de lectura i consum audiovisual -incloent un test de comprensió lectora- que va permetre assignar-los un perfil; i un qüestionari posterior, sobre la seva opinió i les seves preferències en relació amb les pràctiques actuals en subtitulació, incloent la velocitat. Els clips de vídeo eren fragments de pel·lícules de ficció amb diferents graus d'interacció entre el codi verbal i el visual. Amb l'objectiu d'explorar com els espectadors processen i prioritzen la informació en diferents tipus de contingut audiovisual, els dos clips presentaven una càrrega relativament alta de contingut verbal (diàleg continu) i una càrrega d'acció diferent en la imatge (nombre i tipus de plànols).

Els resultats confirmen que el perfil dels espectadors afecta a totes les fases de recepció. Sorprenentment, les diferències observades entre els dos grups amb dèficit auditiu són majors que les diferències entre aquests dos grups i el grup oïdor. L'ús de models lineals generalitzats en l'anàlisi estadística va permetre incloure la variable d'ajust «nivell de comprensió lectora», que va exercir un paper crucial en el procés de recepció. Els resultats indiquen que les diferències entre perfils, més que a factors auditius, lingüístics i comunicatius, podrien deure's al seu nivell de comprensió lectora. La velocitat d'exposició dels subtítols va influir en la distribució d'atenció entre els subtítols i la imatge (fase de resposta) però no en les fases de reacció i repercussió. Les diferències observades en la recepció dels dos clips -per part dels tres perfils i en totes les fases de l'anàlisi- suggereixen que la recepció depèn en gran mesura del tipus de contingut audiovisual que s'analitzi.

Paraules clau: Traducció audiovisual; Subtitulació per a persones amb sordesa i pèrdua auditiva; Velocitat de subtitulació; Recepció; *Eye tracking*

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AENOR Asociación Española de Normalización y Certificación/ Spanish Association for Standardization and Certification

AOI Area of interest

CPS Characters per second

DTV4ALL Digital Television for All

EEM Estimated marginal means

GML Generalized linear model

INE Instituto Nacional de Estadística/ Spanish National Statistical Institute

SDH Subtitling for the deaf and hard of hearing

L1/ L2 First/ Second language

SL Sign language

TIME Translation Research Training: an integrated and intersectoral model for Europe

UAB Universitat Autònoma de Barcelona/ Autonomous University of Barcelona

WPM Words per minute

Chapter 1. Introduction

After obtaining my undergraduate degree in translation and interpreting at the University of the Basque Country (2003-2007), I pursued a master's degree in audiovisual translation at the Autonomous University of Barcelona (UAB) (2007-2008). Within this Master's professional profile I took a course on subtitling for the deaf and hard of hearing (SDH). I must admit that at that point I was not fully aware of the practice from a professional standpoint and I did not know anyone with a hearing loss, but I soon realized its meaning, relevance and scope as a guarantee of the right to access information for people with sensory impairments —in this case hearing impairments— and I decided to specialize in it. After that, and with the ultimate aim of starting my research career in this particular field, I completed a research master's degree in translation studies at the same university (2008-2010). I then became a member of the research group TransMedia Catalonia[1], where I was able to participate in two different projects as a predoctoral student during the year 2010.

First of all, the European project "Digital Television for All" (DTV4ALL)[2] —through the subsection entitled "Emerging Projects"— gave me the opportunity to design and carry out a case study with a reduced number of participants with the aim of evaluating the effect of SDH subtitles displayed at reduced playback speeds, through the use of survey and eye-tracking methods[3]. Secondly, the Catalan project "Accessibility in the Classroom: Learning for All"[4] led me to test the feasibility of displaying live subtitles on the screen of a portable digital device as a potential tool to ensure accessibility within the context of university lectures in an exploratory experiment using online questionnaires and eye tracking (see Orero et al. 2013). Interdisciplinary teams of engineers, broadcasting organizations —such as the German Institute for Broadcasting Technology (IRT)[5] and the Berlin-Brandenburg Broadcasting (RBB)[6] in the first project and the Laboratory for Hardware-Software

[1] See http://grupsderecerca.uab.cat/transmedia
[2] DTV4ALL: Digital Television for All. European Commission ICT PSP/2007/1, 2008-10. Coordinated by Takebumi Itagaki (Brunel University, UK). See http://www.psp-dtv4all.org
[3] See https://www.irt.de/webarchiv/showdoc.php?z=NDQ3MyMxMDA1MjEzI3BkZg
[4] Accessibility in the Classroom: Learning for All. AGAUR: 2009MQD00227, 2009-2010. Coordinated by Pilar Orero (UAB, Spain).
[5] See https://www.irt.de/en/irt.html
[6] See https://www.rbb-online.de

Prototypes and Solutions (CEPHIS)[7] in the second one— worked together with experts in translation at the UAB towards the development of these two projects.

My involvement in these studies helped me and guided me through the process of delimiting the scope of the project for my PhD thesis and highlighted the need for interdisciplinary and technical research in the field of audiovisual translation and accessibility. They made me realize the importance of focusing attention on viewers and citizens. We live in the era of information and communication technologies, where access to information means, to a large extent, access to audio and visual information. Some decades ago, the transportation system, the buildings, the streets and places of towns and cities were adapted to provide inclusive environments that would not exclude the physically disabled through architectural barriers. In the same manner, contemporary societies should fight the barriers in the access to audiovisual information in order to ensure an equal access for people with sensory impairments. Institutions, industry and academia should join forces to promote accessibility in the media.

The audiovisual landscape has changed and undoubtedly will continue to do so. Digital and smart technology has extended its presence in the audiovisual sector, in both industry and academia. Within this specific perspective, where the receptor plays a major role, the use of research tools such as eye tracking has a tremendous potential to explore and improve the viewers' experience. In Chapter 2 (Section 2.1.4 and 2.3) it is highlighted the importance of the figure of the receptor in audiovisual translation over the past years and further empirical and experimental research on reception is encouraged. The combination of eye tracking with survey methods in reception studies reveals itself as a useful and interesting way in understanding the viewers' needs and behavior in processing audiovisual content, which is a line of research that I intend to follow in my PhD.

Subtitle readability, legibility, and in general, adequacy are often related to the speed at which subtitles are displayed on screen and read and processed by the viewers. As it is explained in the following chapter (Section 2.2.4), subtitling speed is one of the most discussed topics in the subtitling literature and in the particular case of SDH it is also a controversial issue in the deaf and hard-of-hearing community. Contrary to what occurs in print reading —where it is the reader who regulates reading speed—, reading speed in

[7] See http://cephis.uab.es/index.ml

subtitling is determined by the subtitler —based on factors such as the rhythm of speech and the audiovisual content and taking into account the spatio-temporal restrictions that are attached to subtitling—, thus minimizing the control of the viewer. This peculiarity captured my research interest and, under the supervision of Dr. Pablo Romero-Fresco, I started working on my PhD proposal on the effect of subtitling speed on the reception of audiovisual texts with SDH. Based on the need to establish connections with the target population, one of the starting points of the proposal was to carry out a reception study with deaf and hard-of-hearing participants. As per the nature of the above-mentioned projects —and mainly due to time constraints—, the participants with whom I had worked until then did not have any hearing impairments and carried out the tests without sound in order to try to simulate the conditions of the deaf population. To amend this situation contacts needed to be established with different institutions, organizations and associations of deaf and hard-of-hearing people. This would allow me to acquire a better understanding of the idiosyncrasies of the target community.

With this in mind, in February 2011, a preliminary PhD proposal was written under the title of "The effect of filmic composition in subtitling speed". In broad terms, this proposal was aimed at tackling the issue of speed in relation to the time and ability of the viewers not only to read the subtitles, but also to watch the visuals on screen by paying attention to whether filmic composition in connection to subtitling speed has an effect on the whole processing of information. Filmic composition was going to be studied in terms of number and type of shots. Different pieces of films with different degrees of composition were intended to be selected and different subtitling speeds were going to be applied, in order to explore which speed is best suited for adequate processing of both the written and visual information in the different pieces. The tests were proposed to make use of eye tracking and questionnaire and survey methods in such a way that the data obtained with each method could be cross-referred with the data obtained in the others.

The PhD proposal was submitted to be considered for the Early Stage Researcher Marie Curie Fellowship in the project "Multimedia and Multimodal Translation: Accessibility and Reception", one of the four projects framed within the overall European TIME project "Translation Research Training: An integrated and intersectoral model for Europe"[8] (2011-2014). Dr. Reine Meylaerts from the University of Leuven in Belgium coordinated the TIME

[8] Funded by the ITN European project (2010-2014) FP7-PEOPLE-2010-ITN TIME: Translation Research Training: an integrated and intersectoral model for Europe.

project together with three other European Universities: Rovira i Virgili University in Spain, Aston University in the UK and University of Turku in Finland. The University of Rovira i Virgili was in charge of the supervision of the project "Translation technologies: for a humanization of efficiencies and usability", Aston University of the project "Transformation through translation: translation policies in political institutions", the University of Leuven of the project "Translating for the minorities: linguistic diversity and integration in Europe", and the University of Turku of the project "Multimedia and multimodal translation: accessibility and reception", to which I applied for. After the process of selection, I was awarded the scholarship under the supervision of Dr. Yves Gambier.

One of the main objectives of the TIME project was to increase the promotion of cooperation between both private and public institutions and between industry and academia in research in translation studies. In order to achieve this goal, during the course of the project I benefited from secondment —that was extended to eight months and divided into two stages— at the company Multisignes[9], a small company of audiovisual and accessibility services formed by deaf and hearing workers[10]. This allowed me to get in direct contact not only with the industry but also with the target population and to establish networks and connections with different deaf associations and organizations. This experience aided me to better understand the needs of both the industry and the target community. The first part of the stay took place at the end of the first year of the PhD (from May to July 2012) and, among other things, allowed me to set up the basis of the experimental study to be carried out. During the second part of the stay (from April to September 2013) the company participated and hosted the pilot test as well as the most part of the experiments, as will be explained in further detail in Chapter 4 (Section 4.3.2).

1.1 Scope of the thesis

The proposal mentioned above served as a starting point for the present reception study; however, it took me almost a year to clarify the objectives, research questions and hypothesis of the study as well as to create the experimental design. The main challenge was to narrow

[9] See http://www.Multisignes.com

[10] The outcome of this experience was presented and discussed in an article written together with the researchers from the other TIME projects (Pym et al. 2014).

down the variables to be analysed, as there are a variety of factors that could influence the results of an experiment in audiovisual translation research, not to mention that the inclusion of certain variables would, in turn, imply the exclusion of others (see Section 4.2 for detailed information about the variables).

In any viewer-oriented experimental study on audiovisual translation at least three types of factors have to be considered: translation-related factors (related to the spatial-temporal, textual or paratextual translation aspects to be studied), sociological factors (related to the population to be tested), and audiovisual factors (related to the material to be analysed).

From a translation-oriented perspective the present study is focused on the parameter of subtitling speed. As it will be seen in Section 2.2.4, this parameter has different dimensions and implications. Traditionally investigated in terms of the number of characters per second (cps) included in the subtitles and of the number of seconds of their presentation on screen (presentation or exposure times), subtitling speed is interconnected with -and sometimes interdependent on- many others aspects (i.e. the number of lines of the subtitles or the degree of editing that needs to be done on them). This increases the complexity of its analysis, and makes it challenging to evaluate its impact on reception. This study tries to shed some light on this by investigating the effect of what —for the purpose of this research— has been designated as the "speed of exposure" of the subtitles, in an attempt to isolate the rates of presentation of the subtitles from its density in terms of cps and its degree of editing. Following an innovative approach, three speeds of exposure will be established and tested in terms of comprehension, preferences, and visual perception. The advantages and disadvantages of this method of procedure will be explained in Chapter 3, and accurate definitions will be provided for each of the parameters involved to avoid confusion.

From a sociological perspective, this study is focused on the potential viewers of audiovisual texts with SDH, mostly deaf and hard-of-hearing viewers (see Section 2.2.1). For experimental purposes, a group of hearing participants was incorporated into the sample for analysis and comparison under the same experimental conditions as their deaf and hearing-impaired peers. Participants were grouped into three hearing and communication profiles: 24 deaf participants who were sign language users, 24 deaf participants who were spoken language users and 24 hearing participants who also were spoken language users (see Section 4.3 for details about the sampling of participants).

Finally, from an audiovisual point of view, the study focuses on fictional films, expected to present a more regular narrative that allows for the evaluation of the comprehension (see Section 4.4 for the details of the films and excerpts selected and its justification). As it will be explained in Section 2.1.2, audiovisual translation is a complex means of communication in which multiple sources of dynamic information interact through the interplay of verbal and visual elements. Viewing with subtitles entails a constant split of attention between reading the subtitles and viewing the image. However, little research attention has been paid to how verbal and visual information are processed and prioritized. In an attempt to tackle this complexity, the two film fragments considered for analysis and comparison have a relatively long and continuous speech but both presented a different degree of combination of visual elements.

Reception will be analysed in a comprehensive manner (see Section 2.3.1 and 3.1.1), by embracing the mechanisms and processes for visual processing and attention allocation (stage of response), comprehension and understanding (stage of reaction) and opinion and evaluation (stage of repercussion). In order to achieve this goal, eye tracking and a set of questionnaires and tests are combined to investigate the role of the speed of exposure of the subtitles and of the participants' hearing and communication profile (see Section 4.5 for an overview of the tools of data collection and procedure). The study incorporates data from 72 participants who watched the same two fragments of films with SDH. Subtitles were randomly displayed at one of the three different speeds of exposure being tested, while their eye movements were recorded through eye tracking. Afterwards the participants answered a set of questionnaires.

The general objective of the study is, on the one hand, to describe and analyze how viewers with a different hearing loss and with a different communication and language background receive films SDH, with a special interest in exploring how they process and prioritize the verbal and the visual information. This intends to bridge the gap between the concepts of actual and the ideal viewers, and thus to strengthen the process of audience reception research and design. On the other hand, the study aims to test and evaluate whether reception is affected by either the speed of exposure in which the subtitles are presented and/or by the hearing and communication profile of the viewers. This will provide empirical data to revise some of the current strategies adopted with regards to subtitling speed.

1.2 Structure of the thesis

Chapter 2 provides a theoretical overview of audiovisual translation research.

Section 2.1 will provide an insight into the current situation and changes in the field, paying special attention to the multimodal nature of audiovisual translation and communication through an interdisciplinary perspective and to the challenges and future research directions. Secondly, Section 2.2 will specifically focus on SDH. The distinctive aspects of the deaf and hearing-impaired population will be first explained, followed by the presentation of the different parameters involved in this particular modality of audiovisual translation and the strong relationships between them. The parameter of subtitling speed will be then analysed separately and in further detail and the recent research carried out in relation to this particular aspect will be presented. Finally, Section 2.3 summarizes and discusses some of the reception studies developed until the present day in audiovisual translation research.

Chapter 3 presents the research statement of the study.

Section 3.1 will provide the working definitions of the concepts on which the study is based: i.e. the notion of reception, the notion of viewers' hearing and communication profile, the notion of speed of subtitling exposure and the notion of visual density. Section 3.2 will specify the different objectives that have been established, as well as the research questions and hypothesis. Section 3.3 will discuss a set of methodological considerations that were taken into account for the design and development of the study, and Section 3.4 will consider a set of implications that are mainly related to the particular procedure that was followed to carry out the experiment with the deaf and hard-of-hearing participants as well as the ethical considerations that had to be addressed.

Chapter 4 presents the methodology and the experimental design that was applied for the purpose of the research.

Sections 4.1 and 4.2 will introduce the overall research design and the variables of study that were considered, including the dependent and independent variables and all remaining controlled variables. Section 4.3 will present and describe in further detail the groups of participants that took part in the study, considering issues such as the population and sampling distribution of the experiment and the processes of recruitment and selection that were followed. Section 4.4 will give details about the audiovisual material that was tested, including information about the procedure and criteria that was applied in the selection of the two fragments of films as well as an analysis of its narrative content and assessment and a thorough description of the characteristics of the subtitles for the deaf and hard of hearing that accompanied the fragments. Section 4.5 will give an account of various different tools that were used for collecting the data, as well as of the overview of the procedure that was followed. Section 4.6 will present certain statistical considerations that were taken into account for the selection of appropriate tests to evaluate results of the study and determine the significance of the effect of the speed of subtitling exposure and the profile of the viewers. Finally, Section 4.7 will provide a summary of the variables that were controlled and analysed.

Chapter 5 presents the results obtained in the study.

As three levels of reception were considered, all of which provided a different type of data and outcome, three sections will be presented according to each level or stage: Section 5.1 will introduce the results of the stage of response, Section 5.2 will present the results of the stage of reaction and Section 5.3 will include the results of the stage of repercussion.

Chapter 6 includes the discussion and the interpretation of the data and findings.

Sections 6.1 and 6.2 will analyze the results in relation to the main effects and the interactions observed for each fragment of the films and for each variable of analysis.
Section 6.3 will interpret the results in relation to the objectives, research questions and hypothesis established for the purpose of this study and Section 6.4 will follow suit in relation to the findings obtained in some of the research studies previously introduced in Section 2.3.1.

Chapter 7 provides a reflection on the conclusions that have been reached.

Section 7.1 will gather the general conclusions of the study in terms of design, results and methodology. Section 7.2 will discuss the limitations of the study and finally Section 7.3 will outline the possibilities for further research.

Chapter 2. Theoretical background

In order to study and investigate the process of reception of SDH, this research is grounded within the field of translation studies and specifically framed within audiovisual translation studies.

This chapter is divided into three sections. Section 2.1 provides an overview of the research situation in audiovisual translation, with an emphasis on the new challenges and concepts that have emerged in the field. Section 2.2 is focused on the modality that is the object of this study: SDH. It presents the peculiarities of the target population and the different parameters and relationships involved, bringing attention to the parameter of subtitling speed that is central in the present research. Finally, Section 2.3 presents a summary of some of the most relevant reception studies carried out within the field.

2.1 Audiovisual translation

Section 2.1.1 summarizes the changes undertaken in the field and describes the current state of the art. Section 2.1.2 examines, from an interdisciplinary perspective, the multimodality inherent to audiovisual translation. Section 2.1.3 focuses on the modality of subtitling and Section 2.1.4 briefly discusses the challenges and future perspectives of the field.

2.1.1 Changes and current situation

In past decades, the field of audiovisual translation has gone through a relatively fast-growing process of consolidation and changes. With its own status as a field of research within translation studies, it is still in ongoing development and constant expansion. This dual-process of consolidation and evolution makes it unavoidable to provide a "picture in motion" of the current situation of the field, rather than a "fixed image".

According to Chaume (2004: 16): "An audiovisual-translated text is a semiotic construct comprising several signifying codes that operate simultaneously in the production of meaning". However, as can be seen in the next section, it is not easy to clearly define what constitutes an audiovisual-translated text. In fact, and as pointed out by Gambier (2013: 46), even the terminology used to designate the practice is varied and changeable with multiple references to be found i.e. "audiovisual translation", "film translation", "screen translation", "multimedia translation", or "multimodal translation". The term "multimodal translation" in particular is gaining ground, but even within it, different nomenclatures and classifications could be observed, such as "multimedial", "multimodal", "multisemiotic", or "audiomedial" (Mary Snell-Hornby 2009: 44, in Sullivan 2013: 5). This points out the fact that audiovisual translation goes far beyond television or film translation, and highlights the complexity and amplitude of the field's scope.

The mass production of digital technology and the ubiquitous presence of the Internet have triggered a wave of structural changes that have affected the discipline as a whole. Technology has transformed the way and the degree in which audiovisual messages are produced and consumed by an almost unlimited, global, connected and active audience. New means and formats of production, distribution and broadcasting are emerging, having an impact on the industry and on academia as well as on the professional and teaching practices (See Díaz Cintas 2013 and Gambier 2013 and 2016).

These changes have put the focus on the audience. On the one hand, as stated by Remael et al. (2016: 250) "technology has turned citizens into netizens, and readers of texts and translated texts into producers of texts and translated texts". One of the most remarkable examples of how the role of the audience is gaining importance can be found in the Internet-based communities that have developed new forms of fan translation, such as funsubbing and crowdsourcing (O'Hagan 2009). On the other hand, new forms of audiovisual translation have emerged with the objective of providing access to specific audiences with specific needs (see the recent HBB4ALL project[11], which focuses on the hybrid broadcast-broadband TV (HbbTV) or Smart TV as a tool for a wide range of accessibility features). This mainly applies to the deaf and hard-of-hearing and blind and partially sighted viewers and to modalities such as SDH (see for instance Remael 2007), audio description or audio subtitling (see Braun et al. 2010) but is not only limited to the accessibility of the audience with sensory impairments. Modalities such as surtitling for the opera and the theatre (see Redzioch-Korkuz 2016) or respeaking for live subtitling (see Romero-Fresco 2011) have also expanded. Gambier (2013: 49-52) provides a summary of types of audiovisual translation that reflects

[11] See http://www.hbb4all.eu

the expansion of scope. Within the traditional distinction made between the audiovisual texts that happen within or between languages, the author distinguishes the following classification: subtitling for language learning, audio description, SDH, audio subtitling, script/scenario translation, interlingual subtitling, dubbing, free commentary, interpreting on screen, voice-over, and surtitling.

2.1.2 A multimodal and interdisciplinary field

An audiovisual-translated text is a rather complex means of communication where multiple sources and modes of information actively interact with each other. The information coming from the audio and the visual communication channels need to be processed and integrated as verbal and non-verbal elements are presented simultaneously creating a network of significance. As stated in Zabalbeascoa 2008 (23-24), the elements that are combined in an audiovisual text (verbal and non-verbal, audio and visual) have the same degree of importance and may be considered as complementary and integrative. This set of elements, however, is not always in balance from a qualitative and quantitative perspective, and the author highlights the need to determine the role, amount and importance of the verbal signs in both channels with respect to the non-verbal signs, and to be able to define the relationship that they maintain at both micro and macro levels (2008: 29). In line with this, Gambier (2013: 47) defines this need to identify the relationships between the different audiovisual elements as a key challenge for audiovisual translation research and proposes a set of functions and relations that could be established among them (i.e. redundancy, complementarity, autonomy, contradiction, distance, criticism, and help). The author in addition identifies a total of fourteen semiotic codes that participate in the construction and transference of meaning (See Table 1).

Elements	Audio-codes	Visual-codes
Verbal	Linguistic	Graphic
	Paralinguistic	
	Literary and theatre	
Non-verbal	Sound arrangement	Iconographic
		Photographic
	Musical	Scenographic
		Film
	Paralinguistic	Kinesic
		Proxemic
		Dress

Table 1: The semiotic codes in audiovisual translation, from Gambier (2013:48)

Despite being a central axis in audiovisual translation, it seems that translation studies have not yet provided a suitable theoretical and methodological framework to accommodate the concept of multimodality (see O'Sullivan 2013). However, researchers are paying more attention to this matter, as shown in research conducted by Taylor (2003 and 2004), which highlights the methodological challenges of implementing a multimodal approach to audiovisual translation. Among others, one of the main challenges comes from the required interdisciplinarity in order to comprehensively address the issue of multimodality. Indeed, Orero et al. (forthcoming) argue that research on audiovisual translation, especially reception as can be seen in Section 2.3.1, needs to resort to other fields "to establish new interdisciplinary connections and multidisciplinary approaches while becoming transdisciplinary in nature". Whereas today's research on audiovisual translation is characterized by an exponential growth in the incorporation of methods and concepts from adjacent fields such as sociology, psychology, reception and film studies that have also addressed the processing of audiovisual-translated information, as stated in Gambier (2013: 56), the framework of analysis still remains located primarily within linguistics.

In this sense, psychology, and in particular psycholinguistics is of special interest. Psycholinguistics studies the cognitive processing and comprehension of language, being especially useful not only to tackle the issue of language acquisition but also to investigate how the verbal and linguistic elements are comprehended, processed and prioritized in relation to the rest of the semiotic elements present in audiovisual translation. Research carried out by Jan-Louis Kruger (Kruger et al. 2013, Kruger and Steyn 2015, Kruger et al. 2014 and Kruger 2016) stands out in the analysis of the relationship between psycholinguistics and audiovisual translation. Psycholinguistics can support the study of how viewers process the verbal information from the dialogue, originally presented in an auditory format, i.e. when it is transferred to another language but yet presented aurally such as in dubbing or voice-over, or when it is (translated or not) codified and represented visually in the format of subtitles, together with sounds and other relevant auditory information in the case of SDH. The performance of the viewers in terms of comprehension ability, as well as their behavioral and physiological responses in terms of cognitive effort and attention distribution can provide insightful information about how the audiovisual-translated texts are processed. In this sense, grounded on the assumption that the eye movements are related to brain and cognitive processes —what is known as the "eye-mind hypothesis" (see Just and Carpenter 1980)—, eye-tracking techniques can offer objective and measurable data on the psycholinguistics of audiovisual translation. Currently, the use of eye-tracking methods is spreading, as, according to Kruger (2016: 287), "when used alongside well-established qualitative measurements (they) have a lot to offer to the field of audiovisual translation research and provide a strong link between this field within translation studies and various theoretical and applied linguistic disciplines".

On the other hand, film studies, in particular through film cognition and cognitive film theory, have also paid attention to the cognitive processes involved in the viewing of audiovisual texts, mainly films and in particular fictional films, expected to present a more regular narrative structure (see Bordwell 1985). Whereas in the case of psycholinguistics the interest is placed on the verbal and linguistic elements and on the cognitive processing of the viewer, film cognition is mainly concerned with the visual elements (i.e. the characters, spaces and actions) in relation to the decisions and strategies used by the filmmakers (Smith and Henderson 2008, Smith et al. 2009, Smith and Vilaró 2011, Smith at al. 2011, Smith 2013 and Smith et al. 2013). Based on Pashler (1998), Smith (2013: 176-177) refers to the effect of the interplay of "endogenous and exogenous" factors in the process of attention. According to the author, where we fixate in a visual scene is a consequence of both of these type of factors. The former would include internal factors related to the viewers, such as their desires and expectations or to the viewing activity itself. The latter, on the contrary, would incorporate external factors that depend to a greater extent on the filmmaker's intentions and decisions, such as color, light, edges and motion. In cinema, exogenous factors are mainly related to the *mise-en-scène*, a complex concept described by Gibbs (2002: 1) as "the contents of the frame and the way they are organized". Result of the filmmakers' decisions about how the narrative will be represented, it includes setting, lighting, the staging of action and costumes and makeup (Bordwell and Thompson 1979/2008: 115). According to the authors (2008: 142) *mise-en-scène* can guide our attention towards certain parts and elements on the screen. In this case, the use of eye-tracking methods also allows for the exploration and measurement of the viewers' experience, "comparing viewing behavior across different viewing conditions and groups and testing hypotheses about how certain cinematic techniques impact where we look" (Smith 2015).

The common interest that is shared by audiovisual translation, psycholinguistics and film cognition in fact has led to interesting joint publications (see Redmond and Batty 2015). In particular, and although approached from slightly different perspectives, the area that has received special attention within the three fields is subtitling, which is discussed in the following section.

2.1.3 Subtitling

Subtitling is a clear example of multimodal communication where several sources of information are to be combined and integrated, as viewers are exposed to verbal and nonverbal visual and auditory elements that need to be processed and understood. According to Gottlieb (1994: 101-102), "subtitling is an amphibian: it flows with the current of speech, defining the pace of reception; it jumps at regular intervals, allowing a new text chunk to be read; and flying over the audiovisual landscape (…)". It is, in fact, an intrasemiotic activity: it is framed within the audiovisual media but at the same time it remains within the linguistic and verbal code.

The activity of reading thus is added to the activities of listening to the dialogue and soundtrack (if accessible) and of watching the visuals. According to Perego (2008: 39), reading is already a complex perceptual and cognitive activity involving a set of interrelated processes, i.e. the identification and combination of letters into words, of words into phrases and phrases into sentences. In the case of subtitling, reading, therefore, is even more complex, as the text is displayed in chunks, for short periods of time and among other channels of information. Reading in subtitling, as opposed to print reading, is a moving and dynamic activity where the rhythm is not only set by the reader/viewer but also by the rhythm and speed of the subtitles themselves that, at the same time, depend on the rhythm of the speech dialogue and the visuals of the audiovisual text itself (Romero-Fresco 2009a). According to Kruger et al. (2015) this has a direct impact on the reading process as the readers/viewers have less time to read and they do not normally have the possibility to read previous sentences or parts of the text a second time around.

The information coming from the three parallel processes of communication involved in subtitling (reading the subtitles, watching the visuals and listening to the soundtrack) is different in nature but it may also overlap with each other (d’Ydewalle and van Rensbergen 1989 and d’Ydewalle et al. 1991). Thus, it is important to acquire knowledge about how the viewers manage to process and prioritize these sources in order to gain an overall understanding of the subtitled text. There is a robust and growing body of research on subtitling cognitive processing, however —mostly because of the number of processes involved and its complexity— the picture is still partial (Perego et al. 2010: 245). The following paragraphs provide an introduction and overview of the knowledge gained to date from a theoretical standpoint in a relation to a variety of factors. Section 2.3 will explain in more detail the most relevant reception studies that are presented here.

Firstly, it is assumed that subtitles can be read in an effortless way.

Subtitles need to be visually processed, competing thus for attention with the image itself (see e.g. Koolstra and Beentjes 1999 and Koolstra et al. 1999). The information from the subtitles and the information from the image cannot be processed simultaneously but in succession (de Linde and Kay 1999, d’Ydewalle et al. 1985 and d’Ydewalle et al. 1987). Viewers need to constantly switch attention in parallel from the subtitles to the visuals, which is expected to increase the cognitive load and effort; however, this process seems to occur “effortlessly and almost automatically” (d’Ydewalle and de Bruycker 2007: 196). The absence of effort in the shift of attention has been extensively validated (see e.g. d’Ydewalle and van Rensbergen 1989, d’Ydewalle et al. 1991, d’Ydewalle and Gielen 1992 and d’Ydewalle and de Bruycker 2007). Moreover, viewers with a certain degree of experience in reading subtitles seem to have the ability to process and to integrate the multimodal information in a cognitively effective way (see also Kruger et al. 2013, Kruger et al. 2015 and Perego et al. 2010). According to d’Ydewalle and Gielen (1992: 425): “Viewers seem to have developed a strategy that allows them to process these channels without problems and in which reading the subtitles occupies a major place”. D’Ydewalle and de Bruycker (2007) and Perego et al. (2010) suggest that viewers are able to adjust their processing strategies to the specific needs and constrains imposed by the subtitled programme. They observed that viewers tend to spend more time reading the subtitles than watching the visuals, but that their fixations on the images are longer than their fixations on the subtitles, therefore being able to process both sources of information in an effective way.

Secondly, subtitles tend to be read immediate and automatically.

In contrast to reading in print, reading in subtitling is less predictable, as viewers can decide where to look at, and, therefore, different viewers can have different viewing and reading behaviors. However, the appearance of text on the screen seems to attract the viewers' attention almost immediately, regardless of the presence of other elements and of the degree of experience of the viewer in reading subtitles (d'Ydewalle et al. 1987, d'Ydewalle et al. 1991, d'Ydewalle and Gielen 1992 and d'Ydewalle et al. 1999). It seems that both the viewers who understand the language of the soundtrack and those who do not understand it rely on the subtitles to a certain extent. Subtitles are expected to attract attention because, on the one hand, they are a source of relevant information (being therefore in part controlled by an exogenous or top-down process), and on the other, a visual salient and dynamic feature embedded on the image (being partially controlled by an endogenous or bottom-up impulse). Viewers often start by reading the subtitles, and then they shift their visual attention between the images and the subsequent subtitles (Jensema et al. 2000a and 2000b). When the subtitles are read, it seems that viewers, instead of scanning the whole image, tend to focus on the most relevant parts of the visuals —usually the faces— for as long as possible. Therefore, it seems that viewers prioritize the written text over the images. This prioritization of the subtitles —that, according to Koolstra et al. 1999, increases with age— is claimed in most of the studies (see also Jensema 1998 and Koolstra et al. 1999 Jensema et al. 2000a and 2000b and Perego et al. 2010), especially when the subtitled text presents a higher and faster load of verbal content (de Linde and Kay 1999, d'Ydewalle and van Rensbergen 1989 and d'Ydewalle and Gielen 1992). In this regard, Romero-Fresco (2009b, 2011 and 2015a and 2015d) states that the distribution of the attention between the subtitles and the visuals depends to a great extent on the presentation rates of the subtitles. He concludes that the higher the rate of subtitling speed, the more time is spent reading them, thus affecting the processing of the visuals. This might negatively affect the comprehension of the viewers with poorer reading skills. However, recent studies have shown that certain types of audiences, with certain types of tasks, might manage to avoid reading the subtitles, as it is shown by Kruger et al. (2013) in their study about the processing of first and second language (L1/L2) subtitles and in Orrego-Carmona (2015) in his study on the effect of professional and (non) professional subtitling. Kruger et al. (2015) acknowledge that the distinct nature of the activities of reading and watching is not called into question as in general reading the subtitles results in more and shorter fixations than watching the image.

However, according to the authors, it must be highlighted that the way in which —and the degree to which— the subtitles are processed seems to be flexible and may vary according to "different contexts with different language combinations, different levels of redundancy of information, and differences in audiences", being thus "far from straightforward" and "unproblematic".

Thirdly, subtitles are fluently read and processed.

According to de Bruycker and d'Ydewalle (2003), subtitles are fluent and actually read, not simply scanned. Viewers do not read all the subtitles on a word-by-word basis but rather by focusing on the words that presumably convey the most relevant information. It seems that more actual and regular reading occurs with two-line than with one-line subtitles (d'Ydewalle et al. 1991, de Bruycker and d'Ydewalle 2003, d'Ydewalle and de Bruycker 2007, Praet et al. 1990 and Perego et. al 2010). Findings suggest that two-line subtitles result in longer reading times than one-line subtitles. This could be caused by two factors. On the one hand, viewers might expect to need more time to read two-line subtitle, what is known as the "length-expectation hypothesis" (d'Ydewalle and Gielen 1992). On the other hand, two-line subtitles are expected to be less redundant in relation to the information provided by the image in such a way that they are more likely to be fully read and processed (de Bruycker and d'Ydewalle 2003, d'Ydewalle et al. 1991 and d'Ydewalle and de Bruycker 2007). On the contrary, one-line subtitles do not necessarily contain much more information than the one that can be inferred from the visuals so they are read easier and faster.

Last but not least, visual aspects also affect the reading and processing of subtitles.

For instance, in the case of cinema, film genre is expected to have a great influence. Action films tend to present less dialogue and make more use of fast editing and special effects than other genres such as drama films or documentaries, which —as explained in Kruger at al. 2015— "creates a stronger visual element which shifts the balance of content towards the action (visual content) and away from dialogue (soundtrack and therefore subtitles)". One of the filming techniques that have received more attention is the cutting or the transition between the shots (see e.g. Krejtz et al. 2013 and de Linde and Kay 1999). According to Smith and Henderson (2008), viewers tend to see films as a continuous process and the transitions are not usually perceived (which is known as "edit blindness"). This is especially valid for fictional films that, through the use of "continuity editing" —a system for cutting the shots that is mainly used to maintain a continuous and clear narrative action (see

Bordwell 1985, 1997 and 2006)—, are expected to have a more regular structure. According to Bordwell (2002), this system has been "intensified" through the use of fast-cut scenes, which result in more and shorter shots. However, in subtitling —as shown by Krejtz et al. 2013— a higher number of shots leads viewers to deflect attention between the subtitles and the image more regularly, thus disrupting the reading and viewing process. More recently, Perego et al. (2016a and 2016b) investigated the reception of subtitling in terms of complexity. By using a comprehensive approach to complexity that not only included linguistic aspects (i.e. the number of words and subtitles and the length of the sentences) but also visual and narrative aspects (i.e. the film's pace, the amount of new visual information in each shot, the linearity of the story and the number of characters, locations and story lines), the authors concluded that the higher the overall complexity of the audiovisual product, the more time is spent reading the subtitles. Thus, it can be argued that the reception of subtitling is likely to be affected by a broad range of factors that go beyond linguistic aspects of translation and in which visual and narrative aspects may play a key role, which emphasizes the semiotic nature of this type of audiovisual translation.

2.1.4 Challenges and future perspectives

Most of the scholars that have been cited throughout this section agree with the fact that more research is required to gain a deeper understanding as to how different viewers in different contexts and with different formats and subtitling strategies process and integrate the multimodal information conveyed in an audiovisual text. Despite the interesting contributions described above that reflect the progress that has been made on this direction, and according to Kruger et al. (2015), "there are still more questions than answers". Audiovisual translation research has been —and still is— primarily focused on analyzing the linguistic code (see e.g. Gambier 2013 and 2016, Sanz Ortega 2011 and Zabalbeascoa 2008), omitting the role and influence of the non-verbal elements. The complexity of the network of elements and mechanisms involved in the processing and the intricacy of the process of reception itself still needs to be addressed, as it would be important to define not only the relationships between the different codes but also the purpose they fulfill. In order to achieve such knowledge, more reception and empirical research is demanded to investigate, among other factors: patterns and habits of viewers in terms of reading, watching and overall processing behavior and the their perception on subtitling strategies (Gambier 2008, 2013 and 2016).

One of the key aspects in the study of how different types of viewers process the audiovisual-translated information is accessibility (Braun 2008, Gambier 2013, Remael et al. 2012 and Remael et al. 2016). Accessibility is not only a current social demand in terms of quantity and availability of accessible media services but also in terms of quality and effectiveness. More information is still needed on the way in which the blind and partially sighted and the deaf and hard of hearing process and integrate audiovisual information. Such studies would require "more integrated research approaches that successfully mobilize different disciplines and combine technology-based applied research methods with more basic research" (Remael et al. 2016: 260). However, as has been mentioned, this poses a challenge in audiovisual translation, as there is not yet a robust and validated theoretical and methodological framework to analyze and integrate the variety of the elements and the stages involved in the process of reception. As pointed out by Kruger (Kruger et al. 2015 and Kruger 2016), methods that collect objective, physiological and behavioral data (such as keystroke logging, eye tracking and electroencephalography) should be combined with the more traditional methods (such as questionnaires and surveys) that elicit subjective data in order to ease the understanding of the whole experience of processing audiovisual-translated texts.

2.2 Subtitling for the deaf and hard of hearing

This section is focused on one of the main modalities of accessibility: SDH, which is the focus of the present research.

Section 2.2.1 introduces the peculiarities of the population targeted by this translation modality: the deaf and hard-of-hearing population. Section 2.2.2 briefly discusses the origins and the development of the practice and Section 2.2.3 provides an insight into the network of codes and elements involved in this modality and the relationships that they maintain. Finally, section 2.2.4 focuses on discussing subtitling speed, as a parameter that has received special interest and that is the object of the present study.

2.2.1 Target population

First of all, it is important to contextualize the research and to introduce the peculiarities of the target deaf population in order to gain some knowledge about the sociocultural reality that surrounds deafness and its multiple implications on factors such as language acquisition and proficiency, reading acquisition and education.

2.2.1.1 Introduction to deafness and hearing loss

There are two main types of hearing loss: conductive and sensorineural. When there is a conductive loss, the cochlea functions normally but the sound information is not properly conducted to the inner ear. In a sensorineural hearing loss, the damage is in the inner ear and it cannot be reversed, being the most common type of permanent deafness (see Alshuaib et al. 2015). The cochlea, nevertheless, has approximately 20,000 tiny hair cells responsible for hearing so even with a high degree of hearing loss, unless the nerves are damaged, some might respond to certain sound frequencies, which is known as residual hearing. The degree of residual hearing varies in each individual but two types can be established: when it allows certain background or ambient sounds to be heard and when it allows to perceive, to a certain extent, foreground sounds, mainly speech.

The degree of hearing loss is inversely proportional to the degree of the residual hearing. According to a threshold that represents the range of the loss in decibels (dB), Clark (1981) proposed the following classification of levels of hearing loss, which is widely accepted (see Ramírez Camacho 2005, Tamayo 2015 and Varela Nieto and Lassaletta Atienza 2012): the hearing loss is slight between 16 and 25 dB, mild between 21 and 40 dB, moderate between 41 and 70 dB, severe between 71 and 90 dB and profound if it is over 91 dB. A mild hearing loss can cause difficulties in hearing speech but may not require the use of hearing aids as a moderate hearing loss would. Individuals with a severe hearing loss may need to rely on lip-reading to understand speech, even with hearing aids. The use of hearing aids allows them to take advantage of their residual hearing (especially if it allows them to perceive speech) so that they can combine it with other methods in order to receive access to speech, such as lip-reading. For individuals with a profound hearing loss, despite the use of aids and implants[12]

[12] A cochlear implant is a small electronic device surgically placed under the skin that replaces the activity of the damaged part of the cochlea and enables the sound to be transmitted.

and the support of lip-reading, it might be extremely difficult to hear the speech sounds and, to communicate effectively, they might need to learn and use a sign language.

Apart from the above, there are other ways to classify hearing loss, such as its presence in one ear (unilateral hearing loss) or in both ears (bilateral hearing loss), and, if bilateral, the symmetry of the degree of the loss in both ears. Another way of classifying the deaf population is by referring to the age in which the deafness appeared in relation to the acquisition of language. The distinction is made between those individuals who lost their hearing after having acquired their L1 —post-lingual deaf— and those who lost it before —pre-lingual deaf— (Ramírez Camacho 2005 and Varela Nieto and Lassaletta Atienza 2012).

2.2.1.2 Sociocultural dimension of deafness

"Deaf", "deaf", "deafened", "hard of hearing", "hearing impaired", "hearing disabled" and even "deaf-mute"[13] are all terms used to refer to people with a form of hearing loss. However, for some people "deaf" would refer to a person with a complete inability to hear, whilst for others it would also refer to a person with partial hearing loss. In the same way "deafness", "hearing impairment" and "hearing loss" can be used to refer exclusively to the total inability to hear or to encompass the wide range of hearing losses. "Hard of hearing", in turn, is usually associated only with the lower levels of hearing loss. Academics and professionals are not excluded from this terminological debate, as it is shown in the absence of consensus regarding the name to denominate this modality of audiovisual translation. In some cases and countries the subtitling would just be addressed to "the deaf", in other cases it would also incorporate the "hard of hearing" or "hearing impaired", and in many cases the two options would coexist. These inconsistencies and ambiguities might be due the fact that the different associations, within and between countries, actually use and define all these terms differently (Shield 2006). This debate may reveal a lack of general awareness about the deaf population and its heterogeneity. The idea of the deaf population as a homogeneous group, according to Neves (2008b: 131), is nothing other than a wide range of people that, for practical purposes, have been "inadequately grouped together". Only if sociocultural factors

[13] For long there has been a common misconception that deaf and mute-deaf are equivalent in meaning, inaccurately attributing to the deaf population the inability to speak properly. Deaf and hard-of-hearing associations have been fighting for decades to eradicate this belief and nowadays the term is barely used by the media.

(related to language, communication, family, identity and culture) are taken into account, it will be possible to obtain a comprehensive picture of the diversity of the deaf population.

Three main subgroups are usually considered: the Deaf, the deaf, and the hard of hearing. "Deaf" (with capital letter) is used to designate the people who have or use sign language as their first language or L1 and who see it as a characteristic feature of their own sociocultural and linguistic group (see Haualand and Allen 2009 and Neves 2005, 2008a, 2008b and 2009). The "deaf", on the contrary and despite a high degree of hearing loss, have a spoken language as L1 and do not differentiate from the hearing culture. The "hard of hearing" also identify themselves with the hearing culture, as it is likely that they still have some degree of residual hearing that will facilitate spoken communication. The preference and use of one term over the other responds, thus, to sociocultural factors, rather than to hearing-related aspects. The differences between the Deaf and the deaf may even come to the point of disagreement in relation to sensitive issues such as the position towards the teaching of sign language, the cochlear implantation in young children and, ultimately, their own perception of deafness. The perception of the world by a person who hears, or a person who has been able to hear at some point in his/her life, is substantially different from the perception of a person who has never heard and does not have any sound reference at all (Tamayo 2015: 20).

Another common way of differentiating between deaf individuals is by the use of the attributes "oralist" and "signer". In contrast to the education in sign language, "oralism" is the education approach for the deaf and the hard of hearing that is exclusively based on spoken language, by focusing on the use of lip-reading and related strategies, and that does not include sign language. Some associations, however, with the aim of tackling the issue of deafness transversally, try to avoid this labeling. In the context of the present research, the dichotomies Deaf and deaf and oralist and signer have been avoided, as in my opinion they do not reflect the complexity involved in defining the target population. Plus, despite the unquestionable existence of two differentiated groups, the threshold between the two is not always so clear, as it will be seen in Chapter 4 (Section 4.3.2) when describing the process of selection of participants that took part in the study. In this research, a first distinction is made based on biological factors (hearing-related) and on aspects related to communication and language. Based on this, two groups are considered:

- The hard of hearing: individuals with lower levels of hearing loss who are likely to have higher degrees of residual hearing and strongly depend on hearing aids and/or cochlear implants to achieve a functional hearing.

- The deaf: individuals with higher levels of hearing loss, who most likely do not have any residual hearing (or very low) and who might not use hearing aids and/ cochlear implants, at least to the same extent.

Within the last group, a second distinction is made on the basis of the mode of their natural language of communication, and two groups are considered:

- The deaf individuals with a spoken language: who normally, although not necessarily, become deaf after having acquired spoken language and do not use sign language.
- The deaf individuals with a sign language: who normally, although not necessarily, become deaf before having acquired the spoken language and who use sign language.

2.2.1.3 Language, reading and education

The process of language acquisition begins at birth and develops throughout the first years of life. The very first three years are often assumed to be especially sensitive (Lust 2006, O'Grady 2005 and Pallier 2007), being associated with a rapid growth in the brain volume. Speaking and comprehension are primary abilities that are developed almost effortlessly in the first years of life, while reading and writing are consciously learned usually at school age. By the age of 8-12 years —depending on the author— the process is completed; after this point, it becomes harder to acquire a L1 and it is usually a L2 that is learned (Sakai et al. 2005). Spoken and signed languages —which develop in a natural way and independently from the spoken language(s) used by the hearing population (see e.g. Bellugi 1980, Lieberman and Mayberry 2015, Mayberry and Squires 2006 and Meier 1991)— share a similar structure and properties. Children go through an analogous process of L1 development in the two cases, facing the same challenges and passing the milestones at predictable and similar stages.

However, the language experiences of deaf and hearing children are different: whereas the auditory-linguistic input is accessible and immediate after birth for hearing children, it is not for deaf children. This is dependent on the linguistic environment of the children, plus, it can affect their age of L1 acquisition (Meier 1991). If born in a deaf/sign language users family, a deaf child could have an early exposure to accessible linguistic input by means of visual-based communication. If born in a hearing family, depending on the degree of the child's hearing loss, his/her exposure to any language may be delayed. Approximately only a 5-10% of deaf children (Mitchell and Karchmer 2004 and Villalba

2009) are born in a family of deaf/sign language users (being considered as “native learners” as they acquire sign language from birth). The great majority of deaf children, however, are born to parents with no deafness and with no contact with sign language. Therefore, these children, being profoundly deaf, could have a low probability of being exposed to a spoken language so even in cases of early identification their exposure to language varies enormously, which is why some are considered as “late learners”. If a L1 is not acquired early in childhood, the effects on the proficiency of this language and on subsequent L2s can be detrimental. Research carried out with pre-lingual deaf individuals who learned sign language at different stages shows that the earlier the exposure to sign language the greater the L1 proficiency. These studies also showed that acquiring a sign language at early stages eases the learning of a L2, including a spoken language (Morales-Lopez 2010). Lust (2006) corroborates that early exposure to any language led to a better performance on the language(s) later acquired.

The process of learning to read is especially difficult for those children who are profoundly deaf, as they also have limited access to the written language. As explained in Torres and Santana (2005), the deaf population is more likely to have a lower linguistic level in terms of semantics and syntax and lower oral skills, which are necessary for reading. According to them, the reading comprehension level of a deaf high school student would correspond to the level of a hearing student seven years younger. In the same terms, Traxler (2000, in Romero-Fresco 2010: 179) points out that deaf children between eight and eighteen years old are expected to have the reading skills of hearing children of between nine and ten years old. Research has found, however, that some pre-lingual deaf children can still be good readers, even without depending on the phonological encoding and without having a solid base of the spoken language (Sakai et al. 2005). In fact, deaf children born into families of deaf/sign language users tend to perform better in reading than those born to hearing families (Morford and Mayberry 2000). Deaf parents might identify the hearing loss earlier, place their children accordingly into a suitable educational environment and provide them not only with immediate and accessible linguistic input that may support the process of learning to read but also with social and emotional support to understand and deal with the hearing loss. Reading proficiency seems to be directly related to the early, steady and successful learning of a L1 rather than to the amount and intensity of the oral training received. The acquisition of a sign language itself, however, does not involve the acquisition of the ability to read but neither does it hinder the process, as it has been found that skilled sign language users tend to perform better in reading than less skilled sign language users (Chamberlain and Mayberry 2000).

For years, the discussion surrounding the education of deaf children has focused on whether using signs or speech to communicate (Haualand and Allen 2009). Throughout recent history, the spoken approach has taken precedence over the signed approach. At the end of the 20th century, the bilingual approach appeared and gained some popularity (Villalba 2009). Medical and technological advances —for instance, nowadays implants can be can be placed in children of between 12 and 18 months— can ease the children's access to phonetic and phonological components and thus to the spoken language through *mainstream* or oral education that places the emphasis on speech. In Spain and Catalonia, the education for deaf students has undergone a lot of legislatives changes in the last fifty years, and significant differences can be found between generations. In the 1980s the schools' approach to the teaching and integration of deaf students was changed from specific to integrated schools (Frigola 2010), but in both cases sign language was not included in the curriculum. It was not until the mid-1990s that the bilingual integrated approach started to be implemented in primary and secondary schools. This approach makes use of the two languages: it stresses the use of the sign language but also puts a strong emphasis on reading and writing the spoken language. The oral or oralist approach, however, is still strong (Camacho 2005 and Villalba 2009) as approximately 80% of the Spanish deaf children attend non-specific oralist schools (Báez Montero and Fernández Soneira 2010). In high schools, professional schools and universities, deaf/sign language user students are allowed to request the support of a sign language interpreter, although this service may not always be available and may not guarantee a minimum number of hours of per week. These changing circumstances may have had a negative impact on their performance at school and may have contributed to hindering the education of the deaf population in post-secondary levels. Haualand and Allen (2009) acknowledge that there is still a high rate of illiteracy within the deaf population. However, as the new generations are entering the university and higher education, it seems that the literacy level of the deaf children is also increasing (Arnáiz 2012a: 39).

2.2.1.4 Data about the deaf population

There have been numerous attempts to quantify the proportion of population with deafness or hearing loss. Numbers have been presented according to different countries, different degrees of loss or different age groups. It is difficult to gather information and to provide accurate estimates, but there are some reliable reports that allow for an accurate estimation. Hersh and Ohene-Djan (2010) estimate that, in any country, the population with a hearing loss would oscillate between 6.6% and 14.3%. The World Health Organization estimates that approximately 0.9 % of the total world population have a hearing loss of more than 61dB. A similar percentage is estimated in relation to Europe: 0.7% of the population would be severely deaf and 0.2% profoundly deaf, with a higher prevalence in the older age groups. The estimate for the total European population with a hearing loss of more than 25 dB is much greater: 16-17%. In fact reports estimate that, as the population ages, in approximately the next 20 years, 100 million of Europeans will have a hearing loss.

In Spain, the last official statistics from the National Statistics Institute (INE, 2008)[14] estimate that over one million people aged between six and 80 years old have a hearing loss of some type (approximately a total of 1,064,000). These figures differ substantially from the data obtained by the European reports that estimate that 12% of the Spanish population has a hearing loss (approximately five and a half million). This discrepancy in the figures might be due to the lack of a national organization or to the absence of an official census (Báez Montero and Fernández Soneira 2010), and the estimates provided by the international reports might be more accurate.

It is even more difficult to find accurate data regarding sign language users, as people without a hearing loss —for instance hearing relatives and sign language interpreters— use it as well. In Spain, the latest official statistics (INE 2008) estimate that 13,274 people between 6 and 80 years old are sign language users. However, more recent reports such as the one carried out by the European Union of the Deaf (de Wit 2008), which includes the data provided by the Spanish associations[15], indicate that the number of sign language users in Spain might be significantly higher: between 120-150,000 people in total. However, the same report estimates that 0,15% of the European population uses sign language, and if this estimate were applied to the Spanish population, the number of users would only reach 70,000.

[14]See: http://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176782&menu=resultados&secc=1254736194716&idp=1254735573175

[15] CNSE (Confederación Estatal de Personas Sordas/ Spanish National Confederation of Deaf People) and FILSE (Federación Española de Intérpretes de Lengua de Signos y Guías Intérpretes/ Spanish Federation for Sign Language Interpreters and Interpreter-Guides)

2.2.2. Origins and development

The first European country to incorporate TV subtitles specifically addressed to the deaf and hard of hearing was the UK, in 1979 at the BBC (Higgs 2006 and Remael 2007). It was not until the 1990s that the Catalan and Spanish public channels introduced the service, which was gradually incorporated by the rest of the channels, both public and private, in subsequent years (Díaz Cintas 2010). In 2003, the Spanish Association for Standardization and Certification (AENOR) published the first set of national standards for SDH: the UNE norm 153010, which was revised in 2012. It includes recommendations for pre-recorded, semi-live and live subtitles with regard to: visual aspects of presentation (e.g. position, format, number of lines, number of characters per line, font size and typography and color contrast), temporal aspects of presentation (e.g. speed of exposure, presentation times, synchrony and delay for live subtitles), character identification (e.g. use of colors, dash and tags), sound information, contextual information and voice in off, music and songs, and editorial issues (e.g. symbols and abbreviations, numbering and literality).

Since the introduction of SDH, the audiovisual landscape has undergone a fast evolution —accelerated by the arrival of the digital television and the DVD— and awareness on the importance of providing accessible services has increased amongst governments and in the industry (Díaz Cintas 2005 and 2010). The number of subtitled TV programs has also augmented (Arnáiz 2012a: 70) and the DVD and cinema industries have started to awaken through new initiatives bringing accessible films to the cinema. In 2014, the Spanish public broadcaster RTVE committed to subtitling their TV programs on the Internet, thanks to a petition of signatures initiated online by a deaf user. Nonetheless, in all the formats, there is still room for improvement in terms of both quantity and quality. Future research directions include an increment in the interaction of the audience with the subtitles (see the ongoing project HBB4ALL introduced in Section 2.1.1) in such a way that viewers can adjust a set of features and parameters according to their needs (see e.g. Arnáiz 2012b, Kirkland 1999 and Neves 2007a). According to Gottlieb (2015: 41) "personal subtitling" can be feasible with digital TV where simultaneous versions of subtitles —e.g. "in different languages and at different reading speeds"— could be broadcast, reducing the cost for the broadcast industry and reaching and satisfying a larger audience.

SDH subtitles can be intralingual and interlingual, although at least in Spain the presence of the latter is very limited (Arnáiz 2012a, Díaz Cintas 2007, Lorenzo 2010 and Pereira 2005).

Subtitling is an overt type of translation (Gottlieb 1994: 102) where the original version is still available to the viewers through the soundtrack. This makes it open to criticism from the viewers with some degree of knowledge of the source language, what is known as "subtitling vulnerability " (Díaz Cintas and Remael 2007: 55). This phenomenon is especially relevant to SDH as —being mostly intralingual subtitles— participants with a certain degree of residual hearing might gain some access to speech and rely on lip-reading to complete this information (Zárate 2010). A central issue in SDH, the dichotomy between edited and verbatim or literal subtitles, is somewhat related to this vulnerability. As it will be seen in the next section, the discussion surrounding editing is highly controversial in research in SDH, being one of the most criticized aspects by viewers. Deaf and hard-of-hearing individuals and associations —mainly due to the sociological implications of deafness and hearing loss explained in Section 2.2.1.2— tend require access to exactly the same information as their hearing peers and to defend the presence of verbatim subtitles. Academic research, on the contrary, in order to ease the reading and comprehension processes seems to opt for editing the subtitles (Romero-Fresco 2015d).

2.2.3 Parameters and its analysis

SDH is mainly characterized by the inclusion of the translated or transcribed original dialogue together with other paratextual information, i.e. suprasegmental and prosodic features, sound effects, music and songs (Díaz Cintas 2007 and 2010).

As has been advanced in Section 2.1.3, in subtitling the oral discourse competes for attention with the visuals and this is expected to entail a higher cognitive load and a continuous split of attention between images and subtitles. In the case of SDH these effects might be increased, as the auditory information is totally or partially absent for the deaf and hard-of-hearing viewers and the subtitles do not only include the dialogue but also other auditory and paralinguistic features. As stated in Kruger et al. 2015 "attention has to be divided between reading the subtitles and processing the scene, extracting information from facial expressions, lip movements and gestures, and making or checking this against the information obtained in the subtitles", which turns SDH in a "mixed intrasemiotic and intersemiotic type of audiovisual translation" (Caimi 2006: 86).

With the aim of creating a framework for the analysis of SDH that considered all the categories and parameters involved, Arnáiz (2012b) developed a taxonomy based on the classification provided in Bartoll (2008) for standard subtitling. Arnáiz distinguished six different categories of parameters: linguistic, pragmatic, aesthetic, technical, aesthetical-technical, and extralinguistic, with a total of 23 different parameters. The first five categories were based on the original groups considered by Bartoll (2008) —linguistic, pragmatic, and technical— whilst the last one incorporated the parameters specific to the deaf and hard-of-hearing audience, i.e. character identification, paralinguistic information, sound effects and music.

Linguistic	Extralinguistic	Pragmatic	Aesthetic	Technical	Aesthetic-technical
1.Language 2.Density	3.Characters identification 4.Paralinguistic features 5.Sound effects 6.Music	7.Target users 8.Aim 9.Authoring 10.Moment of elaboration	11.Placement 12.Color 13.Typography 14.Location 15.Justification	16.Method of elaboration 17.Diffusion 18.Filing 19.Format 20.Media	21.Speed 22.Incorporation 23.Optionality

Table 2: The semiotic codes in SDH, from Arnáiz (2012b)

Linguistic density is concerned with the amount of information gathered in the subtitles (coming from both the dialogue and the soundtrack in the case of SDH) and is considered one of the most relevant parameters. It is determined by the characteristics of the audiovisual text itself and by the space and temporal restrictions implicit to subtitling that leads to establishing a maximum of subtitle lines and characters per line. The pragmatic aspects as a whole and the parameter "target users" in particular play a significant role on SDH, as it is the hearing and communication profile of the participants that makes it a specific type of subtitling. The parameters that constitute the aesthetic code are the ones that are particularly visible to the viewers, whilst the least visible elements form the technical group. In turn, the aesthetic-technical parameters are halfway between the former and the latter. According to the Arnáiz (2012b), this taxonomy should be seen as flexible rather than rigid as it allows for changes and variations.

What it is interesting about this classification is the fact that it highlights the tight interrelationship between some of the parameters and identifies a set of interdependence relations. As it can be seen in the table below (Table 3), the specific type of viewers (n. 7) and the specific type of media (n. 20) have an influence on the rest of parameters, and thus on the process as a whole. Likewise, the incorporation of the extralinguistic and auditory information to the subtitles (parameters n. 3-6) also modifies the other groups of parameters.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		X					X	X	X											X	X		
2	X		X	X	X	X	X	X	X	X	X		X	X						X	X		
3		X					X		X			X	X	X		X	X		X	X	X	X	
4		X					X		X	X	X	X	X	X		X	X		X	X	X	X	
5		X				X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	
6		X			X		X		X	X	X	X	X	X	X	X	X		X	X		X	
7	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	X	X					X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	
10		X		X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
11		X		X	X		X	X	X	X		X	X	X		X	X	X	X	X			X
12			X	X	X	X	X	X	X		X		X			X	X		X	X			
13		X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X			X
14		X	X	X	X	X	X	X	X	X	X		X		X		X		X	X		X	
15					X	X	X	X	X	X				X		X			X	X		X	
16			X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	
17			X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X	X	X
18							X	X	X	X	X		X			X	X			X		X	X
19			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	
20	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
21	X	X	X	X	X		X	X	X	X						X	X		X	X		X	
22			X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X		X
23	X						X	X	X	X	X		X				X	X		X		X	

Table 3: Relations of interdependence between SDH parameters, from Arnáiz (2012b: 121)

Most of these parameters are considered in the different national guidelines or recommendations that coexist in Europe. In the DTV4ALL project (see Romero-Fresco 2015a), an attempt was made to harmonize practices in Europe by analyzing the quality of SDH, in terms of what viewers with different degrees of hearing loss think about subtitles and how they understand, view and process them. The largest reception study in SDH carried out to date, it is one of the greatest contributions to the knowledge about how deaf and hard-of-hearing viewers process and understand the information in audiovisual texts.

The first part of the study included data from Denmark Poland, the UK, Spain, Italy, France and Germany and analyzed the results of a long questionnaire on the profile of the hearing, deaf and hard-of-hearing participants (a total of 1,365), their viewing habits and their opinion on subtitling in general and the following extralinguistic, aesthetic and aesthetic-technical parameters. In the second part of the study, the comprehension and the visual perception of 103 Polish, Spanish, Italian and German participants was analyzed —through the use of questionnaires and eye-tracking tests— in relation to the different variables establish for each of the parameters below (Romero-Fresco 2015b). The project gathered the practices most used in the different countries involved and alternatives in relation to:

1. Background boxes: no box/ box
2. Borders: no border/ border

3. Shadows: no shadow/ shadow
4. Placement: at the top/ at the bottom/ mixed placement
5. Alignment: to the left/ to the center
6. Character identification: use of colors/ use of tags/ use of placement
7. Sound information: no sound information/ description/ use of icons
8. Paralinguistic information: no paralinguistic information/ description/ use of emoticons
9. Subtitling speed/ subtitling style: edited/ standard/ verbatim

According to Romero-Fresco (2015b: 333), the heterogeneity of the audiovisual landscapes and of the hearing-impaired communities in every country —together with their social, economic and political differences— makes it very difficult to homogenize recommendations in Europe. However, relevant data was obtained in every country and, interestingly, some common patterns across the different countries were observed. More specific details about the second part of this study will be given in Section 2.3, but the main results obtained in each country were as follows:

In Denmark (Gottlieb 2015), participants seemed to be satisfied with most of the current conventions. They agreed with the current subtitling speed and with the inclusion of the source of the sound information. However, character identification was not at that time provided and participants seemed to demand it.

In the UK (Romero-Fresco 2015c), most participants were satisfied with the current practices (i.e. the use of colors for identifying the characters, the bottom position of both the subtitles and the sound information, the description of emotions and sound information and the subtitling speed). In relation to subtitling speed, however, half of the participants opted for verbatim subtitles and half preferred to have edited ones.

In France (Muller 2015b), most of the participants seemed to be satisfied with the current subtitling speed but they preferred verbatim subtitles rather than standard ones. The current combined method for identifying the characters (that use both colors and placement) seemed to be problematic and other methods should be considered. Participants validated the use of the color red to designate sound effects, but they preferred to also have either onomatopoeia or descriptions.

In Poland (Szarkowska et al. 2015a and 2015b), most of the conventions turned out to be effective (i.e. the bottom position of the subtitles, the alignment to the center and the description of the sound information). In relation to the conveyance of emotions, on the contrary, most of the participants preferred not to have descriptions, even thought they were found to be easier to understand and faster to read. As far as speed and style are concerned, most participants opted for verbatim subtitles —which resulted in longer reading time— instead than for the conventional standard option.

In Italy (Eugeni 2015a and 2015b), most of the conventions were also considered effective (i.e. the alignment to the left, the use of shadows and the standard style for subtitling density and speed). The conventional identification of the characters through the use of colors was the preferred option, but the use of placement was not rejected by the participants and was found to be more effective. Equally, participants opted for the conventional position of the subtitles (at the bottom of the screen) but the top position resulted in higher comprehension rates and faster and easier reading times. As for the inclusion of sound information, the convention of using blue characters on a yellow box —despite being widely accepted— led to poorer visual comprehension and longer reading times than the option of description.

In Germany (Mascow 2015a and 2015b), most of the participants opted for the current practices (i.e. the bottom position of the subtitles and the description of the sound information). Most respondents also stated their preference for verbatim subtitles even though they led them to spend more time reading the subtitles. In the same terms, participants favored the use of descriptions to convey emotions but this option obtained the lowest comprehension scores and led to longer reading times. The use of emoticons, on the contrary, resulted in good comprehension and easier and faster reading times but was rejected by most of the participants.

Finally, in Spain (Arnáiz 2015a and 2015b), most of the conventions were also found to be effective (i.e. the use of description for the conveyance of emotions, the alignment to the center of the subtitles and the standard style for subtitling speed). The use of colors for identifying the characters was validated and the use of tags and displacement also obtained good results. The conventional use of descriptions for the sound information was widely accepted by the participants but led to lower scores especially for the group of deaf participants. On the other hand, the mixed placement system (at the bottom for the subtitles and at the top for the sound information) —which is exclusively used in Spain— turned out not to be effective. The placement at the bottom obtained the best results in comprehension and the easiest and fastest reading times.

In general, it seems that familiarity with the existing conventions played an important role in the preferences of the participants. In some cases, interesting differences were found between the deaf and hard-of-hearing participants and also within countries.

For instance, in France and in Denmark there seems to exist a general lack of awareness of the provision and practices of SDH, and in Poland and Germany viewers seem to be more concerned about the quantity of SDH rather than the quality. This might be due to the fact that approximately only the 10% and the 27% of the programs, respectively, provide this kind of subtitling (Romero-Fresco 2015e). In the UK the deaf participants were more interested and aware of SDH than their hard-of-hearing peers, having in addition a better opinion on it and being more open to the introduction of changes. In Italy, the hard-of-hearing participants also were less familiar with SDH but it was the deaf participants who were more reluctant to innovation (Eugeni 2015a). On another note, in all the countries subtitling was the preferred method of accessibility, except in Italy —where half of the participants preferred subtitling and the other half preferred sign interpreting— and in Spain —where the majority opted for sign language—.

Another interesting observation was found on the differences between the objective and the subjective data. Sometimes the participants claimed to prefer different options before and after the eye-tracking test and, on some occasions, results showed that the methods preferred by the participants were not the most appropriate in terms of comprehension and reading times and ease. In the case of Spain, in addition, a certain degree of disparity was observed between the self-reported language and reading skills of the participants with a hearing loss and the evidence that was later found in the questionnaires and eye-tracking tests. Only 24% of the deaf participants in Spain claimed to have problems when reading the subtitles, but 57.5% of them were not able to understand the information contained in them in the comprehension test. As for the hard-of-hearing participants, 100% stated not to have difficulties in reading subtitles but only 60% of them were able to answer correctly the question on textual comprehension (Arnáiz 2015a). This seems to show a lack of reliability in their self-assessment of reading skills.

In general, and in all the countries involved in the project, the deaf and hard-of-hearing participants showed a worse comprehension than their hearing peers, especially in textual comprehension. The participants with a hearing loss also tended to locate the subtitles faster than the hearing participants —probably because they rely on the subtitles to a greater extent and are expecting them to be displayed in order to read them— and to spend more time reading them, which might be seen as a symptom of reading difficulties. The same patterns were observed in Szarkowska et al. (2011 and 2013) and Krejtz et al. (2013). According to Burham (2008: 392), the reading comprehension levels of the deaf population are "considerably lower than those of the hearing population" and "hearing status and literacy tend to covary". However, the heterogeneity of the population makes it very difficult to generalize. According to Neves (2005), early exposition to adequate linguistic stimuli and a systematic and regular process of reading might therefore contribute to reduce the difficulty of the process. Thus, "this does not mean that deaf people are cognitively impaired and unable to process information efficiently; what this means is that deaf people resort to other strategies (strong visual memory) to process information" (2005:100). In fact, in the DTV4ALL project, the participants with a hearing loss spent less time on the images but this did not prevent them from processing the visuals and achieving an overall good visual comprehension, as their comprehension of the images was almost as good —and in some cases even better— than their hearing peers. However, the overall results seemed to confirm the pattern that deaf and hard-of-hearing viewers experience problems in reading and comprehension.

The DTV4ALL project also led to the confirmation of some of the findings shown in Section 2.1.3 in relation to the processing of subtitling. It was corroborated that the inclusion of subtitles attracts attention regardless of the simultaneous presence of other aspects, that viewers are able to watch the images and read the subtitles almost effortlessly by shifting attention between them, that —despite spending more time on the subtitles— the fixations on the images are longer, that —instead of further exploring the image— viewers tend to use the time spent on the visuals to focus on key parts such as faces, and that the faster the subtitles the more time is spent reading them. The concept of speed in subtitling is in fact one of the main concerns of the project, which devotes a whole section to it (Romero-Fresco 2015d).

The next section is thus focused on speed as a parameter of interest in subtitling that it is central in the present research.

2.2.4 Subtitling speed

The parameter of subtitling speed has received a lot of research attention in both subtitling and SDH, being considered essential for the reception of subtitled texts. As advanced in

Section 2.1.3, viewers need to adapt themselves to the rhythm of the subtitles and adopt faster reading times (d'Ydewalle et al. 1991). Subtitles must be displayed at a comfortable presentation rate to allow viewers to read the text and to have enough time to follow the visual action. If the presentation rate is too fast, viewers might find it difficult to process and understand the subtitles (Szarkowska et al. 2011) and perceive to have read the film instead of having watched it (Díaz Cintas and Remael 2007). Due to the slow reading patterns (Neves 2009) that are traditionally associated with this population, speed is thus particularly relevant in the case of deaf and hard-of-hearing viewers.

According to the taxonomy proposed by Arnáiz (2012b), speed is halfway between the purer aesthetical and technical aspects. One aspect that makes it such a relevant parameter is its relationship with other linguistic, extralinguistic and pragmatic parameters.

On the one hand, subtitling speed has a direct relation with the linguistic density of the subtitles (see Tables 2 and 3 in Section 2.2.3), identified with the amount of text contained in them. Spatio-temporal restrictions do not usually make it possible to provide a literal transcription of the original content and the subtitles need to be condensed. According to Burham (2008) speed would therefore be related to editing, as slower rates would demand a higher rate of text reduction (approximately 16% in subtitles displayed at a rate of 130 wpm and 8% at a rate of 180 wpm). These two parameters (speed and density in relation to the degree of editing) are in fact usually analyzed together, under the rule that the higher the density of the subtitles the higher the speed, and vice versa. This was the case of the above-explained DTV4ALL, where speed was analyzed in terms of whether the subtitles were edited, standard or verbatim. On the other hand, for Pedersen (2011: 131), the reading speed —which he identifies with the number of characters in the subtitles that the viewers are expected to read for every second of exposure— is "closely connected with the measurement of exposure time". Speed, therefore, is also related to subtitle presentation or exposure times, which are, in turn, closely related to another parameter: the segmentation or the line-breaks of the subtitles.

These different approaches are a reflection of the need to clearly define each parameter and its scope of relationships. Moreover, it brings to light the complexity involved in analyzing speed independently without considering its relations of interdependence with other parameters. In fact, even thought subtitling speed is mostly expressed in terms of cps, its relationship with other factors might cause it to be sometimes expressed also —in certain countries and contexts— in terms of wpm, characters per line or even lines per subtitle (see Szarkowska 2016a).

Under the first approach, according to Romero-Fresco (2015d: 335), “speed in SDH is as much a technical matter as it is cognitive, economic (…), political and ideological”. It is a technical issue because it is usually controlled through a software, and it is cognitive because it affects comprehension and attention. It is also a financial matter, since the broadcast industry is increasingly demanding more verbatim subtitles, which are more economical and do not require as much working time as edited subtitles (Szarkowska 2016a). And last but not least, it also an ideological and political issue. Most deaf associations and viewers are opposed to edited and slower subtitles as they are seen as “a form of censorship” (Ofcom 2005: 17) that denies them full access to information. Paradoxically, most scholars agree on the fact that verbatim subtitles are often too fast to provide full access for many deaf viewers (e.g. Neves 2005 and 2008a and Cambra et al. 2009, 2010 and 2015) and therefore support edited subtitles.

All this emphasizes the impact of subtitling speed as well as the need and importance of further research.

2.2.4.1 Terminological issues

This parameter has been referred to as “subtitling speed”, “reading speed”, “expected reading speed” and, most recently, “viewing speed” (Romero-Fresco 2015d), which are not always equivalent.

Romero-Fresco (2011) first distinguishes between three different types of speed: speech speed (referred to rate of the speech of the audiovisual text), reading speed (referred to the rate of reading ability of the viewers) and subtitling speed —or reaspeaking speed in the case of live subtitles— (referred to the rate of creation and presentation of the subtitles). Based on this, three different factors must be considered when addressing speed in subtitling: the speed at which the viewers read the subtitles, the speed of the original dialogue (i.e. the pace at which the characters/ TV host/ documentary narrator speak) and the speed at which the subtitles are presented on screen.

As far as for speech rate, it must be noted that in the last decades —probably due to technological changes and to the expansion of audiovisual formats— the speech rate on TV has tended to increase and the pauses have decreased (Romero-Fresco 2011 and Szarkowska 2016a), what is expected to affect both reading and subtitle speed.

The notion of reading speed is affected by a set of different factors.

First of all, as explained in Section 2.2.4, reading speed in subtitling has been studied departing from the findings obtained in print reading despite being different activities. Reading speed in print does not account for the multimodal nature of the audiovisual texts where, additionally, it is the subtitler who chooses the speed at which subtitles are displayed and forces the viewer to follow these rates. Secondly, there are many individual and external factors that can affect reading performance, such as the topic of the text and the purpose of the reading (Carver 1974 and 1976), the age (Koolstra et al. 1999), the reading skills and the educational background (Burham 2008) and the familiarity of the viewer with the presence of subtitles or the word difficulty and the lexical ambiguity of the text in the subtitles (Moran 2013 and Pollatsek and Rayner 2006). In the case of deaf and hard-of-hearing audiences, the visibility of the speaker and the characters (Zárate and Eliahoo 2014) and the rate of text reduction (Burham 2008) are also expected to influence reading performance and led viewers to spend longer times reading. Finally, there are other aspects that might come into play. For instance, it is not the same to watch a film on the TV or the computer at home than at the cinema, where the context and the atmosphere seems to stimulate the ease of concentration and lead to lower reading times (Díaz Cintas 2003 and Carroll and Yvarsson 1998).

For its part, the notion of subtitling speed is based on the so-called "six-seconds rule" (see Díaz Cintas and Remael 2007). It establishes that a full two-line subtitle should be displayed on screen for a maximum of six seconds (so that viewers can have enough time to read the subtitles but not too much time to re-read it) with a maximum of two lines of subtitles and 32 characters per line of subtitle (64 in total). It was evaluated in an eye-tracking study carried out by d'Ydewalle et al. (1987) where three different exposure times (four, six, and eight seconds) were analyzed, at approximate rates of 192, 130 and 96 wpm. The six-second rule was validated to be the most adequate in terms of both attention and comprehension. This was adapted in subsequent research (Díaz Cintas 2003 and Remael, 2010), by maintaining the maximum of six seconds of exposure and the two lines of subtitles but increasing the number of characters to a total of 72 characters (36 per line), which resulted in a rate of 144 wpm or

12 cps (Martí Ferriol 2013: 203 and Romero Fresco 2009: 114). It must be noted that, depending on countries and contexts, rates may be expressed in cps or wpm. This measure depends on the average number of characters per word, which, for instance, is considered to be six in German and five in English (see Martí Ferriol 2012 and Díaz Cintas 2008). The conversion to words per minute adds one extra character for the space between words, which means that e.g. 180wpm would be 21cps in German and 18cps in English.

In the surveys conducted by Szarkowska (2016a and 2016b) with professional subtitlers and subtitling companies as part of the SURE project[16], most subtitlers and companies seem to work with cps. The maximum of six seconds on screen and two lines seem to be maintained in the practice but the numbers of characters per line and characters per second seem to have increased. In both the case of subtitlers and companies, the maximum of characters per line range from 37 to 42 (84 in total). The average subtitling speed ranges from ten to 16cps, according to the subtitlers, and from ten to 20cps, according to the companies. This increment (also noticed in Carroll and Yvarsson1998 and Pedersen 2011) might account for the rise of the TV speech rate mentioned above and for the technological developments in subtitling and multimedia equipment (e.g. the increase in the size of TV screens compared). However, differences were found depending on the countries and regions. For instance, Scandinavian countries seem to follow slower average presentation rates (10-12 cps) whereas in the UK the average is 180wpm/ 15cps.

In SDH, the six-second rule was considered by some authors (d'Ydewalle et al. 1987) as too demanding for the deaf population, which was expected to have an overall lower reading ability equivalent to nine-year-old children. They suggested the increment of the exposure time until a maximum of nine seconds on screen, what was later supported in part by researchers such as Linde and Kay (1999) and Neves (2008a), especially in the case of deaf children. However, as it will be seen in the next section, most of the guidelines for SDH in Europe maintain the maximum of six seconds. Jensema (1998), with the aim of identifying the most suitable rate for deaf and hard-of-hearing viewers, compared slower and higher rates that varied from 96 to 200 wpm. The rate of 145 wpm was found to be the most comfortable and rates beyond 170 wpm were perceived as fast. Considering the existing debate surround the adequacy of verbatim subtitles, these results support the need for edited subtitles of

[16] SURE project: "Exploring Subtitle Reading Process with Eye Tracking Technology" funded by the European Union (Marie Skłodowska-Curie Grant Agreement No. 702606) and coordinated by Dr. Agnieszka Szarkowska.

approximately 150wpm, as verbatim subtitles would require a rate of approximately 180wpm.

As opposed to the notion of reading speed, subtitling speed embraces the complexity of the audiovisual medium but it is still primarily focused on the verbal code (the reading of the subtitles). For that reason, Romero-Fresco (2015d: 335) proposes the notion of viewing speed, that would not only be referred to the speed at which viewers read the subtitles, but also to the speed at which they watch the visual action and hears the sound, when it is available or accessible. Analyzing viewing speed, therefore, would require including the visuals elements into the analysis through the examination of visual comprehension, processing and perception (the distribution of attention between the subtitles and the images). Tested in the DTV4ALL project with rates of 120wpm, 150wmp, 180wpm, and 200wpm, Romero-Fresco (2015d: 338) found out that with a viewing rate of 120wpm/ 12cps participants spent on average 40% of the time reading the subtitles and 60% watching the images, whereas with a viewing rate of 200wpm participants spent on average 80% of the time reading and 20% of the time scanning the image (See table 4). According to the author, recent studies carried out in Italy (Perego et al. 2010), Poland (Szarkowska et al. 2011), South Africa (Hefer 2013) and the US (Winke et al. 2013) have so far corroborated this, although —as they were carried out under different conditions and with different types of subtitles and participants— further research would be needed to validate these figures.

Viewing speed	Time on subtitles	Time on images
120 wpm	±40%	±60
150 wpm	±50	±50
180 wpm	±60-70	± 40-30
200 wpm	±80	±20

Table 4: Viewing speed and distribution of gaze, from Romero-Fresco (2015d: 338)

2.2.4.2 Guidelines and recommendations

The relevance of subtitling speed makes that almost all the guidelines and recommendations include information about it to a certain extent. However, the heterogeneity of the deaf and hard-of-hearing communities between —and even within— countries makes it difficult to homogenize guidelines and recommendations at a European level. According to Remael (2007: 39): “there is need for harmonized guidelines up to a point but both national identities and divergent technical developments catering for individual needs, make complete harmonization near-impossible" (page 39). Within this context, different subtitling speed recommendations are to be found depending on the country.

It must be noted that in most countries, national guidelines do not exist. Some of the existing national conventions that are here presented are thus based on the practices, recommendations and book styles of different TV channels, subtitling companies, broadcasters and independent institutions. One may also keep in mind that, as it is stated in Remael (2007: 36), "most current national guidelines have been drawn of the basis of acquired experience" but very few have an empirical basis, what highlights the need for further research projects such as the mentioned DTV4ALL in order to empirically test the validity and effectiveness of current subtitling practices and conventions.

Instances of countries where there are not national guidelines but a conglomerate of guidelines and practices for SDH can be found in Germany, Denmark, Italy, Poland and Portugal.

In Germany, as indicated in Mascow (2015b), current average subtitling speed is approximately 12-13 cps, with a maximum of 40 characters per line, which allows subtitles to be neither edited nor fully verbatim.

In Denmark, according to Gottlieb (2015), average subtitling speed on TV ranges from 10 to 12cps and rarely exceeds 12cps. On DVD, however, the prevalence is 14-16cps, which allows for near-verbatim representation of the original dialogue.

In Italy, some of the existing conventions are the result of some isolated collaboration between some TV broadcasters and deaf associations, but as it is said in Remael (2007: 37), official guidelines are not ready and "their respect is neither guaranteed nor promised". According to Eugeni (2015: 294), standard SDH subtitles on TV follow a speed of 120-130wpm, with a maximum of two lines and 36 characters per line and an average of tree seconds for a full line and five seconds for two lines. Subtitles on DVD, on the contrary, are usually faster and more verbatim.

In Poland, as stated in Szarkowska (2015b) the average maximum speed rate on TV is 12cps.

In Portugal, broadcasters and TV channels seem to use their own guidelines. With the aim of regulating these practices, Neves (2005) —in the context of her PhD research— proposed a set of guidelines that were published two years later (Neves 2007c). These guidelines establish that subtitles should be displayed on screen for a minimum of one second and a maximum of six following a speed of 120-130wpm, allowing for a confortable reading rhythm.

As far as for the UK, there is not a national set of guidelines but both OFCOM (OFCOM 2015) —the independent regulator and completion authority for the UK communication industries— and the BBC channel (BBC 2016) —pioneer in the provision of SDH in Europe— provide a detailed guide for SDH. OFCOM's guidelines recommend that subtitling speed in pre-recorded programs should not normally exceed a rate from 160 to 180wmp (15cps). In the case of live subtitling, however, there is not a maximum recommended. The same subtitling speed is recommended by the BBC guidelines (160-180wpm or 0.33 to 0.375 seconds per word), which also specify that —taking into account that viewers tend to prefer verbatim subtitles— subtitling rate should be adjusted to match the pace of the programme when possible.

France and Spain are two of the few countries with national guidelines.

In France (see Muller 2015a and 2015b), the set of national guidelines for SDH on TV were published and implemented in 2011 by the French audiovisual regulating body (CSA 2011). It stipulates that the subtitling speed for pre-recorded programs should be 12 characters per one second, 20 characters for two seconds, 36 characters for three seconds and 60 characters for four seconds (approximately 144wpm). Currently, guidelines do not include any recommendation for live subtitling.

In Spain, as it has been advanced in Section 2.2.2, the first national standards for SDH were published in 2003 and revised in 2012 by the Spanish Association for Standardization and Certification (AENOR 2003, 2012). According to them, the speed of the subtitles should be in accordance to the source rhythm and be suitable for comfortable reading. If the previous conditions can be met, it is suggested to provide verbatim or literal subtitles. It is worth mentioning that in the edition of the year 2003 the maximum subtitling speed was set to 19 cps, a rate that is far from the 15 cps established in the 2012 edition. It recommends a maximum of 37 characters per line and a maximum display time of six seconds per subtitle.

2.3 Reception Studies

As has been mentioned in Section 2.1, the interest on audience and reception has grown considerably in audiovisual translation research and it is common to discover research references regarding the role and the importance of the readers or viewers and their competence, needs and expectations (Brems and Ramos Pinto 2013 and Gambier 2003). However, it is still at an early stage and more empirical research is needed, not only to gain insight into the gap between the ideal and the real viewers in relation to certain strategies and practices but also to gain knowledge of the process itself. The statement made by Gambier (2003: 186) that “translators can only aim at a potential target audience whose profile they inevitably construct on the basis of their own stereotypes and prejudices” is even more relevant in the case of accessibility. As seen in Section 2.2.1.2, in the case of SDH, there is a gap between the perception of the world by a subtitler who can hear and the perception of the world by the target deaf viewers who have never heard, and therefore a lot of empirical reception research would be needed to reduce this gap between the translators and the audience.

Within translation studies, reception research would be placed within a sociological level, grounded on a causal model that allows to address the effects of the translations as responses, reactions and repercussions (Chesterman 2007). The concern of audiovisual translation on the recipients of the translators was already discussed in the mid-1990s (Kovačič 1995). Based on these discussions and aware of the lack of consensus surrounding the notion on reception, Gambier proposes a model approach that considers these three levels: response, reaction and repercussion (Gambier 2006, 2008, 2009 and 2013). Response is concerned with the physiological and perceptual effects and processes of reception; reaction relates to psycho-cognitive processes such as comprehension or understanding; and repercussion deals with processes of feedback, self-reporting and assessment. The latter can be viewed from an individual or a sociocultural perspective if groups share needs, beliefs or preferences. Each level provides a different type of information and might involve a different method of data collection. In terms of methodology, Gottlieb (1995) distinguishes between consecutive and simultaneous methods, and de Linde and Kay (1999) between survey and controlled (or semi-controlled) experimental methods. Consecutive methods include survey tools such as questionnaires, interviews or standardized tests, and simultaneous or semi-controlled and controlled experimental methods include direct observation, interactive tasks, eye tracking, pupillometry or electroencephalography. Thus, in order to examine viewers' responses we may seek evidence of where attention or effort is deployed through the use of simultaneous and controlled experimental methods that record and measure their eye movements, whilst survey methods can be used to analyze their reactions and repercussions.

According to Gambier (2016: 900), "the ongoing fragmentation of audiences demand a better understanding of viewer needs" so more experimental studies are needed "on the viewer's processing habits, reading strategies and reception patters; differentiating between the three types of reception (the three Rs), at least for the written types of audiovisual translation" (2013: 57).

This section will provide an overview of the most relevant reception studies carried out in audiovisual translation research. They are focused on a variety of variables and use different methods. Some studies applied survey methods for consecutive data collection (focusing on the levels of reaction and repercussion), others applied eye-tracking methods in controlled experiments to elicit and interpret the eye movements of the participants during the process of reception (focusing on the level of reaction), and others combined the two approaches addressing the process of reception as a whole. Triangulation or combination of methods, in particular eye-tracking and survey methods, is becoming common in audiovisual translation (see Orrego-Carmona 2015 for a complete overview). It leads to a higher reliability, since it allows two or more levels to be addressed. Furthermore, comparison and complementarity of methods can lead to a better interpretation of the results and to provide a wide and comprehensive approach to reception.

Section 2.3.1 will present an overview of reception studies that have been carried out in recent years in audiovisual translation from a general perspective, including —among others— issues such as the reception of humor and culturally specific items, the reception of dubbing and *dubbese* and the reception of L2 subtitles in relation to language proficiency. Section 2.3.2 will focus on the reception studies that analyze the processing and understanding of subtitling, in relation to a set of factors, and Section 2.3.3 will present those studies particularly focused on SDH. Finally, Section 2.3.4 will introduce a review of reception studies investigating the specific parameter of subtitling speed in SDH. Some of the studies developed in the areas of subtitling and SDH have already been introduced in previous sections but its methodology will be detailed here and the results will be summarized.

2.3.1 Studies on audiovisual translation

This section deals with the reception of a wide range of aspects, e.g. humor and cultural aspects, dubbing when in comparison to subtitling, the relationship of the processing of subtitles with viewers' level of L2 proficiency, the use of pop-up glosses and surtitles or the reception of non-professional subtitles.

The study of the reception of humor and culturally based references has been addressed in audiovisual translation research, mainly through the use of survey methods. Fuentes Luque (2003) explored the translation of humor from English into Spanish in a reception study with 30 participants, applying direct observation and survey methods. Ten participants watched the original film in English, ten watched it with Spanish subtitles and ten watched the dubbed version into Spanish. Results indicate that those participants who watched the translated version of the film showed a lower rate of positive reaction than those who watched it in English. Antonini (2005) adapted a standardized test to evaluate the reception of subtitles with verbal and visually expressed humor with 32 participants and concluded that participants faced difficulties to understand the verbal humor, which in fact was found to be less funny. In a later study, Antonini (2008) also analyzed the reception of translated humor, and, through an online questionnaire, found that the self-assessed comprehension of the participants did not corresponded to what they had actually comprehended.

Bucaria and Chiaro (2007), in turn, evaluated the effect of culturally and language-specific references dubbed into Italian with different types of audience: from cinema experts, to linguistics and regular spectators. They observed how the audience was getting used to being in contact with foreign cultures and to accepting what is known as *dubbese* (an specific type of language used in dubbing). Later on, Antonini and Chiaro (2009) analyzed the reception of *dubbese* in Italy and realized how the participants were able to recognize some of its characteristics.

Bairstow and Lavaur (2012) investigated the reception of dubbing and subtitling in France by comparing the comprehension of viewers when watching the original film in English, the dubbed version into French, the original version with subtitles in French and the dubbed version with subtitles in English. Best comprehension was achieved in the dubbed versions. Perego et al. (2014) also analyzed the reception of dubbing in comparison to the reception of subtitling in Italy, using survey methods. It was found that the presence of subtitles did not negatively influence the participants' enjoyment and opinion.

The reception of L2 subtitles in relation to the viewers' level of proficiency of the language was analyzed in a series of studies carried out in France by Lavaur and Bairstow (Lavaur and Nava 2008, Lavaur and Bairstow 2011, Bairstow 2011 and Bairstow and Lavaur 2012). Using survey methods, results seem to indicate that the presence of subtitles could distract and negatively affect the visual comprehension of the bilingual participants that did not need subtitles to understand the audiovisual text, whilst it could be beneficial for the monolingual participants and participants with a low level of the L2, mainly in terms of verbal comprehension.

Tuominen (2012) analyzed the reception of subtitling in Finland through a focus group with a group of experts in English and/or translation and non-experts viewers. She found that the first group relied on the subtitles to a greater extent and, despite their high level of the source language, read the subtitles and watch the film in a comfortable and enjoyable manner.

The reception of subtitles with additional text on screen with the aim of offering the viewers supplementary information has also been investigated, combining eye tracking and survey methods. Caffrey (2009) investigated the reception of subtitled anime with pop-up glosses that included cultural references. He observed how the pop-ups contributed to the perception that the subtitles had been displayed at a higher speed, probably because they contained more information in order to be processed during the same time period. Künzli and Ehrensberger-Dow (2011) analyzed the reception of standard subtitles combined with surtitles with additional information and observed how its acceptance seemed to have depended on the age and literacy level of the participants.

Finally, the reception of professional and non-professional subtitling has also been recently addressed. Orrego-Carmona (2015) —in his PhD thesis— carried out an extensive study with university students with different levels of proficiency in English combining eye-tracking and survey methods. Survey data included information from 332 participants and the eye-tracking test was carried out with 52 participants. He found that the level of English proficiency of the participants had a significant effect on the results, as the participants with a lower level of

English showed a more regular and standardized behavior, whilst participants with a higher level showed more variation in their performance: some relied on the subtitles to a higher extent whereas others paid significantly less attention to them.

3.2.2 Studies on subtitling processing

The use of eye-tracking methods to investigate the processing of subtitles has been presented in audiovisual translation research since the 1980s. The first studies were carried out in Belgium by a group of researchers led by Géry d'Ydewalle. The series of studies that they conducted have served as the basis for subsequent reception studies in audiovisual translation. Since then, most of the research carried out with eye tracking has been based on their findings, focusing on a wide range of factors, such as the effects of segmentation, translation strategies, film editing and subtitling speed in attention allocation and comprehension.

This section will first introduce the pioneering studies conducted in Belgium and then will present the more recent research carried out in the area of processing subtitles.

The introduction of eye-tracking methods in reception studies on subtitling dates back to the late-1980s. D'Ydewalle et al. (1985) analysed the eye movements of the participants and realized that the subtitles were not read word-by-word and that participants seemed to follow the pattern of looking first at the image, then at the key points of the subtitles, and then back to the image.

In a subsequent study carried out by d'Ydewalle et al. (1987) subtitle reading was found to be an almost automatic and effortless behavior: on the one hand, even the participants that could understand the source language could not avoid the reading of the subtitles and, on the other, the constant deviation of attention between the subtitles and the visuals seemed to have been made in an effortless way.

Later on, d'Ydewalle and van Rensbergen (1989), in a reception study with children, found that both the reading and viewing processes could be affected by a set of factors, such as the type of visual and verbal content. When watching cartoons with a higher degree of visual action, children tended to rely on the subtitles to a lesser extent. On the contrary, they paid more attention to the subtitles when cartoons presented a higher degree of verbal information.

Praet et al. (1990) compared the amount of time spent reading times one-line and two-lines subtitles and found out that less time is spent reading one-time subtitles. According to the authors, this could be explained in terms of information redundancy and linguistic complexity. The information provided by the two-line subtitles is expected to be less redundant in relation to the information provided by the visuals and the verbal content in two-line subtitles is likely to be more complex in terms of syntax and semantics.

D'Ydewalle et al. (1991) compared the processing of intralingual subtitles with English native speakers with no experience in reading subtitles and with Dutch native speakers with experience in reading subtitles. Results report that the fact of understanding the source language does not stop viewers from reading the subtitles regardless of their degree of familiarity and experience with them.

D'Ydewalle and Gielen (1992) analyzed the processing of subtitles in news programs, where subtitles are likely to convey a higher degree of verbal information and to be displayed for shorter periods of time. Even the participants who understood the source language spent more time reading the subtitles, which were also processed faster.

D'Ydewalle and Van de Poel (1999 investigated incidental foreign-language acquisition by children watching subtitled television programs, in relation to vocabulary, morphology and syntax. Results indicate that the foreign-language acquisition was limited. Language acquisition seemed to be higher when the foreign language was in the soundtrack than when it was presented in the subtitles.

In 1999, Koolstra et al. analysed the six-second rule for the presentation of the subtitles. Three groups of children watched a nine-minute segment from an episode in one of the following presentation times: six seconds on screen, eight seconds on screen, and ten seconds on screen. Their eye movements were registered in order to analyze their attention allocation and after the test the children answered a multiple-choice test with the aim of measuring how many subtitles they were able to remember. Results indicate that the children who watched the ten-second condition spent significantly more time on the subtitles and were able to better remember the subtitles.

The same year, Koolstra and Beentjes (1999) investigated vocabulary acquisition with a group of 246 children who watched a TV programme either in the original version without subtitles or with standard subtitles. Results suggest that vocabulary acquisition and recognition improved in the subtitled condition.

De Bruycker and d'Ydewalle (2003) compared standard (with the audio in a foreign language and the subtitles in the native language) and reversed subtitles (with the audio in the native language and the subtitles in a foreign language) with children and adults in relation to attention allocation. In the standard conditions, subtitles were fluently processed and true reading seemed to be apparent, particularly in the case of two-line subtitles. With reversed subtitles, however, children seemed to have paid less attention the subtitles in the foreign language. In both cases, participants spent more time in two-line subtitles than one-line subtitles and the fixations in one-line subtitles were shorter. They found that more reading occurs with two-line subtitles, which are more likely to provide less redundant information in relation to the visuals.

In a similar study, d'Ydewalle and de Bruycker (2007) analysed again the reception of standard and reversed subtitles in children and adults in relation to attention allocation. No clear differences were observed between children and adults. More time was spent reading the subtitles with standard subtitles. The reversed condition resulted in more subtitles skipped and fewer fixations per subtitle. A more regular reading pattern was detected with standard subtitles two-lines subtitles, corroborating their previous findings. Bisson et al. (2012) recorded the eye movements of 36 participants and analyzed the differences between standard and reversed interlingual subtitles and intralingual subtitles (with the audio and the subtitles in a foreign language). The authors found out that the participants spent less time looking at the subtitles in the reversed condition. Results confirmed that most participants could not avoid reading the subtitles even when they did not need them or did not understand the language of the subtitles.

On a different note, recent research studies have also investigated the processing of subtitling in relation to other specific factors, such as the effect film editing, subtitling segmentation, literality, word frequency and cohesion.

Perego et al. (2010) investigated the eye movements and the comprehension of a group of university students with the aim of assessing the effect of subtitle segmentation. 41 respondents took part in the overall study but only the eye movements of 16 of them were recorded. Participants spent an average of 67% of the time reading the subtitles. The fixations on the image were fewer but longer. Results indicate that poor line segmentation in two-line subtitles did not affect comprehension negatively. Segmentation, thus, was found not to have an effect on cognitive processes.

In 2012, Ghia investigated the effect on reception of literal and non-literal subtitles with a group of 13 university students with an intermediate level of English who watched a video in English with subtitles into Italian. According to the eye-tracking data, non-literal subtitles led to more frequent switches between the subtitles and the image, suggesting less efficient processing.

The same year, Moran (2012) analysed the effect of word frequency and cohesion in the processing of subtitles. The participants who watched the subtitles that presented a higher degree of frequency words —despite presenting also a higher number of characters— spent significantly more time on the image than those who watched the subtitles with a lower degree of frequency words and their fixations on the subtitles were shorter. A similar pattern was observed in the analysis of subtitles with a higher degree of cohesion.

Rajendran et al. 2013 investigated the effect of segmentation possibilities on the processing of live subtitles through respeaking. Results indicate that the participants spent less time reading the subtitles and made fewer deviations between the image and the subtitles when they were well segmented, by phrases or sentences. The author concluded that segmentation, thus, improves the viewing experience.

Krejtz et al. (2013), in a study carried out with both hearing and deaf participants, analyzed the effect of shot changes on the processing of the subtitles. According to the results, the subtitles that were displayed over shot changes —in comparison to those that respected the film cuts— did not cause the participants to re-read the subtitles but led them to make more deviations between the subtitles and the image, thus interfering with the viewing process.

The following paragraphs introduce a series of recent studies carried out in the context of the university classroom in relation to the impact that the use of subtitles may have on the attention and performance of the students.

Kruger 2013 investigated, in terms of comprehension and attention allocation, the effects of using videos with interlingual subtitles in the university classroom. According to the results, when the presentation speed of subtitles increased, students tented to focus on stable textual information (e.g. slides) or nonverbal information (e.g. the face of the lecturer).

Kruger et al. (2013) investigated the cognitive load when students watch a recorded academic lecture with or without intralingual subtitles. The study made use of eye tracking (pupil dilation), electroencephalography, comprehension tests and self-reported ratings of mental effort, frustration, effort and engagement. According to the results, cognitive load was higher in the absence of subtitles suggesting that subtitles do not lead to cognitive overload.

Kruger and Steyn (2014) investigated the impact of subtitle reading on academic performance in the context of academic lectures delivered in English with English subtitles, using eye tracking and comprehension tests. A significant positive correlation was observed between comprehension and subtitle reading, suggesting the benefits of the use of subtitles in reading instruction and language learning. According to the authors, the number of words and the number of lines did not affect the processing of the subtitles as the redundant sources of information led to a partial processing of the subtitles.

Finally, Kruger et al. 2014 compared the distribution of visual attention between subtitles and other sources of information in the context of multilingual classrooms, through the use of eye tracking, self-reported comprehension questionnaires and electroencephalography. Results seem to indicate that the use of both L1 and L2 subtitles has a positive impact in terms of attention distribution and comprehension.

More recently, Perego et al. (2016a and 2016b) compared the reception of dubbing and subtitling in terms of processing and effectiveness.

The first study —by using a set of cognitive (comprehension and dialogue and visual scene recognition) and evaluative measures (film appreciation, self-reported effort and assessment of plot, visual scene and dialogue complexity)— concluded that the two translation modes are processed effectively and that subtitling does not negatively affect the appreciation of the film. The second study replicated this research but it incorporated a set of eye-tracking measurements (mean fixation duration and number of fixations on the subtitles and the image and percentage of time spent in each area). Both studies used the same film fragments, even though the length was reduced from 25 to ten minutes. They showed a different degree of structural-informative complexity (film's pace, amount of new information in each new shot and number of subtitles), linguistic complexity (number of words and average sentence length) and narrative complexity (linearity of the story, number of characters, locations and story lines). It was found out that the degree of attention on the subtitles depended on the degree of complexity of the film: the higher the complexity, the more time spent on them. However, and contrary to what was observed in the first study, complexity did not negatively affect the comprehension and retention of information or the enjoyment of the viewing process. According to the authors, the length of the film fragments might explain this. The effect of complexity may be more palpable when the subtitled material is longer than ten minutes as it seemed that the shorter the audiovisual material the easier it is for the viewers to concentrate and enjoy it.

In the last place, at the time this is being written, Szarkowska (see 2016a and 2016) is developing the project SURE “Exploring Subtitle Reading Process with Eye-Tracking Technology”, aimed at investigating the reading process in interlingual subtitling in relation to the presentation times of the subtitles and its segmentation. The first stage of the process has just been completed and the second stage is currently being designed. The former —aimed at identifying current market and professional practices in relation to the two mentioned variables— collected information from 237 professional subtitlers and nine subtitling companies through a set of surveys. The latter will test the practices identified in a reception study with eye tracking and a set of comprehension and preferences tests in order to validate its effectiveness.

3.2.3 Studies on subtitling for the deaf and hard of hearing

This section is mostly based on the review carried out by Romero-Fresco (forthcoming) about reception studies on live and pre-recorded SDH. It provides information about reception studies in SDH since the 1970s up to the present, including the pioneering experiments carried out in the US that despite having set the basis for the subsequent research carried out in Europe “have been largely overlook in the audiovisual translation literature”, thus highlighting the “still existing gap between the US and the rest of the world in this area”.

The first reception studies on pre-recorded SDH were developed in the US in the in the decade of the 1970s. Focused on the benefits of SDH for deaf students, these studies led to the introduction of SDH on TV in the following decade and prepared the ground for research on reception in audiovisual translation studies. In the 1980s, the US started to evaluate the viewers’ habits and preferences and continued assessing its educational value for deaf students. In the meantime, the UK commenced to develop the first reception studies in SDH in Europe. In the following decade, the US led into the analysis of specific parameters in SDH, where subtitling speed played a dominant role. In Europe, reception research remained marginal and limited to the UK. In the 2000s, however, reception studies started quickly to develop in Europe and the use of eye tracking was expanded. The UK maintained its leading position by conducting a set of national surveys about the use and effectiveness of SDH in TV, but countries such as Spain —or Brazil outside the European countries— started to carry out the first studies on reception. Finally, the current decade is experiencing the rise of reception studies in what Romero-Fresco called “the experimental (re)turn”. According to the author, “the period between 2010 and 2016 has produced more reception studies on SDH in Europe than the previous four decades put together”. The interest in reception is now international and the studies in SDH have become highly specialized. A wide range of aspects and types of viewers have been —and are being— analysed, the use of eye tracking is now consolidated and triangulation has become commonplace. Additionally, the first reception studies on live subtitling are emerging.

The following paragraphs will provide an overview of the most relevant studies. It must be noted that the investigations particularly focused on the parameter of subtitling speed —situated at the core of the present research— will be introduced separately in the following section. Studies will be introduced chronologically.

In the 1970s in the US, Gates (1970 and 1971), Fischer (1971), Nix (1971), Boyd and Vader (1972) and Propp (1972), Davila (1972) and Nomeland (1973) collected the first evidence of the benefits of the use of SDH for deaf students, through a series of studies that compared their performance when watching videos with and without subtitles. In all the cases, comprehension improved with the use of subtitles.

Norwood (1976) compared —through the use of a questionnaire and in correlation with the educational level of the participants— the effectiveness of using subtitles and sign interpreting in news with a group of 116 deaf viewers. The results indicated that those with a college level obtained a higher rate of comprehension but comprehension improved in the two groups with subtitles. Significantly, 90% of the participants preferred the use of subtitles.

In the 1980s, and in the context of the US, Blatt and Sulzer (1981) conducted a national survey among 1,475 deaf and, to lesser extent, hard-of-hearing viewers with a high level of education and experience watching TV. The survey was focused on subtitles of the news and included demographic information of the participants, as well data about viewing habits and opinions on specific aspects of the subtitles. Most of them demanded more subtitles, including live programs. The same year, The National Captioning Institute (1981) —reported in Jensema and Fitzgerald (1981)— conducted a second survey among 2,232 deaf viewers in relation to the readability, the language, the speed of the subtitles and the subtitling of commercials. Respondents seemed to be satisfied with the quality of the subtitle and demanded more captions, not only for news but also for films and series.

Meantime, the effect of SDH on comprehension continued to be further analyzed. Murphy-Berman and Jorgensen (1980) and Nugent (1983) compared the comprehension of deaf students when watching videos with and without subtitles and the results confirmed the benefits of SDH. Nugent's study incorporated hearing students in the sample and found that their comprehension had also improved thanks to the subtitles. Finally, Stewart (1984) analyzed the comprehension of 162 deaf and hard-of-hearing students and found out that 82% of them self-reported to have improved their English skills with the subtitles and 58.6% self-reported to have understood the subtitles most of the time. Hertzog et al. (1989) carried out a more complex reception study with 32 students to investigate the effect on comprehension of a set of factors: the absence or presence of an instruction prior to watching the film, the reading level of the subtitles (subtitles modified at a 8^{th} grade reading level and original subtitles at 11^{th} grade reading level), the test type (recall or recognition) and the reading skills of the students (high or low). The two groups of students benefited from instruction when watching the subtitles with the lower reading level, but only the group with higher reading skills benefited from the instruction when watching the original subtitles. Those who had received the instruction were able to remember and understand more information than the groups that had not received it.

The UK started to show interest in introducing and developing SDH on TV and a series of projects were carried out with the purpose of finding a suitable technique for the majority of viewers based on the developments made in the US and Canada (Baker 1981 and 1982 and Baker and Lambourne 1982). A first monograph was written in 1984 (Baker et al. 1984) and in the next year a reception study was conducted with deaf and hard-of-hearing children to analyze the effect of subtitling speed and language on comprehension. Results led the author to recommend the use of short and frequent words (Baker 1985).

In the 1990s, subtitling speed was the center of most reception studies in the US but other parameters were also analyzed. King et al. (1994) investigated the effect of color and displacement for identifying the characters in a study with 72 deaf and hard-of-hearing students. Results indicated a higher degree of comprehension with the use of color. Harkins et al. (1996) analyzed opinion in relation to a set of factors (sound effects, character identification, distortions of speech, speech in a foreign language, music, etc.) with a sample of 189 deaf and hard-of-hearing participants who watched a total of 19 videos with the different conventions being tested. Results suggested that viewers opted for explicit forms of description and identification and they demanded to be provided with more non-verbal auditory information. The National Center for Accessible Media (NCAM 1998) conducted a survey to obtain information about viewers' preferences regarding the size, the font, the spacing, the color, the boxes and border styles and the presentation method of the subtitles. Respondents opted for a Sans serif white font with a black box and expressed their willingness for a personal control of some of the parameters.

In the UK, Kyle (1993) —commissioned by the BBC— conducted a survey with the preferences of 2,500 viewers and a series of personal interviews with 275 viewers. Respondents seemed to be satisfied with the quality of the subtitles but demanded more subtitles in all types of programs. Gregory and Sancho-Aldridge (1998) investigated the effect of subtitles with different degrees of complexity on the comprehension of a group of deaf children. Results indicated that they were able to obtained more information from the simplified subtitles (with a lower degree of complexity), as only the oldest group of children found the broadcast subtitles (with a greater degree of complexity) useful. De Linde and Kay (1999) —who also developed a comprehensive descriptive analysis of SDH on TV— carried out one of the first eye-tracking studies in Europe, combined with a set of questionnaires used for assessing comprehension. The study included data from ten deaf and ten hearing participants and investigated the effect of different parameters: subtitle rate, onset of speech, shot changes, subtitle editing and visibility of the speaker. The eye-tracking data included the following variables: time to read each word, number of regressions, number and duration of the shifts between the subtitles and the image and re-reading of subtitles. It was found that shot changes caused the participants to make more shifts between the subtitles and the image and to re-read the subtitles and suggested that the visibility of the speaker on the screen might have also influenced their reading performance.

In the 2000s in the US the studies on subtitling speed continued and constituted most of the research that was carried out. Additionally, Fels et al. (2005) and Lee et al. (2007) analyzed the opinion of six deaf and five hard-of-hearing participants about the introduction of emotive subtitles (with a graphical representation of the emotive information). Most hard-of-hearing respondents liked them and found them useful, whilst the deaf respondents rejected its use.

In the UK, in 2001, the Royal National Institute for the Deaf (RNID) conducted a national survey analyzing the preferences of 5,074 viewers. Respondents demanded more subtitles in the news, general entertainment shows, films and documentaries. In 2005, OFCOM —the independent regulator and competition authority for the UK communications industries— also carried out a survey focused on speed.

Outside the UK, in Portugal, Neves 2005 developed her PhD thesis on SDH —the first non-American doctoral study in this area— combining action research and corpus-based analysis to contextualize and evaluate the quality of the subtitles. Based on this study, she established a set of guidelines that are currently used as the national convention for SDH in Portugal (Neves 2007c). In Brazil, Franco and Araújo (2003) assessed the importance of editing and condensation to ensure that deaf viewers adequately understand subtitles. In Spain, Cambra et al. (2008 and 2009) evaluated the comprehension of seven deaf children and 20 deaf teenagers and observed that deaf students face serious difficulties in comprehending subtitled TV programs, mainly because of their poor reading levels and the excessive speed of the subtitles. As a result, they advocated for the use of edited subtitles with children.

Finally, in the current decade, research on reception studies in Europe is at its peak.

For instance, In Spain Cambra et al. (2010 and 2015) have continued to further analyze how deaf children and teenagers comprehend the audiovisual message in comparison to their hearing peers. According to them, the average poor reading skills of this group and the excessive speed of the subtitles can hinder the understanding of the film narrative. In a study with eye tracking, Cambra et al. (2014) compared also the attention allocation and distribution of 11 deaf and 11 hearing children when watching subtitles. According to the results, deaf children relied on the images to a greater extent and —despite the presence of subtitles and their poorer reading skills— they managed to spend more time exploring the images (especially at the characters' lips, more likely to try to lipread) than reading the subtitles. Lorenzo (2010), also in Spain, assessed the comprehension of 83 deaf and hard-of-hearing and 46 hearing children when watching a TV series with SDH and concluded that subtitles supported but did not guarantee comprehension in such a way that the children with hearing loss might have needed some type of previous comments to strengthen the comprehension performance. Porteiro Fresco (2012) —in the context of her PhD research— explored the advantages of using SDH with children with speech-language disorders, and found out that experience and familiarity with subtitles might be of benefit for their reading performance, motivation and self-esteem. Another recent PhD research (Tamayo 2015) analysed the performance of 75 Spanish deaf and hard-of-hearing children according to a set of factors when watching standard and enhanced subtitles. She found that enhanced subtitles led to a better comprehension. According to the results, the profile of the children (sign language users, spoken language users and bilinguals) played a decisive role on comprehension and the spoken language users performed significantly better.

In the UK, the feasibility of enhanced subtitles (with more repetitions, highlighted text, a greater degree of reduction, careful spotting and longer presentation rates) was also analyzed in a study with 20 deaf children (Zárate 2014 and Zárate and Eliahoo 2014). However, in this case, evidence did not support the improvement in the comprehension performance with the enhanced subtitles, even though a positive tendency was observed in terms of word recognition.

In Poland, Szarkowska et al. (2013 and 2014) examined the use of SDH in multilingual films with a group of 135 deaf, hard-of-hearing and hearing participants. Krejtz et al. (2015) investigated the reading function and content words in SDH with a group of 39 deaf, 27 hard-of-hearing and 56 hearing participants and found that less time was needed to process function words and short content words received than longer content words. The deaf participants, however, presented longer reading times for function words than their peers, suggesting possible reading difficulties.

Finally, Romero-Fresco and Fryer (2016) examined the reception of open SDH subtitles displayed on LED screens and closed SDH subtitles displayed on tables in a study with 157 deaf, hard-of-hearing and hearing viewers in the theatre. The former option was widely accepted by the participants and resulted in an effective distribution of attention between the subtitles and the on-stage action, whilst the latter resulted in more head movements and caused participants to spend more time on the subtitles.

As mentioned in Section 2.2.3, the largest reception study in SDH carried out to date in Europe was the DTV4ALL project (Romero-Fresco 2015a). The second part of the study analyzed the comprehension and the visual perception of 103 Polish, Spanish, Italian and German participants in relation to a set of variables. Participants watched 23 dubbed videos (one for each variable) of an animation film with an average of 25-35 subtitles. Some of the patterns observed in the cross examination of the data obtained in each country will be introduced here. The eye-tracking analysis included data about the participants' reaction times (times to first fixation) and mean reading time (the distribution of time between reading the subtitles and the visuals). Comprehension, on the other hand, was analyzed in terms of visual comprehension (information coming from the visuals), textual comprehension (information coming from the subtitles) and overall comprehension (about the film narrative).

The average reaction was 332ms. The deaf participants perceived the subtitles approximately 10% faster than the hearing participants. As they relied on the subtitles to a greater extent to be able to access the information, it is likely that they were waiting for the subtitles to be displayed (Romero-Fresco 2015e: 350).

All the participants	Hearing	Hard of hearing	Deaf
332 ms. *Min: 309 *Max: 393	348	340	309

Table 5: Average reaction times in DTV4ALL, from Romero-Fresco (2015e: 350)

As far as for the mean reading times, with an average reading speed of 150wpm/15cps, participants spent on average 52.7% of the time reading the subtitles and 47.3% looking at the images, in line with the data presented in Section 2.2.4.1 regarding viewing speed. Deaf participants, on average, presented 8% longer reading times than their hearing peers, which might indicate that they needed more time to process the subtitles probably due to reading difficulties as evidenced in their results on textual comprehension (Romero-Fresco 2015e: 350).

All the participants	Hearing	Hard of hearing	Deaf
52.7% *Min: 35.9 * Max 63.2	48.2%	53.1%	56.7%

Table 6: Average time spent on subtitles in DTV4ALL, from Romero-Fresco 2015

In terms of comprehension performance, the scores obtained by the deaf participants were 11% lower than the ones of the hearing respondents in overall comprehension and 15% lower in textual comprehension, despite having spent more time reading them. However, their scores in visual comprehension were as good as the scores obtained by the hearing group, and in some cases even better (Romero-Fresco 2015e: 351).

Type of comprehension	All the participants	Hearing	Hard of hearing	Deaf
Overall	69.6%	77.2%	65.3%	66.2%
Subtitles	67.4%	76.25%	64.6%	61.4%
Images	71%	73.5%	66.2%	73.25%

Table 7: Average comprehension in DTV4ALL, from Romero-Fresco (2015e: 351)

The following table includes the data obtained in Spain in each of the variables explained above (Arnáiz 2015b). For the purpose of comparison with the data obtained in my own study —which will be presented in Chapter 5 and which took place in Spain with the same population— it only presents the data corresponding to this country.

	Hearing	Hard of hearing	Deaf
Reaction times	434ms	391ms	354ms
Mean reading times	51.4%	54.9%	58.7%
Overall comprehension	78.6%	65%	69.9%

Table 8: Summary of average data obtained in Spain in DTV4ALL

2.3.4 Studies on speed in subtitling for the deaf and hard of hearing

This section will provide an overview of the most relevant studies conducted in the area of SDH in relation to the particular parameter of subtitling speed. It is mainly based on the review carried out by Romero-Fresco (forthcoming) about the reception studios on live and pre-recorded SDH.

In 1973 in the US, Shroyer (1973) tried to investigate the average reading speed of 185 deaf and hearing students with the aim of establishing adequate subtitling speeds for guidelines. It was concluded that subtitles should be displayed at a rate of 160 wpm, which coincided with the average speed for spontaneous conversation in English. In 1979, however, Keily and Steer evaluated the effectiveness of this rate and concluded that it was excessively high for deaf students as it was estimated that it would exclude approximately 84% of the students with hearing loss, especially in the case children. It was recommended to reduce this rate to 120wpm.

Braverman (1981) conducted a new reception study to evaluate the impact of the relationship between subtitling speed and subtitling density on comprehension. 187 students from elementary and secondary deaf schools took part in the study and watched a series of videos with subtitles displayed at different rates (60wpm, 90 wpm and 120wpm) with three different degrees of linguistic complexity. Results indicated that students reading at third grade level could comprehend captions written at the highest level of complexity and that subtitles written at the intermediate level could be displayed at rate of 120wpm and with a high degree of subtitle density.

In 1985 in the UK, another reception study was carried out with deaf and hard-of-hearing children to analyze the effect of subtitling speed on comprehension (Baker 1985). Based on the results obtained, it was recommended to apply a rate of 60wpm for middle and secondary school deaf children as well as to use simple language in the subtitles, with preference for short and frequent words.

In the 1990s, as mentioned in Section 2.3.3, subtitling speed became a major research topic in the analysis of SDH in the US.

Meyer et al. (1995) evaluated the impact of subtitling speed on the retention of learning with 158 4th, 5th and 6th grade deficient students. Participants were divided in two groups, each of one watched the subtitles displayed at one of the following rate: 116wpm (standard subtitles) and 78wpm (slow subtitles) and included a control group who read the text in print with no video available. According to the results, the retention of learning was higher when the subtitles were displayed at the reduced rate.

Jensema et al. (1996) conducted a corpus-based analysis that included data from 205 TV programs and estimated an average speed of 141wpm (ranging from 74 to 231wmp). Based on a sample of 26 segments of a length of ten minutes, they also identified a range of editing between 0% (literal or verbatim subtitles) and 19%. With this point of departure, Jensema (1998) analyzed the opinion of 578 deaf, hard-of-hearing and hearing participants who watched a total of 24 short videos (with a duration of 30 seconds) with subtitles displayed at 96 wpm, 110 wpm, 126 wpm, 140 wpm, 156 wpm, 170 wpm, 186 wpm and 200 wpm. Participants were asked to evaluate the subtitling speed as “too fast”, “fast”, “comfortable”, “slow” or “too slow”. According to the results, the most comfortable speed was 145wpm, which coincided with the average subtitling speed used at the time in the US TV as stated in Jensema et al. (1996). The analysis indicated that the age and the sex of the participants did not play a major role in the results. However, it was found that the viewers who had more experience in reading subtitles, as well as those who attended graduate school, opted for higher rates but that did not exceed the 170wpm. Three years later, Jensema and Burch (1999) analyzed the impact of subtitling speed rates ranging from 80wpm to 220wmp on the preferences and the comprehension performance of a group of 1,102 deaf, hard-of hearing and hearing participants. Results suggested that participants were able to comprehend the information conveyed in the subtitles that were displayed at the highest rate but only for shorts periods of time. These findings, however, were limited to this study due to the very specific characteristics of the audiovisual material (very short videos —with a length of 30 seconds— screened without audio).

Later on, in 1995, Kirkland et al. conducted another study to analyze subtitling speed but his time in conjunction with the presence organizers (pieces of information presented prior to the activity to enhance learning). 317 8^{th} grade students with learning disabilities watched a set of videos with edited, standard and highlighted subtitles (displayed at 120wpm, between 150 and 180wpm and with key concepts highlighted in capital letters, respectively) with and without questions to sport the contextualization of the content of the videos. Results indicated that learning improved when subtitles and organizers accompanied the videos.

In the UK, the results obtained in the study conducted by de Linde and Kay (1999) with eye tracking —already introduced in Section 2.2.3— found that the TV programs with faster speech rates and faster subtitling rates led to faster reading times, whilst the programs with slower speech and subtitles rates resulted in the re-reading of the subtitles, thus establishing a direct relation between the type of program, the speech rate and the subtitling rates and reading performance.

In the 2000s, Jensema et al. in the US carried on with the analysis of the impact of subtitling speed. In Jensema et al. (2000a) the eye movements of six participants were recorded to evaluate the processing of the subtitles in relation to speed. Results suggested that the higher the speed rate of the subtitles, the more time is spent reading them. Differences were found between participants on the basis whether they relied on lip-reading or not. The analysis of the eye movements indicated that the presence of subtitles dominated the viewing performance. Moreover, a viewing pattern was observed: participants tended to start looking at the center of the screen, then, they soon shifted their attention towards the subtitle area and then turned back to the screen to explore the images. In a subsequent study, Jensema et al. (2000b), the eye movements of 23 deaf participants were recorded when watching a set of videos without sound. Participants spent most of the time reading the subtitles and a wide variation was observed within the subjects, but on average the participants who watched the subtitles displayed at a rate of 180wpm spent approximately 86% of the time reading the subtitles.

The eye-tracking study conducted in Canada by Chapdelaine et al. (2007) with 15 deaf, hard-of-hearing and hearing participants confirmed the previous findings in the US that correlated subtitling speed and reading times, as the higher speed rates also resulted in more time reading the subtitles. Equally, the type of the program and the degree of hearing loss of the participants were found to have an impact on their reading and watching performance.

Burnham et al (2008), in the UK, analyzed the effect of subtitling speed on comprehension in conjunction with the degree of editing. Participants watched three versions of subtitles, displayed at: 130wpm and with 84% of the original text, 180wpm and with 92% of the original text and 200wmp with no percentage of editing or text reduction. Comprehension performance varied depending on the degree of hearing loss of the participants as well as on their reading level: hard-of-hearing participants with a higher level of reading skills obtained the highest scores in comprehension with the subtitles displayed at 180wpm, while the deaf participants with a lower level of reading skills performed better when subtitles were displayed at 130wpm.

Two years later in Australia, Tyler et al. (2009) investigated the effect of subtitling speed on the comprehension performance of 20 deaf students after watching three short documentaries with subtitles displayed at 90wpm, 120wmp and 180wpm. The intermediate speed rate was considered as the most appropriate in terms of comprehension.

In the UK, in the survey conducted in 2001 by the Royal National Institute for the Deaf — also introduced in the previous section— that collected the opinion and preferences of 5,074 viewers, the speed of the TV subtitles at that time received a rather low rate (5.94 out of 10), even lower in the case of news and live programs (4.43 out of 10) The interviews conducted in 2005 by the regulator OFCOM with 54 viewers with hearing loss were exclusively focused on subtitling speed. Based on the results obtained, it was recommended not to exceed the rate of 180wpm in order to guarantee a comfortable reading.

In Spain, in the series of studies carried out by Cambra et al. (2008, 2009, 2010 and 2015) to assess the comprehension of deaf children and teenagers led the authors to suggest to reduce the speed and the linguistic complexity of the subtitles as their general poorer reading skills stopped them to fully process and understand them.

In Poland, Szarkowska et al. (2016) analyzed the reception of edited and verbatim subtitles —displayed at 12cps and 15cps, respectively— among a group of 44 deaf, 33 hard-of-hearing and 60 hearing participants. Results indicated that verbatim subtitles resulted in a better comprehension and in lesser number of skipped subtitles.

In the DTV4ALL project (Romero-Fresco 2015a), subtitling speed was analysed in terms of subtitling style and degree of editing, by comparing verbatim, standard, and edited subtitles. Each country adapted the variables to the existing guidelines or conventions existing in their country.

In Poland (Szarkowska 2015b), —where the average rate of subtitling speed on TV is 12cps— the verbatim subtitles were displayed at 13cps, the standard subtitles at 10cps and the edited subtitles at 7cps. The edited version triggered the lowest rate of comprehension in the three groups of respondents, whilst the verbatim version achieved the highest comprehension scores. In terms of reaction times, the deaf participants resulted in the shortest reaction times in all the three categories, what suggests that they were waiting for the subtitles to appear on screen. The deaf participants perceived the verbatim subtitles faster, whilst the hard of hearing resulted in shorter reaction times with the standard subtitles. As far as for the mean reading time, the verbatim subtitles resulted in longer times for the three groups, whereas the edited version allowed them to spend less time on the subtitles. Moreover, most deaf and hard of participants preferred the verbatim subtitles.

In Spain (Arnáiz 2015b), standard subtitles were displayed at a rate of 15cps, as stipulated in the AENOR norm. In this country, the standard subtitles obtained the highest comprehension scores in the three groups of participants. The performance of the deaf and hard-of-hearing viewers was lower with the verbatim and the standard subtitles, respectively. In terms of reaction times, edited subtitles resulted in the longest times in the three groups and both the deaf and hard-of-hearing participants perceived the verbatim version faster. As far as for the reading time, the three groups spent more time reading the subtitles when the subtitles were displayed at the verbatim mode. The participants with a hearing loss spent less time on the subtitle area with the edited version —in the case of the hard of hearing— and in the standard version —in the case of the deaf—. In terms of preferences, the three groups opted for the standard version.

In Italy (Eugeni 2015b), the standard subtitles followed a rate of 120-130wpm. No significant differences were observed between the groups of participants in relation to the reaction times. In all the cases the edited subtitles were perceived faster, whilst the verbatim subtitles resulted in the slowest reaction times. As it happened in Poland and Spain, the verbatim version caused participants to spend more time on the subtitles while the edited option resulted in the less time on the subtitles. When asked about their preferences, the three groups stated opted for the standard subtitles. Comprehension was not analyzed in this country.

In Germany (Mascow 2015b), standard subtitles were displayed at rate of 12cps. The deaf participants perceived the subtitles faster in all the cases, confirming the pattern observed in the other countries. In the same terms, the deaf participants spent more time reading the subtitles. In all the groups, verbatim subtitles triggered the longest reading times. Most participants with hearing loss favored the verbatim option, although some hard-of-hearing participants preferred the edited subtitles.

In the subsequent analysis carried out in terms of viewing speed, Romero-Fresco concluded that on average the traditional recommendation of 150wpm/15cps allowed for an equal distribution of attention between the subtitles and the images. Proportionally, higher rates resulted in more time on the subtitles and less on time on the images and lower rates allowed for more time on the images. See Table 9 with a remainder of the percentage of attention established by author in relation to the viewing speed (Romero-Fresco 2015c: 338).

Viewing speed	Time on subtitles	Time on images
120 wpm	±40%	±60
150 wpm	±50	±50
180 wpm	±60-70	± 40-30
200 wpm	±80	±20

Table 9: Viewing and distribution of gaze between subtitles and images (Romero-Fresco 2015c: 338)

Chapter 3. Research statement

The reception study presented here is based on the theoretical background that has been introduced in Chapter 2. It is aimed at investigating how three different types of viewers experience the process of the reception of two film fragments with a different degree of visual and verbal load and with subtitles displayed at three different speeds of exposure. Section 3.1 and 3.2 will present the definitions, objectives and research questions and the hypotheses of the study. Section 3.3 and 3.4 introduce a set of methodological considerations and implications for the study.

3.1 Working definitions

The study is focused on two parameters: the hearing and communication profile of the viewers and the subtitling speed of exposure. As they have been widely discussed, before presenting the objectives and the research questions to be investigated, it might be necessary to recapitulate and to define the four key concepts: reception, viewers' profile, subtitling speed and density in accordance to the purpose of the present research.

3.1.1 Process of reception

As seen in Section 2.3, the notion of reception can encompass a wide range of meanings and definitions so it would be necessary to define what is understood as reception. For the purpose of this research, it will be seen as the overall process that includes the three stages considered in Section 2.3: response, reaction and repercussion (see Kovačič 1995, Chesterman 2007 and Gambier 2007 and 2008). Each stage focuses on different aspects and will provide a distinct type of knowledge:

- Response: related to attentional and psycho-cognitive processes such attention allocation, it refers to the viewers' physiological and behavioral responses (eye-movements) that are consciously or automatically made while viewing an audiovisual text.

- Reaction: related to processes such as recall, comprehension, understanding and inference of information, it refers to the viewers' cognitive reactions from a semiotic perspective (i.e. taking into account the verbal, the visual and the narrative information).
- Repercussion: related to assessment and feedback processes, it refers here to the viewers' opinion and self-evaluation of the process of reception and of the reading and viewing times. It will be approached from both an individual and sociocultural point of view, in order to see if the groups of viewers share opinions and preferences.

The stages of reception are not isolated and relate to one another, so they will be analysed separately in order to be able to address the process of reception as a whole. The establishment of boundaries between the stages and its characterization will allow for the understanding and the interpretation of the relationships that may exist between them.

3.1.2 Viewers' profile

As seen in Section 2.2.1, participants were grouped together according to their hearing and communication profile. On the basis of hearing-related aspects, a first distinction is made between hearing, hard-of-hearing and deaf viewers. The hard-of-hearing group would include the individuals with higher degrees of residual hearing who would most probably depend on hearing aids to achieve a functional hearing. The deaf group would include the individuals with higher levels of hearing loss who, depending on their residual hearing, may or may not use hearing aids. On the basis of language and communication aspects, a second distinction is made within the deaf and two different profiles are established: the deaf participants who communicate in spoken language and the deaf participants who communicate in sign language.

The participants who took part in the study first answered an extensive questionnaire about their age, highest level of education, reading habits and skills, and familiarity with the films used in the experiment. The participants with a hearing loss also informed about their hearing history, their language and communication habits and skills and about their history of education. Based on their answers, participants were assigned one the following profiles:

1. Hearing: formed by hearing participants.
2. Deaf: formed by deaf participants who have a severe or profound hearing loss and who are speakers of a language. They would depend on the use of hearing aids and on the support of lip-reading to achieve a functional spoken communication.
3. Deaf/SL: formed by deaf participants with a severe or profound hearing loss who are sign language users. They would not depend on the use of hearing aids and on the support of lip-reading as they communicate through sign language.

3.1.3 Speed of subtitling exposure

As we have seen in Section 2.2.4, substantial research has been carried out in relation to the parameter of speed. Taking this into consideration, it seems important to provide a definition of what, for the purpose of this research, has been named here as "speed of subtitling exposure".

The parameter of speed is highly correlated to certain parameters and strategies, making it difficult to be analysed separately and without considering the relation with other parameters, especially with the parameter of density, in turn related to the degree of editing and with the subtitling style (verbatim, standard and edited subtitles).

Traditionally, the evaluation of subtitling speed has been carried out modifying the number of cps and, consequently, the density and the editing of the subtitles (see Burnham et al. 2008, Jensema et al. 1996, Jensema et al. 2000a, Jensema et al. 2000b, Romero-Fresco 2015a and Szarkowska et al. 2016). Most studies have analyzed speed in relation to whether the subtitles were verbatim (without editing the source text or editing it to a minimum extent, with longer presentation rates and a higher rate of cps) or edited (with a higher degree of editing, with shorter presentation times and lower rate of cps). However, edited subtitles would likely present changes in the linguistic content of the subtitles (e.g. use of short sentences and words, as apposed to verbatim subtitles that are more likely to contain longer and more complex words sentences) that could have a direct impact on the results and on the performance of the participants, both in terms of visual perception and comprehension (see Krejtz et al. 2015, Moran 2013 and Pollatsek and Rayner 2000). Therefore, this approach hinders the comparison and the analysis of the results, as it makes it impossible to ascertain whether the effect observed is due to the subtitling speed or to the degree of editing and the changes it produces on the linguistic content and complexity of the subtitles.

This study, on the contrary, will follow a new and different approach to both the concepts of subtitling speed and density with the aim of excluding the degree of editing from the analysis. Instead of defining density as the amount of information contained in the subtitles (expressed in terms of the number of characters per line and number of lines per subtitle) according to Arnáiz (2012b), density will be referred to exclusively as the number of characters per second, which is the traditional way of expressing subtitling speed. With the aim of attempting to address speed in isolation from editing, the concept of subtitling speed will be substituted by the term subtitling speed of exposure. The notion of subtitling speed of exposure refers to the average length of time that the subtitles are displayed on screen and it is expressed in number of seconds. Three degrees are considered:

- High speed exposure: referred to the subtitles that are displayed on screen for a short exposure of time, between approximately one and two seconds.
- Medium speed of exposure: referred to the subtitles that are displayed on screen for an intermediate exposure of time, between approximately two and four seconds.
- Low speed of exposure: referred to the subtitles that are displayed on screen for a long exposure of time, between approximately four and six seconds.

The density of the subtitles will remain the same in the three types of subtitles to be tested in such a way that the text will remain identical in the three exposures. Following the recommendations by AENOR (2012), the subtitles will be displayed on screen for a minimum of one second and for a maximum of six (depending on each speed of subtitling exposure) and the maximum density will be maintained on average in 15 cps.

By following this approach, however, it will not be possible to separate the parameter of speed from the parameter of presentation times and, in turn, from segmentation. Segmentation will play a key role in this study and will be considered when analyzing the results, as the high speed of exposure will likely display a higher number of one-line subtitles as opposed to the low speed of exposure that will present more two-line subtitles, and this is expected also to influence the performance of the participants (see de Bruycker and d'Ydewalle 2003, d'Ydewalle et al. 1991, d'Ydewalle and Gielen 1992, d'Ydewalle and de

Bruycker 2007, Perego et. al 2010 and Praet et al. 1990). However, it is not at the center of the analysis, as it will not be conducted in terms of one- and two-lines subtitles but in terms of subtitling presentation or speeds of exposure (high, medium and low). Thus, the main objective of the analysis remains on the effect of the speed of exposure of the subtitles.

3.1.4 Visual density

One of the main reasons for isolating the linguistic density and removing it from the analysis is that the study intends to put the focus on the processing of the image. While the effect of linguistic density on the reception of subtitled audiovisual products has been more widely analyzed, the effect of the visual density has been studied to a lesser extent. It has been argued that the type of audiovisual programs (e.g. action films vs. drama films or documentaries) and the degree of visual action and the number of shots might influence the reading and watching performance (see d'Ydewalle and van Rensbergen 1989, Krejtz et al. 2013, Kruger at al. 2015 and Smith 2015) hypothesizing that higher degrees of visual action could led to lower reading times. However, this possible influence of the visual aspects has not been further investigated.

With the aim of exploring in a preliminary stage how viewers with a different hearing loss and with a different communication and language background process and prioritize the visual and the verbal information conveyed in an audiovisual text, participants will proceed to watch two videos substantially different from a visual point of view. As it will be explained in Sections 4.4.1-4.4.3, the two videos that were selected have continuing dialogue —at a speech rate that is suitable for high-speed subtitles— but they present a different degree of combination of visual and verbal elements, revealed in the use of certain film techniques. In one video (which consists of thirty shots, rather short and diverse in terms of type, angle or lighting) the visual code is more abundant and dynamic and contributes to a greater degree to the construction of the meaning. In contrast, in the other video (which consists of two shots) the verbal code dominates the narrative and the visual code is scarce and static.

Thus, and for the purpose of this research, it was agreed that visual density would be defined in terms of the number, the type and the length of the shots. It must be noted that the effect of this parameter will be considered in the analysis of the results —where the differences observed among the two videos will be described— but it is not included as a variable in the statistical analysis, as the differences among the two videos makes it difficult to measure the effect. Therefore, although it is expected to find differences in the performance of the participants when watching one and the other, no specific research questions and hypothesis are established for this parameter.

3.2 Specific objectives, research questions and hypotheses

This section defines the research questions, the specific objectives and the hypotheses of the study. They are arranged around each stage of reception: Section 3.2.1 identifies the objectives, research questions and hypotheses established for the level or stage of response, Section 3.2.2 the ones established for the stage of reaction and Section 3.2.3 the ones related to the stage of repercussion. Each of them is arranged around the two variables of study: the subtitling speed of exposure and the hearing, language and communication profile of the participants.

3.2.1 Reception stage 1: response

Two objectives are established in relation to the attention allocation and distribution of the participants. They will be expressed in terms of duration and number of times in which attention is allocated either to the subtitles or to the image.

Objective n.1

To determine whether the subtitling speed of exposure has an effect on the way in which the participants allocate attention while reading the subtitles and looking at and exploring the visuals.

- Research question: does the subtitling speed of exposure have an effect on the response of the participants?
- Main hypotheses and sub-hypotheses:
    - When the subtitles are presented at the "Low" speed of exposure, participants will allocate more attention to the subtitles, by showing:
        - A higher total fixation and mean fixation duration on the subtitles.

        - A higher number of fixations count on the subtitles.
        - A lower number of shifts between the subtitles and the image.
    - When the subtitles are presented at the "High" speed of exposure, participants will allocate less attention to the subtitles, by showing:
        - A lower total fixation and mean fixation duration on the subtitles.
        - A lower number of fixations count on the subtitles.
        - A higher number of shifts between the subtitles and the image.

Objective n. 2

To identify whether the hearing, language and communication profile of the participants has an effect on the way in which they allocate attention while reading the subtitles and looking at and exploring the visuals.

- Research question: does the hearing, language and communication profile of the participants affect the response?
- Main hypotheses and sub-hypotheses:
    - The "Deaf" and especially the "Deaf/SL" participants might allocate more attention to the subtitles, by showing:
        - A higher total fixation and mean fixation duration on the subtitles.
        - A higher number of fixations count on the subtitles.
        - A lower number of shifts between the subtitles and the image.
    - The "Hearing" participants might allocate less attention to the image, by showing:
        - A lower total fixation and mean fixation duration on the subtitles.
        - A lower number of fixations count on the subtitles.
        - A higher number of shifts between the subtitles and the image.

3.2.2 Stage of reception 2: reaction

Two objectives are established in relation to the ability of the participants to recall and process the verbal and visual information contained in the film fragments, to comprehend the narrative information and to infer the meaning and consequences.

Objective n. 3

To ascertain whether the subtitling speed of exposure has an effect on the way in which the participants recall and process the verbal information contained in the subtitles and the visual information contained in the visuals, comprehend the narrative information and infer meaning and consequences.

- Research question: Does the subtitling speed of exposure affect reaction?
- Main hypotheses and sub-hypotheses:
    - When the subtitles are presented at the "Low" speed of exposure, participants might show:
        - A higher ability to comprehend and infer the narrative information.
        - A higher ability to recall and process the verbal information.
        - A lower ability to recall and process the visual information.
    - When the subtitles are presented at the "High" speed of exposure, participants might show:
        - A lower ability to comprehend and infer the narrative information.
        - A lower ability to recall and process the verbal information.
        - A greater ability to recall and process the visual information.

Objective n. 4

To find out whether the hearing, language and communication profile of the participants has an effect on the way in which they recall and process the verbal information contained in the subtitles and the visual information contained in the visuals, comprehend the narrative information and infer the meaning and consequences.

- Research question: does the hearing, language and communication profile of the participants affect reaction?
- Main hypotheses and sub-hypotheses:
    - The "Deaf" and especially the "Deaf/SL" participants might show:
        - A lower ability to comprehend and infer the narrative information.
        - A lower ability to recall and process the verbal information.
        - A higher ability to recall and process the visual information.
    - The "Hearing" participants might show:
        - A greater ability to comprehend and infer the narrative information.
        - A greater ability to recall and process the verbal information.
        - A lower ability to recall and process the visual information.

3.2.3 Stage of reception 3: repercussion

Two objectives are established in relation to the assessment and feedback of the participants, in terms of their opinion and evaluation of the difficulty of the process of reception itself, of the time and ease of reading the subtitles, and of the time and ease of looking at and exploring the visuals.

Objective n. 5

To determine whether the subtitling speed of exposure has an effect on the way in which the participants assess and evaluate the difficulty of the process of reception and the time and ease of reading the subtitles and of looking at and exploring the visuals.

- Research Question: does the subtitling speed of exposure affect repercussion?
- Main hypotheses and sub-hypotheses:
    - When the subtitles are presented at the "Low" speed of exposure, participants might be more likely to self-report:
        - The absence of problems to carry out the activity.
        - A more comfortable time and ease of reading.
        - A less comfortable time and ease of watching.
    - When the subtitles are presented at the "High" speed of exposure, participants might self-report:
        - The existence of problems to carry out the activity.
        - A less comfortable time and ease of reading.
        - A more comfortable time and ease of watching.

Objective n. 6

To ascertain whether the hearing, language and communication profile of the participants has an effect on the way in which they evaluate the difficulty of the process of reception and the time and ease of reading the subtitles and of looking at and exploring the visuals.

- Research Question: does the hearing, language and communication profile of the participants affect repercussion?
- Main hypotheses and sub-hypotheses:
    - The "Deaf" and especially the "Deaf/SL" participants might be more likely to self-report:
        - The existence of problems to carry out the activity.

        - A less comfortable time and ease of reading.
        - A more comfortable time and ease of watching.
    - The "Hearing" participants might be more likely to self-report:
        - The absence of problems to carry out the activity.
        - A more comfortable time and ease of reading.
        - A less comfortable time and ease of watching.

3.3 Methodological considerations

Based on the multimodality that characterizes audiovisual translation, the complexity of the reception process and the aim of this study to embrace the three stages in which it is divided, the use and combination of several research methods would be necessary. This will make it possible to compare and contrast the differences in the results obtained in each of the stages and to provide an accurate interpretation of the results and a comprehensive understanding of the object of study.

The methodological framework on which this research is based is grounded in translation studies and in audiovisual translation in particular, as well as in psychology and deaf studies. The combination of approaches was applied in all the stages of the research: from the design, through the collection and the analysis of the data and to the interpretation of the results. As it will be seen in the following chapter, the data from all the three stages has been measured and classified so that it can be analysed statistically, in terms of both descriptive and inferential statistics, with the aim of assessing the external validity of the results. The process of the data collection, together with the different methods used, has been divided into the different stages of the research process, which will be introduced and discussed in the following chapter:

1. Pre-stage: collection of data about the background profile (hearing, language, communication and education aspects) of the participants and their reading and watching habits, through the use of an initial questionnaire. The reading comprehension skills of the participants were also assessed through the use of an additional standardized test, as well as the English listening comprehension of part of

the hearing participants. This information was used to allocate participants into a group or profile.

2. Stage of response: collection of data regarding the attention allocation of the participants while watching two fragments of films with the different speeds of subtitling exposure, through the recording of their eye-movements with eye-tracking methods.
3. Stage of reaction: collection of data about the cognitive processes —in terms of recalling and processing, understanding and inferring verbal, visual and narrative information— of the participants after watching the two fragments, through the use of a questionnaire.
4. Stage of repercussion: collection of data about the participants' opinion and evaluation of the reception process and of the speeds of subtitling exposure after watching the two fragments, through the use of a questionnaire.
5. Post-stage: collection of data about the opinion and the preferences of the participants regarding the current practices in subtitling speed in different platforms, through the use of a final questionnaire.

3.4 Implications of the study

I do not belong to the same sociocultural group as some of the participants who took part in this project, who were part of the deaf/sign language community, as I did not know sign language. Apart from reading, I had not had previous personal contact with part of the target community. The assistance of a mediator was thus required at all stages, from the initial contact with the participants to the realization of the study. These mediators come from the industry partner Multisignes with which the TIME project had an agreement (see Section 4.3.2). They contacted the local associations of deaf/sign language users with whom they worked, explained the project to them, arranged the day and time for the tests with those who volunteered and provided the sign language interpreting services during the development of the study. They even participated in the selection of data collection tools. When defining the methodology, they warned me about the possible reluctance of the deaf/sign language users participants to write, as if they had poor writing and reading skills, it might make them feel uncomfortable. This advice was taken into consideration and it was decided to deliver all the questionnaires orally, not only for the deaf/sign language users but for all the groups, as all of them should follow the same procedure with a view to provide comparable answers.

Therefore, my first direct contact with the participants took place just before the development of the test. The fact that the contact and arrangements with them were made through an intermediary affected the development of the tests, as the delay and the drop back of participants was recurrent. For most participants, it was the first time they had taken part in a research study of this kind and, initially, it seemed to be uncomfortable and heavily relied on the sign interpreter, with whom most of them had personal contact. The pre-stage helped to break the ice with them and to create an environment in which the participants could feel more confident, express doubts and ask questions. Taking into account the possible psychosocial factors associated with hearing loss, such as stigma and isolation, it was essential for me to adopt certain strategies to build trust with them. This protocol of communication included learning and using isolated signs —i.e. say hello, goodbye, or thank you—, finding a balance for the articulation of speech —not to shout, not to talk too fast or too slow—, learning to knock on the door or table to attract their attention and not to turn my back on them, etcetera.

My knowledge about the target population increased throughout the development of the study, and my role as a researcher was not limited to reading the questions and write down the answers together with notes, keywords and any other observations, as I also had to take a more active stance in the interaction with the individuals. This turned out to have a positive effect, as it allowed them to be more confident in their answers, facilitated the fluency of the communication and provided insightful information.

On a different note, the approach taken in the definitions of linguistic density, editing and subtitling speed implied the need of manipulating the presentation times and consequently the segmentation of the subtitles. A professional translator was commission to provide the subtitles of the videos with the requirement of following the Spanish norm for SDH and not exceeding the average rate of 150wpm (15cps). Whereas the content of the text provided by the translator was not modified, the presentation times of the subtitles were manipulated and three different versions were created (one for each speed of exposure being tested). The manipulation was carefully done in order not to maintain the average of 15cps without affecting the synchrony of the subtitles. However, this created a less realistic situation since, although valid in terms of research, the manipulation of the speed in such terms might not be feasible in a real context from a professional standpoint.

Taking into account that the development of the present research involved the participation of individuals who were asked to facilitate a different type of personal information, several ethical issues were considered. At the UAB, the researchers are allowed to consult the research procedure with the Animal and Human Experimentation Ethics Committee (CEEAH). The Committee has a Code of Good Practice, which was updated in January 2013, with guidelines, recommendations and practical aspects of how to conduct experiments with human participants.

In line with the Code of Good Practices by the CEEAH, the main purpose of the study was explained to the participants along with the procedure of the experiment in oral and written format. The participants were told in advance that they were not going to receive monetary compensation. However, the TIME project allowed for the reimbursement of the train and bus tickets and the reimbursement rate of 0.35 cents per kilometer. First, I introduced myself to the participants, as well as the overall project in which my research was framed and explained that the aim of the study was to analyze the reception of different types of viewers when watching films with subtitles for the deaf and hard of hearing. I then briefly described the procedure and the different stages of the test and established a one-hour timeframe. Participants were informed that their eye movements were going to be recorded while watching two short videos with subtitles and that they were going to be asked to answer a set of questions about the content of the videos and about their background information in different terms. I made it clear that the participation was voluntary, so that they were free to withdraw at any moment or not to provide information on particular issues if it caused them to feel uncomfortable. I pointed out that the confidentially of the data was guaranteed as I was the only person with direct access to it and that, in addition, afterwards all the information was going to be treated and processed anonymously. Finally, I provided them with the opportunity to convey any doubts and questions they may have. I then gave them a copy of the information sheet that contained all that information along with my contact details in case they would like to contact me. I asked them to carefully read it and to sign the consent form where they stated: to have read both the information sheet and the consent form, to have been informed about the study, to have understood the terms of the voluntary and confidential participation and to have had the opportunity to ask questions.

Chapter 4. Methodology and experimental design

This Chapter will introduce the methodology that was applied to the present research, as well as information regarding the experimental design. Section 4.1 gives an overview of the research design whilst Section 4.2 presents the different variables that were considered in the study. Sections 4.3-5 continue with the presentation of the sample and subsample of participants, the tools and procedure for data collection, and the audiovisual material selected. Finally, Section 4.6 introduces the statistical model that will be used to analyze the results.

4.1 Introduction to the research design

The present research is descriptive, explanatory and exploratory. First, it will describe the process of reception of SDH in relation to two variables: the hearing, language and communication profile of the participants and the subtitling speed of exposure at which the subtitles are displayed; and secondly, it will attempt to determine and explain the causal effects and relationships between these two variables and the reception process. Finally, taking into account that the participants watch two film fragments with a different load of verbal and visual information and density, this research will also explore whether there are differences on the way they are received.

In order to be able to answer the explanatory research questions, it is necessary to establish different levels of dependent, independent and control variables (or variables of adjustment), as well as to provide operational definitions and to identify measurable and reliable indicators for them. Each independent variable has three categories so a 2x3 factorial design will be needed to examine the effects of the various combinations. Participants were assigned a profile based on their hearing, language and communication characteristics that were evaluated in the pre-stage of the study. The assignment, thus, was not randomized, and the three groups of profiles were expected to be different from the start. In order to identify and control the variables in which they are different —such as their level of education or their reading skills— that may intervene in their performance and in the relationships between the independent variables and the reception process, these variables were also defined and measured.

The participants watched two videos in English with Spanish subtitles for the deaf and hard of hearing while their gaze was recorded through eye tracking, and answered a set of questionnaires. Each video was displayed at one of the speeds of subtitling exposure, which were randomly assigned. This is known as a between-subjects or between-groups design, as each participant is subjected to a single treatment and the whole group cannot be compared. Each participant watched each sequence only once, so they were exposed only to two of the three speed of subtitling exposure conditions. Thus, 24 participants (eight from each profile) carried out the study under each subtitling speed condition. With a view to avoid the possible effect of the order of the videos, this was reversed for half of each group. In the same way, to avoid the hearing participants with a good enough level of English not reading the subtitles, the ones with a higher level of listening comprehension watched the film excerpts with the sound muted. This was assessed in the pre-stage through a brief test for their listening skills in English. Table 10 shows the final design distribution of the experiment used, in relation to the profile of the participants, the two subtitling speeds of exposure that were randomly assigned to them and the order in which they watched the sequences.

It must be noted that the heterogeneity that characterizes the deaf population makes it difficult, if not impossible, to set up the groups in a homogeneous way in relation to all the variables. The external and internal validity of the research were guaranteed, respectively, by selecting participants that represent the heterogeneity of the population and by maximizing the control over the variables in which the heterogeneity appears.

VIDEO 1			VIDEO 2			PROFILE
SPEED OF SUBTITLING EXPOSURE						
HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW	
P01 P02 P03 P04 P17 P18 P21 P22	P05 P06 P07 P08 P13 P14 P23 P24	P09 P10 P11 P12 P15 P16 P19 P20	P05 P06 P09 P10 P13 P14 P15 P16	P01 P02 P11 P12 P17 P18 P19 P20	P03 P04 P07 P08 P21 P22 P23 P24	1. HEARING
P25 P26 P27 P28 P41 P42 P45 P46	P29 P30 P31 P32 P37 P38 P47 P48	P33 P34 P35 P36 P39 P40 P43 P44	P29 P30 P33 P34 P37 P38 P39 P40	P25 P26 P35 P36 P41 P42 P43 P44	P27 P28 P31 P32 P45 P46 P47 P48	2. DEAF
P49 P50 P51 P52 P65 P66 P69 P70	P53 P54 P55 P56 P61 P62 P71 P71	P57 P58 P59 P60 P63 P64 P67 P68	P53 P54 P57 P58 P61 P62 P63 P64	P49 P50 P59 P60 P65 P66 P67 P68	P51 P52 P55 P56 P69 P70 P71 P72	3. DEAF/SL

Table 10: Design distribution of the experiment

4.2 Variables

Section 4.2.1 will introduce the independent variables, Section 4.2.2 the dependent variables, and Section 4.2.3 the control variables.

4.2.1 Independent variables

The two variables expected to affect the process of the reception are the hearing, communication and language profile of the participants and the subtitling speed of exposure at which the subtitles are displayed. I manipulated the latter whereas the former variable corresponds to the natural characteristics of the participants.

- The profile of the participants:
  - Profile 1 “Hearing”: participants who did not have a hearing loss and who had Catalan and/or Spanish as L1.

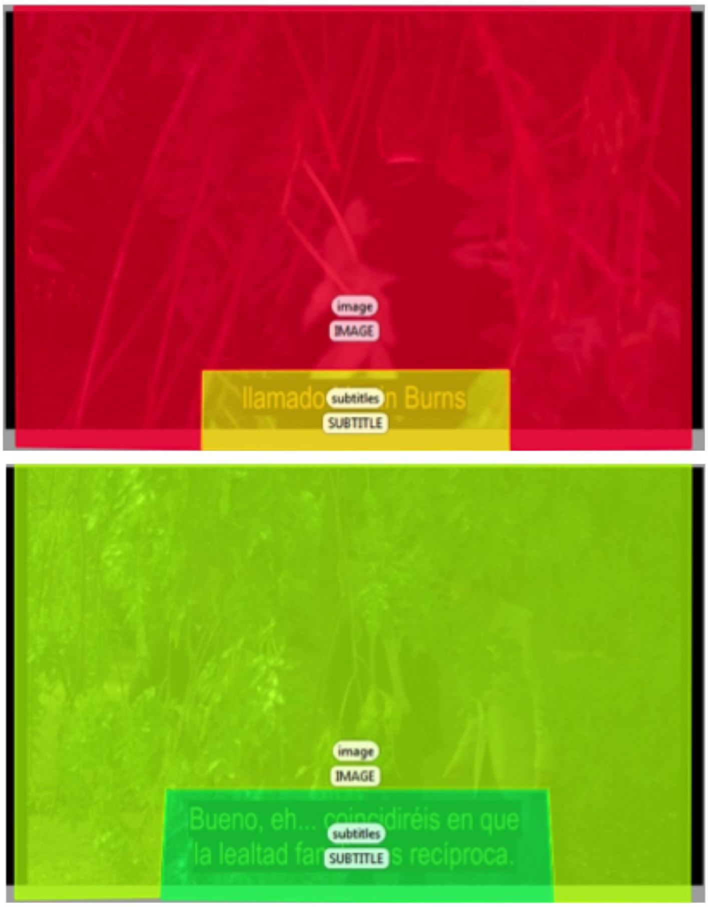
    - Profile 2 “Deaf”: participants who had a severe or profound hearing loss or deafness and who had Catalan and/or Spanish as their L1 or natural language.
    - Profile 3 “Deaf/SL”: participants who had a profound hearing loss or deafness and had Catalan and/or Spanish sign language as their L1 or natural language.
- The subtitling speed of exposure:
    - Low speed exposure: displayed on the screen for a long time, between approximately four and six seconds, with a maximum density of 15 cps.
    - Medium speed of exposure: displayed on the screen for an intermediate time, between approximately two and four seconds, with a maximum density of 15 cps.
    - High speed of exposure: the displayed on the screen for a short time, between approximately one and two seconds, with a maximum density of 15 cps.

4.2.2 Dependent variables

The two independent variables are expected to have a causal effect on the performance of the participants in the process of reception of the film sequences. Here the different effects are operationally defined in terms of dependent variables of a very different type.

4.2.2.1 Stage of response

The participants’ eye movements, considered as indicators of cognitive aspects of visual attention, were recorded and analysed through eye tracking. As it will be seen in Section 4.5, the eye-tracking software Tobii Studio allowed to analyze the eye movements while reading the subtitles and while exploring the visuals by establishing two separate Areas of Interest (AOI) (see picture 1), which were analysed individually: the area of the image and the area of the subtitles.



Picture 1: Screenshots with the area of the subtitles and the area of the image demarcated

The possible effects that the independent variables are expected to have on the participants' response in terms of reading and viewing times and performance are operationally defined in terms of the following variables, related to their cognitive abilities to process the subtitles and the images and to shift and allocate attention. All the variables are numerical, and are either duration or count variables:

1. Total fixation duration: the sum of the duration in milliseconds of all the fixations on the subtitle area and on the image area.
2. Percentage of total fixation duration: the total percentages of time spent on the subtitle area and on the image area.
3. Mean fixation duration: the mean duration in milliseconds of the fixations on the subtitle area and the image area.
4. Fixation count: the number of times there is a fixation on the subtitle area and on the image area.
5. Percentage of fixation count: the percentage of the number of fixations on the subtitle area and on the image area.

6. Visit counts: the number of times there is a visit on the subtitles area and on the image area.

4.2.2.2 Stage of reaction

The ability of the participants to recall and process the verbal, visual and narrative information contained in each of the two sequences was assessed through the use of a questionnaire. The participants' answers to a set of open questions are seen as indicators of cognitive processes such as the process of recall and processing, comprehension and inference. The possible effects that the independent variables are expected to have on the participants' reaction are operationally defined in terms of the following variables:

- Related to the ability of the participants to comprehend the narrative information:
    1. Understanding of the plot: answer to one question about the gist of the plot of each sequence.
    2. Identification of the characters: answer to one question about the identification of the characters and the relationship between them.
- Related to the ability of the participants to recall and process the information:
    3. Recall and process of the visual information: answer to one question about the information conveyed in the visuals of each sequence.
    4. Recall and process of the verbal information: answer to one question about the information conveyed in the subtitles of each sequence.
    5. Recall and process of the open/ ambiguous information: answer to one question about the information conveyed in both the visuals and the subtitles of each sequence.
- Related to the ability of the participants to infer narrative information:
    6. Inference of information: answer to one question about the immediate narrative consequences of each sequence.

4.2.2.3 Stage of repercussion

Repercussion is associated to the self-assessment of the participants in relation to the level of difficulty of the activity, the reading times and the ease to read the subtitles and the viewing times and the ease to explore the visuals. This was assessed through the use of a questionnaire. The possible effects that the independent variables are expected to have on the participants' repercussion are operationally defined in terms of the following variables:

1. Self-assessment of the difficulty of the activity: answer to an open question about the complexity of the task and about the difficulties encountered.
2. Self-assessment of the reading times and the ease of reading the subtitles: answer to a question with five scales of measurement (ranging from "too slow" to "too fast", with the option to not answer) about the reading times and the ease of reading the subtitles comfortably.
3. Self-assessment of the viewing times and the ease of exploring the visuals: answer to a question with five scales of measurement (ranging from "all the time" to "never", with the option not to answer) about the viewing times and the ease of exploring the visuals comfortably.

4.2.3 Control variables

Taking into account the existence of differences between and within the profiles of participants and between the two sequences of films, it was necessary to identify and control to a certain extent these differences in the form of measurable variables. This section will present in detail the groups and the participants in relation to a set of variables (see Section 4.3), which include: reading habits and skills, level of education, mode of education, age onset of the hearing loss, degree of hearing loss and use of subtitles. In the same way, the two sequences of the films will be defined and exposed in relation to a set of variables such as their different degrees of density and integration of visual and verbal information (see Section 4.4)

4.3 Groups and participants

Section 4.3.1 will introduce the population and sampling distribution that was used for the present study. Section 4.3.2 will provide information about the recruitment process that was followed to select the participants and Section 4.3.3 will introduce in further detail the three groups of participants that were established.

4.3.1 Population and sampling

Two factors were expected to affect the process and the outcome of selection of participants: the characteristics and specificity of the target population and the characteristics and specificity of the research design. As explained, a between-groups or between-subjects design was used. Each participant watched each sequence once. As they watched two videos, they were exposed to two of the three conditions of speed of subtitling exposure. In order to obtain statistically significant and reliable results with this type of factorial design with nine combinations (see Table 11), it was recommended to have a minimum of eight participants in each combination. This made a total of 72 participants, twenty-four in each profile.

VIDEO 1			VIDEO 2			PROFILE
SPEED OF SUBTITLING EXPOSURE						
HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW	
n=8	n=8	n=8	n=8	n=8	n=8	1. HEARING
n =8	n=8	n=8	n=8	n=8	n=8	2. DEAF
n=8	n=8	n=8	n=8	n=8	n=8	3. DEAF/SL

Table 11: Factorial design for the experiment. Participants *n=72*

It is difficult to achieve a large number of participants. As noted in O'Brien 2010: 260), the recruitment of participants with similar competences and characteristics is seen as a main impediment to work with large sample sizes. Moreover, the use of eye-tracking methods provides large amounts of data when compared to other methods. The use of large samples size thus, will significantly increase the time required for collecting, processing, analyzing and interpreting the data, which might affect the feasibility of the research. This might be the reason why large sample sizes are not so frequently used in translation studies and most studies include between ten and 25 participants (see Orrego-Carmona 2015: 100). Eye-tracking methods, on the other hand, are prone to lead to higher amounts of data loss (at around 25% according to Saldanha and O'Brien 2013: 139). It was intended to have more participants to counteract the effect of data loss, however, this could not be achieved due to time constraints. As pointed out by Orrego-Carmona (2015: 101), "a total of 48 participants were needed in order to obtain enough good-quality data for al least 36 of them". By applying this rule to this design, a total of 72 participants would then be needed to obtain accurate data from 54 of them.

In relation to the target population, it was not possible to establish a sample size that proved to be representative, as it was difficult to rely on accurate data from the number of population who have a hearing loss or who are sign language users (Arnáiz 2012a, Hersh 2009 and Shield 2006). According to the research design, and taking into account the presence of a control group of hearing people, 48 deaf participants were required (half of which should be sign language users). This number was considered appropriate taking into account the numbers used in previous research with this population and the difficulties encountered in reaching the expected number of deaf participants.

4.3.2 Recruitment and selection process

At the beginning, the plan was to set up the laboratory at a unique location on the premises of the UAB campus. I prepared leaflets and posters to be delivered in person and through email to deaf and hard-of-hearing associations and created a Facebook page to reach deaf individuals through social media (see Picture 2). Despite having generated interest, none of these attempts were successful.

Picture 2: Posters and Facebook page designed for recruiting participants

Finally, it was considered appropriate to move the equipment to set a different location or locations. This decision was expected to have an impact on various issues, such as an increase in the transportation and insurance expenses of the eye-tacking equipment, a growth in the time spent in the preparation of the laboratory setting, and, more noteworthy, a possible increment in the risk of losing data due to the difficulty involved in reproducing exactly the same setting environment in all the different locations (see Orrego-Carmona 2015 and Teixeira 2014). In order to minimize the possible effects in the setting environment and in the accuracy of the data, a strict protocol was established, although it was not possible to counteract all the implications. At the time, I was completing a secondment internship as part of the TIME research project at the company Multisignes; a small company specialized in audiovisual and accessibility services located in Banyoles (Girona). The company was interested in the research and was willing to extend the terms of the secondment so that I could develop the experiments on their premises. The TIME project provided compensation for their services as part of the internship agreement. The laboratory was set up in a separate room, and within this location more than fifty hearing, deaf and deaf sign language users participants took part. Multisignes recruited most of the deaf participants —mainly sign language users— and the majority of the hearing volunteers were contacted through the Public Library in Banyoles, situated in the same building as the company. However, more participants were required. The association ACAPPS[17] in Barcelona offered their premises for installing the laboratory setting for five days, and made contact with the remaining deaf participants who were oral language users. Two more locations were needed to reach the expected number of deaf sign language users and hearing volunteers: the remaining participants carried out the tests in a laboratory setting installed in a private room at the public library El Clot-Josep Benet in Barcelona and at the University Rovira i Virgili in Tarragona.

It took almost eight months to complete the process. The fact of not having direct contact with the participants before the tests had consequences in the time and experimental management, and factors such as age and gender balance were difficult to control. Taking into account that four locations and settings were needed and that the period of time was extended, the consistency and clarity of the instructions turned out to be a critical factor.

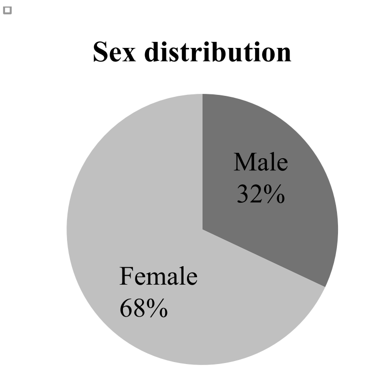
[17] ACAPPS is a Federation of Catalan Associations of Hard of Hearing People, based in Barcelona. See http://www.acapps.org/web

4.3.3 Participants

The questionnaire used in the pre-stage to allocate participants to a profile included a broad range of factors that might affect performance, including questions about education and reading-related issues. Except for the questions related to their hearing loss, all 72 participants answered all the nine questions: an open question about their age, a multiple choice question about their highest level of education completed, an open and guided question about their hearing and education history, a multiple choice question about the mode of their language of daily use, an open question about their language of communication at home, an open question about their language of communication at work, a yes or no question about whether they read everyday, a multiple choice question about the number of hours a week they read and a multiple choice question about whether they were familiar with the films used in the experiment. According to their answers, they were allocated to one of the groups: Group 1 (hearing profile), Group 2 (deaf profile) and Group 3 (deaf/SL profile).

4.3.3.1 General information

From the 72 participants, 49 were females and 23 were males, and their average age was 39.43 years (SD=12.56), ranging from 18 to 69 years old. There were more females in the three groups (see Figure 1 and 2), but Group 2 shows the most noticeable difference with only four male participants. This is also the oldest group (Mean: 43.59 years), followed by Group 3 (39.88 years) and Group 1 (34.84 years). Group 1 is not only the youngest one but also the most homogeneous, as it presents the lowest SD (=6.95, with an age range from 28 to 48 years), followed by Group 2 (SD=14.07, from 23 to 69 years), and Group 3 (SD=14.18, from 18 to 65 years). For descriptive purposes, age has been classified into four intervals of twelve years (see Figure 3 and 4). The interval that occurs the most frequently in the sample is 31-43 years, the same as in the three groups (along with 44-56 years in Group 3).



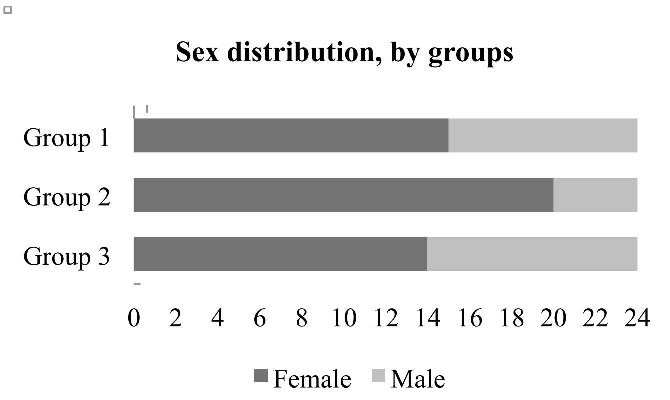
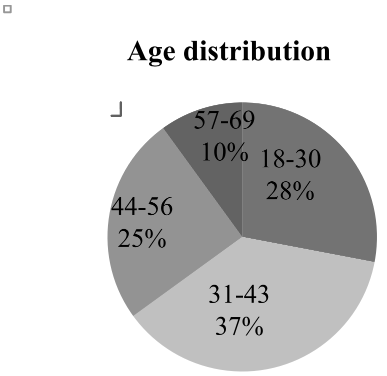


Figure 1: Sex distribution within the sample population

Figure 2: Sex distributions within the sample groups



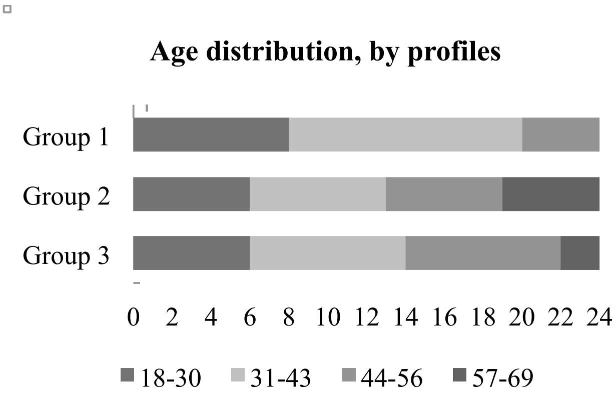


Figure 3: Age distribution within the sample population

Figure 4: Age distributions within the sample groups

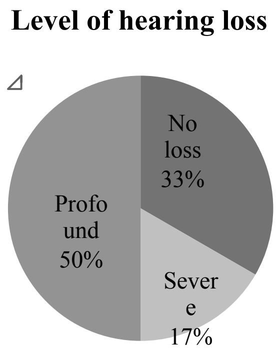
Table 12 summarizes the composition of the groups in terms of sex and age.

PROFILE 1						PROFILE 2						PROFILE 3						
Hearing, Catalan/Spanish speakers						Deaf, Catalan/Spanish speakers						Deaf, Catalan/Spanish Sign language users						AGE INTERVAL
♀	♀	♀	♀	♀	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	18-30 years
♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♀	♀	♀	♂	31-43 years
♀	♀	♀	♀	♀	♂	♂	♀	♀	♀	♀	♀	♂	♂	♀	♀	♀	♂	44-56 years
♂	♂	♀	♂	♂	♂	♂	♀	♀	♀	♀	♀	♂	♂	♂	♂	♀	♀	57-69 years

Table 12: Summary of sex and age distribution within the sample population

4.3.3.2 Hearing-related information

All of the 48 participants with a hearing loss had a permanent sensorineural loss caused by some damage to the inner ear. They had acquired and developed the hearing loss at different stages and it was caused by different conditions, but in all cases it was a bilateral and symmetrical loss, meaning that the loss was present in both ears to the same degree. 12 participants had a severe hearing loss and 36 have a profound hearing loss (see Figures 5 and 6). Group 3 is entirely made up of those with profound deafness and the 12 participants with a severe hearing loss form part of Group 2. 37 participants (77%) acquired it when they were born or at an early stage in life before having fully developed language, and eleven acquired it at later stages once the process of speech and language acquisition was complete (see Figures 7 and 8). It must be noted that Group 2 is more heterogeneous than Group 3: half of the group is pre-lingual and the other half is post-lingual, whereas all the participants allocated in Group 3 were pre-lingual deaf.



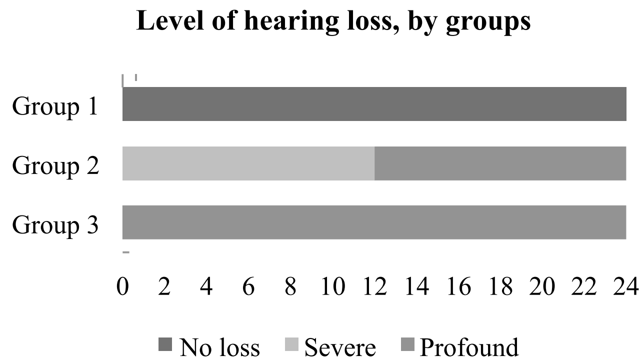
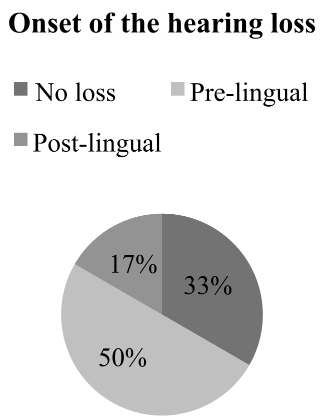


Figure 5: Level of hearing loss within the sample population

Figure 6: Level of hearing loss within the sample groups



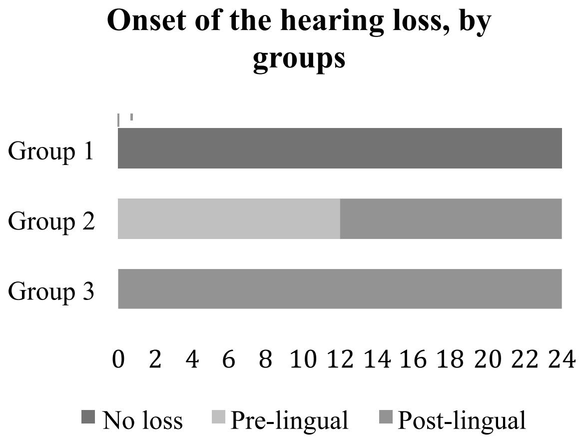
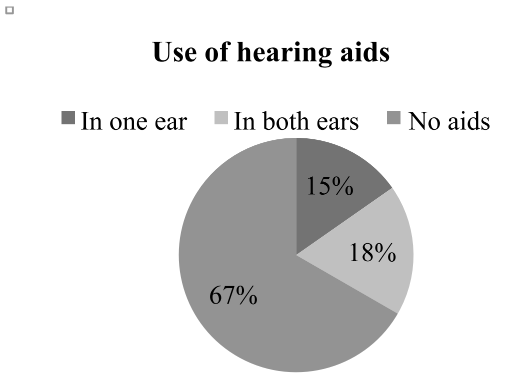


Figure 7: Language onset of the hearing loss within the sample population

Figure 8: Language onset of the hearing loss within the sample groups

Participants were asked whether they used hearing aids (and/or cochlear implants) and, if they did, whether they used it in one or in both ears. As shown in the following Figures, Group 3 —despite showing a higher level of hearing loss than Group 2— shows a lower percentage of use of hearing aids and implants. In Group 2, 17 participants used hearing aids and five had a cochlear implant, whereas in Group 3 only seven participants used aids and two had a cochlear implant. Several participants in Group 3 explained how they stopped using hearing aids at some point, as, among other things, they did not help them to understand speech. All participants in Group 3 were sign language users, so they may not have had the same needs as Group 2 to access speech. On the contrary, participants in Group 2 communicated effectively in the spoken language with the assistance of the aids and the support of lip-reading, especially in the cases when a higher degree of residual hearing allowed the aids to access speech.



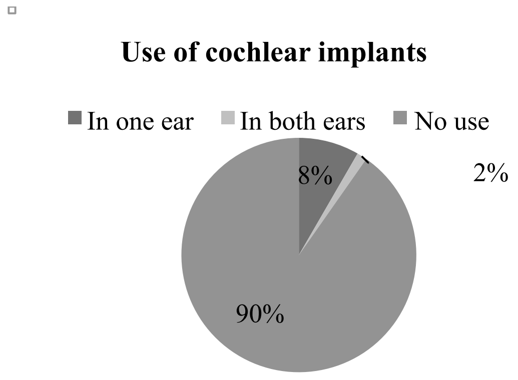
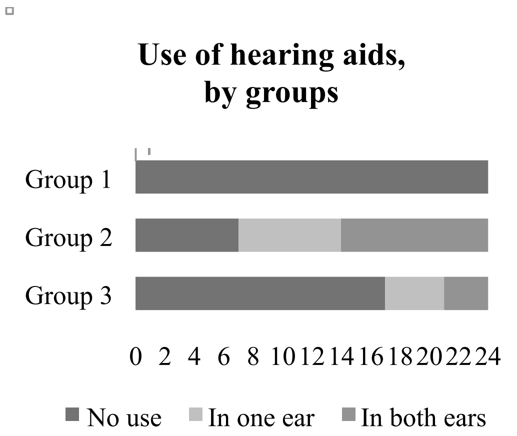


Figure 9: Use of hearing aids within the sample population

Figure 10: Use of cochlear implants within the sample population



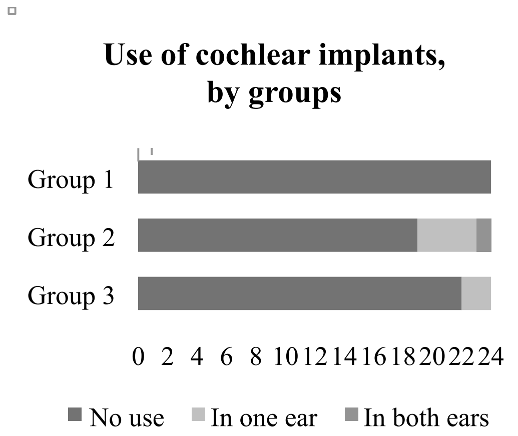


Figure 11: Use of hearing aids within the sample groups

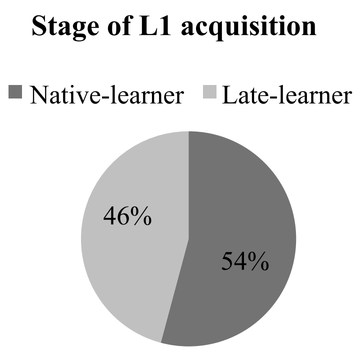
Figure 12: Use of hearing aids across the sample groups

4.3.3.3 Language and communication-related information

In order to understand and determine the usage of a language, a description of the degree and the type of exposure to language at almost every stage of life —including both home and educational/job environment— was needed. This included information about the age and the degree of L1 acquisition, the command of the sign language and the degree of use of the spoken language.

Stage of acquisition of L1

The concepts of native-learner and late-learner are referred to the moment in which a language is fully developed as a L1 (see Section 2.2.1.3). The participants who acquired their L1 —either spoken or sign— during the first stages of life were considered as native-learners and those who developed it in later stages and through a difficult process of learning were seen as late learners (see Figures 13 and 14). All the hearing participants from Group 1, the 11 participants from Group 2 became deaf after having developed and acquired language and the four participants from Group 3 who were born to a family of deaf/sign language users were native-learners. The rest of the participants in Groups 2 and 3 were late-learners. In Group 3, despite the fact that all the participants considered sign language as their L1 or "natural language", only four were strictly natives. 15 participants learned during late childhood (between the age of 9 and 11) or adolescence (beyond the age of 12), and five participants learned it in adulthood.



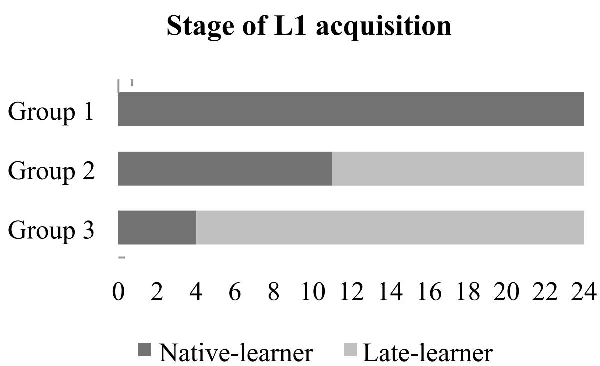


Figure 13: Stage of L1 acquisition within the population sample

Figure 14: Stage of L1 acquisition within the sample groups

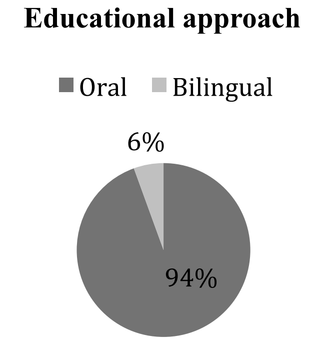
The use of lip-reading and sign language

In Group 2, all the participants but one considered lip-reading as an essential resource to communicate, and used it in a systematic manner thanks to the use of aids and the existence of residual hearing, which made them easier to access speech sounds. Three participants had taken a course in it, and two more said that they were planning to take it soon. With relation to sign language, half of the Group 2 claimed to have some knowledge of it. We found a very specific case (P33): one of the post-lingual deaf participants —a native-learner of the spoken language— had completed a five-year course on sign language and had become a sign language teacher. She identified herself as part of the deaf culture and community and used sign language at home and at work, and asked to be allocated to Group 3. However, she was able to communicate in the spoken language fluently and efficiently and carried out the test without the presence of a sign interpreter so she remained in Group 2.

In Group 3, participants used the resource of lip-reading to a lesser extent, as they were more likely not to have residual hearing. When they were asked about the resources they used to communicate in oral environments, most of them referred to a mixture of spoken an sign languages, *homesign* or meme. Some of them also resorted to the use of a written support. We also found a specific case: one participant (P72) was still studying sign language and she had always identified with the hearing culture. However, a few years before, the external part of her cochlear implant was stolen and due to its high price she could not replace it, so she started to use sign language. She changed her circle of friends, taught sign language to her family and required the presence of a sign interpreter at university in order to complete her studies. At the time of the study, the presence of the sign interpreter was required in order for her to be able to communicate without difficulty. The years of use of sign language are an important factor to determine whether sign language is the first or natural language of a person, although in this case an exception was made and the participant in question was allocated to Group 3.

4.3.3.4 Education and academic information

Participants were asked about their highest level of education completed (or in the process of completing) and about the educational approach of the institutions they had attended, in relation to the teaching or not of sign language. As can be seen in Figures 15 and 16, all the hearing participants, all the deaf participants from Group 2 and the great majority of deaf/sign language users in Group 3 studied with an exclusively oral approach. All the participants in Group 2 and the 12 post-lingual participants in Group 3 attended a *regular* school (nonspecific for deaf children). In Group 3, from the 20 participants who studied with an exclusively oral approach with no sign language, 13 attended a specific school for the deaf and 7 attended a nonspecific school (two of them with no support at all on speech therapy).



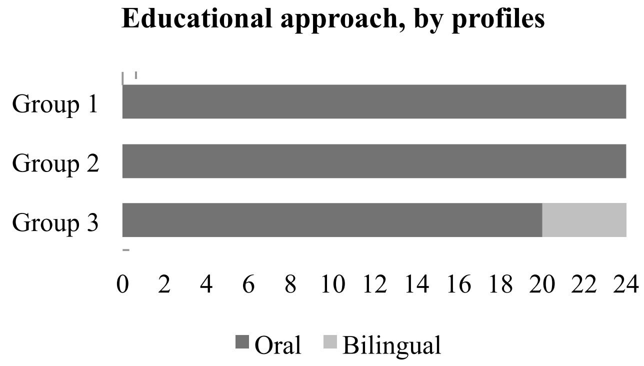
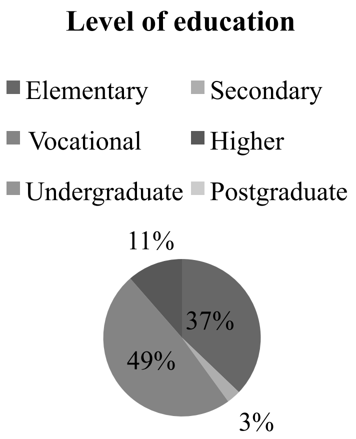


Figure 15: Educational approach within the sample population

Figure 16: Educational approach within the sample groups

As far as their level of education is concerned, there are clear differences between the three groups, mainly between undergraduate and post-graduate levels (see Figures 17 and 18). In Group 1 the number of participants with an undergraduate or a postgraduate degree is quite high (14 and 7), whilst in Group 2 the number starts to decrease (nine and four) and in Group 3 it is almost non-existent (two and zero). In the latter, six participants were between 18 and 20 years old at the time of study: three of them had a vocational level of education, another one had a higher level and two were undergraduates at the time.



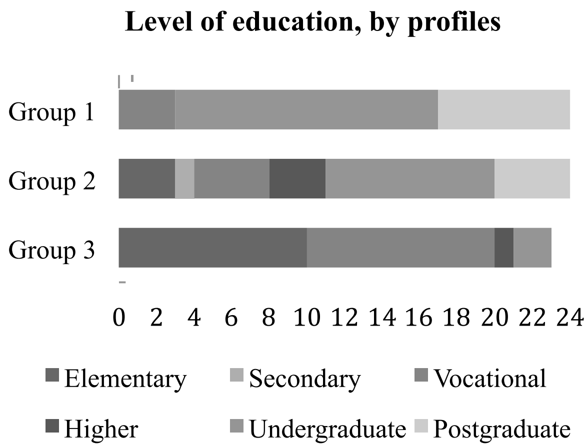


Figure 17: Educational level within the sample population

Figure 18: Educational levels within the sample groups

4.3.3.5 Reading habits and comprehension skills

Participants were asked about the number of hours a week they spend reading and whether they read every day. In addition, their level of reading comprehension in Spanish was assessed through a standardized test, which was specifically adapted and simplified for the purpose of this research. At a first instance, participants were going to be required to self-report on their reading skills, as it was done in the DTV4ALL project. However, as it was explained in Section 2.2.3, in the case deaf participants in Spain a certain degree of disparity was found between the self-reported level of reading comprehension and the evidence that was gathered through the questionnaires and eye tracking, that revealed that —despite spending more time reading the subtitles— almost 60% of them were not able to understand the information contained in the subtitles, suggesting a lack of reliability in their self-assessment. In order to avoid this situation and taking into account that their reading skills can have a strong impact on their performance (see Burham 2008 and Cambra et al. 2008, 2009, 2010 and 2015), it was decided to use a brief test to evaluate their level of reading comprehension before the tests.

As shown in Figure 19, the reading habits of the three groups differ substantially. One participant in Group 1 and six participants in Group 2 claimed not to read everyday, whilst in Group 3, 16 participants did not read on a daily basis. With reference to their weekly hours of reading, in Group 1, 23 participants claimed to read more than six hours a week, and the remaining one to read for at least four hours. In Group 2, two participants read less than one hour a week, five less than three hours, five more than four hours and eleven more than six hours a week. In Group 3, three participants did not read anything at all, eleven read for less than one hour a week, five read between one and three hours, one read for at least four hours and four participants claimed to read more than six hours a day.

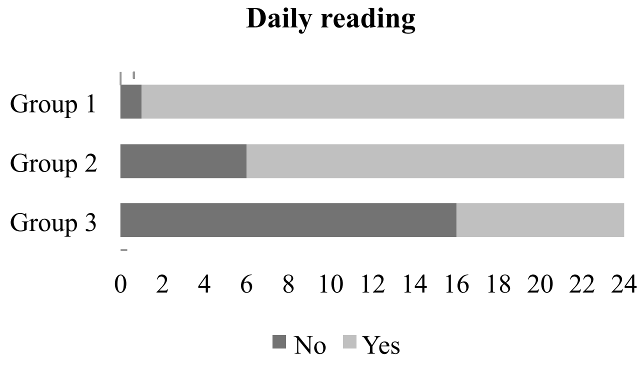


Figure 19: Daily reading within the sample groups

This shows a discrepancy between the three profiles in their attitudes towards reading, which might be linked to their reading skills. An additional test adapted from a standardized test was also used to elicit information about the Spanish reading comprehension skills of the participants. They were required to read a text of 325 words in Spanish from the book "*Caperucita en Manhattan*" (Little Red Riding Hood in Manhattan), written by the Spanish author Carmen Martín Gaité (1990), and to provide answers to a set of five open questions about the content of the text. This book is usually used for the evaluation of reading comprehension of children with an age of between 12 and 15 years old. The appropriateness of the use of this test in the study was assessed with the team of sign language interpreters in Multisignes. According to the number of correct answers of the participants, their reading skills were evaluated as "very bad", "bad", "regular", "good", "very good", or "perfect". This test was the only one administered in paper format and to be filled out directly by the participants. They were given ten minutes to read the brief text and to formulate the answers. Both the wrong answers and the unanswered questions were considered as incorrect. As shown in Figure 20, none of the hearing participants had difficulties in understanding the text and obtained very good results. Among the deaf participants, however, differences are found, but in general terms, the results confirm the problems that the deaf population encounter when understanding a written text.

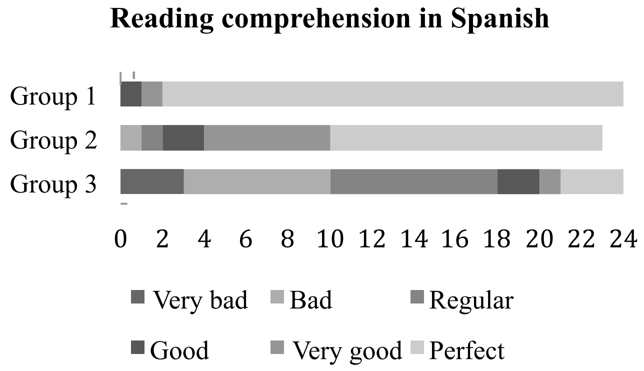


Figure 20: Reading comprehension results within the sample groups

Group 2 shows a greater variability: 11 of the 12 post-lingual deaf participants —one document was unfortunately misplaced— had a "good" (one), a "very good" (two) or a "perfect" (eight) reading performance. However, the results obtained by the pre-lingual deaf participants varied from "perfect" (five), "very good" (four), "good" (one), "regular" (one), to "bad" (one). In Group 3, a few of the participants claimed to not understand the questions or to have problems with the vocabulary and were not able answer all the questions. One participant in fact did not fill out the questionnaire. Thus, 18 deaf/sign language participants obtained "very bad" (three), "bad" (seven), or "regular" (eight) results. Only six participants understood the meaning of the text: two obtained a "good" result, one a "very good" result, and three an "excellent" result. These last four exceptions corresponded to the youngest participants (18-20 years old): three of them had studied with a bilingual approach in an integrated school, whereas the fourth one was the P72 whose specific background has already been detailed. These good results seem to reinforce the idea that reading proficiency in pre-lingual deaf individuals could be more related to an early and steady acquisition of any modality of language than to the amount and intensity of oral or spoken training. However, due to the limited number of participants with a reading performance comparable to the one obtained in the group of hearing people, they should be seen as isolated cases.

4.3.3.6 Listening comprehension skills and familiarity with the stimuli

In order to prevent that the hearing participants with a high level of English would focus on the audio and would not read the subtitles, the listening comprehension skills of some of the participants in Group1 were assessed through an additional and brief test on listening skills.

First, the level of knowledge of English was self-reported by the participants. Those who claimed not to know or understand any English (six participants) did not carry out the test and were placed in the group of participants that would watch the videos with the soundtrack. In the same way, those who claimed to have very good or excellent level of English (three participants) were assigned directly to the mute condition. The remaining participants (15), in order to be assigned a condition, were required to watch one minute of the film "The Royal Tenenbaums" (Wes Anderson, 2001) in English without subtitles and to answer five multiple-choice questions. The questionnaire was administered in paper format to be filled out by the participants. It was intended to correct the questionnaire *in situ* in such a way that the participants who answered all or most of the questions correctly would watch the videos in mute. As shown in Table 10 (Section 4.1 about the experimental design), the participants from each group were distributed in pairs in such a way that each pair would watch the exact same two speeds of exposure. In the case of the hearing profile, it was planned that one participant from each pair would watch the film fragments without sound. However, it was difficult to match the participants to a suitable condition according to their level of English listening comprehension skills and to meet these distribution requirements at the same time. This process was not well planned and mistakes were made in the assignment and some of the hearing participants with a high level of English listening comprehension ended up watching the videos with sound (see for instance P2, P4, P6 and P8 in the following table).

PARTICIPANTS	CONDITION	SCORES	PARTICIPANTS	CONDITION	SCORES
P1	Mute	-	P13	Mute	-
P2	Sound	60,00%	P14	Sound	-
P3	Mute	60,00%	P15	Mute	-
P4	Sound	100,00%	P16	Sound	40,00%
P5	Mute	60,00%	P17	Mute	60,00%
P6	Sound	60,00%	P18	Sound	-
P7	Mute	-	P19	Mute	60,00%
P8	Sound	60,00%	P20	Sound	20,00%
P9	Mute	60,00%	P21	Mute	80,00%
P10	Sound	20,00%	P22	Sound	0,00%
P11	Mute	-	P23	Mute	-
P12	Sound	0,00%	P24	Sound	-

Table 13: Assignment of hearing participants to a sound condition and scores in English listening comprehension.

Additionally, the length of the video turned out to be too short for an adequate assessment of the skills. Some of the participants who self-reported a good level of English listening comprehension and carried out the test were not able to concentrate and answer the questions (see P12 and P22). Finally, for all these reasons, this variable (the sound condition according to the participants' English listening comprehension skills) was not included in the analysis.

In the same way, participants were indirectly asked whether they had ever watched the two films from which the two sequences were extracted: "Cassandra's Dream" and "Slumdog Millionaire". At the beginning of the sessions the volunteers were required to indicate which films from a list of seven films they had watched. 18 participants from Group 1, 16 from Group 2, and five from Group 3 had watched "Slumdog Millionaire" at least once; and one participant from Group 1, and three from the Group 2 had watched "Cassandra's Dream".

4.3.3.7. Habits and preferences

This section presents the data obtained immediately after the experimental stage, in a post-stage. A final questionnaire was used to obtain information about the habits and preferences of the participants. It was delivered orally to the participants at the end of the experimental stage, once they had watched the two videos and had answered their corresponding set of questionnaires. It includes information about the habits of the participants watching audiovisual media with subtitles and about their opinion and preferences regarding the current rates of subtitling speed and the availability and quality of subtitles in different formats.

The first part was focused on the participants' habits of watching with subtitles and consisted of six questions: one scale question about the frequency of consumption of subtitles; one yes or no question on whether they view subtitled programs every day; one multiple choice question about the number of hours of subtitles consumption in a week; one multiple choice question about why they use subtitles; one multiple choice question about the program and format most watched with subtitles; and one scale question about the frequency with which they face difficulties when reading the subtitles.

The second part consisted of a set of questions about the participants' opinion and preferences: one open question about their problems and views on the presence and the quality of current TV and DVD subtitles; three scale questions about their opinion on the speed of pre-recorded, live and DVD subtitles (ranging from "too slow" to "too fast" with the option not to answer); and an open question about their preference for subtitles and sign language interpreting on TV.

Media consumption: habits of watching with subtitles

In Group 1, seven participants never used subtitles, 11 consumed them from "sometimes" to "always" and six only with certain films and series. In general, Group 1 did not use the subtitles on TV but on the Internet, on DVD or in the cinema; except one participant, whose girlfriend was deaf, and consumed subtitles in all formats. Generally, those who used subtitles were not exposed to them on a daily basis. Among the reasons for the use of subtitles, the most common one was the aim of improving their L2 skills —mainly English— or a preference for the original, un-dubbed versions. Most of them "never" or "almost never" had problems to read the subtitles, except for four participants who claimed to face difficulties "sometimes".

In Group 2, 19 participants claimed to use the subtitles "always" and 20 consumed them on a daily basis for more than four hours. Surprisingly, one participant never used them, as he made use of special headphones that transferred the sound directly to the hearing aids. In general, Group 2 used the subtitles in all formats and for all programs. 11 participants considered the subtitles as a support to understand the dialogue, whilst another 11 participants considered them as the only guarantee to access the dialogue. In addition, nine participants considered the subtitles as a way of improving their L1 skills. Most of them "never" or "almost never" tended to have problems to read them, although eight people claimed to experience difficulties "sometimes" or "often".

Group 3 also used subtitles in all formats and for all types of programs. All the participants' —except one who admitted that it was tiring and effort consuming— used them on a daily basis and for more than four hours. All the participants considered subtitles as the only way they have to access the dialogue, and thirteen added that it also allows them to improve their language skills, especially in terms of vocabulary acquisition. However, they claimed to frequently experience problems when reading subtitles. Only six participants admitted to "never" or "almost never" experiencing difficulties.

Opinion and preferences

Participants were asked to explain the difficulties and problems they face, as well as their views on the current situation regarding the presence and the quality of the subtitles in different formats (TV, DVD, Internet, cinema). They were also required to evaluate the speed of current subtitles in pre-recorded TV, live TV and on DVD, according to a 1-to-5 scale (from “too slow” to “too fast”) and including an option not to answer (NR/DK).

When asked about the problems they had to deal with when reading the subtitles, participants from Group 1 mentioned the lack of synchrony, the lack of literalness of the subtitles in relation to the spoken dialogue and the lack of time to explore the visual content. Apart from this, they also referred to the uneven quality of the subtitles depending on the format and on the provider, and to aspects of typography (i.e. font type and size of the subtitles). In relation to the speed of the subtitles, very few participants had an opinion and were able to provide an assessment, especially in the case of live subtitling. Those who answered, however, generally found the speed comfortable in both TV and DVD format.

In Group 2 participants also mentioned the complexity of the vocabulary in the subtitles, the spelling errors and the technical mistakes, and the delay in the live programs. When asked about their opinion, they highlighted the lack of synchrony of the subtitles on TV, the lack of time to read and explore the visuals and, mainly, the lack of literalness of the subtitles and its excessive condensation. They were critical regarding the quality of the subtitles of live programs, which, according to them, contain more mistakes and have a longer delay, thus being impossible to follow. However, what seemed to be more annoying for them was the lack of programs available with subtitles. Most complained about the nonexistence of cinemas with SDH and about the shortage of DVDs with SDH. Instead, they were used to go to the cinemas that offer original versions with subtitles and buy and rent DVDs with standard interlingual subtitles. In general terms, they had a better opinion about cinema and DVD subtitles than of subtitles on TV and tended to make more use of DVDs, as they offer the option to pause and reread the subtitles or even to consult the vocabulary. As far as the speed of subtitles is concerned, they seemed to be more satisfied with speed on the DVD format. In the case of the speed of live subtitles, 17 participants decided not to evaluate it. They claimed to prefer not to activate the subtitles due to the frustration that delay and mistakes cause them. As for the speed of pre-recorded subtitles on TV, half of the group considered it as comfortable, although for seven participants it was fast.

Group 3 shared some of the problems identified by the other two groups, mainly the technical mistakes and the delay, the complexity of the vocabulary and the lack of time to read and to explore the visuals. Like Group 2, they also complained about the quality of live subtitles, the uneven quality of the pre-recorded subtitles depending on the format and the provider, the lack of availability of subtitled programs and the nonexistence of cinemas and DVDs with SDH. In general terms, they perceived better quality in DVD and cinema subtitles and were critical regarding subtitling on TV. As for the lack of literalness and the excessive condensation, some participants reclaimed the right to have the exact information as the hearing viewers but, interestingly, two participants preferred reduced and simplified subtitles. When it comes to the evaluation of the speed of pre-recorded programs, different options were found. Four participants thought that it depended on the channel or the program, eight considered that it was comfortable enough to read, and 12 evaluated it as fast or to fast. As with Group 2, half of the group avoided evaluating the speed of live subtitles, and almost the other half (nine participants) considered it as fast or too fast. Half of the group also avoided evaluating the speed of DVD subtitles as they claimed that they do not use this format as much as the TV or the Internet, but for the remaining participants it was comfortable.

The use that Groups 2 and 3 made of the subtitles differed substantially from Group 1. Group 1 tended to select specific series and films that for personal reasons they prefer to watch with subtitles, and usually did not use the TV for this purpose but other formats. In the case of Groups 2 and 3, however, the TV was the most consumed format and they consumed all types of programs with subtitles. Group 2 and Group 3 differed in the reasons for the use of subtitles: whereas half of the former group saw the subtitles as an assistance, all the participants in the latter group considered them not as a support but as the key to access the information.

A question that arose in the course of the pilot test with the first deaf/sign language user participant was incorporated in the last instance. Those participants who were sign language users were asked about the preference for subtitles or for sign language interpreting on screen. 14 participants preferred the presence of interpreting in the programs where the information takes precedence, such as the news and other live similar events. On the contrary, they preferred the use of subtitles for films, series, documentaries and similar programs. According to them, as they can obtain all the information from it, the presence of the interpreter would attract all their attention and they would not have time to explore the visuals. Although the interpreter provides them with confidence, they thought that the use of both systems would be excessive. As mentioned by one participant, when the two systems are used simultaneously they tend to be different in terms of the standardization of the signs used and this might be confusing. Among the rest of deaf/sign language users, only one preferred to have sign interpreting for all the cases, five preferred to have subtitling always and four preferred the use of the two systems together (although two of these participants made the exception of films, in which case they would prefer to have only subtitles). 14 participants preferred the presence of interpreting in the programs where the information takes precedence, such as the news and other live similar events. On the contrary, they preferred the use of subtitles for films, series, documentaries and similar programs.

These results are in line with what was reported in the DTV4ALL project for most of the countries but, surprisingly, they partially contradict the results of Arnáiz (2015a) in Spain. In all the countries subtitling was the preferred method of accessibility, except in Spain, where the majority opted for sign interpreting. In this case, only one participant opted for sign interpreting for all cases.

4.4 Audiovisual material

This section presents the process of selection of the experimental material: from the establishment and definition of the selection criteria (Section 4.4.1) to the description of the choices (Section 4.4.2 and 4.4.3), which includes information about both film techniques and dialogue. Section 4.4.4 provides information about how the narrative of the two film fragments selected was assessed in order to build the comprehension questionnaire and finally, Section 4.4.5 describes the process of how the subtitles were adapted to the three speeds of subtitling exposure that were tested in the study.

4.4.1 Selection criteria and procedure

I was looking for two videos that ideally would be substantially different from a visual point of view. Interest was focused on fiction films, expected to present a more solid narrative structure and a frequent use of film and storytelling techniques and the search was limited to DVD films that had been released in the last decade. As a great deal of deaf participants would rely on lip-reading to get access to and understand speech even with the presence of subtitles, films in Spanish and Catalan were avoided. Equally, given that some deaf participants have residual hearing that together with the use of hearing aids or implants would allow them to understand the audio and prevent them from reading the subtitles, foreign films dubbed into these languages were also avoided. Therefore, I opted for films with the soundtrack in English, which in addition is the most popular language in the Spanish audiovisual market.

In order to be able to test the impact of three different subtitling speeds of exposure, both videos should have a continuing dialogue at a speech rate that is suitable for high-speed subtitles. However, in order to be able to explore how the verbal information that is conveyed in the subtitles and the visual information that is displayed on the image are integrated and prioritized during the process of reception, the two videos should present a different combination of visual and verbal elements. In one of the videos, and in terms of the construction of the narrative, the verbal information should take precedence over the visual information, whereas in the other video the visual information should be more prominent. For the purpose of this research, it was agreed that significant divergence on the use of the film techniques could to a certain extent indicate differences in the degree of combination of verbal and visual elements.

As the eye movements of the participants were going to be tracked and recorded —and based on what was found out in the pilot tests carried out in the DTV4ALL project (see Romero-Fresco 2015a)— it was decided that the videos should not be longer than two minutes. According to the results obtained in the first of the two pilot tests that were conducted in Spain, they concluded that 1.30 minutes was an optimal duration as longer videos resulted in a drop in attention patterns. The aim, thus, was to increase the probability that the participants would watch and focus on the videos without exceeding their attention span and being distracted. However, as the research also analyses how the audiovisual information is processed and understood, despite its brevity the videos should present a coherent narrative. According to the different narrative theories of film studies the organization of a story into a sequence tends to follow the same patterns. Especially in mainstream cinema, the way in which a story is arranged around the characters, the action and the location tends to have a common structure. According to Branigan (1992), this narrative structure —which is applicable to whole films and to minor units such as sequences— includes the following elements or stages: the introduction of the setting and the characters, the explanation of the state of affairs, the initiating event, the statement of the goal of the main character(s), the complicating action(s), the outcome(s) and the reaction(s) to the outcome(s).

Due to the selection criteria established, the task of selecting the two film sequences was laborious. The choice of films was extensive and so I decided to take the film catalogue of the Spanish distributor *Cine Accesible*[18] as a starting point. It provides regular access for people with sensory impairments to the screening of recently released films in several Spanish movie theatres. It also offers a service of DVD rental and an online video store with accessible films. I asked them to provide me with the catalogue in order to base the selection of films on it. At that point it included 44 Spanish and international films, mostly fiction films. After having watched the films that were expected to fit into the criteria, only these two sequences were found to fulfill all the requirements expected: one from the film "Slumdog Millionaire"[19] (2008) by Danny Boyle and one from "Cassandra's Dream"[20] (2007) by Woody Allen.

It was then agreed to include a question to assess the ability of the participants to infer information. To be able to ask the participants to guess the consequences of the events that were presented in the scenes, it was necessary to cut them in a way that the narrative elements that would correspond to the "outcome" or to the "reaction of the outcome" remained unresolved, but without altering the viewing experience and the overall narrative structure. The video from "Slumdog Millionaire" had a total duration of 00:01:34 (from 00:40:29 to 00:42:03) and the video from "Cassandra's Dream", a duration of 00:01:30 (from 00:34:25 to 00:35:58). I purchased the two DVDs from *Cine Accesible*, then cut and exported the selected videos.

4.4.2 Video 1

This scene was chosen because the visual information was more abundant and dominant in the narrative, contributing to a greater degree to the construction of the meaning. It consisted of 30 shots, which in general were much shorter and diverse in terms of type, angle or lighting than the scene from "Cassandra's Dream". This scene, in addition, showed three

[18] Cine Accessible is a project of *Navarra de Cine* and Orange Foundation. See: http://www.cineaccesible.com
[19] See in IMBD: http://www.imdb.com/title/tt1010048/?ref_=nv_sr_1
[20] See in IMBD: http://www.imdb.com/title/tt0795493/?ref_=nv_sr_1

different locations instead of only one, and the three characters were not in isolation but surrounded by more people.

The scene starts with a distracted young Indian boy standing up on a wall, next to an entrance through which people are coming in and out. A middle-aged couple talks to him with a travel guide in her hand. With a foreign accent, she over-pronounces as she asks him about the time of the next tour to see the Taj Mahal. The kid looks at a sign up next to him that reads: "Guided tours. Visitors are requested to collect receipt by order". He attempts to say something but the woman interrupts him: they are in a hurry and would be willing to pay extra. The man gives money to the boy, who puts it in his back pocket. This part has a total duration of 28 seconds and is formed by fifteen shots, mostly semi close-up or close-up shot-reverse shots that show us the boy and the couple while they are talking. The camera also cuts to the three characters in ¾ shots. They are on the inside of an entrance, next to a door through which light enters. The scene is relatively dark and the light creates shadows. In the background, we start to notice the architecture of the place.

Now in the outdoors, we see the boy walking quickly thorough the road that leads to the front of the Taj Mahal. The couple, a meter away, hurries to follow him. The boy turns back to them as he explains his version of the history of the mausoleum based on funny facts that the woman tries to check with her travel guide. Finally, she points out that her guide does not say that to which the boy replies irreverently. This part has a length of 41 seconds and consists of 12 different shots, mostly semi close-up and close-up shot-reverse while the camera moves forward with the characters. It also includes a long shot of the Taj Mahal and two full and side shots of the three characters together. The sun is shining and illuminates the scene.

After the cut, the characters are inside of the Taj Mahal visiting the tomb. The woman asks about the cause of death and the boy tells them about it, although the man does not seem to be in accordance with the explanation. The scene is relatively dark and we see the shadows of people crossing in front of the camera. This final part of the scene has a total duration of 22 seconds and consists of two shots that show us the three characters in a medium shot. Before the end of the video, we see a last frontal shot of the Taj Mahal while the music plays. In the video, after the cut, we see how the couple reacts to the tour. However, this part was removed in order to be able to ask the participants about how they think that the couple is going to react.

The conversation starts at 00:00:06. The boy speaks most of the time and the couple takes part with short sentences and questions. The dialogue has 195 words (see Table 14). Taking into account the duration of the video and the start and end times of the dialogue, the speech rate per second would be of 2.29 words (137.4 wpm).

CHARACTER	DIALOGUE
WOMAN	Please, please. What time is the next tour? We're on a very tight schedule, you see. Have to see the Red Fort this afternoon.
AMIR	Err…
WOMAN	Would it be possible to show us around now? Obviously we understand it would cost more for just the two of us...
AMIR	But of course, madam. Please, follow me.
AMIR	The Taj Mahal was built by the emperor Khurram, for his wife Mumtaz who was the maximum beautiful woman in the world. When she died, the Emperor decided to build this five star hotel for everyone who would like to visit her tomb... but he died in, in 1587, before any of the rooms were built, or any of the lifts. But the swimming pool, as you can see, was completed on schedule in top class fashion.
WOMAN	It says nothing of this in the guidebook.
AMIR	The guidebook was written by a bunch of lazy, good-for-nothing Indian beggars.
WOMAN	Oh.
AMIR	And this, Lady and Gentleman, is the burial place of Mumtaz.
WOMAN	How did she die?
AMIR	A road traffic accident.
WOMAN	Really?
AMIR	Maximum pile-up.
MAN	I thought she died in childbirth.
AMIR	Exactly, Sir. She was on the way to the hospital when it happened.

Table 14: Original dialogue from Video 1

4.4.3 Video 2

This scene was chosen because the visual information displayed was considered to be relatively scarce, more static and not dominant in the narrative, being primarily based on the verbal language. In this section, the scene will be analysed from a visual and verbal point of view. It must be noted that the aim here is not to offer a comprehensive analysis of camera shots, movements, angles, lighting and *mise-en-scène* in the scene but to provide a general description of film techniques.

The video starts as a long shot with three men with their back towards the camera; it is raining and they are heading for the grove in front of them. The camera moves slightly, accompanying the movement of the men, as they get close to the trees. It is relatively dark, the light illuminates the right side of the frame but the rest remains in darkness. All three of them are wearing suits. The shot has a length of seven seconds and has no dialogue. The only sound is the one of the rain pouring down. In the second and the last shot, the camera is placed within the grove under the trees. The natural light tries to come in and some branches of the trees are at the forefront. The men seek shelter from the rain and place themselves in a circle in the center of the image. As they start the conversation, the camera starts an arc shot: it moves slowly around the three men, tracking in a semicircle and somehow adding drama to the scene as it gets slightly closer to them. The camera circles around the oldest character (named “Uncle Howard”), the only one with a light suit, who opens and guides the conversation with his nephews. The faces of the three characters are covered up at some point by the tree leaves and branches. The duration of this shot is 1 minute and 23 seconds.

The conversation starts at 00:00:10, and it is Howard who speaks most of the time. His nephews participate with brief statements and questions. Howard, who at some points seems to hesitate, explains that he is going through troubles with Martin Burns, a former member of the staff from his business company. He appeals to family values and asks them for a favor, which is not revealed to them at that moment, but which does not seem to be an issue of money. After the cut, Howards reveals that he wants them to “get rid of him”. However, and as explained above, this final part was finally removed. This way the participants could be asked about what they think he is going to ask for. The complete dialogue has 246 words and is provided in the following table (Table 15). Taking into account the duration of the video and the start and end times of the dialogue, the speech rate per seconds would be of 3.075 words (184.5wpm).

CHARACTER	DIALOGUE
UNCLE HOWARD	Well, um, I think you'll agree that family loyalty cuts both ways.
TERRY	Oh, without a doubt.
UNCLE HOWARD	And thank God I've never had to ask you for anything... but, uh, the time has come when, uh, I need your help.
TERRY	Name it, Uncle Howard.
IAN	Anything.
UNCLE HOWARD	Well, I seem to have got myself into a little situation.
TERRY	Yes?
UNCLE HOWARD	Well, uh, actually, it's, uh- it's-it's more serious than that. And, uh, after much thought, there don't seem to be many options.
TERRY	Right.
UNCLE HOWARD	Well, there's going to be a review in a few months... an investigation into my, uh, business affairs, you know, the foundation and the clinics, and, uh, there's a former member of staff... who is prepared to talk about things that could be extremely detrimental to me. I… Extremely.
TERRY	But surely you have nothing to worry about.
UNCLE HOWARD	Well, to be quite candid, I- I really can't allow a colleague called Martin Burns... to give certain evidence.
TERRY	But why? Sorry, I'm not following.
UNCLE HOWARD	Well, I'm in a very vulnerable position and the consequences could be dire.
IAN	Well, what are the options? Is this Martin Burns unwilling to listen to reason?
UNCLE HOWARD	Well, unfortunately, I've had several discussions with him, and he just won't see it my way.
IAN	Well, why not? Is it not just a question of money?
UNCLE HOWARD	Well, not really. I don't think compensation would change his mind... and, to be quite honest, it's not a road I really want to go down.
IAN	Well, what then?
UNCLE HOWARD	Uh…
UNCLE HOWARD	I think Burns has to be got rid of.

Table 15: Original dialogue from Video 2

4.4.4 Narrative assessment

In order to assess the ability of the participants to comprehend the narrative of the scenes, to recall and process its verbal and visual information and to infer the consequences in the narrative, it was necessary, first of all, to establish the measures of assessment. The identification of the correct answers to these questions was carried out through a control test with eight native English speakers. As the recording of the eye movements of these participants was not needed at this stage, the laboratory setting that was going to be used during the experiment was not used. The participants were recruited in a hostel in Barcelona.

Four male and four female native English speakers aged between 21 and 45 years old (with an average age of 31 years) signed the consent to participate in the test, which had an average duration of ten minutes. They watched the videos on an Ipad screen placed on a table in a separate room and with headphones. They were asked to watch the videos once, in English and without subtitles, and to provide an answer to the questions that follow. In the questions that included two parts, the second part was added with the aim to delimit the scope of the questions and thus to avoid ambiguity.

1. Assessment of narrative elements in the video from "Slumdog Millionaire"
    - Who are the main characters?
    - What is the plot of the video?
    - At the beginning of the scene, how does the woman approach the boy?
    - The man gives the boy some money. What does the boy do with it?
    - The characters visit the grave of the ex-emperor's wife. What does the boy explain about her death?
    - Can you guess how the couple would react at the end of the guided tour? Are they satisfied with the tour?
2. Assessment of narrative in the video from "Cassandra's Dream"
    - Who are the main characters?
    - What is the plot of the video?
    - How would you define the mood of the oldest character? On what basis?
    - Regarding their clothes, is there anything in particular that attracts your attention?
    - What kind of clothes do they wear?
    - Who is threatening the oldest character? What are his intentions?
    - Do you think the oldest character wants to ask the young ones for something? Can you guess what he would ask them?

All the native participants were able to provide a valid answer to the above questions: they identified the characters and their relationship, understood the gist of the story, recalled the verbal and the visual information (most of them) and inferred the narrative consequences.
Based on their answers, a qualification framework was established that allowed for the evaluation of the comprehension of the hearing, deaf and deaf/sign language participants that took part in the final and definitive study.

4.4.5 Subtitles

The subtitling into Spanish was commissioned to a professional translator specialized in audiovisual translation and with more than five years experience. The two videos were sent to him, together with the dialogue list and a copy of the UNE 153010 Spanish standards for SDH (AENOR 2012). He was required to follow the guidelines included in it, especially in terms of subtitling speed. As stated in the UNE 153010, the speed of the subtitles should then be in accordance with the rhythm of the original speech and suitable for comfortable reading, without exceeding the average of 150 wpm (15 cps). The translator produced two .srt files with the subtitles. In the case of the subtitles for "Slumdog Millionaire", it consisted of 26 subtitles (twelve one-line subtitles and fourteen two-line subtitles) that did not exceed 15 cps, and with a total average of 12.23 cps. The subtitles for "Cassandra's Dream" consisted of 27 subtitles (seven one-line and twenty of two-line) that only exceeded the 15 cps once and had an average of 13.67 cps. The text contained in the subtitles provided by the translator was not modified, but the exposure times, and therefore its segmentation, were changed in order to be adapted to the three proposed levels of speed of subtitling exposure. Once they were generated, the different versions were embedded into the videos, applying the color code for the identification of characters established in the UNE 153010 (2012). This way, each video had three experimental versions:

1. Slumdog Millionaire/ Low speed: It consisted of 21 subtitles (five one-line, and sixteen two-line). One subtitle exceeded the 15 cps, but the average density was 09.90 cps.
2. Slumdog Millionaire/ Medium speed: It consisted of 28 subtitles (eleven one-line, and seventeen two-line). Three subtitles slightly exceeded the 15 cps, but the average density was 10.39 cps.
3. Slumdog Millionaire/ High speed: It consisted of 41 subtitles (thirty-five one-line, and six two-line subtitles). Five subtitles slightly exceeded the 15 cps, but in average the density of the whole set of subtitles was 11.22 cps.
4. Cassandra's Dream/ Low speed: It consisted of 22 subtitles (two one-line, and twenty of two-line). One subtitle slightly exceeded the 15 cps, but the average density was 10.91 cps.
5. Cassandra's Dream/ Medium speed: It consisted of 27 subtitles (three of one-line, and twenty-four two-line). Two subtitles slightly exceeded the 15 cps, but the average

density was 11.26 cps.

6. Cassandra's Dream/ High speed: It consisted of 43 subtitles (thirty-three one-line, and ten two-line). Eight subtitles slightly exceeded the 15 cps, but in an average the density of the whole set of subtitles was 11.79 cps.

In terms of the number of subtitles, the medium versions are the most similar to the versions provided by the translator. In the short versions, as they stay on screen for a short period of between one and two seconds, the number of subtitles increments substantially. In the long versions that stay on screen for between four and six seconds the number of subtitles decreases. The former have more one-line subtitles, and the latter have more two-line subtitles. In terms of the number of cps, it is to be noted that due to the adaptation to the types of speed of exposure it was not possible to respect the maximum of 15 cps in all the subtitles. An attempt was made to reduce the number of such cases and, more importantly, not to surpass the average of 15 cps. The six experimental versions have a slightly lower average of cps than the versions provided by the translator. The short versions show a higher cps than the other two versions, which would imply fast reading, especially if compared to the long versions with a lower average that would allow for slower reading.

4.5 Tools for data collection and procedure

Section 4.5.1 will introduce the eye-tracking tool that was used to elicit data in the stage of response and Section 4.5.2 will present the set of questionnaires that were used to collect the information related to the stages of reaction and repercussion. Section 4.5.3 will provide information about the procedure that was followed.

4.5.1 Eye tracking

In order to study the stage of response and to collect data about the attention allocation of the participants while they were watching the two videos with the different speeds of subtitling exposure, eye-tracking methods were used to measure the eye movements of the participants.

4.5.1.1 Eyes movements and areas of interest

Eye tracking is the process of measuring eye positions and eye movements. According to Holmqvist (2011), the two most relevant types of eye movements are fixations and saccades.

As defined by Pollatsek and Rayner (2006), fixations correspond to the moments in which the eyes, in order to encode information, are relatively still and focused on a particular point. In audiovisual translation, fixations are the most commonly used measure (Perego 2008). The duration of a fixation on a particular point can be highly variable, according to Duchowski (2007), as well as its number. The average fixation duration in reading in print is about 200 to 250 milliseconds, although there is considerable variability with some fixations under 100 and some over 500 depending on the type of task and type of text, among other factors.

As defined by Holmqvist et al. (2011), saccades are the rapid movements made by the eyes when moving from one fixation point to another. During the saccades the eyes do not acquire and process information. The duration of a saccade is very short: from 30 to 80 milliseconds on average (20 to 50 according to Rayner 1998). The average fixation duration in reading subtitles, however, and according to the findings obtained in d'Ydewalle and de Bruycker (2007), is approximately 178 milliseconds. Thus, and as stated by Dwyer (2015) "it would seem that the subtitle conditions blur the boundaries somewhat between saccades and fixations, scanning and reading".

Based on the eye-mind hypothesis formulated by Just and Carpenter (1980) that assumed that only the regions where the eyes are fixed are cognitively processed, eye movements are expected to provide valuable information about cognitive processes in such a way that the number and the length of the fixations can be interpreted in terms of cognitive load or effort. As eye-tracking software allows for the demarcation of different areas of interest —the area of the subtitles and the area of the image in the case of subtitling research— by analyzing and comparing viewers' fixations on them we can obtain valuable information about how these two areas are prioritized and processed.

4.5.1.2 Types of measures

On the basis that information from a scene is taken during fixations rather than during saccadic movements, this study will focus on fixations. It is assumed that higher cognitive processes can be reflected by an increase in the number and the length of the fixations, so two types of fixation data will be analyzed: count and temporal. Data will be taken separately from the area of the image and the area of the subtitles so the demands of each activity —reading the subtitles and viewing the image— can be compared and contrasted in order to see how they have been processed and prioritized. If this information is combined with qualitative information collected from other tools —such as questionnaires or surveys— we can obtain valuable data that will help us determine the reasons why one area received more fixations or was fixated for longer than the other.

Temporal data: fixation duration

By calculating the fixation duration we obtain information about for how long a participant —or a group of participants— has looked at the images and for how long he/she has looked at the subtitles. This is expected to be the best indicator of the distribution of attention between these two regions. As mentioned in Section 4.2.2.3, two types of data will be taken into account in relation to the fixation duration: total fixation duration and mean fixation duration.

- Total fixation duration: the sum of the duration of all fixations with the area of the subtitles and the area of the image. It will be also expressed in terms of percentage, calculated by comparing the total fixation duration within both areas. This measure will provide information about how participants cognitive process and prioritize the reading of the subtitles and the viewing of the images.
- Mean fixation duration: the sum of the duration in milliseconds of all the individual fixations of a participant on the subtitles and the image, divided by the number of fixations on each area. This measure will provide information about the cognitive effort involved in reading the subtitles and viewing the images.

Count data

Two types of count data will be analyzed: the number of fixations within the area of the images and the area of the subtitles, and the number of visits within them.

- Fixation count: the number of fixations that a particular area receives —in this case the image and the subtitles— can provide information about how this area is processed and prioritized. A higher number of fixations on one area could indicate that the processing of it required more cognitive effort. The percentages of fixations are calculated based on the total number of fixations within each area in relation to the total number of fixations.
- Visit counts: a visit is defined by the interval of time between the first and the last fixation within a particular area. Calculating the number of times that the area of the subtitles and the area of the images is visited can provide insightful information about how participants manage to shift attention from one area to the other.

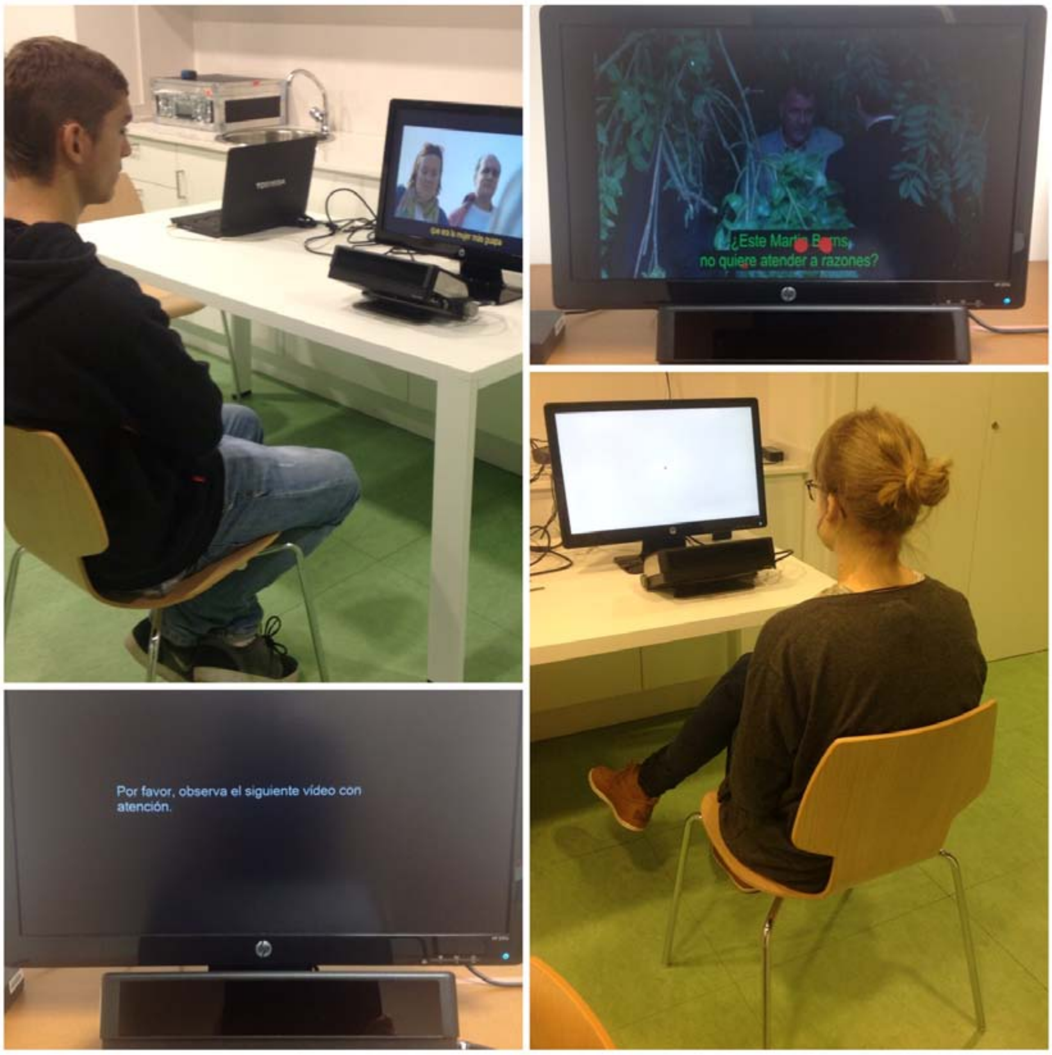
4.5.1.3 Data quality

As mentioned in Section 4.1, eye-tracking methods might lead to higher amounts of data loss due to its sensitivity to a range of aspects, including lighting, distance to the device, etc. Some authors assume up to a 25% of data loss rate and suggest including a similar percentage of extra participants in order to counteract the amount of poor-quality data. In order to be able to calculate the percentage of data loss, first it is necessary to establish a threshold level for the quality to the data. Some authors rely on the mean fixation duration to assess the quality of the eye-tracking data and establish the minimum mean fixation duration required to be considered as valid data for analysis. However, there is not a consensus about the minimum required, and several measures are used depending on whether we are analyzing one- or two-line subtitles, adults or children participants, etc. Some of the latest studies on the reception of audiovisual translation (Caffrey 2009 and Orrego-Carmona 2015) opted for a different method and established a minimum percentage threshold of 85% of gaze time on screen to be considered as valid data. The calculations in percentages were carried out individually by dividing the total duration of the recorded gaze by the total media element duration, multiplied by 100 to obtain the percentage of data recorded in comparison to the percentage of data that could have been recorded.

4.5.1.4 Eye-tracking equipment

The eye-tracking model used was a video-based Tobii X120, a standalone and independent device that can be connected and applied to a range of setups. In the case of this study, it was installed under a 23” LCD monitor[21] (see picture below). Through an infrared light it records the reflections on the cornea of the participants and calculates the position of the gaze on the screen. This eye-tracking model registered the eye movements of the participants every 8.3 milliseconds at a rate of 120Hz, providing an average accuracy of 0.5 degrees. It was connected to a laptop with the eye-tracking software Tobii Studio. This software was used for the design and preparation of the eye-tracking tests as well as for the analysis of the data. As the eye-tracking device collects a considerable amount of different data, the software allows for the use of a fixation filter (in this case the IV-T) to filter out the fixations from the raw eye-tracking data.

[21] Specific details of the monitor: 2311x58/ 4-cm/ 23-inch. Led backlit LCD HP monitor.



Picture 3: Images of the monitor and the eye-tracking equipment with two participants

The eye-tracking software allows the design and creation of a project with as many tests as required by the experiment. In the case of this study, taking into account the use of two different videos, and the existence of three versions of each in relation to the three subtitling speeds of exposure, twelve tests were defined. Each test gathered the data of six participants, two from each of the groups (two hearing, two deaf and two deaf/sign language users).

Each test consisted of a sequence of six elements: a first set of instructions that indicated the participant to watch the first video, a first movie —one of the videos in AVI format displayed at its corresponding subtitling speed of exposure—, a second set of instructions that indicated the participant to answer a set of questions, a new set of instructions that indicated them to watch the second video, the second movie —the other video in AVI format displayed at its corresponding subtitling speed of exposure— and a last set of instructions that indicated them to answer another set of questions. The two videos had a resolution of 1920×1080. When the participants answered the questions, the recording was intended to be placed on pause and I stood in front of the participants in order to prevent them from suddenly changing their body posture, as it was important to try and maintain a constant distance between the participant and the eye tracker.

In order to divide the area of the images of the videos into two AOIs, specific interactive AOIs were established for each of the six versions of the videos, as they presented differences in the exposures times of the subtitles and its segmentation (see Section 4.4.5). Thus, the subtitles AOIs were established manually one by one by activating and deactivating them on a frame-by-frame basis according to the start and end times of each subtitle. The process of identification of the AOIs within the set of six videos consumed a lot of time but it guaranteed an accurate distribution of the areas of analysis that allowed for a reliable comparison of the three subtitling speeds of exposure.

4.5.1.5 Development of the tests

The equipment had to be moved to four different locations in order to accommodate the expected number of participants and the whole process had a total duration of almost eight months. The lapse between the first and the last tests and the difficulty to replicate the exact laboratory conditions in the different locations made it mandatory to take precautions that increased the time for the preparation of each setting. A protocol was applied with the aim of maintaining a high consistency in the preparation of the laboratory setting in terms of lighting, type of chair, availability of a separate room, distance between the equipment and the participant, etc., as well as maintaining the clarity in the instructions provided to the participants.

In the first location, the laboratory was set up intermittently in a room on the premises of the company Multisignes in Banyoles (Girona). In the second location, the laboratory was set up for five days on the premises of the association ACAPPS in Barcelona. The third location was a room at the public library El Clot-Josep Benet in Barcelona and the fourth and final location was a room at the University Rovira i Virgili, located in Tarragona. In all the settings, the eye tracker was placed below the same monitor and the participants were seated at approximately 60cm from the eye tracker. After answering the questionnaire of the pre-stage, the participants entered the laboratory individually or with the presence of the sign language interpreter. They were first introduced to the presence and the functioning of the eye tracker and then they carried out the process of the nine-point calibration. The participants were asked to look at a black dot that was going to be displayed in nine positions of the screen in a 3x3 grid. The process was repeated until the nine points were calibrated. Then the Tobii Studio Track Status tool calculated the distance between the eye tracker and the eyes of the participants. It displays two white dots that represent participants' eyes and measures the distance between the participant and the eye tracker. The participants were asked to change their posture and to sit in the posture correctly and comfortably, until the tool indicated an approximate distance of 60 cm. After the process of calibration, the procedure of the test was explained, and the sign language interpreter was asked to leave the room in order to avoid distractions. Taking into account the short duration of the videos, I took a step aside and stood at the back of the room. As soon as they had finished, the sign language interpreter came back and I stood in front of them again in order to ask them the set of questions. Once they had answered all the questions, the process was repeated with the second video.

In order to analyze the eye-movements of the 72 participants, the data was exported from the eye-tracking software to Microsoft Excel. The amount of data made it impossible to export all the data from the project in a single file and so it was exported gradually.

4.5.2 Questionnaires

As indicated in Orero et al. (forthcoming), "where possible, it is advisable to use previously validated instruments or questionnaires". For this reason, the set of questionnaires that were used was mostly based on the ones used in the DTV4ALL project, which were slightly modified in the cases when it was required.

Questionnaires were used in the stages of reaction and repercussion. They were going to be administered in a paper format, but as explained in Section 3.4, finally it was decided to deliver it orally to the three groups of participants. A blank copy of the questionnaire was prepared for each participant. The set of questions were read out loud —or signed by the interpreters— and I wrote down the answers, together with notes, keywords and any other observations. The oral delivery of the questionnaires allowed for a natural interaction with the participants, who were provided the opportunity to state their views on several aspects affecting the process of reception.

4.5.2.1 Stage of reaction

Two questionnaires were used to evaluate the ability of the participants to comprehend the narrative information contained in each of the videos, to recall and process the semiotic information and to infer narrative information. Each one included six open questions: one about the understanding of the plot, one about the identification of the characters, one about the visual information conveyed in the visuals, one about the verbal information conveyed in the subtitles, one about the information conveyed in both the visuals and the subtitles, and one about the possible narrative consequences. Their answers were evaluated as “correct”, “semi-correct” or “incorrect” in accordance to a scale based on the answers given by the group of eight English native speakers (see Section 4.4.4).

4.5.2.2 Stage of repercussion

Three additional questions were used to analyze the assessment of the participants in relation to the difficulty of the activity, the reading times and the ease of reading the subtitles, the viewing times and the ease of exploring the visual content. A first open question asked about their opinion on the difficulty of the task and about the type of difficulties that they had encountered. A second scale question asked about their opinion on the reading times and the ease of reading of the subtitles; and a last scale question asked about their opinion on the times for exploring the visual content and the ease of watching the image.

4.5.3 Procedure

In total, 76 participants took part in the study: four for the pilot study and 72 for the final experiment. This section provides information about the development of the pilot study and the changes applied in the tools and the protocols as a consequence. It also accounts for the procedure followed during the development of all the stages of the research.

4.5.3.1 Pilot test

Taking into account the multiple stages of the research process, the amount and the special characteristics of the subjects and the numerous variables influencing reception, it was necessary to test the adequacy of the tools and the methods in a pilot test. Before the pilot test all the questionnaires, the standardized tests and the eye-tracking test were also checked and discussed with the research supervisors, with colleagues and members of the TIME project and with the staff from the company Multisignes in charge of the coordination of the experiment. Thus, the instruments and materials that were used in the pilot study had already been adapted according to their recommendations and discussions.

The use of pilot tests in audiovisual translation research with eye-tracking methods is desired and extended. A pilot test allows for the validation of the methods, of the material and of tools to be used in the experimental stage. In addition, and taking into account that eye-tracking techniques are rather sophisticated, a pilot test is a good opportunity to familiarize oneself with the equipment, including the software and the setting. As pointed out by Arnáiz (2012a), the necessity to develop a pilot test is also based on the aim of confirming the efficiency of the structure and procedure of the study. As part of the European DTV4All project, Arnáiz developed a set of two pilot tests with a total number of 57 hearing and deaf participants. As a result of this test, the duration of the videos was significantly reduced so as not to exceed the attention span of the participants. In addition, the familiarity of the participants with the stimuli used in the experiment was added as a variable that may affect the results. The results obtained in this study were applied to the present research. Thus, the limit of the duration of the videos was established in two minutes and the question about the familiarity of the participants with the films was included at the start. Orrego-Carmona (2015) carried out a pilot test with nine participants and according to the results both the instruments and the methods were revised. At the beginning of the eye-tracking test, he included a 40-second video in order to test the precision of the recording, as he found it imprecise on some occasions and a presentation of the characters to provide context to the participants. In addition, some of the questions were reformulated.

I carried out a pilot study with four participants in a laboratory setting installed at Multisignes. Due to time constraints, the pilot study had been expected to run for three days and two tests had been planned for each day. Unfortunately, two of the participants that had confirmed their assistance did not show up at the last minute. Thus, four participants participated in the pilot study: one hearing, one deaf and two deaf/sign language users. With an age between 24 and 53 years old, three female and one male took part in all the stages of the study, from the pre-stage through to the post-stage. One of the participants stated his discomfort with the use of a recording, so its use was discarded. The hearing participant watched the videos with the sound mute as she had a very good knowledge of English. She obtained very good results in the test for assessing the level of written comprehension, as well as in the two questionnaires used to evaluate her level of reaction after having watched the videos. The test had a total duration of approximately 20 minutes.

The deaf participant obtained good results in the test for reading comprehension. She was told that she would have ten minutes to do the test, but it took her longer to read the text and to answer the five questions. In the experiment, no time limit was imposed upon the participants but they were informed about the time if it took them longer than 10 minutes. The use of the test was auxiliary and to allocate more time to it could be counterproductive and affect substantially to the overall duration of the experiment. The participant had no problems in understanding the questions about the content of the videos, but her results were poor in Video 2. She was not able to answer several questions and explained that it was difficult for her to read and understand the subtitles. The test had a total duration of approximately 35 minutes.

Two pre-lingual deaf/sign language users participated in the pilot study. Their performance on the reading comprehension test was very poor and the two had problems to read the text and to understand the questions. As far as the questions of reaction are concerned, the two participants demonstrated a very poor performance in Video 2 and in general terms they were not able to comprehend the information contained in the subtitles. One of the participants had problems to understand the questions about the inference of consequences, so the questions were reformulated immediately in a way that she could understand it. For the final experiment, in order to prevent this from happening, these and other questions from all the questionnaires were reformulated to avoid ambiguity and misunderstanding. The explanations of the questions were included in the questionnaire in order to control that all the participants received the same information. One of the tests had an approximate duration of 40 minutes and the other of approximately 50 minutes. The significant differences between the durations of the tests were taken into account in the planning of the sessions. The tests with the hearing participants were expected to be shorter in comparison to the tests with the participants with a hearing loss, in particular with the deaf/sign language users.

As far as eye tracking is concerned, the data could not be analysed in detail due to the low percentages of recorded gaze found in the tests of the deaf/sign language users. During the development of the eye-tracking test the interpreter was not asked to leave the room after the process of calibration and she stayed behind the participants while they were watching the videos. The two participants constantly turned around and tried to establish eye contact with the sign language interpreter, even though they had been advised not to do so. Consequently, most of the time the eye tracker could not record their eye movements and, in addition, they were not able to concentrate on watching the videos and understand the content. For the final experiment, the eye-tracking protocol was reformulated: more information about the device was given to the participants in a way that they would understand its functioning and the importance of staying focused, and more time was spent on the process of finding a comfortable and adequate position for the participants in relation to the eye tracker and in the process of calibration. Lastly, the protocol about the presence of the sign language interpreter during the eye-tracking session was modified accordingly and she was required to leave the room even if the participants asked her to stay.

4.5.3.2 Definitive test

On an individual basis, the participants were informed about the overall purpose of the research and about the procedure to be followed. All the different stages of the study were briefly introduced, and special attention was given to minimize the amount of detailed information provided at this point. Only at the post-stage the participants were informed about the general objectives of the study and about the focus on the parameter of subtitling speed. In order to comply with the requirements of the university in terms of ethical considerations the participants were asked to carefully read the information sheet that was provided to them and to sign the consent participation form. For those participants who were deaf/sign language users, the text from both the information sheet and the consent form was interpreted into sign language. Questions and instructions were given in the same order, followed by the possible answers, if there were any. This had an effect on the duration of each test and consequently on the overall duration of the stage of data collection, as the number of participants tested in one day was reduced. In addition, as the answers of the participants were not recorded, it was important to develop clear questions, explanations and operational protocols in order to avoid distortion in the writing of the answers, observations and interpretations.

In the pre-stage, after answering the background questionnaires, the reading comprehension skills of the participants were assessed through the use of an additional test. A second additional test was used to evaluate the English listening skills of some of the hearing participants. It is difficult to establish the average duration of this part. In general, the hearing participants did not need more than 10 minutes to answer the questions and the additional tests. However, within the groups of deaf participants —especially with the group of the sign language users where the presence of the interpreter was required— the duration could range from 15 to 25-30 minutes as some participants provided much more detailed information.

The experimental stages of response, reaction and repercussion were developed in a separate room. After the introduction to the system and the process of calibration, each participant, first, watched one video with a randomly assigned speed of subtitling exposure and answered the corresponding questions; and the process was repeated with the second video. Once they had watched the two videos and answered the two sets of questionnaires, in the post-stage phase of the study, the participants were informed about the general objectives of the research. Finally, they were asked to answer a last set of questions about their opinion and preferences in relation to the current subtitling practices in terms of quality and speed. The duration of this part ranged from 15 to 30-35 minutes, including the processes of calibration, recording and answering. In general terms, much more time was spent with the deaf participants in comparison with the hearing participants, as well as with the deaf/sign language participants in comparison to the deaf participants. The post-stage had an approximate duration of five-ten minutes, although some participants with a hearing loss stayed for around 20 minutes as they were offered the opportunity to ask questions. As some of the volunteers were curious about the presence of the eye tracker, they were offered the opportunity to watch part of their eye-tracking recordings. The high variability of the duration had been expected and a limit of one hour was set. However, in a few cases the participants had a lot to say about their opinion on subtitling and the tests went beyond the limit. If there were no time constraints, and taking into account that the last questionnaire provided auxiliary information, the participants were not interrupted and were allowed to continue.

4.6 Statistical considerations

Descriptive and model statistics were used to analyze the data and to present the results. Initially, the aim was to apply inferential statistics tests such as T-test and ANOVA in order to evaluate the impact of "Profile" and "Speed" on the set of dependent variables. However, after the assistance and advise received from the statistical services at both the University of Turku and the UAB, it was decided to use a statistical model —Generalized Linear Models (GLMs or GLIMS)— as it would allow for the simultaneous analysis of the two main variables and their interaction. The statistics software used was IBM SPSS Statistics 24. The development and output of the analysis was supervised in a series of regular meetings at the statistical services and consultancy center at the UAB.

4.6.1 Generalized Linear Models

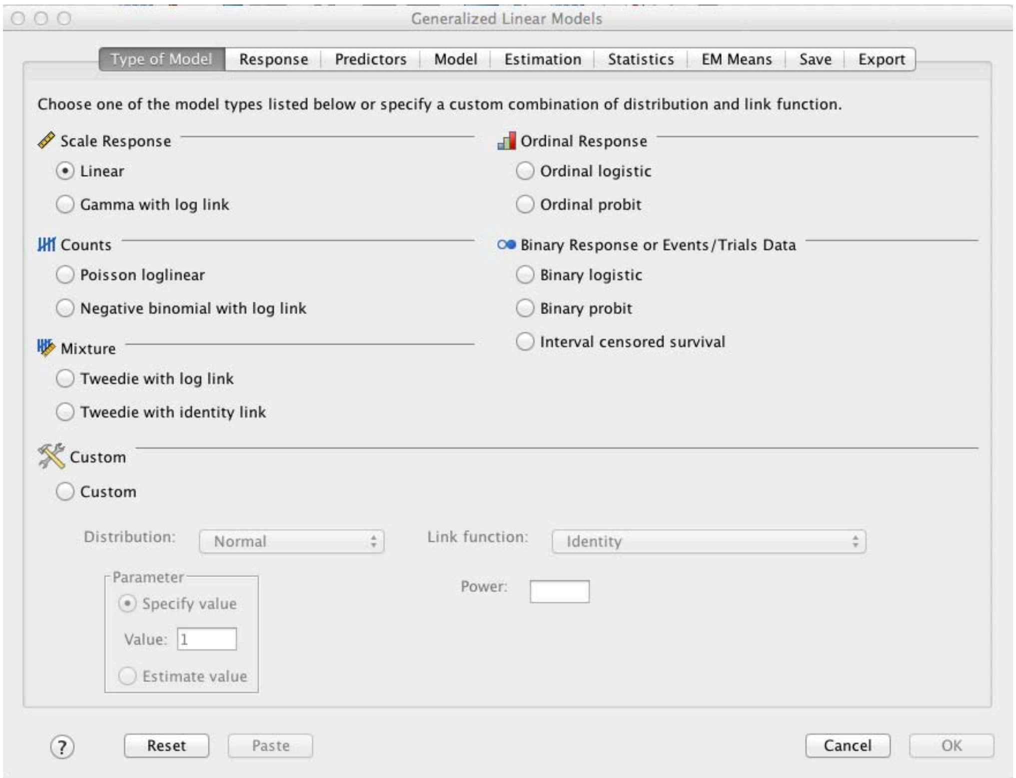
GLMs are a flexible type of regression model that encompasses a wide range of response variables (dependent variables) including continuous numerical, count data and percentages, and binomial and multinomial categorical data. Also applied in audiovisual translation research (see Orrego-Carmona 2015 and Tamayo 2015), GLMs allow a dependent variable to be linearly related to a set of factors and/or covariates (explanatory or independent variables) by the use of a link function.

GLMs include a random component (the dependent variable or the variable of response) and an associated probability distribution, a systematic component or a linear predictor (the explanatory variables and the interaction among them) and a link function that specifies the relationship between the linear predictor and the mean of the response. There are several assumptions that must be met to use a GLM approach, the violation of which may cause the model to provide unreliable effects and compromise the interpretation of the results.

The dependent variable needs to be continuous, ordinal, or binary; and in the case of a continuous variable, their estimated errors must be normally distributed. The observations of the dependent variables must be independent and collinearity (correlation between the explanatory variables or covariates) should be avoided. If present, the model could provide a misleading picture of the effects. On the other hand, GMLs do not assume the homogeneity of the variance (dispersion) of the dependent variable, so overdispersion (when the observed variance is higher than the variance assumed by the model) might still be present. Among other reasons, overdispersion might be caused by the existence of outliers, which can be detected at a preliminary descriptive stage through the use of box-plots. It is important to identify the outliers and to explain why they are excluded from or included in the model.

Normality of the data implies a normal distribution of the residuals (the differences between the raw data values and the estimated values calculated by the model). It can be graphically analysed through the use of histograms, which would allow as well for the identification of outliers. In case of normality, the distribution of the points would have a bell-shaped curve so the use of the model would be validated. In the present work, the normal distribution of the residuals was numerically calculated through the Tests of Normality and graphically represented in Normal Q-Q Plots. The Shapiro-Wilk test, being more appropriate for small sample sizes (<50), was used to assess normality. A significant value (<0.05) would mean that the variable is normally distributed. In the Q-Q Plots, the linear distribution is confirmed when the data points are situated close to the diagonal line in the graph.

The present analysis used the GLMs procedure from the Advanced Statistics module, by selecting “Generalized Linear Models” from the “Analyze” menu. See Picture 4 with the dialogue box. The type of model depended on the type of response or dependent variable: the “Scale Response/ Linear” model was chosen for count and continuous and numerical data and the “Binary Responses or Events/Trials Data/ Binary logistic” model was used for categorical data.



Picture 4: Screen shot of the dialogue box of the Generalized Linear Models in SPSS

Once the dependent variable was selected, the predictors or explanatory variables were incorporated to the model as either factors (categorical variables) or covariates (numerical variables). An initial model was performed with “Profile” and “Speed” as the only predictors, and a second model incorporated the set of variables of adjustment. The model without adjustment investigated the main effects of the two variables as well as the interaction effect between them, and the model with adjustment also addressed the main effects of the variables of adjustment, that were entered in block in a single step. The comparison between the two models allowed for a better understanding and interpretation of the roles played by each of the predictors.

The final model included only the predictors that had a significant effect, with the exception of “Profile” and “Speed” that were always present. Once the final model was built, the estimated marginal means (EMM) were set to provide pairwise comparisons between the different levels of factors and interactions, so that the estimations could be contrasted in each pair of factor combinations. With the significance level set to 0.05, there was a 5% risk of concluding that an effect existed when it really did not. It must be noted that the two videos were not statistically compared. They were different by definition as their degrees of visual density —as defined in Section 3.1.4 and discussed in the Sections 4.4.2 and 4.4.3— were substantially different, making them unsuitable for a statistical comparison. However, as a matter of fact, the reception of the two videos was expected to differ due to these differences, so the results obtained in each of them will be compared and described in the qualitative analysis of the data.

4.6.2 Tests of homogeneity for the variables of adjustment

The three subsamples of participants may be statistically different in the following aspects: interval of age, level of hearing loss, onset of the hearing loss, status of L1 acquisition, reading comprehension skills, level of academic education and familiarity with the films (see Section 4.3.3). It was necessary to know which of these variables had to be entered in the prediction of the model with adjustment without causing collinearity. To check whether the populations were indeed not homogeneous respect to these aspects the Chi-Square test of Homogeneity was used.

Several conditions had to be met to apply this test: the sampling method had to be simple, random, the variable of analysis had to be categorical, the sample size had to be large ($n > 30$), and the expected frequency count for each cell of the contingency table had to be of at least 5. Data was gathered in a contingency table that showed the observed and the expected frequencies counts. Based on the corresponding number of degrees of freedom and with a significance level of 0.05, the test statistic Chi-Square compared the observed and the expected values and allowed for the evaluation of the homogeneity of the distribution across the subsamples. With a significance level of 0.05 the risk of concluding that a difference existed when there was no actual difference was set at 5%. When the P-value was less than or equal to the significance level the homogeneity was rejected, so it could be concluded that there were significant differences between the subsamples.

4.6.2.1 Interval of age

Initially, four intervals were defined: “18-30”, “31-43”, “44-56”, and “57-69”. Some of the cases had a very small number of frequencies and the last two categories were grouped together. The results of the Chi-Square Test revealed that the assumption of homogeneity could not be rejected. Therefore, the variable “Interval of age” was not included in the model to adjust the prediction, as the differences between the three subsamples did not seem to be statistically significant.

CHI-SQUARE TESTS	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.396	4	0.249
Likelihood Ratio	5.773	4	0.217

Table 16: Results of Chi-Square Test (age)

4.6.2.2 Hearing-related variables

Two categories were defined for the level of hearing loss (severe and profound), two for its onset (pre-lingual and post-lingual) and two for the status of L1 acquisition (native-learner and late-learner). In order to evaluate the statistical significance of these differences, the Fisher's Exact Test was used. This test is preferred over the Chi-Square Test in the analysis of 2x2 contingency tables when the sample sizes are small, or when the expected values in any of the cells are less than 5.

FISHER'S EXACT TEST	Exact Sig. (2-sided)
LEVEL	0.000
ONSET	0.000
STATUS	0.015

Table 17: Results of Fisher's Exact Test (level and onset of hearing loss/ status of L1)

Results indicated the presence of significant differences. However, the inclusion of these variables in the statistical model could have interfered with the prediction due to the plausible collinearity. The three variables were highly correlated with themselves and with the variable "Profile". As this would have interfered with the analysis, it was finally decided not to include any of these variables in the model with adjustment, even though these differences should still be taken into account in the qualitative description of the results.

4.6.2.3 Reading comprehension skills

This variable was initially expressed in six categories: excellent (comprehension), very good, good, poor, very poor, and no comprehension. However, some of the categories had very few cases and the expected values could not be computed, so they were transformed into numerical data: 0= no comprehension, 1= very poor, 2= poor, 3= good, 4= very good, and 5= excellent comprehension. The profile of the participants was also codified (1= hearing, 2= deaf, and 2= deaf/ SL) and the One-way ANOVA Test was applied to compare the differences between the means and to assess whether there are significant differences between the three subsamples. Results confirmed the existence of significant differences between the group means, so this variable was included into the model.

ANOVA TEST	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	105.861	2	52.931	36.355	0.000
Within Groups	100.458	69	1.456		
Total	206.319	71			

Table 18: Results of ANOVA Test (reading skills)

4.6.2.4 Level of academic education

The six initial categories (elementary, secondary, high, vocational, undergraduate, and postgraduate) were grouped together into basic, intermediate and superior to be able to apply the Chi-Square test, although three cells (33,3%) still had expected count less than 5, being the minimum expected count 4.67. According to the results, the difference in the distribution was statistically significant so it was safe to include the variable as a predictor in the model. However, the information provided by this variable might be correlated with the variable "Reading comprehension skills" and cause collinearity, so finally, it was not included.

CHI-SQUARE TESTS	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.618[a]	4	0.000
Likelihood Ratio	34.109	4	0.000

Table 19: Results of Chi-Square Test (level of education)

4.6.2.5 Familiarity with the films

52.8% of the participants had watched Film 1 "Slumdog Millionaire" (video 1): 70.8% of the hearing, 66.7% of the deaf, and 20,8% of the deaf/SL. In the case of "Cassandra's Dream" (video 2), however, only 5,6% of the sample had watched it already: one hearing and three deaf participants. In order to prevent the fact of having watched the films to affect the results, the variable "Familiarity with the film" was controlled. The Chi-Square Test was applied to evaluate the significance of the differences observed in the distribution of yes and no categories across the three subsamples. Results reveal the presence of significant differences in the case of Video 1, so it was concluded that it was safe to include this variable in the statistical model at least in this case.

VIDEO 1			
CHI-SQUARE TESTS	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.824[a]	2	0.001
Likelihood Ratio	15.500	2	0.000
VIDEO 2			
CHI-SQUARE TESTS	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.706[a]	2	0.157
Likelihood Ratio	4.498	2	0.106

Table 20: Results of Chi-Square Test (familiarity with the films)

4.6.3 Summary of the variables

The three subsamples were proved to be non-homogeneous in a set of variables. Among them, two were incorporated to the statistical model of adjustment: "Reading skills" (included as a covariate) and "Familiarity with the film" (added as a factor). The variables "Level" and "Onset" (of hearing loss), "Status of L1 acquisition" and "Level of academic education" were not incorporated as they could potentially distort the results due to their correlation between themselves and with the variable "Profile". It is worth mentioning that the adjustment of the model was not aimed at finding the model with the highest explanatory power, but at controlling the differences between the subsamples so that they could be comparable and the models could provide accurate information about the observed effects.

Table 21 summarizes all the 21 variables and its categories that were finally included in the GML, either as response (dependent variables) or predictors (independent variables and variables of adjustment).

VARIABLE		CATEGORY	TYPE
1	PROFILE	Hearing	Independent
		Deaf	
		Deaf/SL	
2	SPEED	Low	
		Medium	
		High	
3	FAMILIARITY WITH THE FILM	Yes	Of adjustment
		No	
4	READING COMPREHENSION SKILLS	Very poor	
		Poor	
		Good	
		Very good	
		Excellent	
5	TOTAL FIXATION DURATION (IMAGE)	Seconds/ Percentage	Dependent Stage 1: response
6	TOTAL FIXATION DURATION (SUBTITLES)	Seconds/ Percentage	
7	MEAN FIXATION DURATION (IMAGE)	Seconds	
8	MEAN FIXATION DURATION (SUBTITLES)	Seconds	
9	FIXATION COUNT (IMAGE)	Count/ Percentage	
10	FIXATION COUNT (SUBTITLES)	Count/ Percentage	
11	VISIT COUNT (IMAGE)	Count	
12	VISIT COUNT (SUBTITLES)	Count	
13	IDENTIFICATION OF THE CHARACTERS	Correct	Dependent Stage 2: reaction
		Incorrect	
14	UNDERSTANDING OF THE PLOT	Correct	
		Incorrect	
15	RECALL OF VISUAL INFORMATION	Incorrect	
		Correct	
16	RECALL OF VERBAL INFORMATION 1	Incorrect	
		Correct	
17	RECALL OF VERBAL INFORMATION 2	Incorrect	
		Correct	
18	INFERENCE OF INFORMATION	No	
		Yes	
19	PRESENCE OF PROBLEMS	No	Dependent Stage 3: reaction
		Yes	
20	TIME AND EASE OF VIEWING	Almost never	
		Almost always	
21	TIME AND EASE OF READING	Fast	
		Comfortable	

Table 21: Summary of the variables included for statistical analysis

Chapter 5. Results

This Chapter gathers the results obtained in each of the stages of the reception process: response (Section 5.1), reaction (Section 5.2) repercussion (Section 5.3).

5.1 Stage of response

In this stage, participants' eye movements were analysed for each area: the image and the subtitles. A linear regression approach was used to analyze the effect of the variables "Speed" and "Profile" and of the variables of adjustment.

Section 5.1.1 includes some preliminary remarks about the statistical analysis applied. Section 5.1.2 presents the results with regards to the independent variable "total fixation duration" and Section 5.1.3 with regards to "mean fixation duration". Section 5.1.4 introduces the results for the variable "Fixation count" and Section 5.1.5 for the variable "Visit count". Finally, Section 5.1.6 presents a set of preliminary conclusions regarding this stage of analysis.

5.1.1 Preliminary remarks

In order to estimate the amount of data recorded, it was necessary to find a systematic way to identify and deal with poor data quality. It was first intended to establish a minimum threshold of the percentage of recorded gaze time and to discard the recordings with a lower percentage (see Section 4.4.1.3). The Tobii software estimates the total percentage of gaze recorded by each participant, however, this percentage is calculated for the whole test that, in this case, included a total of six elements (four instruction elements and two media elements with the videos, see Section 4.4.1.5), making it impossible to calculate the real percentage for each video. Additionally, when the participants answered the questionnaires the eye-tracking device continued recording in most of the cases even though there was no gaze to be recorded. Thus, the percentages estimated by the eye-tracking software were extremely low and were not considered as reliable for the decision making in regards to whether or not to include all the recordings. The identification of poorly recorded values was finally carried out by a thorough inspection of each of the variables of the data and the creation of box-plots, histograms and Q-Q plots that allowed for the identification of outliers in such a way that it could be established whether it is a *real* outlier or it is a poorly registered data value that might be due to problems in the recording. In case of doubt, the statistical model was run with and without the outliers. If the outlier modified the results, its exclusion was considered.

Preliminarily, six participants were excluded from the analysis in Video 1 and five participants in Video 2. P40, P63 and P68 (only in Video 1) were immediately excluded, as their movements could not be registered properly. P22, P49 and P56 presented extremely low frequencies in all the variables of response. After pre-testing their behavior in the model analysis, it was decided that it was safe to remove them. Therefore, at a first instance, 66 of the original 72 participants were included in the analysis of Video 1 and 67 participants in the analysis of Video 2.

5.1.2 Total fixation duration

Three variables were analysed: the total fixation duration on the image, the total fixation duration on the subtitles and the percentage and distribution of total fixation duration. A linear regression model was built for the analysis in the statistical terms expressed in Table 22. Section 5.1.2.1 introduces the results for Video 1 and 5.1.2.2 for Video 2.

MODEL INFORMATION	
Dependent Variables	Total fixation duration on the image Total fixation duration on the subtitles Percentage of total fixation duration
Probability Distribution	Normal
Link Function	Identity

Table 22: Statistical model for total fixation duration

5.1.2.1 Video 1

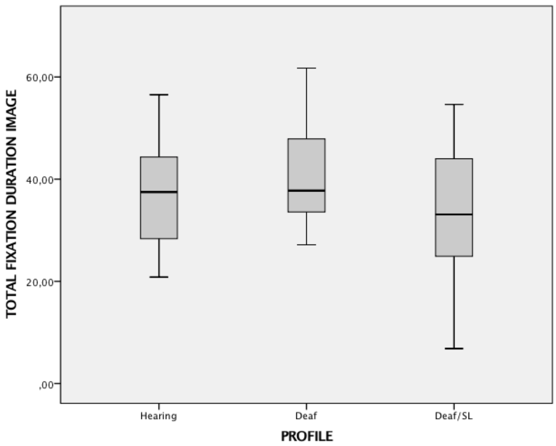
The results obtained from the analysis of image will be first analysed, followed by the results from the subtitles.

Image

"Deaf" participants and "Medium" speed showed the longest fixation duration on the image, whilst "Deaf/SL" and "Low" presented the shortest duration (Table 23). The box-plot (Figure 21) shows the distribution of the values. Even though there were not outliers, a high-dispersion was observed in the "Hearing" and, especially, the "Deaf/SL groups. However, according to the histogram (Figure 22), the distribution of the data seemed to be normal and closed to a bell-shaped curve.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	37.1958	66	11.66542	6.83	61.73
HEARING	37.7083	23	10.40104	20.84	56.52
DEAF	40.6083	23	9.60985	27.14	61.73
DEAF/SL	32.6820	20	14.05306	6.83	54.63
LOW	34.2714	22	12.00409	6.83	56.52
MEDIUM	41.2074	23	11.06275	25.51	61.73
HIGH	35.8657	21	11.25026	13.11	54.12

Table 23: Fixation duration data on the image/ Video 1



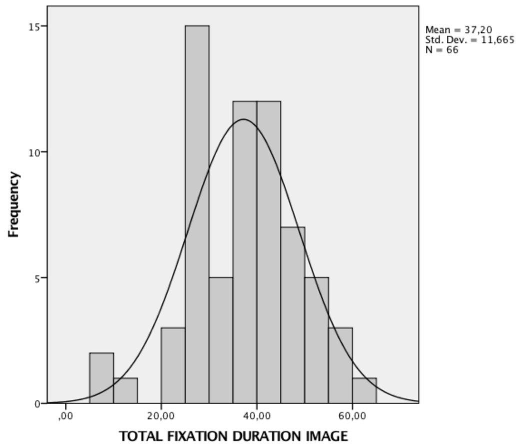


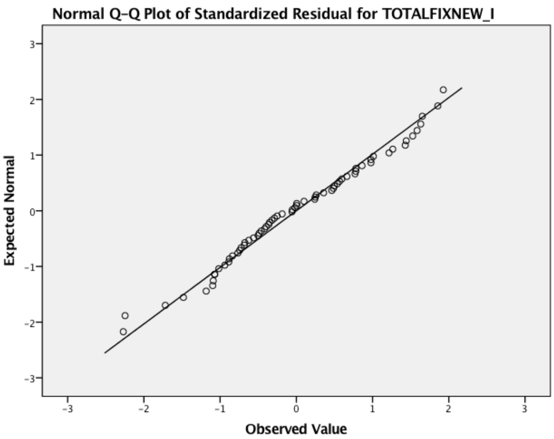
Figure 21: Box-plots of the fixation duration data on the image/ Video 1

Figure 22: Histogram of the fixation duration data on the image/ Video 1

To confirm the normality of the distribution, the residuals were calculated and the normality test was applied. Results showed that there were no significant differences (Table 24). The distribution was assumed to be normal and the linear model could be applied. The normality of the distribution can be appreciated in the Q-Q plot (Figure 23) and the dispersion across subsamples in the Scatter plot (Figure 24) where "1" represents "Hearing", "2" represents "Deaf", and "3" represents "Deaf/SL".

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Total fixation duration on the image	Total	0.981	66	0.388
	Hearing	0.956	23	0.393
	Deaf	0.946	23	0.241
	Deaf/SL	0.956	20	0.476

Table 24: Results of Normality Test (total fixation duration data on the image/ Video 1)



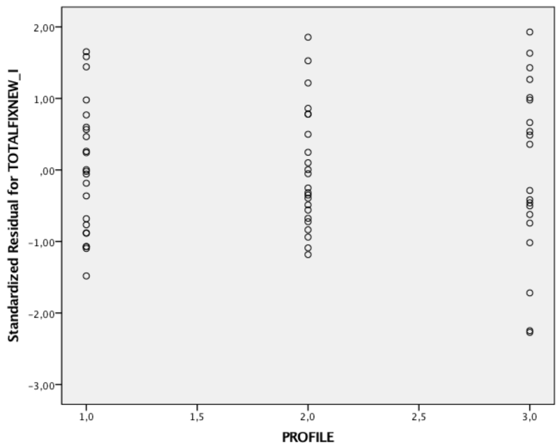


Figure 23: Normal probability plot of residuals (total fixation duration on the image/ Video 1)

Figure 24: Scatter plot of residuals (total fixation duration on the image/ Video 1)

The linear model was applied with the hypotheses that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the total fixation duration on the area of the image.
>
> $H_{1:}$ "The profile of the participants/ the subtitling speed of exposure does have an effect on the total fixation duration on the area of the image.

The model without adjustment incorporated the effects of "Profile" and "Speed" and their interaction that was excluded, as it was not significant. Results indicate the presence of a quasi-significant effect on the two variables. The variables of adjustment did not show any effect so the model without interaction and without adjustment was selected. According to the EMM, the quasi-significant effect is placed upon the "Deaf" when compared to "Deaf/SL", suggesting that the former spent significantly more time on the image than the latter. In terms of speed of exposure, the quasi-significant difference is found on "Medium" when compared to "Low". The effect is less intense, but it seems that the participants who watched Video 1 at the "Medium" speed spent almost significantly more time on the image than those who watched it at a "Low" speed rate. The alternative hypotheses are partially validated.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.036	.051	Profile	0.383
Speed	0.058	.075	Speed	0.064
Interaction between Profile * Speed	0.417		Familiarity	0.178
			Reading	0.285

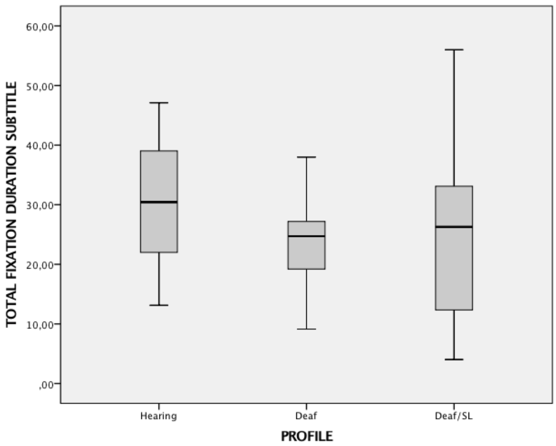
Table 25: Significant effects for total fixation duration on the image/ Video 1

Subtitles

"Hearing" and "Low" showed the longest duration of the fixations on the subtitles, whilst "Deaf" and "High" presented the shortest duration. The "Deaf" was again the most homogeneous group and the "Deaf/SL" the one with the highest dispersion (Figure 25). The histogram below (Figure 26) shows a regular distribution but the Normality Test was applied to confirm the normality.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	26.8264	66	11.68911	4.02	56.00
HEARING	30.4309	23	9.86626	13.12	47.10
DEAF	23.8091	23	7.74958	9.13	37.99
DEAF/SL	26.1510	20	16.06104	4.02	56.00
LOW	30.7923	22	11.85091	4.02	56.00
MEDIUM	26.1722	23	11.85665	5.96	55.43
HIGH	23.3881	21	10.57138	5.23	40.84

Table 26: Fixation duration data on the area of the subtitles/ Video 1



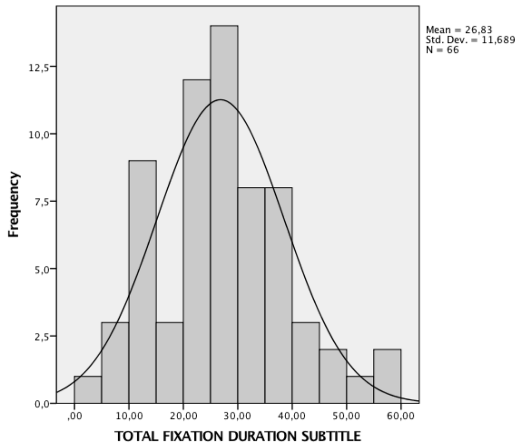


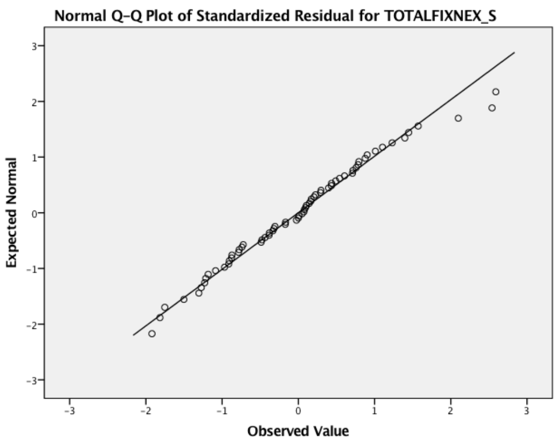
Figure 25: Box-plots of the fixation duration data on the subtitles/ Video 1

Figure 26: Histogram of the fixation duration data on the subtitles/ Video 1

According to the test, the distribution of the residuals was normal, as it can be seen in the Q-Q plot (Figure 27). The Scatter plot presents the dispersion of the groups (Figure 28).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Total fixation duration on the image	Total	0.982	66	0.432
	Hearing	0.962	23	0.500
	Deaf	0.965	23	0.574
	Deaf/SL	0.937	20	0.209

Table 27: Results of Normality Test (total fixation duration on the subtitles/ Video 1)



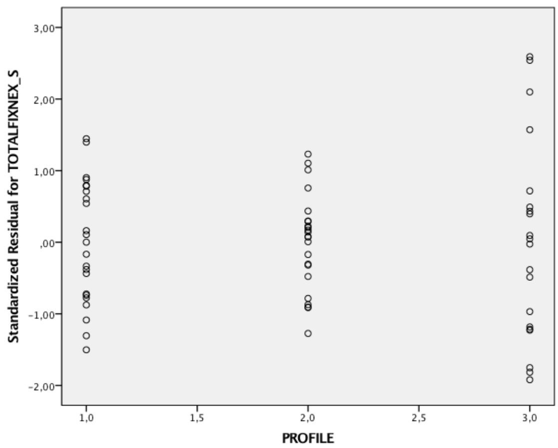


Figure 27: Normal probability plot of residuals (total fixation duration on the subtitles/ Video 1)

Figure 28: Scatter plot of residuals (total fixation duration on the subtitles/ Video 1)

The linear model was applied with the hypotheses that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the total fixation duration on the area of the subtitles.
>
> $H_{1:}$ "The profile of the participants/ the subtitling speed of exposure does have an effect on the total fixation duration on the area of the subtitles.

The variables "Speed" and "Profile" are again quasi-significant —the effect of the first being stronger— but not the interaction between them or the variables of adjustment. The model of adjustment is discarded and the model without interaction is considered. The alternative hypotheses are regarded as partially validated: the participants assigned to "Low" spent more time reading the subtitles than those assigned to "High", and the "Hearing" seemed to have relied to a greater extent on the verbal information contained in the subtitles.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.079	0.085	Profile	0.092
Speed	0.038	0.059	Speed	0.063
Interaction between Profile * Speed	0.315		Familiarity	0.742
			Reading	0.853

Table 28: Significant effects for total fixation duration on the subtitles/ Video 1

Percentage and distribution of total fixation duration

Taking into account that the distribution of the original variables was normal, a normal distribution was assumed. To avoid redundancy, the model was applied only for one of the areas, as both reported the same effects.

PERCENTAGE OF TOTAL FIXATION DURATION		IMAGE	SUBTITLE
HEARING	N: 23 Std. Deviation: 11.23018	55.5458	44.4542
DEAF	N: 23 Std. Deviation: 8.46153	63.3917	36.6083
DEAF/SL	N: 20 Std. Deviation: 15.53997	57.2650	42.7350
LOW	N: 22 Std. Deviation: 10.45941	52.7573	47.2427
MEDIUM	N: 23 Std. Deviation: 13.23710	61.9434	38.0566
HIGH	N: 21 Std. Deviation: 10.85210	61.6907	38.3093

Table 29: Percentage of fixation duration data on the image and subtitles/ Video 1

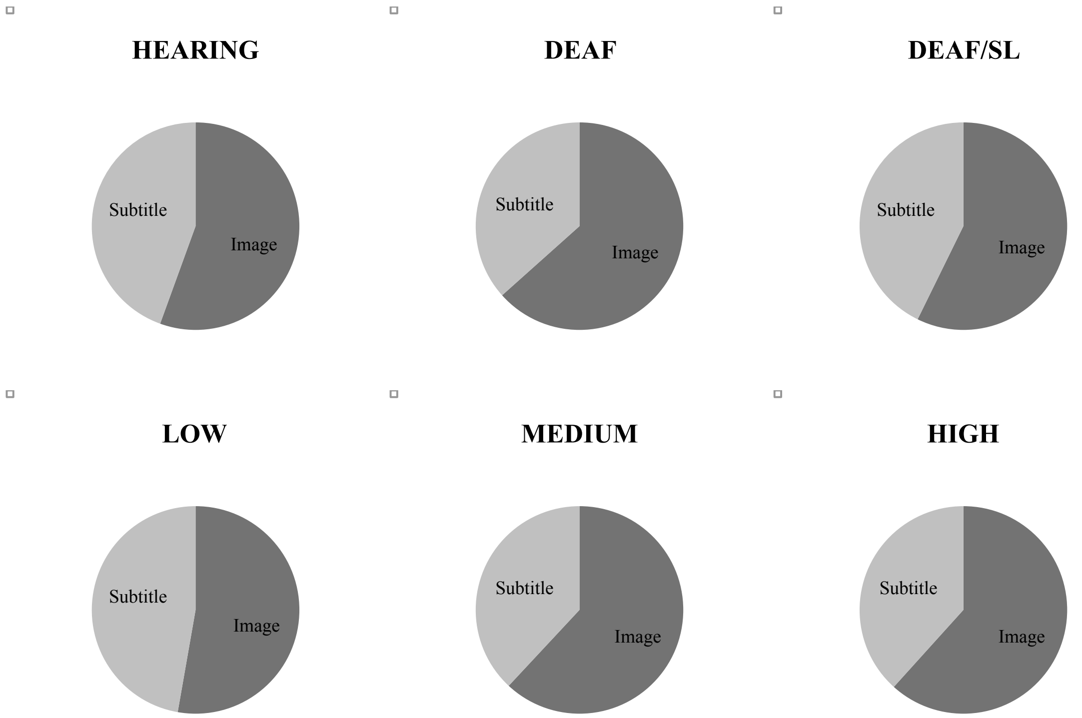


Figure 29: Percentage distribution of the total fixation duration data (Hearing group/ Video 1)

Figure 30: Percentage distribution of the fixation duration data (Deaf group/ Video 1)

Figure 31: Percentage distribution of the fixation duration data (Deaf/SL group/ Video 1)

Figure 32: Percentage distribution of the fixation duration data (Low speed/ Video 1)

Figure 33: Percentage distribution of the fixation duration data (Medium speed/ Video 1)

Figure 34: Percentage distribution of the fixation duration data (High speed/ Video 1)

All the speeds and profiles spent more time on the image. The "Deaf" group presents the shortest time on the subtitles. "Deaf/SL" and "Hearing" obtained very similar results. Percentages indicate that the participants assigned to the "Low" speed spent more time on the area of the subtitles than "High" and "Medium", which result in the same percentage.

The model was applied to confirm the significance of this differences, under the hypothesis that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the percentage and distribution of total fixation duration.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the percentage and distribution of total fixation duration.

According to results, both the profile of the participants and the speed of the subtitles had a significant effect. The inclusion of the variables of adjustment did not result in significant effects so they were discarded. The EMM indicate that the effect is significant on "Deaf" whilst the effect on "Speed" is placed upon "Low".

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.023	0.027	Profile	0.026
Speed	0.002	0.004	Speed	0.004
Interaction between Profile * Speed	0.170		Familiarity	0.263
			Reading	0.724

Table 30: Significant effects for percentage of fixation duration on the image/ Video 1

It was expected that the two groups with a hearing loss would have spent more time on the subtitles, as they might have needed more time to read and process the subtitles. However, this was only valid for the "Deaf/SL" as the "Deaf" group spent significantly more time on the image than the other two groups. Additionally, it seems that "Low" resulted in significantly more time on the subtitles. The fact that the subtitles were displayed for longer times and contained more two-line subtitles might have led participants to spend more time reading them. However, the opposite hypothesis —that "High" would result in longer times on the image— has not been proved as both "High" and "Medium" speeds showed a similar distribution of time.

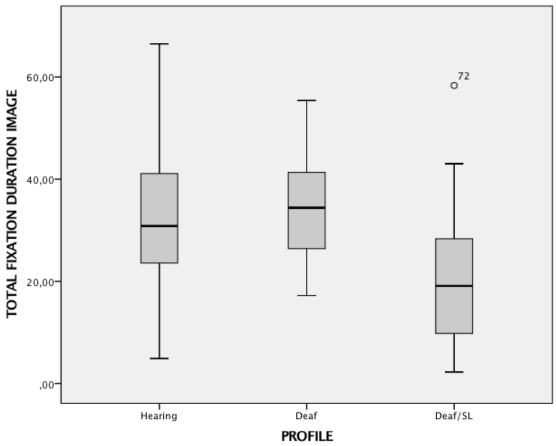
5.1.2.2 Video 2

Image

"Deaf" and "High" showed the longest fixation duration on the image, and "Deaf/SL" and "Medium" the shortest. The box-plots (Figure 32) and the histogram (Figure 33) present the distribution and the dispersion across the three subsamples. A great dispersion can be observed in the "Hearing" group. P72 presents a relatively high value and is seen as an outlier. The distribution is slightly skewed, so the Normality Test was applied for confirmation of normality.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	29,4343	67	14,81278	2,26	66,48
HEARING	31,5643	23	15,59218	4,91	66,48
DEAF	34,9109	23	11,08956	17,21	55,39
DEAF/SL	21,1033	21	14,44967	2,26	58,34
LOW	30,3432	22	11,92627	7,30	55,27
MEDIUM	26,1235	23	12,58752	4,28	52,14
HIGH	31,9868	22	19,01784	2,26	66,48

Table 31: Fixation duration data on the image/ Video 2



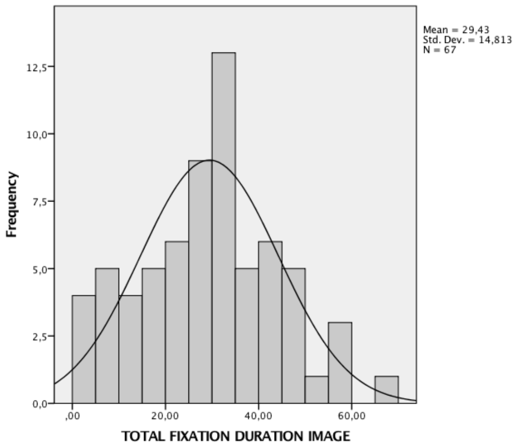


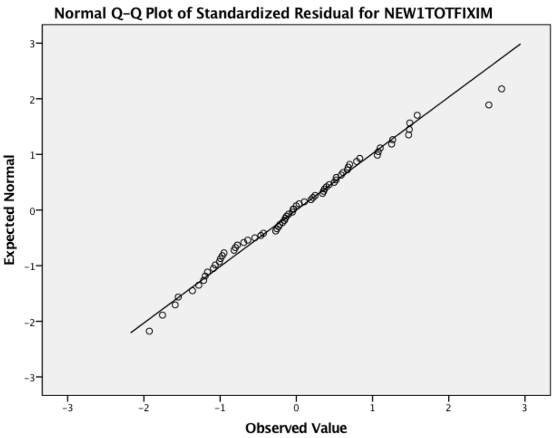
Table 32 Box-plots of the fixation duration data on the image/ Video 2

Table 33 Histogram of the fixation duration data on the image/ Video 2

Results reported that the sample, even with the outlier, followed a normal distribution, being valid for the modeling so P72 was not excluded. The Q-Q plot and the Scatter-plot below show how the residuals of the data follow a normal distribution, and how the values are distributed across the subsamples.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Total fixation duration on the image	Total	0.983	67	0.486
	Hearing	0.973	23	0.763
	Deaf	0.961	23	0.491
	Deaf/SL	0.936	21	0.179

Table 34: Results of Normality Test (total fixation duration on the image/ Video 2)



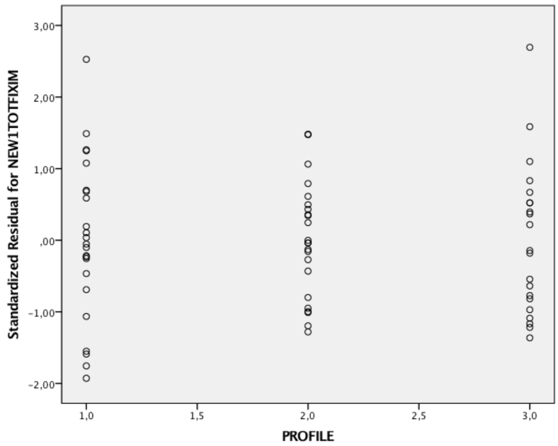


Figure 35: Normal probability plot of residuals (total fixation duration on the image/ Video 2)

Figure 36: Scatter plot of residuals (total fixation duration on the image/ Video 2)

The hypotheses defined were as follows:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the total fixation duration on the area of the image.

$H_{1:}$ "The profile of the participants/ the subtitling speed of exposure does have an effect on the total fixation duration on the area of the image.

The model without adjustment indicates that "Profile" has a significant effect. However, after the inclusion of the variables of adjustment, the effect in "Profile" is quasi-significant, as well as in "Reading". The positive effect provided by the EMM reveals that the greater reading skills, the longer the total fixation duration might have been on the image. As both variables are associated to a certain extent, "Reading" might have absorbed the effect initially found in "Profile". The model without interaction and without adjustment was selected assuming that the significance was placed upon the "Deaf/SL" group. The subtitling speed of exposure did not influence the duration of the time so the null hypothesis could not be rejected.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.001	.0002	Profile	0.056
Speed	0.300	0.291	Speed	0.259
Interaction between Profile * Speed	0.776		Reading	0.066

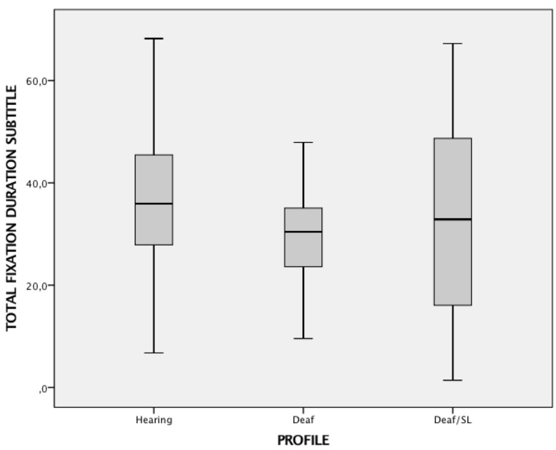
Table 35: Significant effects for total fixation duration on the image/ Video 2

Subtitles

“Deaf” and “High” showed the shortest time on the subtitles, and “Medium” and “Hearing” the longest time. As seen in the box-plots, there is a high-dispersion in “Hearing” and “Deaf/SL”, even though the overall distribution seems to be normal in the histogram.

	Mean	N	Std. Deviation	Minimum	Maximum	Variance
TOTAL	32.243	67	15.2035	1.4	68.2	231.146
HEARING	35.043	23	14.9318	6.8	68.2	222.958
DEAF	29.478	23	9.8718	9.6	47.9	97.452
DEAF/SL	32.205	21	19.8120	1.4	67.2	392.517
LOW	32.695	22	12.8261	6.8	60.0	164.508
MEDIUM	32.857	23	14.6981	2.7	49.8	216.035
HIGH	31.150	22	18.2688	1.4	68.2	333.751

Table 36: Fixation duration data on the subtitles/ Video 2



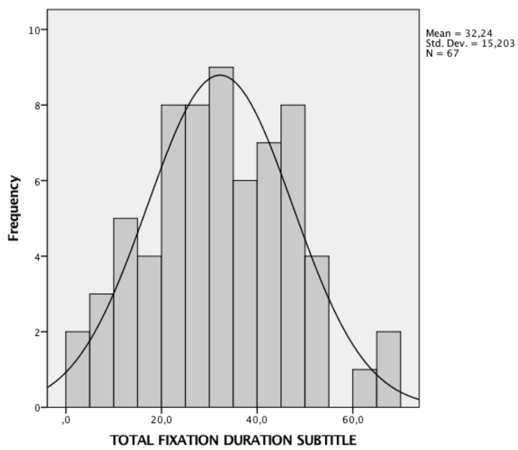


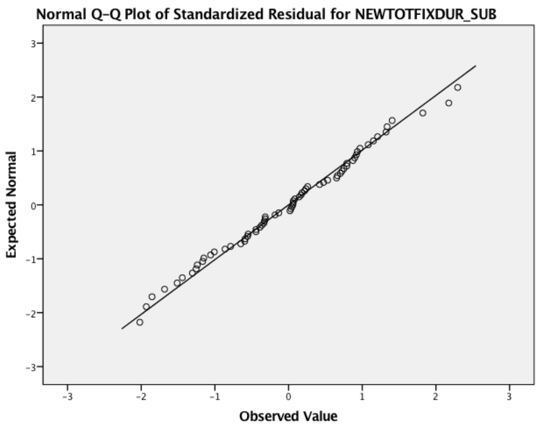
Figure 37: Box-plots of the fixation duration data on the subtitles/ Video 2

Figure 38: Histogram of the fixation duration data on the subtitles/ Video 2

To determine whether the data set did not violate the assumption of normality, the Normality Test was applied. Results confirmed the uniformity of the distribution so normality was assumed. The linear and normal distribution of the data can be appreciated in the Q-Q plot (Figure 39) and Scatter plot (Figure 40).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Total fixation duration on the image	Total	0,988	67	0,792
	Hearing	0,973	23	0,771
	Deaf	0,971	23	0,701
	Deaf/SL	0,944	21	0,257

Table 37: Results of Normality Test (total fixation duration data on the subtitles/ Video 2)



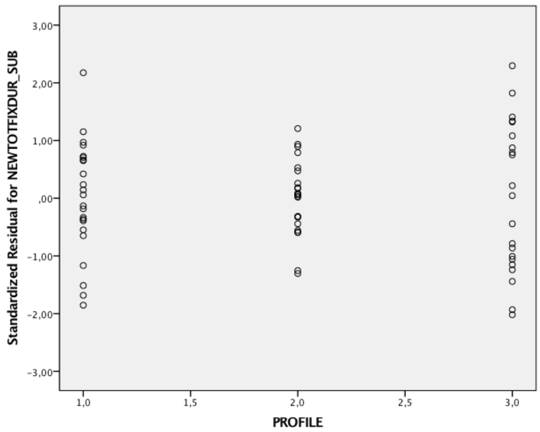


Figure 39: Normal probability plot of residuals (total fixation duration on the subtitles/ Video 2)

Figure 40: Scatter plot of residuals (total fixation duration on the subtitles/ Video 2)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the total fixation duration on the area of the subtitles.

$H_{1:}$ “The profile of the participants/ the subtitling speed of exposure does have an effect on the total fixation duration on the area of the subtitles.

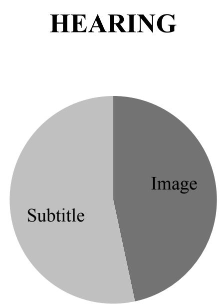
No effects were reported by any of the models. Probably the overdispersion of the responses made it more difficult to estimate the effects. A second inspection of the data set revealed the presence of several relatively low values that were discarded as a preventive measure. The models with and without adjustment were reapplied, with the aim of reducing the dispersion and being able to obtain significant effects. However, no effects were reported. The alternative hypotheses can be validated, and the absence of effect in “Profile” and “Speed” must be assumed.

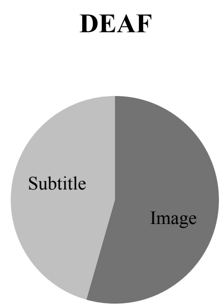
TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	Sig.	Sig.	Effects	Sig.
Speed	0.431	0.456	Profile	0.459
Interaction between Profile * Speed	0.928	0.931	Speed	0.931
	0.210		Familiarity	0.794

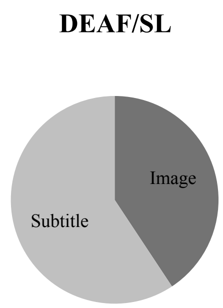
Table 38: Significant effects for total fixation duration on the subtitles/ Video 2

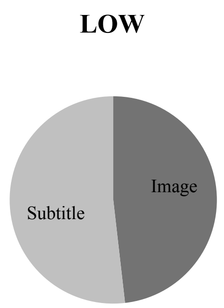
Percentages and distribution of total fixation duration

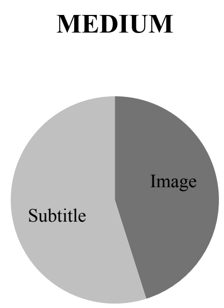
The "Hearing" and "Deaf/SL" groups spent more time reading the subtitles. The latter was the group that fixated on the visuals for the shortest amount of time. All three categories of exposure resulted in more time being spent on the subtitles.











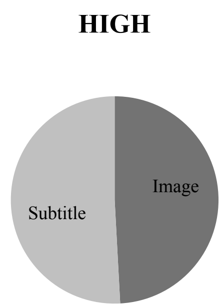


Figure 41: Percentage distribution of the fixation duration data (Hearing group/ Video 2)

Figure 42: Percentage distribution of the fixation duration data (Deaf group/ Video 2)

Figure 43: Percentage distribution of the fixation duration data (Deaf/SL group/ Video 2)

Figure 44: Percentage distribution of the fixation duration data (Low speed/ Video 2)

Figure 45: Percentage distribution of the fixation duration data (Medium speed/ Video 2)

Figure 46: Percentage distribution of the fixation duration data (High speed/ Video 2)

To evaluate whether the differences observed were significant, the linear model was applied under the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the percentage of total fixation duration on the area of the image.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the percentage of total fixation duration on the area of the image.

The two models reported the same degree of significance in "Profile": the "Deaf/SL" group spent a significantly longer time on the area of the subtitles, probably because they needed more time to read and comprehend the subtitles. The alternative hypothesis is validated and it is assumed that the "Deaf/SL" participants prioritized the subtitles. On the contrary, the differences among the three speeds of exposure were not significant and the null hypothesis cannot be rejected.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.023	0.024	Profile	0.031
Speed	0.732	0.690	Speed	0.623
Interaction between Profile * Speed	0.720		Familiarity	0.133
			Reading	0.817

Table 39: Significant effects for percentage of fixation duration on the image/ Video 2

5.1.3 Mean fixation duration

Section 5.1.3.1 presents the results from Video 1, and Section 5.1.3.2 from Video 2. The cognitive information to be provided through this analysis was presented in Section 4.5.1.2. The following linear regression approach was used to analyze the possible effect of the independent variables and variables of adjustment.

MODEL INFORMATION	
Dependent Variable(s)	Mean fixation duration on the image Mean fixation duration on the subtitles
Probability Distribution	Normal
Link Function	Identity

Table 40: Statistical model for total fixation duration

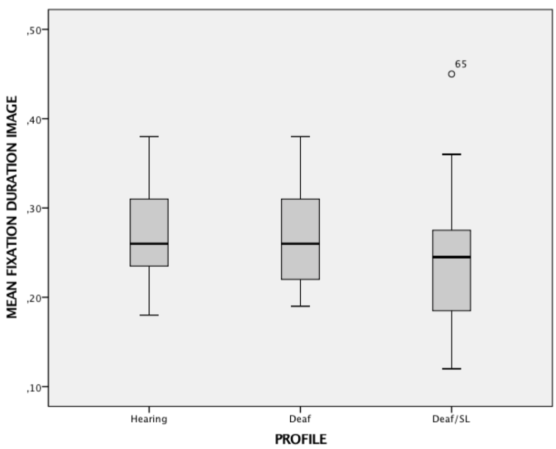
5.1.3.1 Video 1

Image

“Deaf/SL” and “High” resulted in shorter fixations on the image. The box-plot indicates that the “Hearing” and “Deaf” groups were more homogeneous whereas the “Deaf/SL” presented the greatest dispersion (Figure 47). P65 (“Deaf/SL”) was seen as an outlier. The histogram (Figure 48) showed a normal distribution, but the residuals of the values were estimated and the Normality Test was applied for confirmation.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	0.2592	66	0.06524	0.12	0.45
HEARING	0.2700	23	0.05808	0.18	0.38
DEAF	0.2661	23	0.05574	0.19	0.38
DEAF/SL	0.2390	20	0.08019	0.12	0.45
LOW	0.2686	22	0.07864	0.12	0.45
MEDIUM	0.2626	23	0.06383	0.18	0.38
HIGH	0.2457	21	0.05055	0.14	0.36

Table 41: Mean fixation duration data on the image/ Video 1



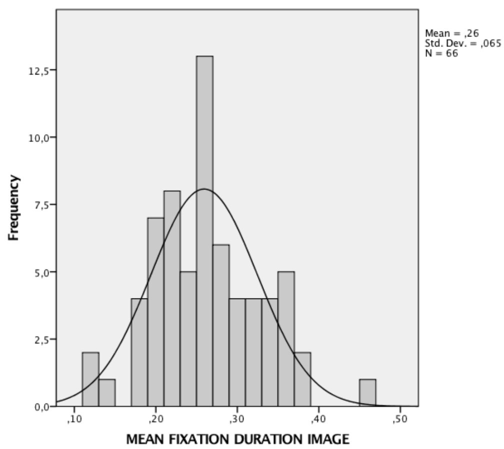


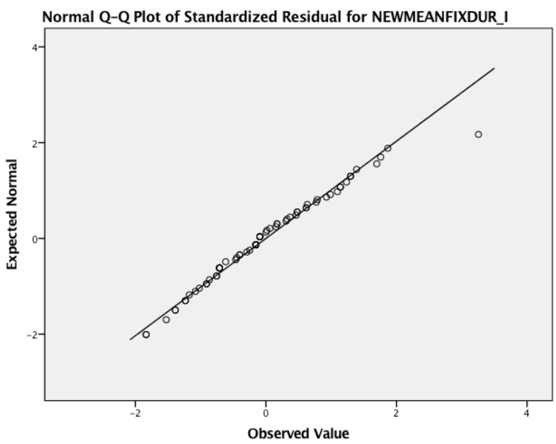
Figure 47: Box-plots of the mean fixation duration data on the image/ Video 1

Figure 48: Histogram of the mean fixation duration data on the image/ Video 1

The inclusion of P65 did not modify the results provided by the Normality Test so it was not excluded. Even though a non-normal distribution was found in "Deaf", the test confirmed the normal distribution of the sample data and the linear approach was used. The normality can be appreciated in the Q-Q plot (Figure 49) as well as the distribution across the subsamples in the Scatter plot (Figure 50).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Mean fixation duration on the image	Total	0.976	66	0.231
	Hearing	0.959	23	0.444
	Deaf	0.900	23	0.026
	Deaf/SL	0.949	20	0.347

Table 42: Results of Normality Test (mean fixation duration on the image/ Video 1)



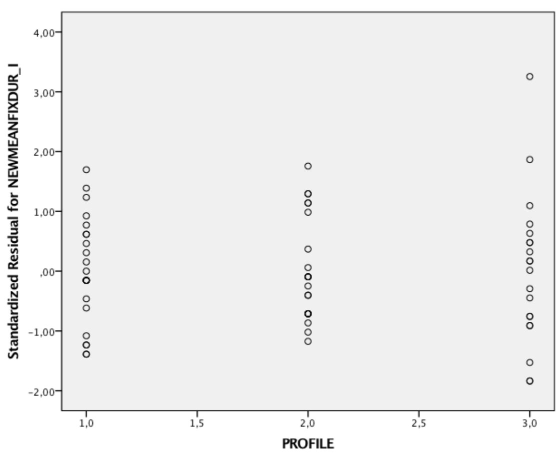


Figure 49: Normal probability plot of residuals (mean fixation duration on the image/ Video 1)

Figure 50: Scatter plot of residuals (mean fixation duration on the image/ Video 1)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the mean fixation duration on the area of the image.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the mean fixation duration on the area of the image.

According to the results of the model without adjustment, none of the effects investigated was significant. The model with adjustment confirmed this absence of significance but detected the effect of the variable "Reading". This seems to indicate that the participants with the lower level of reading comprehension skills —mainly concentrated on the "Deaf/SL" group”— were less likely to show a higher mean duration on the image, as they might have need longer durations on the subtitles in order to read them. The null hypotheses defined for “Speed” was validated, and the terms of the alternative hypothesis for “Profile” were adjusted taking into account the “Reading” differences between the groups.

TEST OF MODEL EFFECTS					
Model without adjustment			Model with adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	0.164	0.201	Profile	0.795	0.842
Speed	0.348	0.428	Speed	0.711	0.725
Interaction between Profile * Speed	0.587	-	Reading	0.022	0.011
			Familiarity	0.457	-

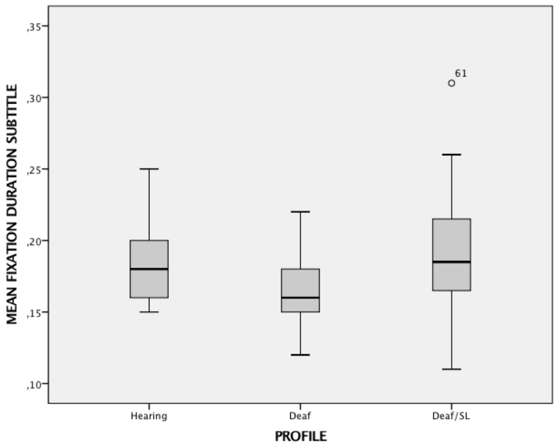
Table 43: Significant effects for mean fixation duration on the image/ Video

Subtitles

“Deaf/SL” displays the longest mean duration, closely followed by “Hearing” and far away from “Deaf”. Smaller differences were observed in relation to the speeds, even though the participants assigned to “Medium” had longer durations than those assigned to “High”. According to the box-plot (Figure 51), the “Deaf/SL” group presented a high dispersion and P61 was considered as an outlier. The distribution of the data in the histogram (Figure 52) seems to be slightly skewed, probably due to the presence of the outlier.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	0.1792	66	0.03416	0.11	0.31
HEARING	0.1843	23	0.02555	0.15	0.25
DEAF	0.1665	23	0.02248	0.12	0.22
DEAF/SL	0.1880	20	0.04841	0.11	0.31
LOW	0.1795	22	0.03184	0.11	0.23
MEDIUM	0.1887	23	0.04093	0.12	0.31
HIGH	0.1686	21	0.02575	0.12	0.22

Table 44: Mean fixation duration data on the subtitles/ Video 1



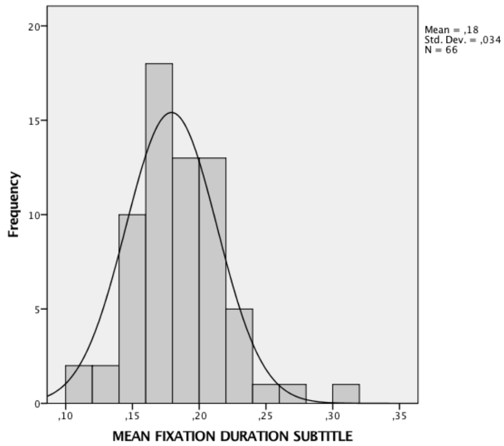


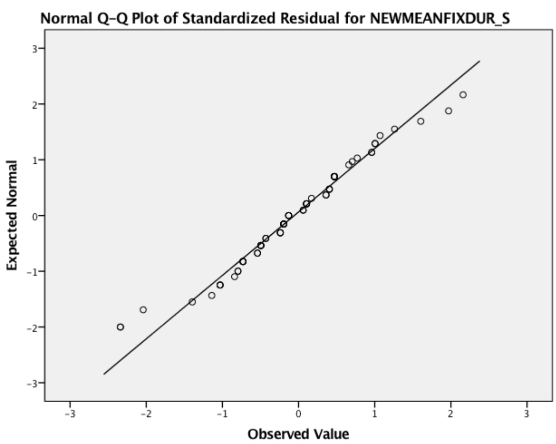
Figure 51: Box-plots of the mean fixation duration data on the subtitles/ Video 1

Figure 52: Histogram of the mean fixation duration data on the subtitles/ Video 1

The Normality Test was applied with and without this participant to decide whether to include it or not. Results showed a non-normal distribution so it was excluded. The test showed a quasi-significant effect of non-normality in "Hearing", but as the overall distribution was normal the linear regression approach was used. Normality can be seen in Figure 53 and group distribution and dispersion in Figure 54.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Mean fixation duration on the subtitles	Total	0.977	65	0.254
	Hearing	0.923	23	0.078
	Deaf	0.969	23	0.667
	Deaf/SL	0.962	19	0.621

Table 45: Results of Normality Test (mean fixation duration on the subtitles/ Video 1)



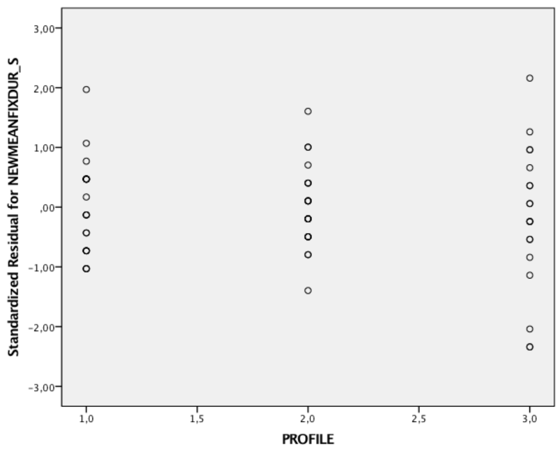


Figure 53: Normal probability plot of residuals (mean fixation duration on the subtitles/ Video 1)

Figure 54: Scatter plot of residuals (mean fixation duration on the subtitles/ Video 1)

The regression model was built around the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the mean fixation duration on the area of the subtitles.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the mean fixation duration on the area of the subtitles.

The model with and without adjustment reported the quasi-significant effect of “Profile”, observed on “Deaf” when compared to the other two groups. The alternative hypothesis was verified, as the “Deaf” group was significantly more likely to make shorter fixations on the subtitle area. On the contrary, the alternative hypothesis for “Speed” could not be validated, and it was concluded that exposure did not influence mean fixation duration.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.055	0.064	Profile	0.060
Speed	0.103	0.186	Speed	0.236
Interaction between Profile * Speed	0.231		Familiarity	0.387
			Reading	0.281

Table 46: Significant results for mean fixation duration on the subtitles/ Video 1

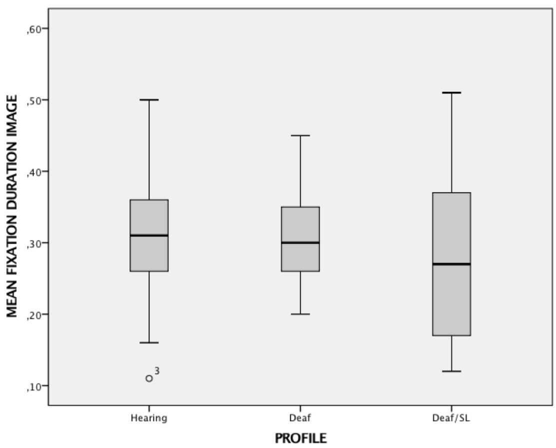
5.1.3.2 Video 2

Image

The highest mean fixation duration was observed in “Deaf” and “Low”, closely followed by “Hearing” and —to a lesser extent— “High”. “Deaf/SL” and “Medium”, on the contrary, showed a decrease that could be significant. According to the box-plot (Figure 55) the distribution in “Deaf/SL” was particularly dispersed and P9 (“Hearing”) was an outlier. The histogram (Figure 56) seems to indicate a normal overall distribution at a certain extent that needed to be confirmed in the Normality Test.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	0.3009	67	0.09196	0.11	0.51
HEARING	0.3113	23	0.09211	0.11	0.50
DEAF	0.3117	23	0.07050	0.20	0.45
DEAF/SL	0.2776	21	0.11081	0.12	0.51
LOW	0.3123	22	0.06969	0.16	0.45
MEDIUM	0.2900	23	0.09601	0.13	0.51
HIGH	0.3009	22	0.10862	0.11	0.50

Table 47: Mean fixation duration data on the image/ Video 2



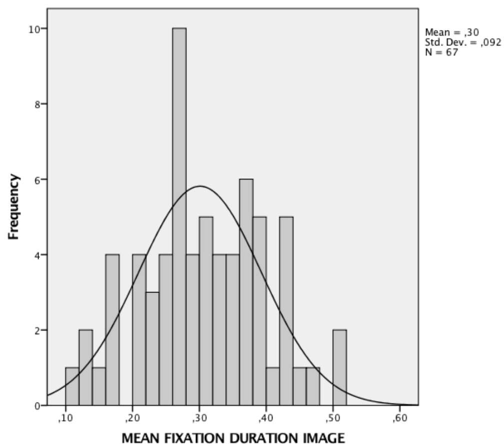


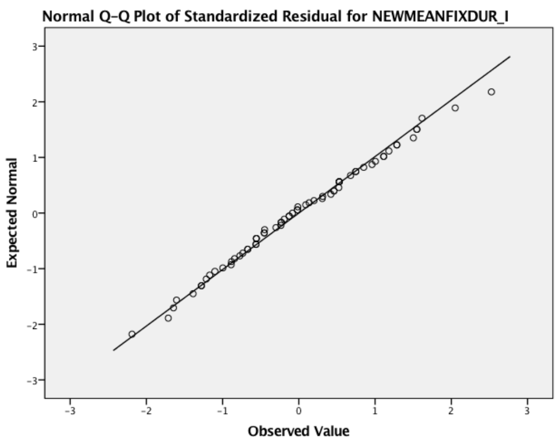
Figure 55: Box-plots of the mean fixation duration data on the image/ Video 2

Figure 56: Histogram of the mean fixation duration data on the image/ Video 2

Results corroborated the normal distribution of the residuals, making the sample suitable for a linear modeling. P9 was included, as its presence did not modify the outcome. The linear distribution and the dispersion of the values can be visualized in Figures 57 and 58.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Mean fixation duration on the image	Total	0.992	67	0.953
	Hearing	0.983	23	0.948
	Deaf	0.950	23	0.288
	Deaf/SL	0.954	21	0.409

Table 48**:** Results of Normality Test (mean fixation duration on the image/ Video 2)



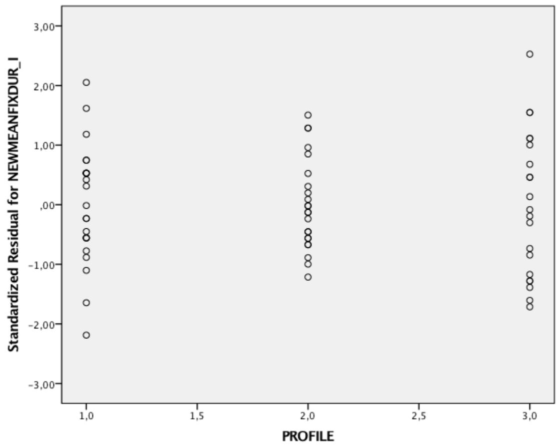


Figure 57: Normal probability plot of residuals (mean fixation duration on the image/ Video 2)

Figure 58: Scatter plot with of residuals (mean fixation duration on the image/ Video 2)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the mean fixation duration on the area of the image.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the mean fixation duration on the area of the image.

The model without adjustment indicated that the interaction effect between "Profile" and "Speed" was quasi-significant, which was confirmed after the inclusion of the variable of adjustment. "Profile" and "Speed" turned out to be significant only on interaction, but not in isolation. The effect was focused on the "Deaf/SL" profile when combined with the "Low" speed. The subtitles that were displayed at a "Low" speed were displayed for longer and contained more two-line subtitles. This fact seemed to negatively affect the mean fixation duration on the image in the case of the "Deaf/SL" participants. The mean shown by the combination Deaf/SL-High was significantly lower than on the rest of possibilities of combinations. "Reading" also resulted in a significant effect, suggesting that the participants with a higher level of reading comprehension might have tended to fixate on the image for longer periods of time.

TEST OF MODEL EFFECTS			
Model without adjustment		Model with adjustment	
Effects	Sig.	Effects	Sig.
Profile	0.294	Profile	0.464
Speed	0.615	Speed	0.281
Profile * Speed	0.071	Profile * Speed	0.016
		Reading	0.002

Table 49: Significant effects for mean fixation duration on the image/ Video 2

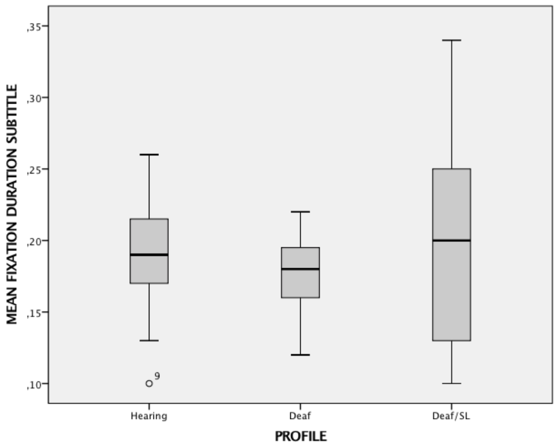
The null hypotheses could not be fully rejected, as the interaction between "Profile" and "Speed" was quasi-significant. Plus, as "Reading" is strongly correlated to "Profile" and the interaction effect was focused on one of the subsamples, the effect of the profile could not be fully dismissed. Deaf/SL participants with reading difficulties —especially those assigned to the "Low" speed— tended to fixate on the image for significant shorter periods of time.

Subtitles

"Deaf/SL" and "High" resulted in the highest mean fixation duration, whilst "Deaf" and "Low" showed the lowest mean, even though the differences do not seem big enough. Values seemed to be overdispersed in the case of the "Deaf/SL" group, and P9 was again considered as an outlier, as shown in Figure 59. The distribution seemed to be homogeneous (Figure 60) but normality was statistically evaluated.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	0.1857	67	0.04533	0.10	0.34
HEARING	0.1887	23	0.03733	0.10	0.26
DEAF	0.1752	23	0.02626	0.12	0.22
DEAF/SL	0.1938	21	0.06546	0.10	0.34
LOW	0.1809	22	0.04898	0.10	0.34
MEDIUM	0.1813	23	0.04203	0.10	0.27
HIGH	0.1950	22	0.04554	0.12	0.26

Table 50: Mean fixation duration data on the subtitles/ Video 2



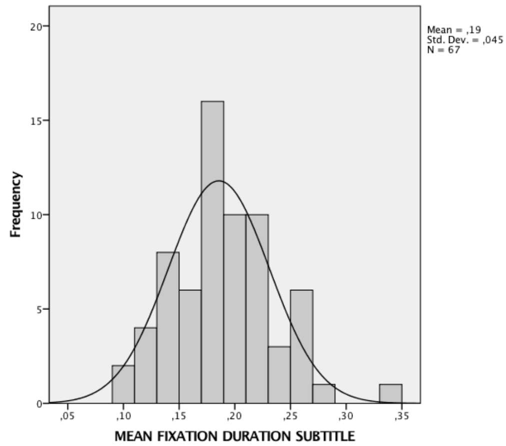


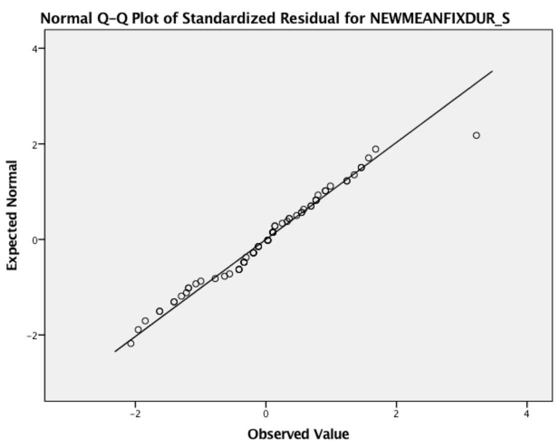
Figure 59: Box-plots of the mean fixation duration data on the subtitles/ Video 2

Figure 60: Histogram of the mean fixation duration data on the subtitles/ Video 2

The test confirmed the normality of the distribution, despite the overdispersion and the outlier. The linear distribution of the sample and the dispersion across the subsamples are presented in the plots below (Figure 61 and 62).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Mean fixation duration on the subtitle	Total	0.977	67	0.238
	Hearing	0.972	23	0.743
	Deaf	0.967	23	0.620
	Deaf/SL	0.939	21	0.210

Table 51: Results of Normality Test (mean fixation duration on the subtitles/ Video 2)



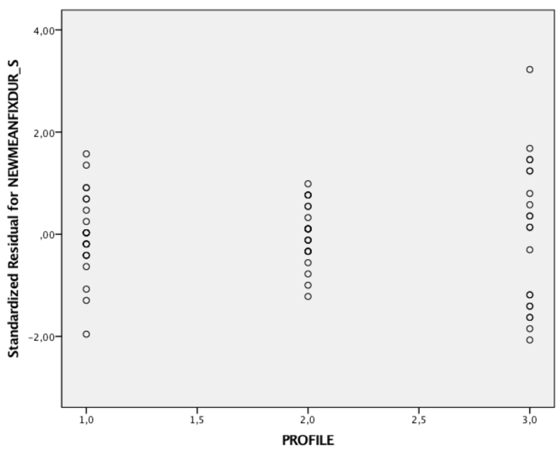


Figure 61: Normal probability plot of residuals (mean fixation duration on the subtitles/ Video 2)

Figure 62: Scatter plot of residuals (mean fixation duration on the subtitles/ Video 2)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the mean fixation duration on the area of the subtitles.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the mean fixation duration on the area of the subtitles.

Results reported the absence of significance of the variables investigated, and the null hypotheses were validated. The "Deaf/SL" participants had a longer duration of mean fixation on the subtitles, suggesting that their processing was slower and required more reading time. However, the difference did not seem to be significant. In the same terms, "High" showed a longer duration of mean fixations on the subtitles than "Low", probably because the latter contained more and longer lines with more information in such a way that participants might have been forced to make shorter fixations to be able to read them. However, this difference was not significant. The great variability of the responses in the area of the subtitles of this video in particular might have made it impossible to attribute significance.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.283	0.328	Profile	0.243
Speed	0.442	0.455	Speed	0.603
Interaction between Profile * Speed	0.134		Familiarity	0.626
			Reading	0.305

Table 52: Significant effects for mean fixation duration on the subtitles/ Video 2

5.1.4 Fixation count

Three distinct variables were analysed: the total fixation count on the image, the total fixation count on the subtitles and the percentage of total fixation count on each area. Results related to the fixation count for Video 1 and Video 2 will be presented in Sections 5.1.4.1 and 5.1.4.2. Section 5.1.4.3 will introduce the results in terms of percentages. The linear regression approach was applied and built in the following terms:

MODEL INFORMATION	
Dependent Variable(s)	Fixation count on the image Fixation count on the subtitles Percentage of fixation count
Probability Distribution	Normal
Link Function	Identity

Table 53: Statistical model for fixation count

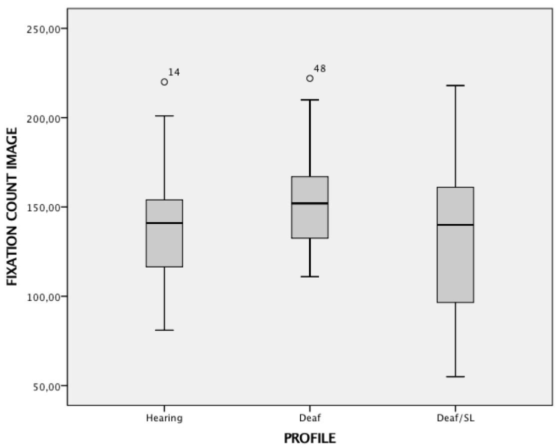
5.1.4.1 Video 1

Image

The “Deaf” and “Medium” categories resulted on more fixations on the image. On the contrary, “Deaf/SL” and “Low” showed the lowest number of counts. According to the box-plot (Figure 63) the responses of the “Deaf/SL” group might be overdispersed, and P14 (“Hearing”) and P48 (“Deaf”) are outliers. In spite of this, the distribution in the histogram seems to be normal (Figure 64).

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	143.4848	66	36.42452	55.00	222.00
HEARING	140.6957	23	31.94233	81.00	220.00
DEAF	154.0000	23	28.01785	111.00	222.00
DEAF/SL	134.6000	20	47.13966	55.00	218.00
LOW	125.2727	22	31.61401	55.00	171.00
MEDIUM	159.4783	23	36.42161	92.00	222.00
HIGH	145.0476	21	33.78976	81.00	210.00

Table 54: Fixation count data on the image/ Video 1



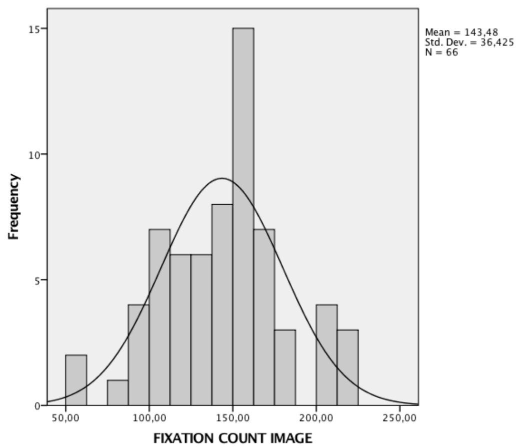


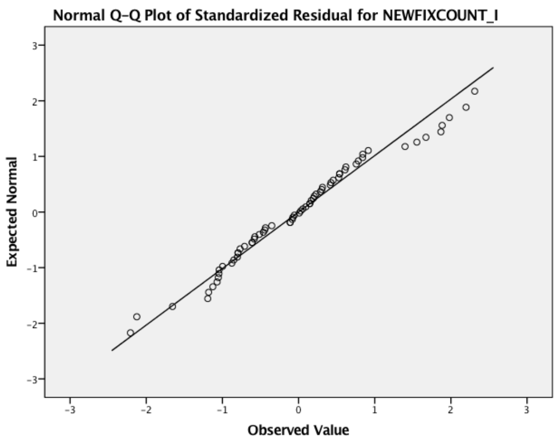
Figure 63: Box-plots of the fixation count data on the image/ Video 1

Figure 64: Histogram of the fixation count data on the image/ Video 1

Normality was assessed through a Normality Test. Results conclude that the distribution was normal in presence or absence of the outliers, so they were maintained. The normality can be seen in the Q-Q plot (Figure 65) and the distribution across subsamples in the Scatter plot (Figure 66).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Fixation count on the image	Total	0.975	66	0.199
	Hearing	0.963	23	0.533
	Deaf	0.953	23	0.340
	Deaf/SL	0.961	20	0.563

Table 55: Results of Normality Test (fixation count data on the image/ Video 1)



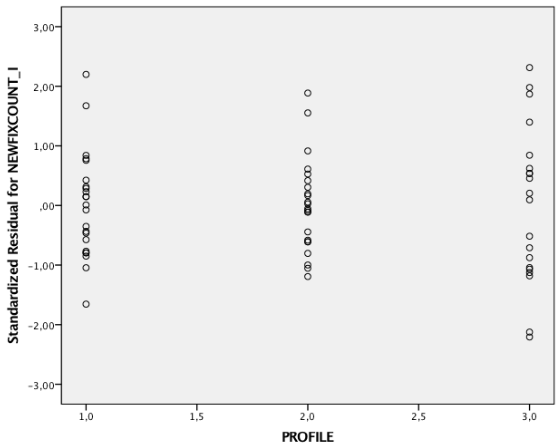


Figure 65: Normal probability plot of residuals (fixation count on the image/ Video 1)

Figure 66: Scatter plot of residuals (fixation count on the image/ Video 1)

It was hypothesized that:

H_0: The profile of the participants/ the subtitling speed of exposure does not have an effect on the fixation counts on the area of the image.

H_1: The profile of the participants/ the subtitling speed of exposure does have an effect on the fixation counts on the area of the image.

Results from the model without adjustment indicated a significant effect on “Speed”, which was confirmed as any of the two variables of adjustment had an influence on the number of fixations. According to the EMM, the significance was placed upon “Low”, suggesting that it led to a lower number of fixations. The alternative hypothesis was verified and its effect was assumed: the lower the subtitling speed of exposure, the fewer the number of fixations on the image. “Profile” was not significant so the null hypothesis was validated.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.097	0.119	Profile	0.105
Speed	0.001	0.002	Speed	0.004
Interaction between Profile * Speed	0.116	-	Familiarity	0.270
			Reading	0.213

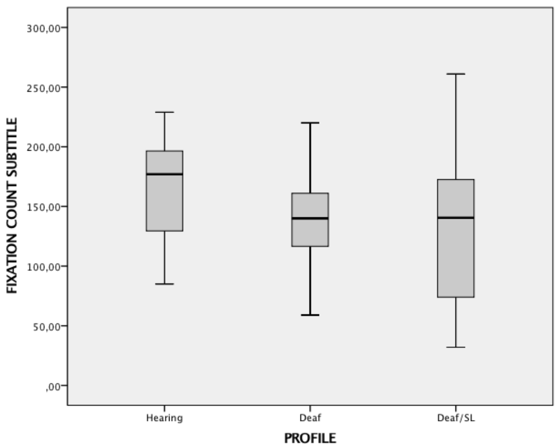
Table 56: Significant effects for fixation count on the image/ Video 1

Subtitles

“Hearing” and “Low” showed the highest number of fixations on the subtitles and “Deaf/SL” and “High” presented the lowest number. According to the box-plot (Figure 67) no outliers were identified, and the histogram (Figure 68) with the distribution of the sample seems to be normal despite overdispersion in “Deaf/SL”.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	146.7727	66	50.56566	32.00	261.00
HEARING	163.5652	23	41.96517	85.00	229.00
DEAF	141.9565	23	39.55948	59.00	220.00
DEAF/SL	133.0000	20	65.77954	32.00	261.00
LOW	166.3636	22	47.20729	38.00	261.00
MEDIUM	139.2609	23	51.48452	32.00	229.00
HIGH	134.4762	21	49.07506	44.00	213.00

Table 57: Fixation count data on the subtitles/ Video 1



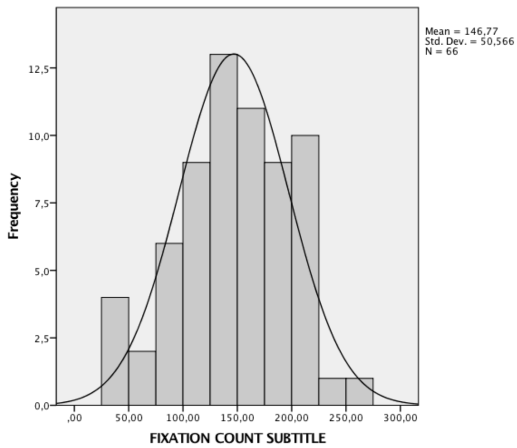


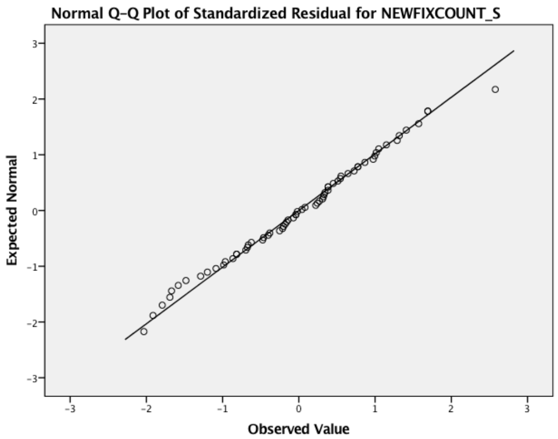
Figure 67: Box-plots of the fixation count data on the subtitles/ Video 1

Figure 68: Histogram of the fixation count data on the subtitles/ Video 1

The Normality Test was applied to confirm the distribution of the data. Results indicate that, despite the high dispersion in "Deaf/SL", the distribution is normal, as represented in the Q-Q and the Scatter plots below (Figures 69 and 70).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Fixation count on the image	Total	0.990	66	0.856
	Hearing	0.952	23	0.329
	Deaf	0.981	23	0.925
	Deaf/SL	0.961	20	0.565

Table 58: Results of Normality Test (fixation count data on the subtitles/ Video 1)



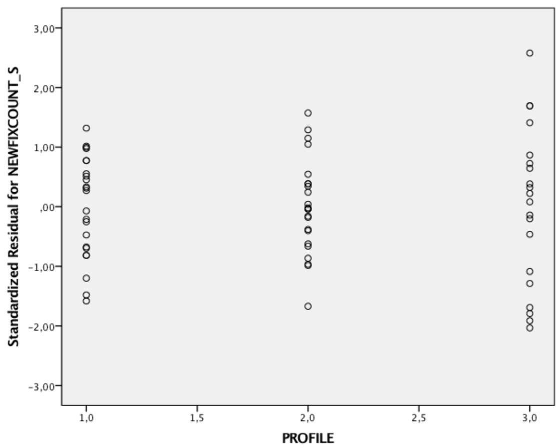


Figure 69: Normal probability plot of residuals (fixation count on the subtitles/ Video 1)

Figure 70: Scatter plot of residuals (fixation count on the subtitles/ Video 1)

The linear model was applied with the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the fixation counts on the area of the subtitles.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the fixation counts on the area of the subtitles.

The model without adjustment confirms that the speed of the subtitles and the profile of the participants —at a lesser extent— significantly affected the number of fixations on the subtitles. The inclusion of the adjustment did not modify the effect found on "Speed" but it distorted the quasi-significant effect that was observed on "Profile", so it is excluded and the model without interaction and without adjustment was selected. "Profile" was found to be quasi-significant on "Hearing" when contrasted to "Deaf/SL", suggesting that the former made significantly more fixations on the subtitles. The null hypothesis was rejected and a quasi-significance effect was validated. As far as “Speed”, the participants assigned to “Low” also made significantly more fixations on the subtitles than the participants assigned to the other speeds, so the hypothesis of effect was validated. It is confirmed that the exposure that contained more two-lines subtitles that were displayed for longer led participants to make significantly more fixations on them.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.055	0.061	Profile	0.125
Speed	0.028	0.037	Speed	0.036
Interaction between Profile * Speed	0.512		Familiarity	0.918
			Reading	0.730

Table 59: Significant effects for fixation count on the subtitles/ Video 1

Percentage of fixation count

“Deaf” and “Deaf/SL” had a higher percentage of fixations on the image, whilst the “Hearing” had a higher percentage of fixations on the subtitles. “High” and “Medium” speeds also reported a higher percentage on the image, being “Low” the only speed of exposure that presented more fixations on the subtitle area.

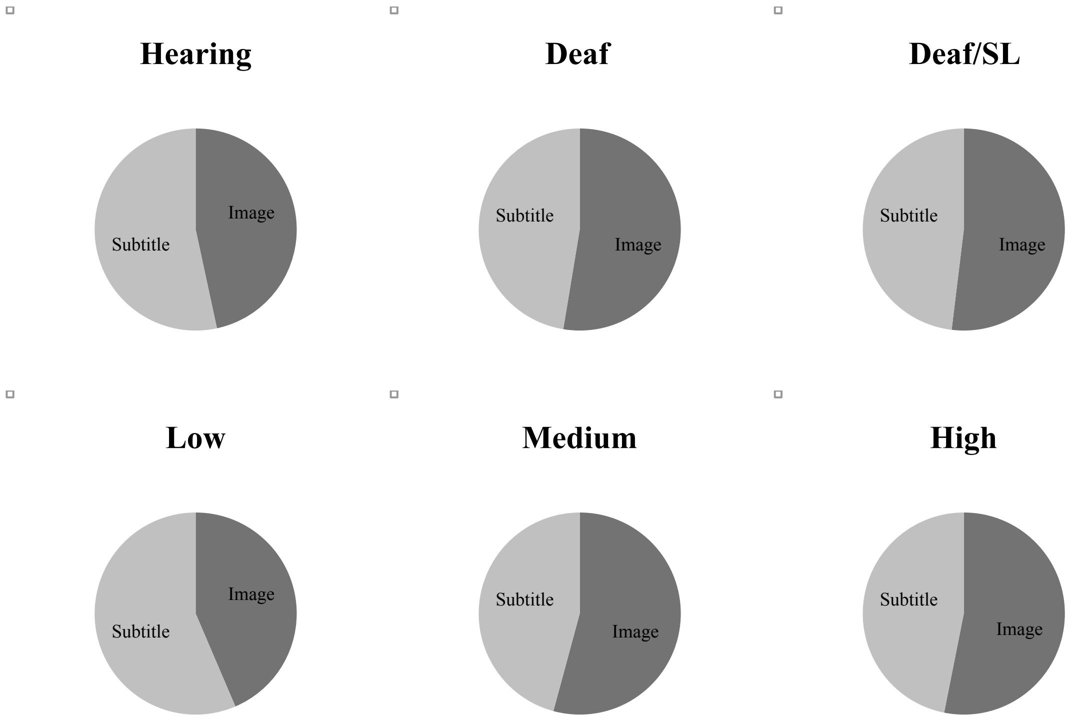


Figure 71**:** Percentage distribution of the fixation counts (Hearing group/ Video 1)

Figure 72**:** Percentage distribution of the fixation counts (Deaf group/ Video 1)

Figure 73**:** Percentage distribution of the fixation counts (Deaf/SL group/ Video 1)

Figure 74**:** Percentage distribution of the fixation counts (Low speed/ Video 1)

Figure 75**:** Percentage distribution of the fixation counts (Medium speed/ Video 1)

Figure 76**:** Percentage distribution of the fixation counts (High speed/ Video 1)

Under the assumption of normality in the distribution, a linear regression model was used to confirm the existence of significant differences. It was hypothesized that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the percentage of fixation counts on the area of the image.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the percentage of fixation counts on the area of the image.

The model without adjustment confirmed the significance of "Speed", and identified a quasi-significant effect of "Profile". The variables of adjustment were discarded and the version without interaction and without adjustment was selected. In "Profile" the quasi-significance was observed in "Deaf" and "Deaf/SL" when compared to "Hearing", whilst in "Speed" the significant effect was on "High" and "Medium" when compared to "Low". The null hypotheses were rejected in both cases. The percentage of fixations on the subtitles was quasi-significantly higher in the case of the "Hearing" participants, who seemed to have prioritized reading over watching —at least in terms of number of fixations—, being the only group with a higher proportion of fixations on this area. Taking into account that this group was less familiarized with the use of subtitles, this fact might explain that they showed a more regular reading pattern. In the same way, participants assigned to "Low" exposure resulted in a significantly higher percentage of fixations on the subtitles. It seems that the longer presentation times and the fact that this exposure contained mostly two-line subtitles led participants to fixate more on them. This could confirm the assumption that two-line subtitles result in more regular reading than one-line subtitles —displayed for shorter times— that often are not read but scanned. "Low" was the only speed of exposure that showed a higher number of fixations on the subtitles, suggesting that the longer presentation rate might have hindered the processing of the images.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.061	0.071	Profile	0.145
Speed	0.000	0.001	Speed	0.001
Interaction between Profile * Speed	0.139		Familiarity	0.590
			Reading	0.648

Table 60: Statistical model for percentage of fixation count on the image

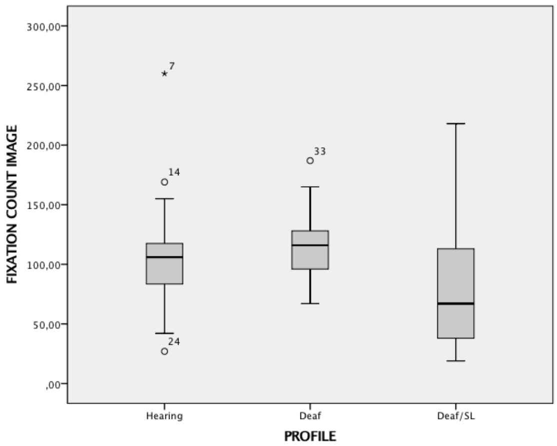
5.1.4.2 Video 2

Image

"Deaf" and "Low" showed a higher number of fixations on the images. "Deaf/SL" and "Medium", on the contrary, resulted in the lower number of fixations. As shown in the box-plot (Figure 77), the "Deaf/SL" presented a high dispersion. The histogram (Figure 78) indicates that the curve of distribution is not centered but situated to the right, hinting at a slightly skewed distribution. Plus, four outliers were identified (P7, P14 and P24 —from "Hearing"— and P33 —from "Deaf"—).

	Mean	N	Std. Deviation	Minimum	Maximum	Variance
TOTAL	102.1045	67	46.07771	19.00	260.00	2123.156
HEARING	106.1304	23	47.98135	27.00	260.00	2302.209
DEAF	115.3478	23	28.03992	67.00	187.00	786.237
DEAF/SL	83.1905	21	54.89228	19.00	218.00	3013.162
LOW	116.3636	22	37.71894	26.00	187.00	1422.719
MEDIUM	86.3478	23	28.94762	31.00	126.00	837.964
HIGH	104.3182	22	62.30676	19.00	260.00	3882.132

Table 61: Fixation count data on the image/ Video 2



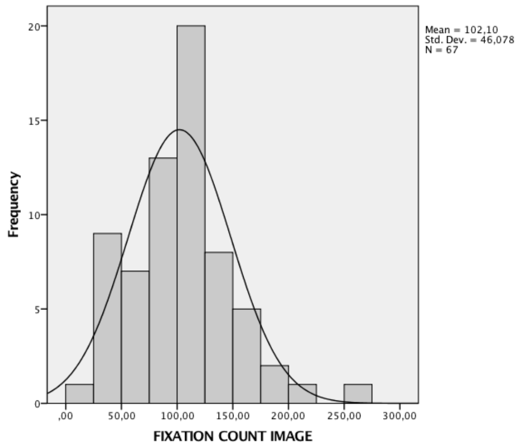


Figure 77: Box-plots of the fixation count data on the image/ Video 2

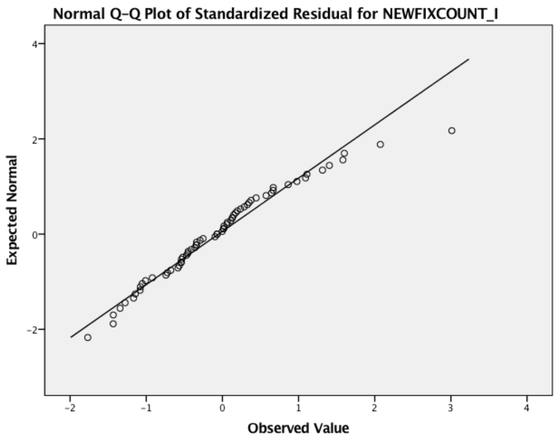
Figure 78: Histogram of the fixation count data on the image/ Video 2

The Normality Test confirmed the non-normality of the overall distribution and the "Hearing" and "Deaf/SL" subsamples, making the data set unsuitable for the linear model.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Fixation count on the image	Total	0.934	67	0.001
	Hearing	0.897	23	0.022
	Deaf	0.959	23	0.449
	Deaf/SL	0.908	21	0.050

Table 62: Results of Normality Test (fixation count on the image/ Video 2)

Even with the exclusion of the outliers, the distribution of the overall sample and of the "Deaf/SL" subsample continued to be abnormal. The Poisson model in the GLM —by using the "Negative binomial log linear" option— is more suitable for the analysis of count values that do not follow a normal distribution and was tested as a second option. However, the descriptive statistics of the data set showed a variance much greater than the mean and the use of this model assumes that the mean is equal to the variance in all categories. As this requirement was not satisfied, the alternative use of this model was discarded. Finally, it was decided to exclude P7 and to still apply the linear model. The exclusion did not lead to the normality of the overall sample (p-value = 0,046) as the “Deaf/SL” group continued being abnormal (p-value = 0,046). However, it resulted in the “Hearing” group no longer being abnormally distributed, as shown in the graphs below (Figure 79 and 80).



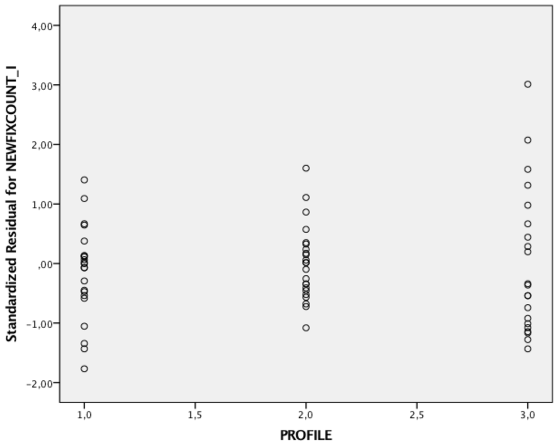


Figure 79: Normal probability plot of residuals (fixation count on the image/ Video 2)

Figure 80: Scatter plot of residuals (fixation count on the image/ Video 2)

It was hypothesized that:

H_0: The profile of the participants/ the subtitling speed of exposure does not have an effect on the fixation counts on the area of the image.

H_1: The profile of the participants/ the subtitling speed of exposure does have an effect on the fixation counts on the area of the image.

The results from the model without adjustment suggested that both “Speed” and “Profile” had affected the results. After the incorporation of the variables of adjustment, this pattern was verified. The number of fixations was significantly lower on the “Deaf/SL” participants when compared to the “Deaf” as well as in the “Medium” speed when opposed to “Low”. The null hypotheses were therefore rejected. Keeping in mind the high variability of this group, it seems that the “Deaf/SL” participants made less fixations on the image. In the same terms, the “Low” exposure seems to have led to a higher number of fixations. However, due to the problems explained above, these results should be taken with caution.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.012	0.014	Profile	0.077
Speed	0.016	0.020	Speed	0.018
Interaction between Profile * Speed	0.428		Reading	0.454

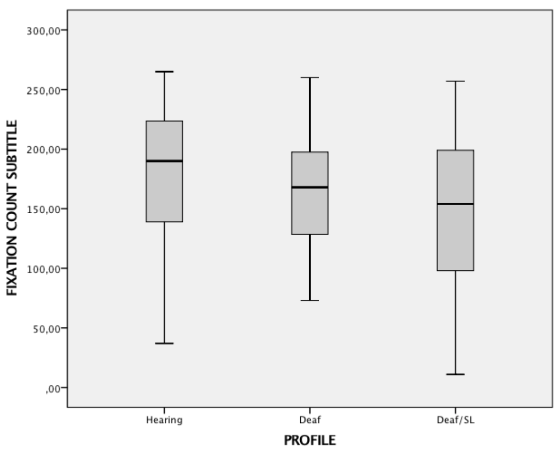
Table 63: Significant effects for fixation count on the image/ Video 2

Subtitles

“Hearing” and “Medium” obtained the highest number of fixations on the subtitles. On the contrary, “Deaf” and “High” showed the lowest number of counts. As it can be seen in the box-plot (Figure 81) in this case the three groups showed a high variability, even though the distribution is perceived as normal in the histogram (Figure 82).

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	163.5821	67	58.52664	11.00	265.00
HEARING	178.8696	23	58.67499	37.00	265.00
DEAF	165.0000	23	48.89227	73.00	260.00
DEAF/SL	145.2857	21	65.30401	11.00	257.00
LOW	164.3636	22	46.32036	85.00	260.00
MEDIUM	173.6087	23	61.98221	27.00	252.00
HIGH	152.3182	22	65.96564	11.00	265.00

Table 64: Fixation count data on the subtitles/ Video 2



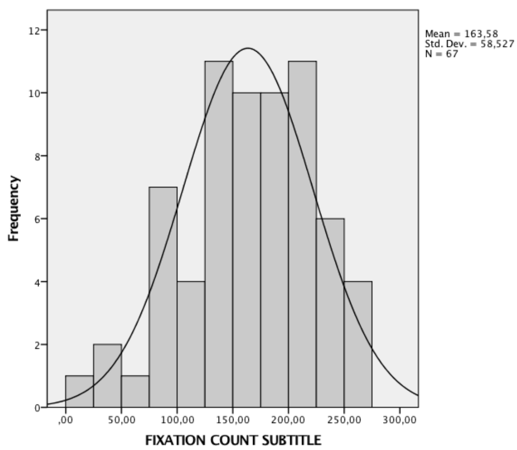


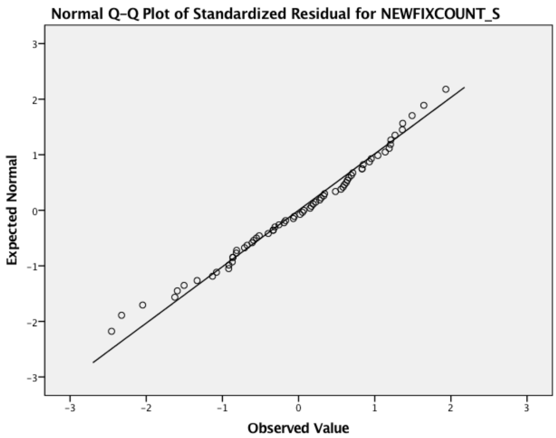
Figure 81: Box-plots of the fixation count data on the subtitles/ Video 2

Figure 82: Histogram of the fixation count data on the subtitles/ Video 2

The normality of the distribution of the residuals was confirmed. The linear distribution of the overall sample and the dispersion of the groups can be seen in the following graphs:

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Fixation count on the subtitle	Total	0.981	67	0.416
	Hearing	0.950	23	0.286
	Deaf	0.986	23	0.982
	Deaf/SL	0.973	21	0.793

Table 65: Results of Normality Test (fixation count on the subtitles/ Video 2)



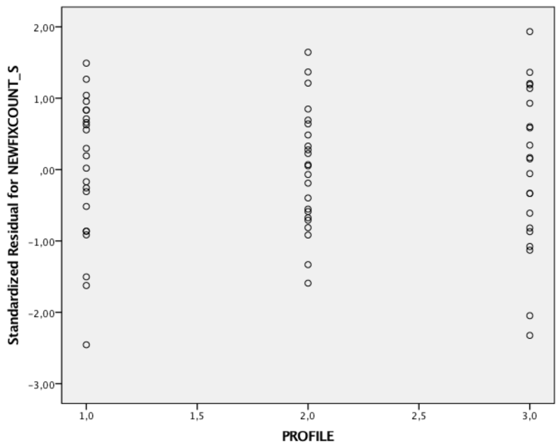


Figure 83: Normal probability plot of residuals (fixation count on the subtitles/ Video 2)

Figure 84: Scatter plot of residuals (fixation count on the subtitles/ Video 2)

The following hypotheses were defined:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the fixation counts on the area of the subtitle.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the fixation counts on the area of the subtitle.

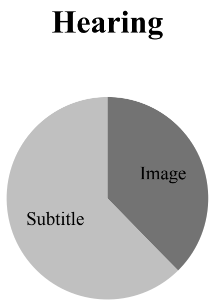
The models with and without adjustment reported the absence of effect of the predictors. The effect of “Profile” and “Speed” could not be validated, so the null hypothesis was verified in both cases. It seems that none of the variables played a key role in terms of number of fixations on the subtitles in this video.

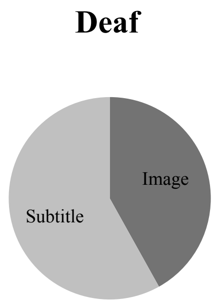
TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.132	0.143	Profile	0.456
Speed	0.480	0.464	Speed	0.491
Interaction between Profile * Speed	0.396		Familiarity	0.251
			Reading	0.829

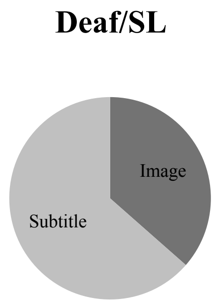
Table 66: Significant effects for fixation count on the subtitles/ Video 2

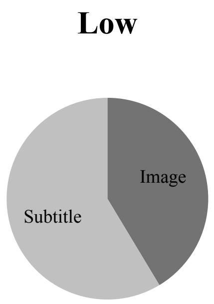
Percentage and distribution of fixation counts

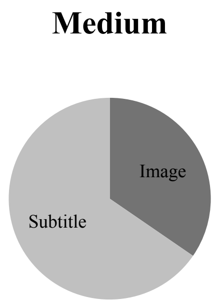
Despite the differences observed between the different profiles and speeds, all the cases resulted in more fixations on the subtitles.











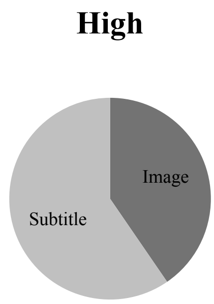


Figure 85: Percentage distribution of the fixation counts (Hearing group/ Video 2)

Figure 86: Percentage distribution of the fixation counts (Deaf group/ Video 2)

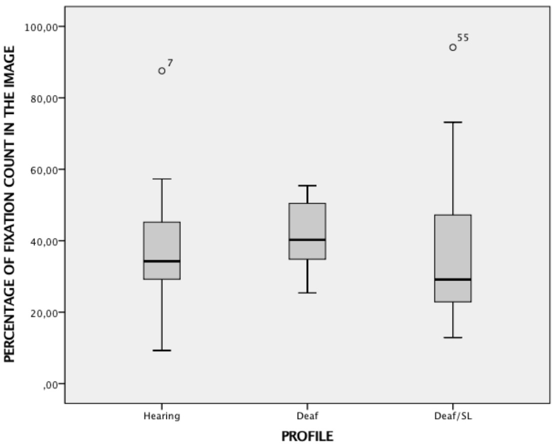
Figure 87: Percentage distribution of the fixation counts (Deaf/SL group/ Video 2)

Figure 88: Percentage distribution of the fixation counts (Low speed/ Video 2)

Figure 89: Percentage distribution of the fixation counts (Medium speed/ Video 2)

Figure 90: Percentage distribution of the fixation counts (High speed/ Video 2)

As the distribution of one of the original variables ("Total fixation count on the image") was not normally distributed in the "Deaf/SL" subsample, exceptionally, it was preferred to apply the Normality Test to confirm that the assumption of normality had not been violated. The slightly skewed distribution can be seen in the histogram (Figure 91) and the existence of the outliers P7 and P55 in the box-plot (Figure 92).



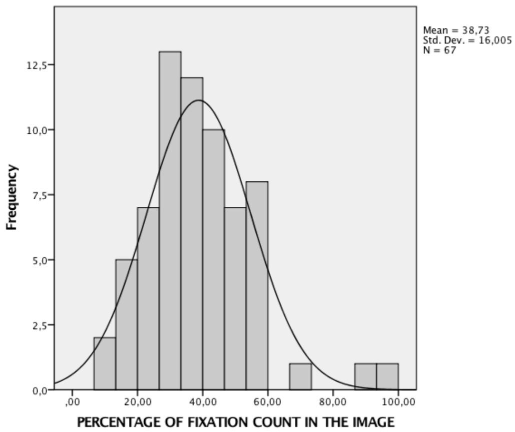


Figure 91: Box-plots of the percentage of fixation count data on the image/ Video 2

Figure 92: Histogram of the percentage of fixation count data on the image/ Video 2

The Normality Test indicated that the sample was not normally distributed. However, after the exclusion of the outliers the distribution was confirmed to be normal. The differences in the linear distribution of the residuals with and without the outliers can be seen in the following plots (Figures 93 and 94).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Fixation count on the subtitle	Total	0.984	65	0.563
	Hearing	0.972	22	0.751
	Deaf	0.948	23	0.272
	Deaf/SL	0.930	20	0.155

Table 67: Results of Normality Test (percentage of fixation count on the image/ Video 2)

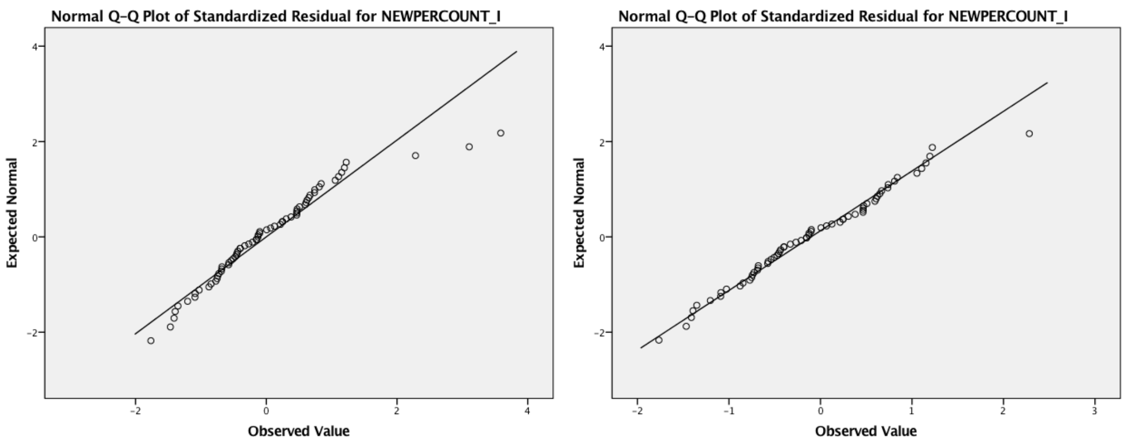


Figure 93: Normal probability plot of residuals (percentage of fixation count on the image/ Video 2)

Figure 94: Scatter plot of residuals (percentage of fixation count on the image/ Video 2)

It was hypothesized that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the percentage of fixation counts on the area of the image.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the percentage of fixation counts on the area of the image.

According to the results of the model without adjustment, the participants' profile had a significant effect on how they distributed their fixations between the image and the subtitles. They indicated that "Deaf" resulted in a significantly higher percentage of fixations on the image and "Deaf/SL" in a significantly higher percentage of fixations on the subtitles. Possibly due to the characteristics of this video —where the images did not contribute to a greater extent in the construction of narrative meaning— it could be argue that the "Deaf/SL" participants made a significantly greater reading effort. On the other hand, it seems that in this case, the speed of exposure of the subtitles did not affect the results. This might be due to the fact that this video had a greater verbal load in such a way that in all the cases reading was prioritized —in terms of number of fixations— regardless the presentation times of the subtitles and the amount of one or two-lines subtitles contained in the different speeds. The null hypothesis is thus validated for "Speed" and rejected for "Profile".

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.037	0.048	Profile	0.059
Speed	0.088	0.105	Speed	0.109
Interaction between Profile * Speed	0.200		Reading	0.883

Table 68: Significant effects for the percentage of fixation count on the image/ Video 2

5.1.5 Visit counts

The number of visits was calculated for each video and area with the aim of analyzing the participants' ability to switch attention between subtitles and the image. Section 5.1.5.1 will present the results for Video 1 and Section 5.1.5.2 for Video 2. The linear regression approach applied to analyze the significance of the set of variables of study on the number of visits was built in the following terms:

MODEL INFORMATION	
Dependent Variable(s)	Total visit count on the image Total visit count on the subtitles
Probability Distribution	Normal
Link Function	Identity

Table 69: Statistical model for visit count

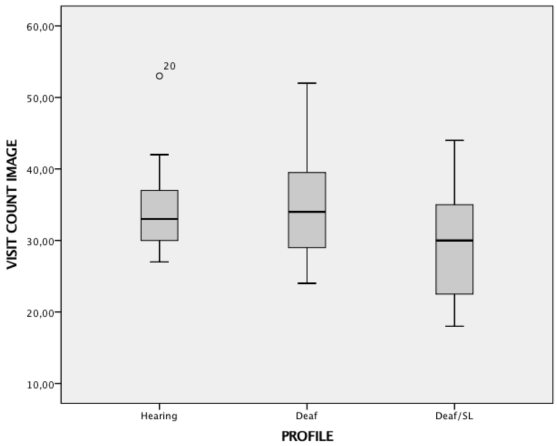
5.1.5.1 Video 1

Image

The "Deaf" participants had more visits on this area, while the "Deaf/SL" was the group with the lowest number of visits. Likewise, the "High" speed resulted in a higher number of visits counts. According to the box-plot (Figure 95), P20 ("Hearing") is an outlier and a high dispersion is observed in the two groups with a hearing loss. The histogram (Figure 96), however, seems to have a bell-shaped normal distribution.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	33.0909	66	7.14192	18.00	53.00
HEARING	34.3478	23	5.88997	27.00	53.00
DEAF	35.0000	23	6.98049	24.00	52.00
DEAF/SL	29.4500	20	7.59137	18.00	44.00
LOW	30.5000	22	5.77144	20.00	45.00
MEDIUM	32.4783	23	5.04407	18.00	43.00
HIGH	36.4762	21	9.10834	21.00	53.00

Table 70: Visit count data on the area of the image in Video 1



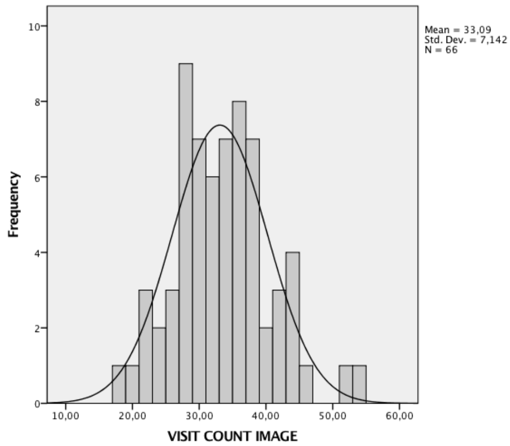


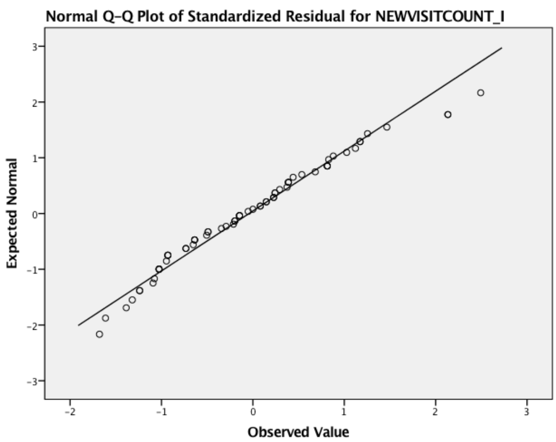
Figure 95: Box-plots of the visit count data on the area of the image in Video 1

Figure 96: Histogram of the visit count data on the area of the image in Video 1

Results from the normality test showed a non-normal distribution with the outlier so it was excluded. The normality of the distribution can be seen is the Q-Q and the Scatter plots below (Figures 97 and 98).

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Fixation count on the image	Total	0.951	22	0.333
	Hearing	0.960	23	0.455
	Deaf	0.952	20	0.394
	Deaf/SL	0.951	22	0.333

Table 71: Results of Normality Test (visit count on the image/ Video 1)



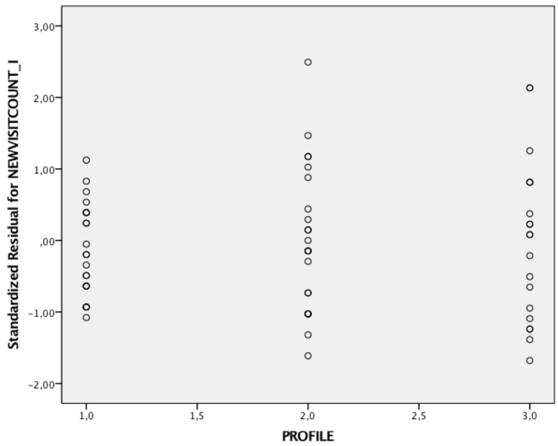


Figure 97: Q-Q plot of residuals with observed and expected values (visit count data on the image/ Video 1)

Figure 98: Scatter plot of residuals for subsamples (visit count data on the image/ Video 1)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the visits counts on the area of the image.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the visits counts on the area of the image.

As reported by the non-adjusted model, the two main explanatory variables affected the results. The inclusion of the variables of adjustment was not required, as it reported no effects. According to the EMM, the significance was placed in “Deaf/SL” and in “High”. The null hypotheses could thus be rejected. It is assumed that the “Deaf/SL” made significantly fewer visits to the image than the other two groups of participants. “Deaf” was the profile with the highest rate of visits to the image, but the difference was only significant when compared to “Deaf/SL”. This could indicate a lower ability to switch attention for the latter group who might have experienced more difficulties processing the two areas of information. In the same way, the participants assigned to the “High” speed resulted in significantly more visits to the image. This was expected, as this exposure had the highest number of subtitles, meaning that the participants were forced to switch their attention between the two areas a greater amount of times, as usually viewers direct their attention to the image at the end of each subtitle.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.009	0.008	Profile	0.106
Speed	0.018	0.020	Speed	0.021
Interaction between Profile * Speed	0.992		Familiarity	0.543
			Reading	0.842

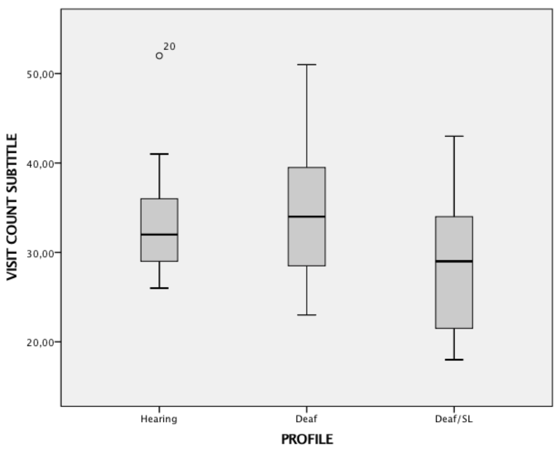
Table 72: Significant effects for visit counts on the image/ Video 1

Subtitles

"Deaf" and "High" resulted in a greater number of visits to the subtitles, being "Deaf/SL" and "Low" the categories that obtained the lowest number. The box-plot (Figure 99) confirms the high dispersion of the groups with a hearing loss and P20 ("Hearing") is seen as an outlier. The distribution of the values appears to be normal in the histogram (Figure 100).

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	31.9077	65	6.77708	18.00	51.00
HEARING	32.4091	22	4.39328	26.00	41.00
DEAF	34.4783	23	6.97313	23.00	51.00
DEAF/SL	28.4000	20	7.47205	18.00	43.00
LOW	29.5455	22	5.67977	19.00	44.00
MEDIUM	31.7826	23	5.29113	18.00	42.00
HIGH	34.6500	20	8.49938	20.00	51.00

Table 73: Visit count data on the subtitles/ Video 1



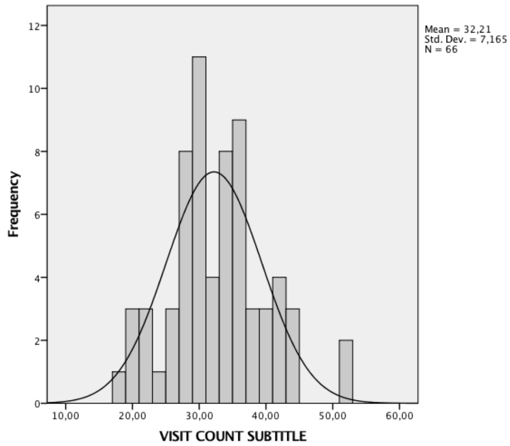


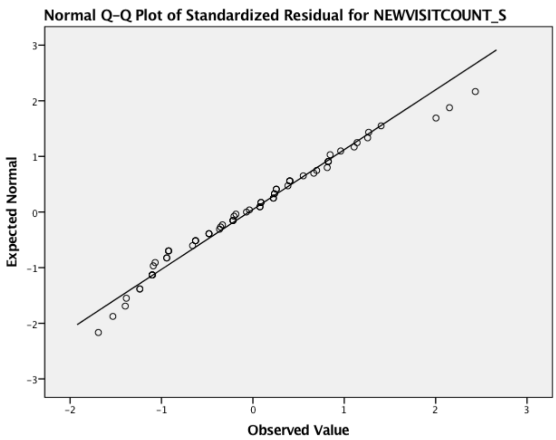
Figure 99: Box-plots of the visit count data on the subtitles/ Video 1

Figure 100: Histogram of the visit count data on the subtitles/ Video 1

The distribution of the residuals was tested in the Normality Test directly without the outlier. Results confirmed the normality of the sample —as observed in the following plots (Figures 101 and 102)—s o that the linear distribution was assumed and the model was applied.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Standardized Residual for: Fixation count on the image	Total	0.973	65	0.157
	Hearing	0.942	22	0.220
	Deaf	0.969	23	0.656
	Deaf/SL	0.942	20	0.266

Table 74: Results of Normality Test (visit count on the subtitles/ Video 1)



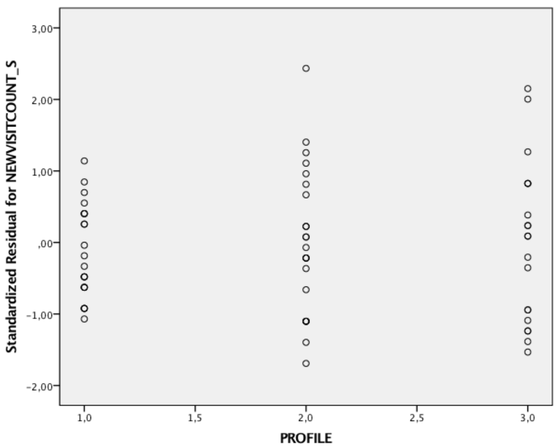


Figure 101: Normal probability plot of residuals (visit counts on the subtitles/ Video 1)

Figure 102: Scatter plot of residuals (visit counts on the subtitles/ Video 1)

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the visit counts on the area of the subtitle.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the visit counts on the area of the subtitle.

According to the results, the variables of adjustment did not have any influence on the results, as opposed to the explanatory variables “Speed” and “Profile”. The model without interaction and without adjustment confirmed the significant effects that were observed in the analysis of the visit counts on the image: the “Deaf/SL” profile and the “Low” speed resulted in significantly fewer visits than the rest of the categories. Therefore, the two alternative hypotheses were validated. “Deaf” participants showed a greater ability to switch attention between the two areas of interest, as they showed a greater amount of visits to the two areas, however this difference is not significant. The significance is placed upon the “Deaf/SL” who, on the contrary, showed a less skilled ability to switch attention and resulted in the fewer number of visits to both areas, suggesting a slower processing. In the same terms, the “High” exposure forced the participants to make more visits to both areas, as they presented the higher number of subtitles and they were displayed for shorter times. On the contrary, the “Low” exposure —displayed for longer times and with more two-lines subtitles— forced participants to follow a slower rhythm and to result in less visits.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.004	0.003	Profile	0.067
Speed	0.020	0.021	Speed	0.018
Interaction between Profile * Speed	0.984		Reading	0.657

Table 75: Significant effects for visit counts on the subtitles/ Video 1

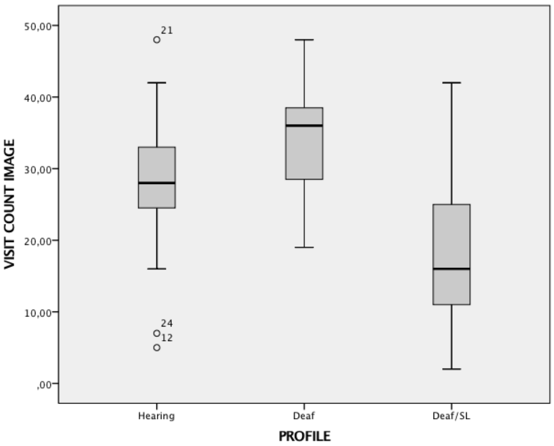
5.1.5.2 Video 2

Image

As with the previous video, “Deaf” and “High” showed the highest number of visits and “Deaf/SL” and “Low” resulted in the fewest number. However, the differences between the speeds did not seem to be as relevant as between the profiles, mainly due to the noticeable decrease of visit counts observed in the “Deaf/SL” group. As it can be seen in the box-plot (Figure 103) the “Deaf/SL” group presented once again a highly dispersed distribution, and three outliers (P12, P21, and P34) were identified in the “Hearing” group. Probably due to the fact that the mean of the visit counts was considerably lower in the “Deaf/SL”, the histogram shows a slightly skewed distribution (Figure 104).

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	26.8358	67	11.24870	2.00	48.00
HEARING	27.5217	23	9.92183	5.00	48.00
DEAF	33.7826	23	7.67497	19.00	48.00
DEAF/SL	18.4762	21	10.72669	2.00	42.00
LOW	25.1818	22	7.85364	2.00	37.00
MEDIUM	26.6957	23	11.10051	4.00	42.00
HIGH	28.6364	22	14.16416	7.00	48.00

Table 76: Visit count data on the image/ Video 2



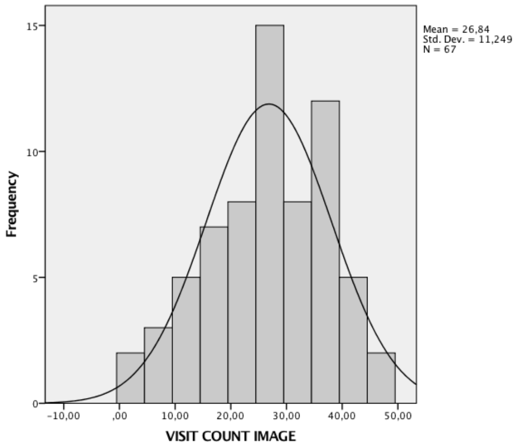


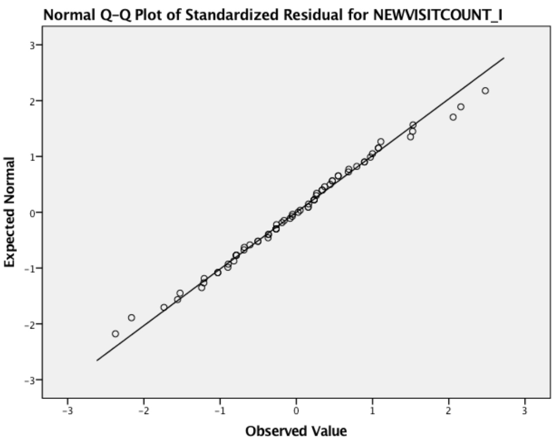
Figure 103: Box-plots of the visit count data on the image/ Video 2

Figure 104: Histogram of the visit count data on the image/ Video 2

The Normality Test was applied to evaluate the distribution of the sample. Results showed that the overall sample and the subsamples were normally distributed even with the outliers. The dispersion across the subsamples can be seen in Q-Q plot (Figure 105). However, as long as the distribution was assumed to be normal —as shown in the Scatter plot (Figure 106)— the linear model could be built.

NORMALITY TEST				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Fixation count on the subtitle	Total	0.993	67	0.977
	Hearing	0.964	23	0.558
	Deaf	0.975	23	0.812
	Deaf/SL	0.958	21	0.479

Table 77: Results of Normality Test (visit count on the image/ Video 2)



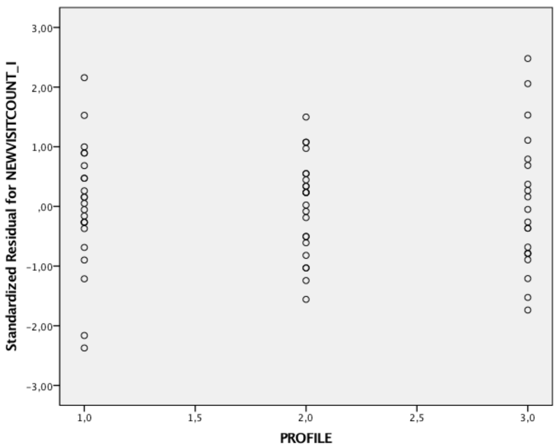


Figure 105: Normal probability plot of residuals (visit counts on the image/ Video 2)

Figure 106: Scatter plot of residuals (visit counts on the image/ Video 2)

It was hypothesized that:

> H_0: The profile of the participants/ the subtitling speed of exposure does not have an effect on the visit counts on the area of the image.
>
> H_1: The profile of the participants/ the subtitling speed of exposure does have an effect on the visit counts on the area of the image.

According to the results, the interaction between "Speed" and "Profile", as well as "Speed" and the variables of adjustment were not significant. The model without interaction and without adjustment, however, indicated the existence of significant differences between the three profiles. Despite the differences in the number of visits resulting from "High" and "Low", the exposure of the subtitles was not significant. Again, the visual characteristics of the video might have influenced this outcome. The fact that the visual information provided was repetitive and static might have caused participants not to show as much interest on the image, influencing thus the switching of attention between the subtitles and the image. The null hypothesis was rejected in the case of "Profile" and validated in "Speed". The "Deaf/SL" group made significantly fewer visits to the image than the two other groups, in the same way as the "Hearing" made significantly fewer visits to the image than the "Deaf". This suggests that the "Deaf" resorted to the image even when this was rather static and did not contribute that much to narrative meaning. Taking into account that this group tended to rely to lip-reading to a greater extent, they might have made a greater effort to switch attention to the image in order to try to focus on the characters' faces that were sometimes hidden behind the tree branches. On the contrary, the "Deaf/SL" showed a slower ability to switch attention between the areas, which might indicate a higher cognitive load when reading the subtitles.

TEST OF MODEL EFFECTS				
Model without adjustment			Model with adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.000	0.000	Profile	0.000
Speed	0.538	0.512	Speed	0.804
Interaction between Profile * Speed	0.105		Familiarity	0.141
			Reading	0.263

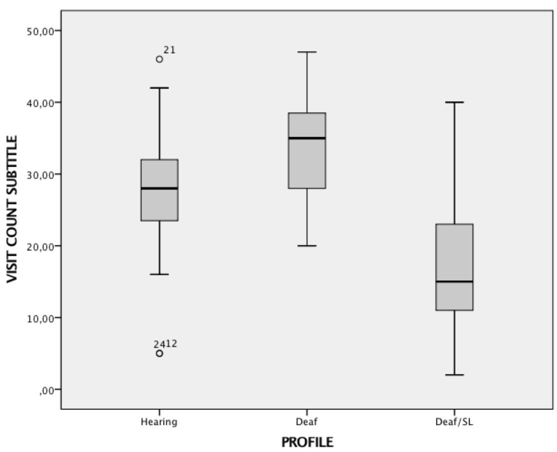
Table 78: Significant effects for visit counts on the image/ Video 2

Subtitles

In this case there were no bigger differences between the numbers of visits shown by the three speeds, even though “High” resulted in the highest number of visits and “Low” in the lowest. As far as for “Profile”, “Deaf/SL” showed a considerable decrease in the number of visits, especially when it was compared to “Deaf”. The box-plot (Figure 107) confirms the presence of the same outliers in the “Hearing” group and shows a highly dispersed distribution in “Deaf/SL”. The histogram (Figure 108) shows a slightly skewed distribution, the normality of which was assessed in the Normality Test.

	Mean	N	Std. Deviation	Minimum	Maximum
TOTAL	26.4030	67	11.04956	2.00	47.00
HEARING	26.6522	23	9.88851	5.00	46.00
DEAF	33.8696	23	7.18777	20.00	47.00
DEAF/SL	17.9524	21	9.96733	2.00	40.00
LOW	24.8182	22	7.87181	2.00	37.00
MEDIUM	26.4783	23	10.33032	5.00	42.00
HIGH	27.9091	22	14.31586	5.00	47.00

Table 79: Visit count data on the subtitles/ Video 2



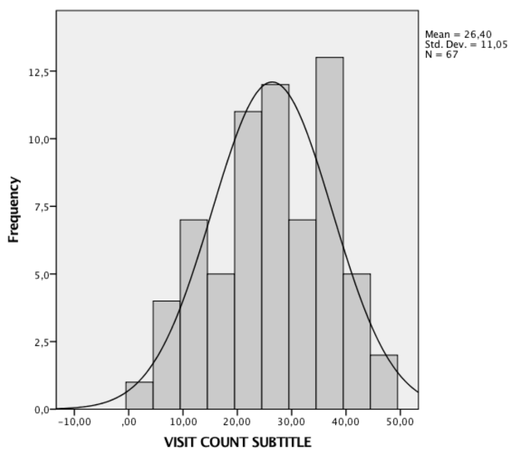


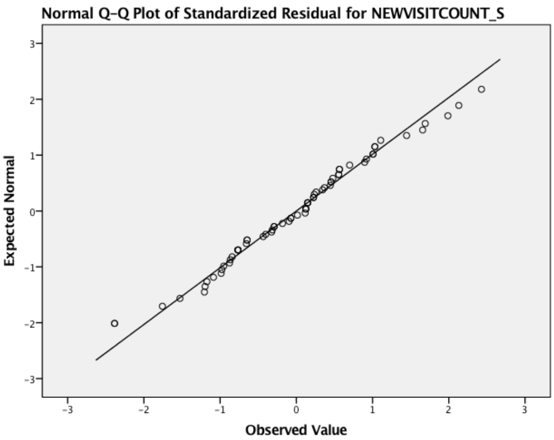
Figure 107: Box-plots of the visit count data on the subtitles/ Video 2

Figure 108: Histogram of the visit count data on the subtitles/ Video 2

Results confirmed the normality of the distribution even with the presence of the outliers so the model was applied under the assumption of a linear distribution, which can be appreciated in the Q-Q plot (Figure 109). The dispersion of the subsamples can be seen in the Scatter plot (Figure 110).

TEST OF NORMALITY				
Variable	Group	Shapiro-Wilk		
Standardized Residual for: Visits count on the subtitle	Total	0.987	67	0.710
	Hearing	0.956	23	0.389
	Deaf	0.970	23	0.678
	Deaf/SL	0.936	21	0.179

Table 80: Results of Normality Test (visit count on the subtitles/ Video 2)



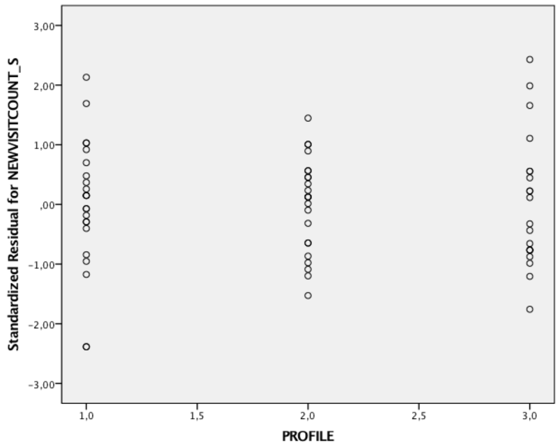


Figure 109: Normal probability plot of residuals (visit counts on the subtitles/ Video 2)

Figure 110: Scatter plot of residuals (visit counts on the subtitles/ Video 2)

The following hypotheses were defined:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the visit counts on the area of the image.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the visit counts on the area of the image.

According to the results, the speed of the subtitles had no effect on the number of visits made to subtitles. However, both the profile of the participants and the interaction between “Profile” and “Speed” resulted in significant effects. With the inclusion of the adjustment variables, “Reading” appeared to also have a quasi-significant effect, suggesting a positive correlation between the reading skills of the participants and the number of visits. However, the effect was not significant enough so the model with interaction and without adjustment was selected. The null hypothesis was not fully rejected for “Speed”, but it was for “Profile”, assuming that the “Deaf” participants visited the area of the subtitles significantly more times than the other groups. As for “Speed”, despite having no direct influence on the results — probably because of the same reasons explained in the analysis of the visits on the image— it showed an effect when combined with “Profile”. The significance was placed on the “Deaf” when combined with “High”, indicating that the “Deaf” participants who were assigned to the “High” speed resulted in more visit counts on the subtitles than any of the other possibilities. This suggest that this group was able to follow the faster rhythm imposed by this exposure.

TEST OF MODEL EFFECTS			
No adjustment		With adjustment	
Effects	Sig.	Effects	Sig.
Profile	0.000	Profile	0.000
Speed	0.603	Speed	0.723
Interaction between Profile * Speed	0.046	Reading	0.088
		Profile * Speed	0.022

Table 81: Significant results for visit counts on the subtitles/ Video 2

5.1.6 Summary of the results

This section provides a summary of the results presented above. The analysis of the different effects observed in relation to the different explanatory variables and the different videos will be reported in the following Chapter in Sections 6.1 and 6.2.

In terms of total fixation duration, differences were observed between Video 1 and 2: in the former all the categories spent more time viewing the image, whilst in the latter, all except “Deaf” spent more time reading the subtitles. This suggests that the different degree of combination of visual and verbal elements between the two videos might have influenced the time that participants spent reading the subtitles and watching the visuals.

In Video 1, the “Deaf” participants spent significantly more time viewing the images than the other two groups, and those who were assigned to the “Low” speed of exposure resulted in a shorter time on the image. In Video 2, the “Deaf/SL” participants spent significantly less time on the images. The speed of exposure of the subtitles was quasi-significant, where “Low” resulted in more time on the subtitles.

On the one hand, and contrary to what was expected, not all participants with a hearing loss spent longer times on the subtitles. In fact, the “Deaf” participants showed a great ability to read the subtitles faster and spend more time on the image. The longer reading times showed by the “Deaf/SL”, on the contrary, suggest slower reading times that might indicate reading difficulties. On the other hand, a preliminary pattern is observed in relation to the “Low” speed of exposure. It seems that this modality of exposure can lead to a longer time on the subtitles and, consequently, a shorter time on the image. This might be explained by the fact that these subtitles were fewer in number, were displayed on screen for longer times and contained more two-line subtitles.

In terms of mean fixation duration, fixations were longer on the image in the two videos. The “Deaf/SL” participants presented the longest mean on the subtitles and the shortest mean on the image in both cases, and the “Deaf” the shortest mean on the subtitles. “Low” showed the longest mean duration on the image in both cases too. The variable of adjustment “Reading” was significant on the two videos, suggesting that the higher the reading skills of the participants the longer the mean duration of the fixations on the image, and vice versa.

In Video 1, a quasi-significant effect is found: the “Deaf” were quasi-significantly more likely to make shorter fixations on the subtitles. In Video 2, the interaction effect between “Profile” and “Speed” also turned out to be significant: the “Deaf/SL” participants assigned to the “Low” subtitling exposure were more likely to fixate on the images for a shorter time.

It seems that the “Deaf” participants —who spent a longer time on the images— also tended to make shorter fixations on the subtitles in the two videos. This could indicate a faster reading behavior: they read the subtitles faster and thus had more time to explore the images. The fact that the reading skills of the participants turned out to be significant in Video 1 might corroborate this hypothesis: the participants with a lower level of reading comprehension —mainly concentrated on the “Deaf/SL” group”— were more likely to make shorter durations on the image, as they might have need longer durations in order to read and process the subtitles. The “Hearing”, however, were skilled-readers but they did not show the same pattern of fast reading. This might be explained by the fact that they were not as familiar with the use of subtitles as the “Deaf”. It is worth mentioning that when the “Deaf/SL” participants were assigned to the “Low” speed of exposure they resulted in the shortest mean duration on the image. The fact that the subtitles were displayed for longer and contained more two-lines subtitles might have forced an increase in the cognitive load required for the reading of the subtitles and thus have hindered the viewing process.

In terms of fixation counts, the “Deaf/SL” participants showed the fewest number of fixations on both the image and the subtitles and in the two videos, the “Deaf” made the highest number of fixations on the image and the “Hearing” on the subtitles. The fact that the

“Deaf/SL” tended to make fewer fixations on the two areas and in the two videos may be a reflection of their reading and viewing processes and could indicate a less regular reading pattern and a tendency to explore the image with fewer fixation counts. On the contrary, the “Hearing” seemed to present a more regular reading pattern and the “Deaf” showed a tendency to explore the image with more fixation counts.

In Video 1, the “Hearing” made quasi-significantly more fixations on the subtitles, suggesting that they might have followed a more regular reading pattern. Participants assigned to the “Low” speed of exposure resulted in significantly fewer fixations on the image and in more fixations on the subtitles. In Video 2, the “Deaf/SL” participants were significantly more likely to make fewer fixations on the image as well as fewer fixations on the subtitles, and the “Deaf” to make more fixations on the image. In this case, “Low” led to make more fixations on the image, even though no significant effects were reported for speed exposure. Interestingly, the participants assigned to “Low” presented a contradictory pattern: in Video 1 this exposure led to a lower number of fixations on the image (and to a higher number of fixations on the subtitles) and in Video 2 it resulted in a higher number of fixations on the images. These tendencies, although only significant in Video 1, might be explained by the different degree of combination of verbal and visual load in each video that might have led to different patterns.

Finally, in terms of visit counts, all the categories showed a steady behavior, regardless of the video and the area of interest: the “Deaf” profile and the “Low” speed of exposure resulted in the highest number of visits counts, whereas “Deaf/SL” and “High” showed the lowest number. This regular performance seems to indicate that the “Deaf” were more likely to switch attention between the images and the subtitles in an effective way, displaying a faster reading and viewing processing that led them to make more visits to both areas. The “Deaf/SL”, on the contrary, seemed to follow a slower overall rhythm. As far as for the speed of exposure of the subtitles, “High” led to more visits to both areas and “Low” to fewer. Assuming that after the display of each subtitle participants would deviate attention to the image, this outcome was expected, as the former speed consisted of a higher number of one-line subtitles that were displayed for a shorter time, and the latter speed consisted of a fewer number of two-line subtitles that were displayed for longer.

The effect of these tendencies was corroborated in the statistical analysis to a certain degree. In Video 1, the “Deaf/SL” group made significantly fewer visits to the two areas and the “High” speed resulted in a significantly higher number of visits to them. In the case of the subtitles, the effects of “Low” and “Deaf” were also significant, as the former category led to fewer visits and the latter to more visits. In Video 2, significance was found on the profiles of the participants but not on the subtitling speed of exposure. The number of visits to the images was significantly lower in the case of the “Deaf/SL” and the number of visits to the subtitles was significantly higher in the “Deaf” group. Interestingly, the interaction between “Deaf” and “High” was also significant, as the “Deaf” participants assigned to this exposure made more visits to the subtitles than the rest of possible combinations. This might be an indication that this group of participants were able to effectively follow the faster rhythm imposed by this modality of exposure.

5.2 Stage of reaction

This stage was aimed at analyzing the abilities of the participants to understand the narrative of the videos and the information coming from the subtitles and from the images. The generalized linear model approach was used to analyze the effect of the exploratory variables (“Profile” and “Speed” and the variables of adjustment) on the following set of dependent variables:

1. Identification of the characters.
2. Understanding of the plot.
3. Recall of visual information.
4. Recall of verbal information 1.
5. Recall of verbal information 2.
6. Inference of information.

5.2.1 Preliminary remarks

The answers of the participants for each video were collected in a questionnaire and evaluated as correct or incorrect (in the case of variables one, three and six), as correct, semi-correct or incorrect (in the case of variables two and four) and as yes or no (in the case of variable five). As all of the dependent variables were categorical, and most were dichotomous (correct vs. incorrect and yes vs. no) or pseudo-dichotomous (correct, semi-correct and incorrect), the Binary Logistic regression analysis was selected. Similar to the linear regression model, it allows the dependent variable to be linearly related to a set of factors and/or covariates by the use of a link function (Logit). To be validated, however, its use required a set of assumptions. The dependent variable should have been measured on a dichotomous scale with two mutually exclusive and exhaustive categories and the observations had to be independent. On the other hand, the assumptions of normality in the distribution of the dependent variable and in the distribution of the errors —as well as the homogeneity of the variance— did not need to be met. For each dependent variable, one of two categories had to be defined as the reference category. In this case, the correct and yes categories were selected, in order for the model to be built around the axis of correct and yes answers.

Categories in variables one, three and five (correct vs. incorrect), and six (yes vs. no) were originally dichotomous and mutually exclusive. Variables two and four, however, were defined as pseudo-dichotomous as they consisted of three categories (correct, semi-correct, and incorrect). For the purpose of the analysis, the semi-correct and incorrect answers were analysed in conjunction in order to obtain binary responses. To be able to build the model, the categories were given a numerical value (correct and yes =1, incorrect and no =2).

Variables were independently selected and two models were created for each of them: a first model without adjustment, and a second one that incorporated the variables of adjustment. The final model only included the effects that turned out to be significant (p-value < 0.05) with the exception of “Profile” and “Speed” that were always present.

5.2.2 Comprehension of narrative information

The results obtained in relation to the ability of the participants to comprehend the narrative information —in terms of identification of the characters and understanding of the plot— are presented in Sections 5.2.2.1 and 5.2.2.2. The binary logistic model built was defined as follows:

MODEL INFORMATION	
Dependent Variable(s)	Identification of the characters Understanding of the plot
Probability Distribution	Binomial
Link Function	Logit[22]

Table 82: Statistical model for comprehension of narrative information

5.2.2.1 Video 1

Identification of the characters

In general, the three groups of participants understood who the characters were. Only five "Deaf/SL" participants were not able to answer correctly. In relation to the speed of exposure of the subtitles, no clear differences were observed.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	24	24	19	67
	Percentage	100.0%	100.0%	79.2%	93.1%
INCORRECT	Count	0	0	5	5
	Percentage	0.0%	0.0%	20.8%	6.9%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	23	22	22	22
	Percentage	95.8%	91.7%	91.7%	91.7%
INCORRECT	Count	1	2	2	2
	Percentage	4.2%	8.3%	8.3%	8.3%

Table 83 Percentage of answers for identification of the characters/ Video 1

To test the existence of significant differences a logistic linear model was built. It was hypothesized that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to identify the characters.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to identify the characters.

The model without adjustment reported no effects for "Speed" and "Profile". The incorporation of the variables of adjustment confirmed the absence of significance but reported a quasi-significant and positive effect on "Reading". On average, participants were

[22] The procedure models "Incorrect" as the response, treating "Correct" as the reference category.

able to identify the characters correctly, regardless of their profile and the subtitling speed of exposure. However, the covariate “Reading” seemed to have influenced the results: the participants with good reading skills were more likely to answer correctly. The null hypothesis was validated for “Speed”. In relation to “Profile”, however, as the reading skills of the participants were correlated to their profile to a certain extent, the effect of “Profile” was partially assumed and adjusted in terms of reading skills.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	1.000	1.000	Profile	1.000	1.000
Speed	1.000	0.784	Speed	0.481	0.473
Interaction between Profile * Speed	1.000		Familiarity	0.999	0.052
			Reading	0.081	1.000

Table 84: Significant effects for the identification of the characters/ Video 1

Comprehension of the plot

63% of the participants were able to understand the plot. The highest rate of correct answers was observed in “Deaf” —followed by “Hearing”—, whilst “Deaf/SL” showed a considerably poorer comprehension. In relation to the speeds of exposure, “Low” resulted in the highest percentage of correct answers.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	17	20	9	46
	Percentage	70.8%	83.3%	37.5%	63.9%
INCORRECT	Count	7	4	15	26
	Percentage	29.2%	16.7%	62.5%	36.1%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	14	18	14	14	46
	58,3%	75.0%	58.3%	58.3%	63.9%
INCORRECT	10	6	10	10	26
	41,7%	25.0%	41.7%	41.7%	36.1%

Table 85: Percentage answers for comprehension of the plot/ Video 1

To evaluate whether the differences observed were significant, the logistic regression approach was applied. The following hypotheses were defined:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to understand the plot.

H_1: The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to understand the plot.

Results from the model without adjustment indicated that the profile of the participants had an effect on the results, suggesting that the ability of the "Deaf/SL" to understand the plot was significantly poorer. However, according to the model with adjustment, it was the familiarity of some of the participants with the film that affected the results. The effect detected in "Deaf/SL" might rather be explained by the fact that 79% of them had not watched the film (compared to 70.8 % and 66.7% of the "Hearing" and "Deaf" who had watched it before). According to this, the participants who had already watched the film were more likely to provide the right answer. The null hypothesis for "Speed" was validated —as "Low" obtained higher scores but no effects were reported— whilst the alternative hypothesis for "Profile" was partially verified due to the collinearity between "Familiarity" and "Profile".

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	0.005	0.005	Profile	0.251	0.078
Speed	0.503	0.327	Speed	0.440	0.289
Interaction between Profile * Speed	0.520		Reading	0.053	0.024
			Familiarity	0.181	

Table 86: Significant effects for the comprehension of the plot/ Video 1

5.2.2.2 Video 2

Identification of the characters

59.7% of the participants were able to identify the characters. "Hearing" and "Deaf" obtained very good results, but "Deaf/SL" showed a low rate of correct answers: only five participants provided the right answer. In the same way, "Low" resulted in the highest percentage of correct answers, even thought the differences with the other two categories do not seem to be relevant.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	19	19	5	43
	Percentage	79.2%	79.2%	20.8%	59.7%
INCORRECT	Count	5	5	19	29
	Percentage	20.8%	20.8%	79.2%	40.3%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	17	12	14	43
	Percentage	70.8%	50.0%	58.3%	59.7%
INCORRECT	Count	7	12	10	29
	Percentage	29.2%	50.0%	41.7%	40.3%

Table 87: Percentage of answers for identification of the characters/ Video 2

The logistic regression model was applied, under the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to identify the characters.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to identify the characters.

The low variability between some of the groups, and the existence of cases with very small values, caused again the presence of a quasi-separation in the data so the maximum likelihood could not be estimated. Results from the model without adjustment indicated that, without the interaction effect between the two main explanatory variables, the profile of the participants had a significant effect on their answers: the performance of the "Deaf/SL" group was significantly poorer. In the model with adjustment, however, the inclusion of the variable "Reading" absorbed the effect observed in "Profile". This indicates that the lower the reading skills of the participants, the worse their ability to identify the characters.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	1.000	0.000	Profile	0.200	0.117
Speed	0.831	0.219	Speed	0.106	0.101
Interaction between Profile * Speed	0.996		Reading	0.004	0.004
			Familiarity	0.999	

Table 88: Significant results for identification of the characters/ Video 2

Participants assigned to the "Low" exposure obtained better results —probably because the subtitles were displayed for longer times and in two-lines, supporting this way the process of reading— but no significant effect was observed so the null hypothesis was validated. In the case of “Profile”, however, it could not be fully rejected, as the “Reading” skills of the participants were correlated to their profile. The alternative hypothesis was therefore partially verified and redefined in terms of “Reading”: a lower level of reading comprehension skills might lead to a poorer performance in the identification of the characters.

Comprehension of the plot

Slightly more than half of the sample was able to provide a complete answer. In other words: almost half of the participants did not understand the gist of the story. The “Hearing” obtained the highest rate of correct answers. The majority of “Deaf/SL”, however, were not able to answer correctly. As far as for the speed of exposure, participants assigned to “Low” presented the highest rate of correct answers.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	18	15	5	38
	Percentage	75.0%	62.5%	20.8%	52.8%
INCORRECT	Count	6	9	19	34
	Percentage	25.0%	37.5%	79.2%	47.2%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	15	13	10	38
	Percentage	62.5%	54.2%	41.7%	52.8%
INCORRECT	Count	9	11	14	34
	Percentage	37.5%	45.8%	58.3%	47.2%

Table 89: Percentage of answers for comprehension of the plot/ Video 2

To evaluate the significance of the differences observed, it was hypothesized that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to identify the characters.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to identify the characters.

In the model without adjustment the interaction between “Speed” and “Profile” was not significant so it was excluded. Without it, “Profile” turned out to be significant. Results from the model with adjustment indicated that the variable “Reading” once again absorbed the effect observed in “Profile”. The differences between the reading skills of the participants seemed to explain the results better. The effect of “Speed” could not be confirmed and the null hypothesis was validated. As “Profile” and “Reading” were highly correlated, the alternative hypothesis was verified and redefined in terms of reading comprehension skills: the participants with greater reading skills were more likely to comprehend the plot.

TESTS OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	0.626	0.001	Profile	0.598	0.625
Speed	0.777	0.270	Speed	0.534	0.434
Interaction between Profile * Speed	0.758		Reading	0.007	0.008

Table 90: Significant effects for comprehension of the plot / Video 2

5.2.3 Recall and process of information

The binary logistic model built to evaluate the effect of the explanatory variables was defined as expressed in Table 91. Section 5.2.3.1 will present the results regarding the recall and process of visual information, and Section 5.2.3.2 the results of the recall and process of verbal information

MODEL INFORMATION	
Dependent Variable(s)	Recall and process of visual information Recall and process of verbal information 1 Recall and process of verbal information 2
Probability Distribution	Binomial
Link Function	Logit[23]

Table 91: Statistical model for recall/ process of information

5.2.3.1 Recall and process of visual information

Video 1

Slightly more than half of the participants were able to answer correctly. The two groups with a hearing loss resulted in a higher rate of correct answers, with the performance of the

[23] The procedure models "Incorrect" and "No" as the response, treating "Correct" and "Yes" as the reference category.

"Deaf/SL" being slightly better. On the contrary, a considerable part of "Hearing" participants (62.5%) was not able to process and recall the requested information. In relation to the speeds of exposure, preliminarily no big differences were perceived: the lowest rate was obtained at "Medium", while "High" and "Low" presented the same proportion of correct answers (50%).

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	9	15	16	40
	Percentage	37.5%	62.5%	66.7%	55.6%
INCORRECT	Count	15	9	8	32
	Percentage	62.5%	37.5%	33.3%	44.4%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	12	14	12	40
	Percentage	50.0%	58.3%	50.0%	55.6%
INCORRECT	Count	12	10	12	32
	Percentage	50.0%	41.7%	50.0%	44.4%

Table 92: Percentage of answers for visual recall and process/ Video 1

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to recall and process the visual information.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to recall and process the visual information.

In the model without adjustment, no effects were reported. "Deaf/SL" —for the first time— obtained the best scores and a tendency of difference was observed in "Hearing" —that obtained the worst results— but any of these patterns was statistically significant. In the model with adjustment, even though the tendency observed in "Profile" gained significance, no effects were identified so the null hypotheses could not be rejected. Any of the variables investigated were shown to have an effect on the ability of the participants to recall and process the visual information

TEST OF MODEL EFFECTS				
No adjustment			With adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.092	0.095	Profile	0.053
Speed	0.780	0.786	Speed	0.741
Interaction between Profile * Speed	0.913		Familiarity	0.614
			Reading	0.251

Table 93: Significant effects for visual recall and process/ Video 1

Video 2

Most participants were able to recall the piece of visual information required. “Hearing” and “Deaf” obtained the best results, closely followed by “Deaf/SL”. Differences were also seen in relation to the speed of exposure of the subtitles: 83.3% of the participants assigned to “Low” and “High” and 66.7% of those assigned to “Medium” answered correctly.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	19	19	18	56
	Percentage	79.2%	79.2%	75.0%	77.8%
INCORRECT	Count	5	5	6	16
	Percentage	20.8%	20.8%	25.0%	22.2%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	20	16	20	56
	Percentage	83.3%	66.7%	83.3%	77.8%
INCORRECT	Count	4	8	4	16
	Percentage	16.7%	33.3%	16.7%	22.2%

Table 94: Percentage of answers for visual recall and process/ Video 2

The linear logistic approach was used with the hypotheses that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to recall and process the visual information.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to recall and process the visual information.

According to the model without adjustment, no effects were reported. However, when the variables of adjustment “Familiarity” and “Reading” were incorporated, a significant effect was detected in the latter. The null hypothesis defined for “Speed” could not be rejected and the non-effect of the speed of exposure of the subtitles was assumed. With regards to “Profile”, the null hypothesis could not be fully rejected, as “Reading” was proven to have an effect. The effect credited to “Profile” was then reformulated in terms of the different reading skills of the participants. It seems that the on average poorer reading skills of the “Deaf/SL” participants negatively affected their ability to recall and process the visual information, despite having show an overall good performance.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	1.000	0.920	Profile	0.248	0.248
Speed	1.000	0.288	Speed	0.293	0.301
Interaction between Profile * Speed	0.973		Reading	0.011	0.011
			Familiarity	0.617	

Table 95: Significant effects for visual recall and process/ Video 2

5.2.3.2 Recall and process of verbal information

The ability of the participants to recall and process the verbal information was assessed in two separate questions. The first one was evaluated as correct or incorrect and the second one was evaluated as yes or no.

Video 1

A similar percentage of participants answered the first (56.9%) and the second question correctly (65.3%). In both cases, “Hearing” and “Deaf” obtained very good results, whilst “Deaf/SL” obtained a low percentage of correct answers. This group seemed to have encountered problems to process the verbal information. With regards to the speed of exposure of the subtitles, “Low” obtained the highest rate of correct answers in the two questions, and “High” and “Medium” resulted in similar scores.

QUESTION 1		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	18	18	5	41
	Percentage	75.0%	75.0%	20.8%	56.9%
INCORRECT	Count	6	6	19	31
	Percentage	25.0%	25.0%	79.2%	43.1%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	15	14	12	41
	Percentage	62.5%	58.3%	50.0%	56.9%
INCORRECT	Count	9	10	12	31
	Percentage	37.5%	41.7%	50.0%	43.1%
QUESTION 2		HEARING	DEAF	DEAF/SL	TOTAL
	Count	22	20	5	47
YES	Percentage	91.7%	83.3%	20.8%	65.3%
NO	Count	2	4	19	25
	Percentage	8.3%	16.7%	79.2%	34.7%
		LOW	MEDIUM	HIGH	TOTAL
YES	Count	17	15	15	47
	Percentage	70.8%	62.5%	62.5%	65.3%
NO	Count	7	9	9	25
	Percentage	29.2%	37.5%	37.5%	34.7%

Table 96: Percentage of answers in the verbal recall and process/ Video 1

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to recall and process the verbal information.

$H_{1:}$ "The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to recall and process the verbal information.

As it was expected —based on the above percentages—, the models without adjustment confirmed the significant effect of the profile of the participants, as well as the no-effect of the speed of exposure. However, in the first question, the inclusion of the variable "Reading" absorbed the effect observed for "Profile". In the second question, however, the effect of profile did not totally disappear and it was still considered as quasi-significant. This might suggest that the differences observed between the profiles might mainly, but not only, be due to the reading skills. Since the effects identified were always placed upon the "Deaf/SL", the null hypothesis of "Profile" could not be totally rejected. The effect was thus redefined in terms of reading skills: participants with a lower level of reading comprehension were more likely not to understand the verbal information contained in the subtitles, probably due to their reading difficulties. On the contrary, the null hypothesis about the non-effect of the speed of exposure was corroborated

QUESTION	TEST OF MODEL EFFECTS					
1	No adjustment			With adjustment		
	Effects	Sig.	Sig.	Effects	Sig.	Sig.
	Profile	0.000	0.000	Profile	0.328	0.322
	Speed	0.608	0.587	Speed	0.990	0.990
	Interaction between Profile * Speed	0.726		Reading	0.003	0.003
				Familiarity	0.991	
2	No adjustment			With adjustment		
	Effects	Sig.	Sig.	Effects	Sig.	Sig.
	Profile	1.000	0.000	Profile	0.091	0.059
	Speed	0.900	0.650	Speed	0.903	0.904
	Interaction between Profile * Speed	0.666		Reading	0.017	0.009
				Familiarity	0.369	

Table 97: Significant effects for verbal recall and process/ Video 1

Video 2

54.2% of the participants answered correctly to the first question and 36.1% to the second one. Most “Hearing” and “Deaf” gave the right answer to the first question, whilst the majority of “Deaf/SL” were not able to answer correctly. It seems that the second question was on average more difficult to answer, as none of the groups showed a high percentage of correct scores. Again, “Hearing” and “Deaf” obtained similar results, and “Deaf/SL” resulted in the poorest performance. The differences between the three speeds of exposure, on the contrary, did not seem to be relevant.

QUESTION 1		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	19	17	3	39
	Percentage	79.2%	70.8%	12.5%	54.2%
INCORRECT	Count	5	7	21	33
	Percentage	25.0%	25.0%	79.2%	43.1%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	13	12	14	39
	Percentage	54.2%	50.0%	58.3%	54.2%
INCORRECT	Count	11	12	10	33
	Percentage	45.8%	50.0%	41.7%	45.8%
QUESTION 2		HEARING	DEAF	DEAF/SL	TOTAL
	Count	11	10	5	46
YES	Percentage	45.8%	41.7%	20.8%	63.9%
NO	Count	13	14	19	26
	Percentage	54.2%	58.3%	79.2%	36.1%
		LOW	MEDIUM	HIGH	TOTAL
	Count	8	6	12	46
YES	Percentage	33.3%	25.0%	50.0%	63.9%
NO	Count	16	18	12	26
	Percentage	66.7%	75.0%	50.0%	36.1%

Table 98: Percentage of answers in the verbal recall and process/ Video 2

It was hypothesized that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to recall and process the verbal information.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to recall and process the verbal information.

According to the models without adjustment, “Profile” was significant on the first question but in the model of adjustment “Reading” absorbed this effect. The effect was placed upon “Deaf/SL”, who performed significantly worse than the other groups. In the second question, no effects were reported. “Deaf/SL” obtained the lowest scores but the other groups did not perform significantly better. The null hypotheses for “Speed” were validated. As for “Profile”, its effect was partially confirmed in the first question. The poor reading skills associated to the “Deaf/SL” group had a significant negative effect on their ability to process the verbal information, corroborating their potential reading difficulties. Therefore, the alternative hypothesis was accepted and adjusted in terms of reading skills.

QUESTION	TESTS OF MODEL EFFECTS					
1	No adjustment			With adjustment		
	Effects	Sig.	Sig.	Effects	Sig.	Sig.
	Profile	.736	.000	Profile	.102	.138
	Speed	.863	.773	Speed	.726	.825
	Interaction between Profile * Speed	.797		Reading	.003	.005
				Familiarity	.170	
2	No adjustment			With adjustment		
	Effects	Sig.	Sig.	Effects	Sig.	
	Profile	.891	.155	Profile	.897	
	Speed	.199	.179	Speed	.159	
	Interaction between Profile * Speed	.798		Reading	.260	
				Familiarity	.140	

Table 99: Significant effects for verbal recall and process/ Video 2

5.2.4 Inference of narrative information

The binary logistic model was built on the following terms:

MODEL INFORMATION	
Dependent Variable(s)	Inference of narrative information
Probability Distribution	Binomial
Link Function	Logit[24]

Table 100: Statistical model for inference of narrative information

Video 1

Most of the participants answered correctly. On average the three groups obtained good results, but differences existed between them: all the “Hearing” were able to infer the information requested, as well as 83.3% of “Deaf” and 62.5% of “Deaf/SL”. No clear differences were observed in relation to the different speeds of exposure of the subtitles.

[24] The procedure models “Incorrect” as the response, treating “Correct” as the reference category.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	24	20	15	59
	Percentage	100.0%	83.3%	62.5%	81.9%
INCORRECT	Count	0	4	9	13
	Percentage	0.0%	16.7%	37.5%	18.1%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	20	18	21	59
	Percentage	83.3%	75.0%	87.5%	81.9%
INCORRECT	Count	4	6	3	13
	Percentage	16.7%	25.0%	12.5%	18.1%

Table 101: Percentage of answers in the inference of information/ Video 1

To evaluate the significance of the differences, it was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to infer information.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to infer information.

Results from the model without adjustment did not report any effect. However, the inclusion of the variables of adjustment led to conclude that the differences observed might be due to the familiarity of the participants with the film: those participants who had watched it were more likely to answer correctly. As “Familiarity” and “Profile” were associated to a certain extent —most of the “Deaf/SL” had not watched the film— the alternative hypothesis for “Profile” was partially verified and redefined in terms of familiarity. The null hypothesis could not be validated in “Speed” and the non-effect was assumed.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	0.322	.273	Profile	0.655	0.999
Speed	1.000	.468	Speed	0.326	0.287
Interaction between Profile * Speed	0.731		Familiarity	0.024	0.015
			Reading	0.180	

Table 102: Significant effects for inference of narrative information/ Video 1

Video 2

Half of the participants answered correctly. Differences existed between the groups, but no great differences were observed in terms of speed. A great part of the "Hearing" was able to infer the information requested, whilst most "Deaf/SL" were not able to do so.

		HEARING	DEAF	DEAF/SL	TOTAL
CORRECT	Count	19	10	7	36
	Percentage	79.2%	41.7%	29.2%	50.0%
INCORRECT	Count	5	14	17	36
	Percentage	20.8%	58.3%	70.8%	50.0%
		LOW	MEDIUM	HIGH	TOTAL
CORRECT	Count	14	11	11	36
	Percentage	58.3%	45.8%	45.8%	50.0%
INCORRECT	Count	10	13	13	36
	Percentage	41.7%	54.2%	54.2%	50.0%

Table 103: Percentage of answers in the inference of information/ Video 2

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the ability of the participants to infer information.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the ability of the participants to infer information.

According to the model without adjustment, "Profile" appeared to be significant: "Hearing" resulted in a significantly higher proportion of correct scores. Nevertheless, as soon as the "Reading" variable was incorporated, the effect was transferred to their reading skills. The fact that 91.7% of the "Hearing" participants showed to have an "Excellent" level of reading comprehension skills, might have caused them to also show a greater ability to infer information. Thus, the null hypothesis was validated for the variable "Speed" and partially rejected for "Profile", as the differences between participants' reading skills —associated to their profiles— seemed to have a positive effect in the ability of the "Hearing" group to infer information.

TEST OF MODEL EFFECTS				
No adjustment			With adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.003	0.003	Profile	0.106
Speed	0.511	0.547	Speed	0.879
Interaction between Profile * Speed	0.234		Reading	0.002

Table 104: Significant effects for narrative information/ Video 2

5.2.5 Summary of the results

This section will provide a summary of the results obtained in each of the variables that were analyzed in this stage. As it happened with the stage of response, the tendencies and effects observed in relation to the categories of the explanatory variables ("Profile", "Speed", and the variables of adjustment) and in relation to the two videos, will be presented in the following Chapter (Sections 6.1 and 6.2).

In terms of narrative comprehension, all the groups performed better in Video 1.

The overall performance of the "Hearing" and "Deaf" participants was good in the two videos, but the "Deaf/SL" were less able to understand the narrative of Video 2. This might imply that that this video —where the higher load of verbal content played a major role in the construction of narrative— was more challenging for them to understand.

The "Hearing" and "Deaf" groups obtained comparable results, showing a very good overall ability to understand the narrative information. The behavior of the "Deaf/SL", on the contrary, was less stable. In Video 1, on average they were able to identify the characters correctly but they did not show to have understood the story of the plot. In Video 2, not even they were able to identify the relationship between the characters. Thus, they did not show an overall good performance. Differences were significant (or quasi) on the identification of the characters in the two videos and on the comprehension of the plot in Video 2. Significance, however, seems to be better described by the reading skills of the participants rather than by the profile alone: the lower level of most of the "Deaf/SL" participants seems to have led them to have a poorer understanding. In turn, in Video 1, the familiarity of the participants with the film had a positive effect on their understanding of the plot. As most "Deaf/SL" had not watched the film before, they had problems to comprehend it.

In terms of speed of exposure, participants assigned to “Low” obtained the highest scores. This might suggest that a longer time of exposure and the display of more two-line subtitles supported the understanding of the narrative, however, the effect was not found to be significant.

In terms of the recall and processing of the visual information, all the groups presented better results in Video 2 than in Video 1, what might be explained by the different nature of the videos in terms of visual density. Interestingly, the “Deaf/SL” participants, who are used to communicating in a visually based language, showed a very good ability to process the visual information. They achieved the best results in Video 1 —where it was more visual information to be processed— and performed very well in Video 2, although in this case the other two groups also had good results. In Video 2 — with a priori slower visual rhythm— their results were in fact slightly poorer. If they found difficulties reading and understanding the subtitles of this video this might have had consequences on their processing of the visuals. The “Hearing” participants, less familiar with the use of subtitles, were expected to show a poorer processing of the image. This pattern was observed in Video 1 —more demanding and with a higher visual load— but it was not significant. In Video 2, they showed a very good performance.

No significant effects were reported for Video 1. However in Video 2, interestingly, statistical results indicate a slight degree of significant between the level of reading skills of the participants and their performance. It seems that, in fact, a lower level of reading comprehension might have had a negative effect on visual processing and comprehension. As far as for the speed of exposure of the subtitles, any pattern was shown. The different modalities did not have an influence on the results.

In terms of the processing of the verbal information, the behavior of the three profiles was more or less stable in the two videos.

The “Hearing” and the “Deaf” participants had a very good and comparable performance —slightly better in the former— and significantly better than the performance of the “Deaf/SL”, with the exception of the second question in Video 2 where in general all participants seemed to have had problems and where no effects were reported. The “Deaf/SL” participants, on the contrary, had serious difficulties to process and recall the information contained in the subtitles. According to the statistical results, this was due to their reading skills: the poorer the level of reading comprehension of the participants, the more likely not to understand the verbal information contained in the subtitles.

In terms of speed of exposure, "Low" obtained slightly better results in Video 1. In Video 2, however, this was the case of "High". Any of these patterns were significant, but they might reflect a different behavior in accordance to each video. It may be possible that in Video 2 —taking into account the secondary role of the visual code— the exposure times and the modality of the subtitles in terms of one or two-lines of subtitles reveal itself as irrelevant in terms of comprehension.

Finally, in terms of inference of information, the performance of all the profiles was better in Video 1. This might indicate that the visual support eased the process of inferring information. In general, the three groups were able to answer correctly in Video 1, but only the "Hearing" managed to infer the information requested in Video 2, thus showing a better ability to infer information. The performances of the "Deaf" and "Hearing" groups were comparable in Video 1, but in Video 2 the results of the "Deaf" were more similar to the obtained by the "Deaf/SL": they both had difficulties to infer the information. The "Deaf/SL" obtained the lowest percentage of correct answers in both videos, but, on average, in Video 1 they were still able to infer the information requested, supporting the hypothesis that the visual information helped them in the process.

According to the statistical results the differences observed in Video 1 were due to the familiarity with the film: as most "Deaf" and "Hearing" had watched the film, they were more likely to infer the information. In Video 2, however, the differences were significant in terms of reading skills. It seems that the "excellent" level of reading comprehension of the "Hearing" participants helped them to successfully infer the information. On the other hand, the participants assigned to the "Low" obtained better results, but this tendency was not statistically significant. It seems that the speed of exposure of the subtitles did not affect either the process of inferring narrative information.

5.3 Stage of repercussion

Participants were required to self-report a set of factors associated to this stage:

1. Presence of difficulties.

2. Time and ease of reading the subtitles
3. Time and ease of viewing the images

Section 5.3.1 will include some preliminary remarks about the statistical analysis. Section 5.3.2 will introduce the results of the first variable, and Sections 5.3.3 and 5.3.4 will present respectively the results of the second and third variables. Finally, Section 5.3.5 will provide some preliminary conclusions. The binary logistic approach used to evaluate the effect of the explanatory variables on the answers of the participants was defined in the terms expressed in Table 105.

MODEL INFORMATION	
Dependent Variable(s)	Presence of problems Time and ease of reading Time and ease of viewing
Probability Distribution	Binomial
Link Function	Logit[25]

Table 105: Statistical model to analyze the stage of repercussion

5.3.1 Preliminary remarks

The answers to variable one (yes or no) were originally dichotomous and mutually exclusive. Variables two and three, however, were evaluated —respectively— in a scale ranging from too fast, fast and comfortable to slow and from never, in some moments and almost all the time to all the time, being not suitable for a linear logistic regression analysis. Then the plan was to apply the “Ordered logistic regression” which is aimed at analyzing ordinal responses. However, as shown in the tables below corresponding to Video 1, some cases presented no values and in some others the values were smaller than five, which is the minimum expected, thus not being suitable for the model.

[25] The procedure models “No”/ “Fast”/ “Occasionally” as the response, treating “Yes”/”Comfortable” / “All the time” as the reference categories.

READIGN TIMES		HEARING	DEAF	DEAF/SL	TOTAL
TOO FAST	Count	0	1	4	5
	Percentage	0.0%	4.2%	16.7%	6.9%
FAST	Count	4	6	10	20
	Percentage	16.7%	25.0%	41.7%	27.8%
COMFORTABLE	Count	19	16	9	44
	Percentage	79.2%	66.7%	37.5%	61.1%
SLOW	Count	1	1	1	3
	Percentage	4.2%	4.2%	4.2%	4.2%
		LOW	MEDIUM	HIGH	TOTAL
TOO FAST	Count	3	0	2	5
	Percentage	12.5%	0.0%	8.3%	6.9%
FAST	Count	6	8	6	20
	Percentage	25.0%	33.3%	25.0%	27.8%
COMFORTABLE	Count	14	16	14	44
	Percentage	58.3%	66.7%	58.3%	61.1%
SLOW	Count	1	0	2	3
	Percentage	4.2%	0.0%	8.3%	4.2%

Table 106: Percentage of answers for reading times/ Video 1

VIEWING TIMES		HEARING	DEAF	DEAF/SL	TOTAL
ALMOST NEVER	Count	0	1	3	4
	Percentage	0.0%	4.2%	12.5%	5.6%
IN SOME MOMENTS	Count	5	3	1	9
	Percentage	20.8%	12.5%	4.2%	12.5%
ALMOST ALL THE TIME	Count	8	6	3	17
	Percentage	33.3%	25.0%	12.5%	23.6%
ALL THE TIME	Count	11	14	17	42
	Percentage	45.8%	58.3%	70.8%	58.3%
		LOW	MEDIUM	HIGH	TOTAL
ALMOST NEVER	Count	1	0	3	4
	Percentage	4.2%	0.0%	12.5%	5.6%
IN SOME MOMENTS	Count	3	4	2	9
	Percentage	12.5%	16.7%	8.3%	12.5%
ALMOST ALL THE TIME	Count	3	7	7	17
	Percentage	12.5%	29.2%	29.2%	23.6%
ALL THE TIME	Count	17	13	12	42
	Percentage	70.8%	54.2%	50.0%	58.3%

Table 107: Percentage of answers for viewing times/ Video 1

It was decided to group together some categories, to transform the dependent variable into a dichotomous variable and to apply the binary logistic regression. In variable two, the categories too fast and fast and comfortable and slow were grouped together and transformed into fast and comfortable. In variable three, the categories almost never and in some moments and almost all the time and all the time were grouped together and transformed into occasionally and all the time. In the first, "Comfortable" was set as the reference category and "All the time" in the second.

5.3.2 Presence of difficulties

5.3.2.1 Video 1

In general, participants did not report problems but 18 participants admitted that it had been difficult for them to successfully complete the task (12 of them from the "Deaf/SL" group). In other words, half of the "Deaf/SL" group reported that the activity had been difficult for them. On the other hand, no differences were observed between the subtitling speeds of exposure.

PROBLEMS		HEARING	DEAF	DEAF/SL	TOTAL
NO	Count	21	21	12	54
	Percentage	87.5%	87.5%	50.0%	75.0%
YES	Count	3	3	12	18
	Percentage	12.5%	12.5%	50.0%	25.0%
		LOW	MEDIUM	HIGH	TOTAL
NO	Count	18	17	19	54
	Percentage	75.0%	70.8%	79.2%	75.0%
YES	Count	6	7	5	18
	Percentage	25.0%	29.2%	20.8%	25.0%

Table 108: Percentage of answers for the presence of difficulties/ Video 1

The logistic linear model was applied under the hypotheses that:

> $H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report of problems.
>
> $H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report of problems.

According to the model without adjustment, the profile of the participants had a significant effect on how they perceived the difficulty of the task, being significantly more difficult for the "Deaf/SL". When the variables of adjustment were incorporated, the effect of "Profile" was no longer statistically significant and the model considered that the effect was, in reality, due to their familiarity with the film: the participants who had not watched the film reported significantly more difficulties. It was assumed that the speed of the subtitles did not affect the self-assessment of problems. However, the "Familiarity" of the participants with the film —

associated to their profile their "Profile" as most "Deaf/SL" had not watched it— did.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	1.000	0.005	Profile	0.645	0.127
Speed	1.000	0.768	Speed	0.752	0.784
Interaction between Profile * Speed	0.866		Familiarity	0.043	0.020
			Reading	0.422	

Table 109: Significant effects for presence of difficulties/ Video 1

5.3.2.2 Video 2

In this case, a slightly higher percentage of participants admitted the difficulty of the task. In general they did not have problems except in the case of the "Deaf/SL" participants, where more than half of the group reported difficulties. In terms of the subtitling speed of exposure, no clear differences were observed.

PROBLEMS		HEARING	DEAF	DEAF/SL	TOTAL
NO	Count	20	21	10	51
	Percentage	83.3%	87.5%	41.7%	70.8%
YES	Count	4	3	14	21
	Percentage	16.7%	12.5%	58.3%	29.2%
		LOW	MEDIUM	HIGH	TOTAL
NO	Count	17	16	18	51
	Percentage	70.8%	66.7%	75.0%	70.8%
YES	Count	7	8	6	21
	Percentage	29.2%	33.3%	25.0%	29.2%

Table 110: Percentage of answers for presence of difficulties/ Video 2

The logistic linear model was applied under the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report of problems.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report of problems.

Results from the model without adjustment indicated that the profile of the participants had an influence on the way in which they perceived the difficulty of the task. In the model with adjustment this effect was transferred to their reading skills. The null hypothesis was validated for "Speed" as no effects were reported. In the case of "Profile", the null hypothesis could not be fully rejected as "Reading" and "Profile" were correlated. The alternative hypothesis was verified and reformulated in terms of the reading skills of the participants: the lower their reading skills, the higher the perception of difficulty.

TEST OF MODEL EFFECTS				
No adjustment			With adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.001	0.001	Profile	0.269
Speed	0.830	0.777	Speed	0.769
Interaction between Profile * Speed	0.983		Reading	0.011

Table 111: Significant effects for presence of difficulties/ Video 2

5.3.3 Time and ease of reading

5.3.3.1 Video 1

Differences were found between profiles but not between speeds. Whilst for the majority of the "Hearing" and "Deaf" the reading times were comfortable, for more than half of the "Deaf/SL" group they were fast. The speed of exposure of the subtitles did not seem to have affected the way in which they perceived and self-assessed the time and ease of reading.

TIME AND EASE OF READING		HEARING	DEAF	DEAF/SL	TOTAL
COMFORTABLE	Count	20	17	10	47
	Percentage	83.3%	70.8%	41.7%	65.3%
FAST	Count	4	7	14	25
	Percentage	16.7%	29.2%	58.3%	34.7%
		LOW	MEDIUM	HIGH	TOTAL
COMFORTABLE	Count	16	15	16	47
	Percentage	66.7%	62.5%	66.7%	65.3%
FAST	Count	8	9	8	25
	Percentage	33.3%	37.5%	33.3%	34.7%

Table 112: Percentage of answers for time and ease of reading/ Video 1

The logistic linear model was applied with the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report about the time and ease of reading.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report about the time and ease of reading.

Based on the results of the model without adjustment, the profile of the participants played a significant role in their self-evaluation, but this effect was assigned to their familiarity with the film when the variables of adjustment were incorporated. Those who had watched the film were more likely to find the time and ease of reading as comfortable. The negative pattern was thus observed in "Deaf/SL", as the vast majority of these participants had not watched the film. Surprisingly, the differences in the reading skills did not make any difference in this case. The null hypothesis was validated for "Speed" but partially rejected in the case of "Profile". The effect of significance was adjusted accordingly and expressed in the following terms: most probably due to not having watched the film, the proportion of participants that perceived the reading times as fast was significantly higher on the "Deaf/SL".

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	1.000	0.012	Profile	0.556	0.192
Speed	1.000	0.932	Speed	0.895	0.884
Interaction between Profile * Speed	0.309		Familiarity	0.017	0.010
			Reading	0.614	

Table 113: Significant effects for time and ease of reading/ Video 1

5.3.3.2 Video 2

In this case, differences were found in terms of both the profile of the participants and the speed of the subtitles. 62.5% of "Deaf/SL" considered that the reading times were fast, whilst for 66.7% of "Hearing" and 79.2% of "Deaf" considered that they were comfortable. On the other hand, the proportion of participants who perceived the reading times as comfortable was higher at the "Low" speed.

TIME AND EASE OF READING		HEARING	DEAF	DEAF/SL	TOTAL
COMFORTABLE	Count	16	19	9	44
	Percentage	66.7%	79.2%	37.5%	61.1%
FAST	Count	8	5	15	28
	Percentage	33.3%	20.8%	62.5%	38.9%
		LOW	MEDIUM	HIGH	TOTAL
COMFORTABLE	Count	17	14	13	44
	Percentage	70.8%	58.3%	54.2%	61.1%
FAST	Count	7	10	11	28
	Percentage	29.2%	41.7%	45.8%	38.9%

Table 114: Percentage of answers for time and ease of reading/ Video 2

It was hypothesized that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report about the time and ease of reading.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report about the time and ease of reading.

Based on the results provided by the model without adjustment, the profile of the participants influenced their self-assessment: a significantly higher proportion of "Deaf/SL" participants considered that subtitles were too fast for a comfortable reading. In this case, however, their reading skills did not absorb the effect when the variables of adjustment were incorporated to the model. As they did not provide insightful information, the model without adjustment was selected and it was assumed that the effect was caused by "Profile". Despite the tendency observed in the "Low" category, it did not seem to be significant so the null hypothesis could not be rejected for "Speed". It was assumed that exposure did not significantly influence the perception of the participants. The alternative hypothesis for "Profile" was validated, as the "Deaf/SL" participants were more likely to consider the rhythm too fast, what might be an indicator of reading and understanding difficulties.

TEST OF MODEL EFFECTS				
No adjustment			With adjustment	
Effects	Sig.	Sig.	Effects	Sig.
Profile	0.120	0.013	Profile	0.188
Speed	0.929	0.425	Speed	0.283
Interaction between Profile * Speed	0.255		Reading	0.097

Table 115: Significant effects for time and ease of reading/ Video 2

5.3.4 Time and ease of viewing

5.3.4.1 Video 1

When required to self-assess the time and ease of viewing, most participants agreed to have had enough time to explore the image comfortably. There were not big differences among the categories of "Profile" and "Speed", as all the cases resulted in a higher rate of "All the time" answers, although the "Hearing" showed a slightly lower proportion.

TIME AND EASE OF VIEWING		HEARING	DEAF	DEAF/SL	TOTAL
ALL THE TIME	Count	19	20	20	59
	Percentage	79.2%	83.3%	83.3%	81.9%
OCCASIONALLY	Count	5	4	4	13
	Percentage	20.8%	16.7%	16.7%	18.1%
		LOW	MEDIUM	HIGH	TOTAL
ALL THE TIME	Count	19	20	20	59
	Percentage	79.2%	83.3%	83.3%	81.9%
OCCASIONALLY	Count	5	4	4	13
	Percentage	20.8%	16.7%	16.7%	18.1%

Table 116: Percentage of answers for the time and ease of watching/ Video 1

Even though a priori there were no significant differences, the logistic linear approach was applied under the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report about the time and ease of watching.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report about the time and ease of watching.

The models with and without adjustment corroborated the absence of significance in any of the predictors: none of the variables ("Speed", "Profile", "Familiarity" and "Reading") influenced the participants' perception on the time and ease of watching the image.

TEST OF MODEL EFFECTS				
No adjustment			With adjustment	
	Sig.	Sig.		Sig.
Profile	1.000	0.910	Profile	0.932
Speed	1.000	0.910	Speed	0.914
Interaction between Profile * Speed	0.997		Familiarity	0.994
			Reading	0.987

Table 117: Significant effects for time and ease of watching/ Video 1

5.3.4.2 Video 2

Most of the participants had enough time to explore the visuals of the scene in a comfortable way, according to their self-reporting. As it happened with Video 1, there were no big differences between the different categories. In terms of "Speed", however, it was noticeable that "Low" resulted in a higher proportion of "All the time" answers.

TIME AND EASE OF VIEWING		HEARING	DEAF	DEAF/SL	TOTAL
ALL THE TIME	Count	17	18	17	52
	Percentage	70.8%	75.0%	70.8%	72.2%
OCCASIONALLY	Count	7	6	7	20
	Percentage	29.2%	25.0%	29.2%	27.8%
		LOW	MEDIUM	HIGH	TOTAL
ALL THE TIME	Count	22	14	16	52
	Percentage	91.7%	58.3%	66.7%	72.2%
OCCASIONALLY	Count	2	10	8	20
	Percentage	8.3%	41.7%	33.3%	27.8%

Table 118: Percentage of answers for time and ease of watching/ Video 2

The logistic linear approach was applied under the hypotheses that:

$H_{0:}$ The profile of the participants/ the subtitling speed of exposure does not have an effect on the participants' self-report about the time and ease of watching.

$H_{1:}$ The profile of the participants/ the subtitling speed of exposure does have an effect on the participants' self-report about the time and ease of watching.

According to the model without adjustment, the effect observed in the "Low" speed was statistically significant: it seems that the slower pace of the subtitles allowed the participants to explore the image more comfortably. This might be due to the fact that two-line subtitles forced them to deviate attention between the image and the subtitles to a lesser extent and to follow a slower rhythm that —since the visual content was more static in this video— allowed them to perceive the visuals in a more conformable manner. After incorporating the variable of adjustment "Reading" the effect of "Speed" was maintained and "Reading" turned out to be quasi-significant. However, taking into account that the differences were very discrete, it was more difficult to interpret and evaluate the degree of influence of "Reading" and its association with "Profile". As a consequence, it was decided not to select the model with adjustment and to assume that the null hypothesis for "Profile" was valid. On the contrary, —as the participants assigned to "Low" subtitles were more likely to perceive that they had more time to view the image— the null hypothesis defined for "Speed" was rejected.

TEST OF MODEL EFFECTS					
No adjustment			With adjustment		
Effects	Sig.	Sig.	Effects	Sig.	Sig.
Profile	0.999	0.926	Profile	0.374	0.378
Speed	0.833	0.050	Speed	0.029	0.033
Interaction between Profile * Speed	0.950		Reading	0.050	0.051
			Familiarity	0.527	

Table 119: Significant effects for time and ease of watching in Video 2

5.3.5 Summary of the results

This section provides a summary of the results obtained in the analysis of the stage of repercussion, which consisted of the self-assessment of three aspects: the presence of problems during the development of the experiment, the time and ease of reading the subtitles, and the time and ease of viewing the images.

There are not substantial differences between the two videos in terms of presence of difficulties. The task was not difficult for the “Hearing” and the “Deaf”, which provided a similar self-assessment rate. On the contrary, half of the “Deaf/SL” participants self-reported to have had problems in Video 1 and slightly more than half experienced problems in Video 2.

According to the statistical analysis, in Video 1 the differences observed within the “Deaf/SL” group —more likely to report problems— seem to be explained by the fact that most of them were not familiar with the film. In Video 2, as the majority of the sample had not watched the film, this effect did not occur. In this video —where the verbal code took precedence over the visual code— results indicate that the differences perceived in the “Deaf/SL” participants are due to their level of reading comprehension: those with a low level of reading skills seem to be more likely to self-report problems.

There were not differences between the speeds of exposure of the subtitles, which did not influence the perception of difficulty. Interestingly, however, the participants were given the opportunity to name the problems they had, to which most of them referred to the excessive speed of the subtitles. The few “Hearing” and “Deaf” participants that self-reported difficulties mentioned the speed of the subtitles and the effort required to be able to simultaneously read the subtitles and explore the image (two “Deaf” participants also referred to the difficulty of the vocabulary). For their part, the “Deaf/SL” participants also pointed out the excessive speed of the subtitles, the effort required to read the subtitles and view the image in a comfortable way and the difficulty of the vocabulary as the main obstacles to carry out the activity.

In relation to the evaluation of the time and ease of reading the subtitles, a similar behavior is observed in both videos. More than half of the "Deaf/SL" participants considered it was fast for a comfortable reading, whilst on average it was comfortable for the other two groups (although Video 1 was more comfortable for the "Hearing" and Video 2 for the "Deaf").

Once again, the statistical analysis reported the significance of the familiarity of the participants with Video 1: the "Deaf/SL" were less familiar with it and this influenced negatively their perception of the time and ease of reading the subtitles. The differences observed in Video 2 were also significant: the "Deaf/SL" were more likely to report that the reading times were fast. Interestingly, in this case the differences were not explained by the familiarity with the film or by the level of reading skills but by the hearing and communication profile itself. Regardless of their level of reading comprehension, this profile found the subtitles of this video less confortable to read. Taking into account that they showed a general good ability in processing the visual information and in using it as a support in understanding, the absence of relevant visual information in this video might explain the fact that they felt more uncomfortable when reading the subtitles.

Finally, with regards to the evaluation of the time and ease of viewing the image, the three groups admitted that Video 1 was slightly more comfortable to watch. In fact, all the profiles and speeds admitted to have had enough time to explore the image. Therefore, no significant effects were identified. In Video 2, no differences were found between the profiles of participants. Taking into account the slow pace of the visuals, for most of them it was conformable to explore the images. However, and for the first time at this stage, there are quasi-significant differences between the speeds of exposure: the participants assigned to "Low" subtitles were slightly more likely to report that they had had plenty of time to explore the image. It seems that the fact that the subtitles were displayed for a longer time on screen —thus leading to a smaller amount of deviations between the subtitles and the image— might have led participants to perceive that they had more time to explore the visuals in more detail or in a more confortable and slow way.

Chapter 6. Interpretation of the results

As the participants watched two videos with a different combination of visual and verbal elements, the differences and similarities observed in the processes of reception in each of them will first be presented in Section 6.1. Section 6.2 summarizes the main tendencies and the effects observed in the statistical analysis that will be introduced for each level of the two independent variables and the variables of adjustment. Sections 6.3 and 6.4 provide an overview of the results in relation to the objectives, research questions and hypotheses established in the Section 3.2 and in relation to previous research introduced in Chapter 2.

6.1. Reception process in Video 1 and Video 2

In order to explore how viewers with a different communication and language profile and with a different degree of hearing loss process and prioritize the information conveyed in an audiovisual text and to examine whether the reception process is affected by the type of visual content, they watched two videos that presented a substantially different degree of combination of visual and verbal elements. The two videos were cuts from fictional films (expected to present a more structured narrative) and had a continuing dialogue (at a speech rate suitable for high-speed exposure). However, the degree and relationship established between the verbal and visual code was different in each video: by making a different use of certain film techniques, in one video the verbal information took precedence over the visual and in the other video it was the opposite.

In video 1, it was considered that visual information contributed to a greater degree to the construction of the meaning. Three different locations were displayed and the three main characters were most of the time surrounded by other people. It consisted of thirty shots quite short and diverse in terms of type, angle or lighting and the speech rate was approximately 137.4 wpm. In video 2, on the contrary, the verbal code dominated the narrative, as the visuals were rather static. It consisted of two shots, one with a length of seven seconds and one with a length of more than one minute, and the three main characters —whose faces were often covered up by trees— were situated in a single and rather dark location. The speech rate was approximately 184.5wpm. The reception process was expected to differ but no specific hypotheses and research questions were established. The differences and similarities observed in the three stages of reception are presented in the following lines.

As far as for the stage of response, in Video 1 all the profiles and speeds spent more time on the images, whereas in Video 2 all except "Deaf" spent a longer time on the subtitles. With regard to the number of fixation counts, in Video 1 all the levels —with the exception of the "Deaf/SL" profile and the "Low" speed— made more fixations on the image, whilst in Video 2 all made more fixations on the subtitles.

It seems that on average the image was prioritized in Video 1, where the visual information was more dynamic and contributed to a greater extent to the narrative. In Video 2, on the contrary, the reading of the subtitles appears to have taken precedence over watching, as the narrative was more focused on the dialogue. Likewise, all the levels of "Profile" and "Speed" made on average more visit counts on the images in Video 1 than in Video 2, suggesting that viewers were able to adapt their attention to the faster rhythm imposed by the visuals and to process effectively the subtitles and the scene. On the one hand, this pattern confirms what Kruger at al. 2015 and d'Ydewalle and van Rensbergen 1989 suggested, as the higher degree of visual action in Video 1 is seemed to have influenced the reading and viewing rhythm of the participants, by leading them to spend less time reading the subtitles than in Video 2, where the verbal load was higher. On the other hand, this somehow contradicts —or at least modifies— the general assumption that in the processing of subtitling the reading activity tends to dominate the viewing activity, as it seems that, at a certain degree of visual action and despite competing for attention, certain viewers can prioritized the images over the subtitles.

It seems that the "Deaf" resulted in a greater ability to explore the image, even in Video 2. This might be explained by a combination of factors. First, —and when compared to the performance of the "Hearing"— their higher degree of familiarity with the use of the subtitles might have helped them to read the subtitles more efficiently and to have time to explore the image. Secondly, —and when compared to the performance of the "Deaf/SL"— their average higher reading skills might have led them to read the subtitles faster and to shift their attention quicker to the image. And thirdly, their higher tendency to lip-read might have led them to resort to the image to a greater extent. Both the "Deaf/SL" and the "Hearing", on the contrary, seemed to have relied on the subtitles at a greater extent, even though they also adapted their strategies depending on the video.

On the other, the “Low” speed of exposure —that displayed less but longer and more complete subtitles— also tended to result in more fixations on the subtitles and longer reading times. This effect was significant in Video 1 that was more demanding in terms of visual attention, suggesting that it might have hindered the viewing process. This is also in line with previous research on subtitling segmentation that stated that two-lines subtitles would result in more fixations on the subtitles and in longer reading times. However, it must be noted that here all the versions of speed of exposure displayed the exact same information. Therefore, the effect of the redundancy of information could not play a major role in this case and the effect observed may be rather attributed to the different presentation or exposure times.

Regarding the mean duration of the fixations, no big differences were observed. In both videos and in all cases fixations were longer on the image and shorter on the subtitles, being slightly longer in Video 1. This is also in line with previous research that shows that on average the mean fixation duration is longer on the image than on the subtitles.

Finally, in terms of visit counts, all the profiles and speeds made on average more visits in Video 1 than in Video 2. This suggest that the higher degree of visual action also led participants to deviate their attention between the image and the subtitles more times and at a higher rhythm. This corroborates the patterns observed by De Linde and Kay (1999) and Krejtz et al. (2013) where it was found that shot changes led participants to make more shifts between images and subtitles. Taking into account that Video 1 contained more than 30 shots whilst Video 2 consisted of only two, it was expected to observe a higher number of visits in the former, regardless of the profile of the participants and the speed of exposure of the subtitles.

In the stage of reaction, all the profiles and speeds resulted in a better understanding of the narrative in Video 1. On average, the “Hearing” and “Deaf” groups obtained comparable and good results, while the “Deaf/SL” showed a higher variability but overall poor results, especially in Video 2 despite having spent more time reading the subtitles. Video 2 seemed to have been more challenging and demanding for this group, probably because of the prominence of the verbal code and the limited role of the visual code in the construction of narrative. In Video 1, however, the scene’s higher degree of action and the complementarity between the verbal and non-verbal elements might have assisted them in the process of understanding and inferring the narrative information. However, this might be taken with caution as it might also be due to the fact that most “Hearing” and “Deaf” participants had watched the film before.

With regard to the visual information, it seems that for all the cases it was easier to recall and process the information in Video 2, where the visual action was more static. The role of the visuals in Video 1 was more relevant and competed to a greater extent for attention with the verbal code, what might have caused the task of combining reading and watching to be more demanding, thus affecting reaction. It is worth mentioning that the “Deaf/SL” participants, despite having spent longer times on the subtitles and having made fewer fixations and fewer visits to the area of the image, achieved the best results in Video 1. This seems to confirm their ability to process the visual information in a fast and effective manner, contrarily to what was observed in the “Hearing” group that —being less familiar with the use of the subtitles— resulted in a poorer visual comprehension. In Video 2, however, —and despite presenting rather static visuals— the “Deaf/SL” participants did not stand out from the other groups. This might indicate that the difficulties they found to read and extract meaning from the subtitles affected negatively their processing of the visuals.

As far as for the verbal information, the three groups behaved similarly in both videos. The “Deaf” and “Hearing” participants were able to understand the information from the subtitles in the two cases whilst the “Deaf/SL” had serious difficulties in understanding both, especially Video 2 where they could not rely on the support of the visual code at the same extent as in Video 1. In terms of the speeds of exposure, despite not being significant, it must be noticed that those participants assigned to “Low” obtained slightly better results in Video 1 and those assigned to “High” obtained slightly better scores in Video 2. The slower pace of the “Low” subtitles might have helped them to understand better the verbal information that competed for attention with the visual information, whilst in Video 2 —where that competition did not occurred or at least not at the same degree— a slower rhythm was not that necessary to lead to a good performance.

Finally, as far as for inference of information, all the profiles and speeds obtained good and better results in Video 1, thus corroborating the potential support of the visual code. In Video 2, on the contrary, the “Deaf” and “Deaf/SL” obtained poorer and similar results. The former group showed a special prioritization for the visual code and the latter a special ability to understand visual information. However in this case, as the information could not being inferred from the visuals but from the dialogue, they were not able to infer the information required.

In relation to the stage of repercussion, there are not big differences between the videos in terms of perception of difficulty. On average, none of them was difficult for the “Deaf” and “Hearing”. However, half of the “Deaf/SL” reported problems in Video 1 and slightly more than half in Video 2, most probably because of the absence of visual support.

In the evaluation of the time and ease of reading the subtitles, the “Hearing” and “Deaf/SL” participants admitted that Video 1 was slightly more conformable to read. This was expected because, even though both videos presented a fluent conversation between three characters, the speech rate was slightly higher in Video 2. Moreover, the support of the visual code may have influenced their perception of effort. Surprisingly, taking into account the static nature of the scene and that the fact that it was actually easier for all the cases to recall the visual information in this case, for all the groups and speeds it was less comfortable to follow the visuals in Video 2. The characteristics of the scene (i.e. it was dark and rainy, and the faces were most of the time covered by the tree branches), might have led them to perceive that they did not have enough time to explore the image. This, at the same time, might have contributed to the perception of not having so much time as in Video 1 to read the subtitles, and to report it as being, overall, more difficult. Again, however, it must be remembered that the familiarity of some participants with the film in Video 1 might have also led them to perceive the task as being easier and more comfortable.

Based on the explanations above explained, it seems that the differences between the videos affected the three stages of the reception process. The figures below provide a summary of the significant effects detected by the statistical models on each video and stage. Those variables with an asterisk indicate that the effect was quasi-significant (being the p-value between 0.05 and 0.08).

VIDEO 1				
STAGE OF RECEPTION	DEPENDENT VARIABLE		INDEPENDENT VARIABLE	SIG.
RESPONSE	Total fixation duration	Image	Profile*	0.051
			Speed*	0.075
		Subtitles	Profile*	0.085
			Speed*	0.059
		Percentage	Profile	0.027
			Speed	0.004
	Mean fixation duration	Image	Reading	0.011
		Subtitles	Profile*	0.060
	Fixation counts	Image	Speed	0.002
		Subtitles	Profile*	0.061
			Speed	0.037
		Percentage	Profile*	0.071
			Speed	0.001
	Visit counts	Image	Profile	0.008
			Speed	0.020
		Subtitles	Profile	0.003
			Speed	0.021
REACTION	Narrative comprehension	Characters	Reading*	0.052
		Plot	Profile*	0.078
			Familiarity	0.024
	Recall and processing	Visual	Profile*	0.053
		Verbal 1	Reading	0.003
		Verbal 2	Profile*	0.059
			Reading	0.009
	Inference		Familiarity	0.015
REPERCUSSION	Presence of problems		Familiarity	0.020
	Time and ease of reading		Familiarity	0.010
	Time and ease of viewing		-	-

Table 120: Summary of the significant effects identified on video 1

VIDEO 2				
STAGE OF RECEPTION	DEPENDENT VARIABLE		INDEPENDENT VARIABLE	SIG.
RESPONSE	Total fixation duration	Image	Profile*	0.056
			Reading*	0.066
		Subtitles	-	-
		Percentage	Profile	0.024
	Mean fixation duration	Image	Interaction	0.016
			Reading	0.002
		Subtitles	-	-
	Fixation counts	Image	Profile	0.014
			Speed	0.020
		Subtitles	-	-
		Percentage	Profile	0.048
	Visit counts	Image	Profile	0.000
		Subtitles	Profile	0.000
			Interaction	0.022
REACTION	Narrative comprehension	Characters	Reading	0.004
		Plot	Reading	0.008
	Recall and processing	Visual	Reading	0.011
		Verbal 1	Reading	0.005
		Verbal 2	-	-
	Inference		Reading	0.002
REPERCUSSION	Presence of problems		Reading	0.011
	Time and ease of reading		Profile	0.013
	Time and ease of viewing		Speed	0.050

Table 121: Summary of the significant effects identified on video 2

6.2 Discussion about the effects on the process of reception

The effects reported by the statistical analysis are here presented and discussed for each profile (Section 6.2.2) and each speed of exposure (Section 6.2.3), followed by the interaction effects identified between them (Section 6.2.4). A first section, however, (Section 6.2.1) will include the effects observed in the variables of adjustment "Familiarity" (only in Video 1) and "Reading". Results were already summarized in Sections 5.1.6, 5.2.5 and 3.5.5.

6.2.1 Effect of the variables of adjustment

It must be stressed that the two variables of adjustment are correlated to a certain extent to the "Deaf/SL" profile, as —in comparison to the "Hearing" and "Deaf" profiles— a significant part of them had not watched the film (Section 4.3.3.6) and their reading skills were significantly lower, based on the results obtained in the test carried out in the pre-stage of the experiment (Section 4.3.3.5). This explains why when these variables were included in the analysis they tended to absorb the effect previously detected in "Profile". This collinearity with the variables of adjustment and the profile of the participants was taken into consideration when interpreting the results. On most occasions, the effect of "Profile" was not totally discarded but transformed and redefined in terms of adjustment.

6.2.1.1 Familiarity

Based on the results of the test of homogeneity (see Section 4.6.2) that was carried out to identify the possible differences between the subsamples that might affect the results, this variable was only incorporated in the statistical model of Video 1. Its inclusion resulted in significant effects on two of the stages of analysis: reaction and repercussion.

The familiarity of the participants with the film resulted in the following significant effects:

- The participants' ability to understand the plot was significantly higher on the participants who had watched the film.
- The participants' ability to infer the information was significantly higher on the participants who had watched the film.
- The number of participants that self-reported they had problems in the activity was significantly higher on the participants that had not watched the film.
- The number of participants that self-reported that the reading time was fast was significantly higher on the participants that had not watched the film.

The fact of having watched the film seems to have influenced the ability of the participants to understand the plot and to infer information in a positive way and the self-report of problems and of the time and ease of reading the subtitles in a negative way. Although it was not expected, it seems that familiarity played an important role in the participants' self-assessment.

6.2.1.2 Reading

As important differences were identified between the three subsamples of participants in terms of reading skills, this variable was included in the model of adjustment of the two videos. When compared to the other two groups, the “Deaf/SL” participants showed a significant lower level of reading comprehension so most of the following effects are placed upon this group and in a negative way. However, only six “Deaf/SL” participants resulted in “Good”, “Very Good” and “Excellent” skills. Taking this factor into consideration, the inclusion of this variable allowed for a better interpretation of the effect of profile as well as for the definition of more precise effects.

Its incorporation to the analysis resulted in significant effects on all the three stages of reception:

- Video 2: the higher the reading skills of the participants, the longer the total fixation duration on the image and vice versa (quasi-significant effect).
- Videos 1 and 2: the higher the reading skills, the longer the mean duration of the fixations on the image and vice versa.
- Video 2: the higher the reading skills, the longer the total duration of the fixations on the image and vice versa (quasi-significant).
- Videos 1 and 2: the higher the reading skills, the better the ability to identify the characters and vice versa (quasi-significant in Video 1).
- Video 2: the higher the reading skills, the better the ability to understand the plot and vice versa.
- Video 2: the lower the reading skills, the lower the ability to recall and process the visual information and vice versa.
- Videos 1 and 2: the higher the reading skills, the higher the ability to recall and process the verbal information (question 1) and vice versa.
- Video 2: the higher the reading skills, the higher the ability to recall and process the verbal information and vice versa (in the question 2).
- Video 2: the higher the reading skills, the higher the ability to infer information and vice versa.
- Video 2: the number of participants that self-reported the presence of problems was significantly higher on those with a lower level of reading skills.

On the stage of response, “Reading” affected the mean duration of the fixations on the image in the two videos and showed a positive tendency on the total duration of the fixations on the image in Video 2. Interestingly, the influence seems to be significant when it comes to processing the images rather than the subtitles. The high reading skills of some participants seem to have positively influenced their ability to process the image. This might suggest that more skilled readers were able to read faster and to process the image more slowly through longer fixations. On the contrary, less skilled readers (most “Deaf/SL” participants) did not manage to process the image in the same way. However, this might be taken with caution as the statistical models might have had difficulties estimating the effects on the subtitles in Video 2 due to the high variability of the responses.

On the stage of reaction, the reading skills of the participants had an influence on all the dependent variables analyzed: their ability to identify the characters, to understand the plot, to process the verbal and even the visual information, and to infer information. A poor level of reading skills —such as in the case of most “Deaf/SL” participants— resulted in a negative effect on all this set of variables.

The reading skills of the participants also affected the stage of repercussion, as it seems that those with a lower level —mostly “Deaf/SL”— were more likely to self-report problems in Video 2. Interestingly, the reading skills did not affect variables where an effect might be expected, such as the self-report of the time and ease of reading.

The fact that these effects are attributed to the reading skills of the participants rather than to their hearing and communication profile is important, because this way the very small group of “Deaf/SL” who showed a good level of reading skills could be excluded from the pattern that associates pre-lingual deafness and the use of sign language with poor reading skills and shows that this profile can also result in a good performance in terms of comprehension. However, it must be noted that these are exceptions rather than the rule. Reading skills are still related to a certain extent to this profile of participants. Therefore, the effect of “Profile” should not be completely discarded but transformed or redefined in terms of reading skills.

6.2.2 Effect of the profile of the participants

It was expected that the “Deaf” and “Deaf/SL” participants, despite their differences, would behave in a similar way —differentiated from the “Hearing” group— and show a comparable performance to a certain extent. However, results indicate that, apart from a few exceptions, the “Hearing” and “Deaf” groups performed similarly in the three stages, the “Deaf/SL” group being the one with a clearly different behavior.

It must be remembered that the inclusion of the variables of adjustment absorbed a great part of the effects observed in the model without adjustment that were assigned to “Profile”. However, apart from the effects reported for “Reading” and “Familiarity” that can be also interpreted in terms of “Profile”, the effect of the profile itself was still present and significant in the three stages of reception and mainly focused on the two groups with a hearing loss.

6.2.2.1 Deaf/ SL

Most of the effects assigned for “Reading” were placed upon this group, as they were the less skilled readers. According to the models’ results, the behavior of this group was also statistically different in the following terms:

- Video 1: the total duration of the fixations on the image was significantly shorter.
- Video 1: the number of fixation counts on the image was significantly lower.
- Video 1: the number of visits to the area of the image and the area of the subtitles was significantly lower.
- Video 1: the ability to understand the plot was quasi-significantly lower.
- Video 1: the ability to process and recall the verbal information was quasi-significantly lower.
- Video 2: the probability to self-reported a fast reading time was significantly higher.

The “Deaf/SL” participants were more likely to spend less time and make fewer fixations (and visit counts in video 1) on the image. The fact that they resorted to the subtitles to a greater extent might indicate that they devoted more time and put more effort in reading the subtitles, thus suggesting a higher cognitive load. However, it must be noted that they showed the lowest number of fixations and visits counts in the subtitles as well, although in this case the difference was not statistically significant. This might suggest a slow overall processing rhythm.

Their behavior was slightly different in each video. In video 1 —more demanding in terms of attention as it had a higher degree of visual action— they did not show the same ability that the other two groups to follow the rhythm set by the subtitles and the image, resulting in a slow attention switching that could indicate processing difficulties. Despite having spent more time on the image, they seem to have related to the image at a lesser extent. However, they did not resort to the subtitles at a greater degree either, as they resulted in the lowest number of fixations and visit counts. In Video 2, they also made fewer visits to both the image and the subtitles. The scene was essentially verbal and the process of reading the subtitles seems to have taken precedence over the watching of the image, but the slow rhythm of the visuals, rather than easing the process of attention allocation, seems to have even obstructed it. The fact that the characters were not fully visible may also have hindered the process for this group. Their responses in this video were uneven and too variable, suggesting that they did not follow a unique and regular process.

These participants showed a good ability to process the visual information but on average they were not able to recall, process and understand the verbal information and the narrative, suggesting difficulties to read and/or to understand the information conveyed in the subtitles, more likely due to their overall poor reading comprehension. It seems that Video 2 was more difficult to process cognitively, which might have caused their uneven behavior in terms of attention allocation. As explained, however, the inclusion of the variable "Reading" proved to have been very significant on this stage and to have absorbed the effects placed upon the "Deaf/SL". In Video 1, however, their profile was still quasi-significant on two occasions, as they were quasi-significantly more likely not to understand the plot and process the verbal information correctly, confirming the existence of problems when extracting information from the subtitles. The absence of more significant effects does not imply they do not exist, but that they should be approached in terms of reading skills.

The stage of repercussion seems to confirm the patterns observed in the two previous stages, as this profile reported on average the presence of more problems as well as more excessive times in Video 1. Plus, according to the "Reading" results, they were more likely to self-report the existence of problems in Video 2. Also in this case, they were found to be significantly more likely to self-report that the reading times were too fast. Taking into account that —for this group— this video was more difficult to process at the three stages of reception, their perception of the reading times might have been influenced by factors different from their reading skills, which might include the visual characteristics of the video, Some of the participants admitted that, despite the presence of colors in the subtitles for the identification of the characters, it was still difficult for them to follow the conversation and to know exactly who was talking. This fact might have had an influence on how they perceived the reading process.

6.2.2.2 Deaf

Based on the outcome of the models, the responses of this group were statistically different in the following cases:

- Video 1: the total duration of the fixations on the image was significantly higher.
- Video 1: the mean duration of the fixations on the subtitles was quasi-significantly lower.
- Video 1: the number of fixations on the image was significantly higher.
- Video 2: the number of visits to the area of the image and the area of the subtitles was significantly higher.

The behavior of this group seemed to be more homogeneous and predictable. In terms of attention allocation, in both videos the "Deaf" was the only group that spent more time exploring the image than reading the subtitles. Even in Video 2 —despite having made more fixations on the subtitles— they spent on average more time on the image, as the number of fixations on the subtitles was greater and its duration was shorter. In Video 1, they were significantly more likely to show a longer total duration of the fixations and a higher number of fixations on the image, as well as quasi-significantly more likely to make shorter fixations on the subtitles. In Video 2, they made significantly more visits to the two areas of interest. This greater ability to explore the image seems to indicate that this group related to the visual information to a greater extent. They were able to process the subtitles more effectively and to switch their attention more smoothly at the rhythm set by the subtitles and the image, resulting in more visits to both areas. It seems that this group was able to process the subtitles efficiently, what might suggest that they read the subtitles faster so that they could quickly switch their attention towards the images.

The greater ability to allocate attention and to process multimodal information is in line with the results obtained in the stages of reaction and repercussion. In both cases, the effects were not directly observed in the "Deaf" profile but on the groups with higher reading skills. In the stage of reaction, the participants with a high reading level tended to be better able to identify the characters, understand the plot and to process the verbal information correctly. In the stage of repercussion, they tended not to report the presence of problems and to find the reading and viewing times as more comfortable. Their familiarity with the use of subtitles, as opposed to the "Hearing", might have also played a key role.

6.2.2.3 Hearing

This group resulted in the following significant effect:

- Video 1: the ability to process and recall the visual information was significantly lower.

The "Hearing" group also spent on average more time on the image in Video 1 and more time on the subtitles in Video 2, but the number of fixations was higher in the subtitles in both cases, being the only group with more fixations on the subtitles in Video 2. This pattern might be explained by their on average lower degree of familiarity with the use of subtitles that might have caused them to fixate on the subtitles for longer and more often. However, neither of these tendencies were significant, as this group did not positively or negatively stand out as the others did: they were not more likely to allocate attention to the subtitles —like the "Deaf/SL"— not to the image —like the "Deaf"—. In the same terms, their ability to switch attention between the image and the subtitles was not higher not lower in terms of visit counts, as it occurred with the "Deaf" and the "Deaf/SL". Thus, it could not be confirmed that they did relate to a greater extent to the verbal information conveyed in the subtitles. It must be stressed that this group also presented a relatively high variability in the responses that made it more difficult to estimate and define its behavior.

The only significance directly observed was found in the stage of reaction, in the analysis of their ability to recall and process the visual information in Video 1: they were significantly less likely to do it correctly. Apart from that, they showed a very good overall ability to understand the narrative information and to recall and process the verbal information (an ability that seems to be associated to their high level of reading skills, as it happened with the "Deaf"). Interestingly, and due to the higher proportion of "Hearing" participants with "Excellent" reading skills, this group was more likely to infer the information correctly in Video 2.

In terms of repercussion, no significant effects were reported. Only a few participants reported the existence of problems and excessive reading and viewing times, suggesting that on average they did not perceive the task as too demanding. Their self-evaluation was slightly worse in Video 2, as a great part of the group had watched Video 1 and this might have positively influenced their perception.

6.2.3 Effect of the subtitling speed of exposure

The effect of "Speed" was found to be less prominent than the influence of "Profile" and the patterns and tendencies observed are not so obvious and conclusive. Results indicate that most differences are found between the most extreme categories, being slightly more regular in "Low". The intermediate "Medium" speed, however, did not show such a clear effect. As opposed to "Profile", "Speed" resulted in significant effects on the stages of response and repercussion but not on the stage of reaction (where the variables of adjustment turned out to be more relevant). This indicates that the speed of exposure of the subtitles did not have a significant influence on the ability of the participants to understand the narrative information or to cognitively process the audiovisual information. This might be due to the fact that all three versions of speeds contained the exact same information, as there were no differences in the amount of cps and in the degree of editing.

6.2.3.1 Low speed of exposure

Based on the results, the behavior of the participants assigned to this speed of exposure was statistically different in the following terms:

- Video 1: the total duration of the fixations on the subtitles was significantly higher.
- Video 1: the number of fixations on the image was significantly lower.
- Video 1: the number of fixations on the subtitle was significantly higher.
- Video 2: the number of fixations on the image was significantly higher.
- Video 2: the number of visits to the image was significantly lower.
- Video 2: the number of participants that self-reported a comfortable viewing time was significantly higher.

Participants assigned to the "Low" speed made fewer visit to both areas (subtitles and image) in the two videos. This was expected, as the "Low" speed of exposure displayed the smallest number of subtitles —mostly of two-line subtitles— with longer exposure times (of between four and six seconds). This might have caused the participants to follow a slower rhythm in terms of attention switching. Apart from that, the effects detected are slightly different in each video. In Video 1, participants were more likely to spend more time and to make more fixations on the subtitles. It seems that, despite the fast visual rhythm of the scene, the “Low” speed of exposure led the participants to allocate their attention at a greater extent on the subtitles, prioritizing the activity of reading. Contrarily, in Video 2 —and probably due to the specific visual characteristics of the scene itself— they made significantly more fixations on the image.

The participants assigned to this speed of exposure were more likely to perceive the viewing times as comfortable, although this tendency was only significant in Video 2. It seems that the slower visual rhythm of the scene in conjunction with the slower rhythm of the subtitles led the participants to perceive the watching times at ease. Contrarily to what might have been expected, the high exposure of the subtitles did not affect the self-assessment of the participants about the reading times.

6.2.3.2 High speed of exposure

According to the results, this speed affected the results in the following terms:

- Video 1: the number of visits to the area of the image was significantly higher.

This speed of exposure was significant only in the stage of response. Participants assigned to the “High” speed made more fixations on the image in Video 1, and more visit counts to both areas in Video 1 and Video 2, although the tendency was significant only in the latter. This might be explained by the fact that subtitles were displayed for shorter periods (approximately between one and four seconds) and the number of the subtitles —mostly one-line subtitles— was significantly lower (in Video 1 it displayed a total of 21 subtitles, as opposed to the 43 displayed in “Low”). Therefore it seems that, as it was expected, this exposure lead to more deviations between the image and the subtitles, causing the process of switching and distributing visual attention to be faster.

6.2.3.3 Medium speed of exposure

As mentioned, this intermediate speed did not seem to influence the process of reception at any of the stages. The participants that were assigned to it did not show a regular pattern, although they were significantly more likely to make more fixations on the image in Video 1.

6.2.4 Interaction effects between profile and speed

The interaction between the profile of the participants and the speed of exposure of the subtitles resulted in significant effects in the following cases:

- Video 2: the “Deaf/SL” participants assigned to the “Low” speed of exposure were more likely to have shorter fixation durations on the image.
- Video 2: the “Deaf” participants assigned to the “High” speed of exposure were more likely to make more visits to the area of the subtitles.

The interaction between the two main explanatory variables turned out to be significant — and was therefore included in the prediction model— only in the stage of response. It must be noted that the binary logistic approach used to analyze the categorical data from the stages of reaction and repercussion could not calculate the interaction effects between all levels of the variables, as some values were too small.

The interaction between “Profile” and “Speed” was significant only in Video 2, the video that was more demanding in terms of visual attention as it presented a higher degree of visual action that competed for attention with the subtitles. On the one hand, the smaller number of subtitles —mostly two-line subtitles— and the longer presentation rates of the “Low” speed of exposure led the “Deaf/SL” participants to make even shorter fixations on the image. On the other hand, the “Deaf” participants assigned to the “High” exposure tended to make more visits to the subtitles. In this case, the higher number of one-line subtitles and the shorter exposure times led them to make more visits to the subtitles. The “Deaf” participants showed on average an efficient way of switching attention between the image and the subtitles and a good processing of both sources of information. The fact that they made more visits to the subtitles might indicate that they were able to follow the faster rhythm established by this modality of exposure, thus suggesting a fast and efficient reading — at least in the video where the rhythm established by the visual action was slower—.

6.3 In relation to the objectives, research questions, and hypotheses.

The overall purpose of the present research was twofold: to describe how viewers with a different hearing, communication and language background undergo the process of reception of films with SDH and to analyze whether and how this process —and/or its different stages— are affected by the profile of the participants and/ or by the speed of exposure of the subtitles. In the case of the subtitling speed of exposure, the hypotheses were defined only for the most separated categories ("High" and "Low") and not for the intermediate speed "Medium". In the same terms, in the case of the profile of the participants, the hypotheses were defined, on the one hand, for the participants with a hearing loss ("Deaf" and "Deaf/SL") and, on the other, for the "Hearing" participants.

This section will discuss the validation of the objectives and the hypotheses established for each of the stages of reception. Section 6.3.1 presents the stage of response, Section 6.3.2 the stage of reaction and Section 6.2.3 the stage of repercussion.

6.3.1 Stage of response

Objectives n.1 and n.2: To determine whether the hearing, language and communication profile of the participants and/or the subtitling speed of exposure has an effect on the way in which the participants allocate attention while reading the subtitles and exploring the visuals.

It was hypothesized that:

- The "Deaf" and especially the "Deaf/SL" participants, as well as the participants assigned to the "Low" speed of exposure, will allocate more attention to the subtitles, by showing: A higher total fixation and mean fixation duration on the subtitles, a higher number of fixations count on the subtitle, and a lower number of shifts between the subtitles and the image.
- The "Hearing" participants as well as the participants assigned to the "High" speed of exposure, will allocate more attention to the image, by showing: A lower total fixation and mean fixation duration on the subtitle, a lower number of fixations count on the subtitles and a higher number of shifts between the subtitles and the image.

According to the results, both the profile of the participants and the speed of exposure of the subtitles affected the stage of response. The two research questions are therefore validated to a certain extent, even though some findings were unexpected. Thus, not all the hypotheses are validated and not all the hypotheses that are validated are totally verified.

For instance, it must be noticed that —contrary to what was hypothesized based on previous research when the two groups had behaved in a more similar way— in this study the “Deaf” and the “Deaf/SL” behaved in a substantial different manner in most of the variables. The “Deaf” participants spent significantly more time on the image than the “Deaf/SL” in the two videos, whilst the “Deaf/SL” showed —on average and in both videos— a shorter mean fixation duration on the image and tended to make significantly fewer fixations on the image than the “Deaf”. Additionally, the “Deaf” participants showed the highest number of visits to both areas, whilst the “Deaf/SL” showed the lowest number of visits. By its, part, the “Hearing” participants made significantly more fixations on the subtitles than the rest. Their different level of reading comprehension skills might explain this behavior. The “Deaf” did not have so many problems as the “Deaf/SL” to process and understand the subtitles and seemed to have showed the ability to read fast and to resort to the image to a greater extent in the two videos, as well as to switch attention between the image and the subtitles probably because of their experience with the use of subtitles and their tendency to lip-read. On the contrary, the “Deaf/SL” and —mainly— the “Hearing” resorted to the subtitles to a greater extent: the behavior of the former might be explained by their difficulties in reading and their overall slow rhythm to process both the image and the subtitles and the behavior of the latter by their absence of familiarity with the presence of subtitles.

On relation to the speeds of exposure, however, the observed effects were more in line to what was expected. The “Low” exposure resulted in significantly shorter times on the image (in Video 1) as well as in a higher mean duration of the fixations on the subtitles. It also resulted in significantly fewer fixations on the image in Video 1 (with a fast visual rhythm) but in more fixations on the image in Video 2 (with a slow visual rhythm). Additionally, the participants assigned to the “High” speed made a higher number of visits to the two areas of interest, whilst those assigned to Low” showed a lower number of visits. The fact that the “High” speed of exposure had a higher number of subtitles which were displayed for shorter periods of time (most one-line subtitles) and that “Low” had a lower number of subtitles which were displayed for longer periods of time (most two-line subtitles) seem to explain this behavior.

6.3.2 Stage of reaction

Objectives n.3 and n.4: To determine whether the hearing, language and communication profile of the participants and/or the subtitling speed of exposure has an effect on the way in which the participants recall and process the verbal information contained in the subtitles and the visual information contained in the visuals, comprehend the narrative information, and infer the meaning and narrative consequences.

It was hypothesized that:

- When subtitles are presented at the "Low" speed, participants might show: a higher ability to comprehend and infer the narrative information, a higher ability to recall and process the verbal information, and a lower ability to recall and process the visual information.
- When subtitles are presented at the "High" speed, participants might show: a lower ability to comprehend and infer the narrative information, a lower ability to recall and process the verbal information, and a greater ability to recall and process the visual information.
- The "Deaf" and especially the "Deaf/SL" participants might show: a lower ability to comprehend and infer the narrative information, a lower ability to recall and process the verbal information, and a higher ability to recall and process the visual information.
- The "Hearing" participants might show: a greater ability to comprehend and infer the narrative information, a greater ability to recall and process the verbal information, and a lower ability to recall and process the visual information.

According to the results, and contrary to what had been expected, the speed of exposure of the subtitles did not affect the way in which the participants processed and understood the information. This may be explained by the decision of isolating speed from verbal density and editing, as the three speeds of exposure displayed exactly the same content.

On the contrary, the language and communication profile of the participants had a clear effect on this stage of reception, although the effects observed were different from the ones that had been hypothesized. The performances of the "Hearing" and "Deaf" groups were similar in narrative comprehension and in the recall and processing of the verbal information, and the two groups obtained very good results. However, the "Hearing" group was significantly better than the two groups with a hearing loss in terms of inference of information. The "Deaf/SL" participants showed a good ability to process the visual information but on average they were not able to recall and process the verbal information, suggesting difficulties to read and/or to understand and infer the information conveyed in the subtitles. Again, the differences between the three profiles in terms of their level of reading comprehension seem to explain this behavior.

6.3.3 Stage of repercussion

Objectives n.5 and n.6: To determine whether the hearing, language and communication profile of the participants and/or the subtitling speed of exposure influence the way they assess and evaluate the difficulty of the process of reception and the time and ease of reading the subtitles and of looking at and exploring the visuals.

It was hypothesized that:

- The participants assigned to the “Low” speed of exposure, as well as the “Hearing” participants might be more likely to self-report: the absence of problems to carry out the activity, a more comfortable time and ease of reading, and a less comfortable time and ease of watching.
- The participants assigned to the “High” speed of exposure, as well as the “Deaf” and especially the “Deaf/SL” participants might be more likely to self-report: the existence of problems to carry out the activity, a less comfortable time and ease of reading, and a more comfortable time and ease of watching.

According to the results, the effect of the hearing and communication profile of the participants was confirmed according to the hypotheses established, but only for the “Deaf/SL” group. In the two videos, the percentage of participants that self-reported to have had problems completing the task and that considered that the speed of the subtitles was fast for a comfortable reading was higher in the “Deaf/SL” group. The effect of the subtitling speed of exposure, on the contrary, could not be confirmed as it was only present in the self-assessment of the viewing times in Video 2, as the participants assigned to the “Low” subtitles were more likely to report they had had plenty of time to explore the image. The speed of exposure of the subtitles, thus, did not have a clear influence of the difficulty and the assessment of reading times.

6.4 In relation to previous research

This section is aimed at comparing the results from the present study with some of the results and findings that had been presented and discussed in Chapter 2.

As pointed out by Zabalbeascoa (2008) and Gambier (2013), the verbal and the non-verbal, the audio and the visual elements present in an audiovisual text are not always in balance from a qualitative and quantitative point of view. It is essential to identify the relationship that these elements establish in order to be able to analyze its various implications in reception. As a first step towards this direction, the present study tried to define and identify the degree and relationship between the visual and the verbal codes in the two videos selected for experimental analysis. In Video 1 the visual information was more dynamic and contributed to a greater extent to the narrative, whereas in Video 2 the verbal code was more prominent. The use of eye tracking and questionnaires allowed for the measurement and comparison of the viewers' experience across these two different viewing conditions, as well as for the exploration on how the relationship between the codes has an impact on the different stages of reception.

According to researchers such as Krejtz et al. 2013, De Linde and Kay 1999 and D'Ydewalle and van Rensbergen 1989, visual aspects are expected to influence the reading and the processing of the subtitles, affecting the overall viewing activity. They argued that the type and the genre of the audiovisual programs, the load of visual action in relation to the load of verbal content and the number of shots might influence the reading and viewing performance. They also claimed that higher degrees of visual action could led to shorter reading times, as well as that higher number of shots could led to more deviations between the images and the subtitles, disrupting the reading and viewing process. On a different note, and in the case of deaf and hard-of-hearing viewers, according to de Linde and Kay 1999 and Zárate and Eliahoo 2014, the visibility of the speaker and the characters might also influence the reading and viewing performance by resulting in longer reading times. Perego et al. (2016a and 2016b) also stated that the degree of attention on the subtitles depended on the degree of structural-informative, linguistic, and narrative and visual complexity of the film: the higher the complexity, the more time spent on them.

Taking into account that the two videos analysed were substantially different in terms visual density (e.g. number and type of shots, the load of the visual action in relation to the load of the verbal code and the visibility of the characters), it was expected that this might influence the patterns of reception. No specific hypotheses were established, but —based on the above— it was expected that Video 1 (with a higher load of visual action and a higher number of shots) would result in longer viewing times and in more deflections. This pattern has been confirmed: the image was prioritized in Video 1 whilst in Video 2 the reading of the subtitles appeared to have taken precedence over viewing. All the categories of "Speed" and "Profile" resulted on average in more visit counts on the images in Video 1, suggesting that viewers were able to adapt their attention to the fast rhythm imposed by the visuals and to process the subtitles effectively. The fact that the characters were not fully visible in Video 2 might have also caused the "Deaf/SL" participants to spend more time reading the subtitles, as they might not have obtained valuable information from the image.

The assumption that in the processing of subtitling the reading activity tends to be dominant (see e.g. d'Ydewalle and Gielen 1992, D'Ydewalle and de Bruycker 2007 or Perego et al. 2010 that established that participants spent an average of 67% of the time reading the subtitles) is valid for the Video 2 —with a higher verbal load— but not for the Video 1 —with a higher load of visual action—. All the categories spent more time on the image in Video 1, whereas in Video 2 all the categories except the "Deaf" profile spent more time reading the subtitles. This shows that reading does not always take control over viewing. According to Kruger et al. (2015), the role of reading is flexible and may vary according to different contexts and different languages and audiences, suggesting that certain viewers, under certain conditions, can prioritize the images over the subtitles. In this study, differences can be observed between the percentage of time spent on the image and on the subtitles in Video 1 and Video 2 and between the different categories of profile and speed of exposure. Its thus seems that distribution of attention may be influenced by the type of audiovisual content, the profile of the participants and the exposure times of the subtitles.

Video	Profiles and speeds		Time on subtitles	Time on images
1	Profile	Deaf	37%	63%
		Deaf/SL	43%	57%
		Hearing	44%	56%
	Speed	Low	47%	53%
		Medium	38%	62%
		High	38%	62%
2	Profile	Deaf	46%	54%
		Deaf/SL	58%	41%
		Hearing	53%	47%
	Speed	Low	52%	48%
		Medium	55%	45%
		High	51%	49%

Table 122: Percentage distribution of gaze between image and subtitles

Despite these differences, the distribution seems to be quite uniform: the maximum time on the subtitles is 58% (Deaf/SL) and the minimum 37% (Deaf), whilst the maximum time on the images is 63% (Deaf) and the minimum 41% (Deaf/SL). This might be due to the fact that all the subtitles had a density of approximately 15cps (150wpm). Based on the findings obtained by, among others, Jensema (1998, 2000a, 2000b) and Romero-Fresco (2009b, 2011 and 2015a) the distribution of the time between the image and the subtitles depends to the presentation rates of the subtitles. According to Romero-Fresco (2015d), the higher rates would lead to more time on the subtitles, being the subtitles displayed at 15cps the ones that show a more even distribution:

Viewing speed	Time on subtitles	Time on images
120 wpm	±40	±60
150 wpm	±50	±50
180 wpm	±60-70	± 40-30
200 wpm	±80	±20

Table 123: Viewing speed and distribution of gaze (Romero-Fresco 2015d)

In the present study, all the subtitles were displayed at a maximum rate of 15cps. If the percentages of distribution of gaze obtained in each video are analyzed in conjunction, the overall results match with the percentages proposed by Romero-Fresco (2015d) for the 150wpm viewing speed, as 47% of the time was spent on the subtitles and 53% on the images. As seen in the following table, the results of the three different profiles and the three speeds of subtitling exposure are also close to a ±50/50 distribution. This confirms the validity of the results on viewing speed obtained in the DTV4ALL project but they add additional information about the actual impact that the type of audiovisual content, the profile of the participants and the exposure times of the subtitles might have on reception in terms of gaze distribution.

Profile/ Subtitling exposure speed	Time on subtitles	Time on images
Deaf/SL	51%	49%
Deaf	41.5%	58.5%
Hearing	48.5%	51.5%
Low	49.5%	50.5%
Medium	46.5%	53.5%
High	44.5%	55.5%

Table 124: Distribution of gaze between the subtitles and the image

The display of subtitles with different speeds of exposure but with the same density of cps is what distinguishes this research from most of the studies carried out in subtitling. The latter investigated speed in relation to the editing of the subtitles, such as the DTV4ALL (Romero-Fresco 2015a). This way, subtitles displayed at 120wpm contained a higher degree of editing than the subtitles displayed at 200wpm, which were verbatim or nearly verbatim. Ghia (2012), Krejtz et al. (2013) and Szarkowska et al. (2011, 2013) followed the same approach by comparing edited, standard and verbatim subtitles displayed at a different rate of cps and different presentation times. These studies found that the participants with a hearing loss tended to make more and longer fixations on the subtitles —being longer in the edited version— and to make a higher number of shifts between the subtitles and the image in the edited subtitles. According to them, they might have tried to rely on the image to a greater extent for lip-reading or residual hearing. In the DTV4ALL project, for instance, when the subtitles were displayed at an average rate of 150wpm/ 15cps, participants spent on average 52.7% of the time reading the subtitles. The participants with hearing loss, especially the deaf, showed longer reading times, which might be considered as an indication of reading difficulties. In this study, however, this pattern only applies to the "Deaf/SL" group, as the pattern observed on the "Deaf" is in fact the opposite: they showed shorter reading times (37% in Video 1 and 46% on Video 2, 41.5% in total).

All the participants	Hearing	Hard of hearing	Deaf
52.7% *Min: 35.9 * Max 63.2	48.2%	53.1%	56.7%

Table 125: Average time spent on subtitles (Romero-Fresco 2015e)

The fact that the different speeds tested in these studies contained subtitles with different degrees of editing implied that the linguistic content within each modality also varied. However, edited subtitles —compared to verbatim— are more likely to present short and frequent words and short and more simple sentences and findings from previous research (e.g. Krejtz et al. 2015, Moran 2012 and Pollatsek and Rayner 2006) suggest that factors such as word difficulty, frequency or lexical ambiguity can have an impact on the reading process in subtitling. In Moran (2012), for instance, participants who watched subtitles with a higher degree of frequency words —despite including a higher number of characters— spent significantly more time on the image than those who watched the subtitles with a lower degree of frequency words and who also made shorter fixations on the subtitles. This raises the question of whether the results were due to the divergent linguistic content of the subtitles rather than to the speed itself.

In the present study, however, the content of the subtitles did not vary as all the subtitling alternatives displayed the same content —at approximately 15cps— but with different presentation speeds. Following this approach the effect of "Speed" was found to be less intense, especially if compared to the effect of the profile of the participants or their reading skills. Participants assigned to the "Low" speed made fewer visits to the image and the subtitles and participants assigned to the "High" speed made more visit to both areas. It thus seems that "High" led to more deviations between the image and the subtitles, causing the process of switching attention to be faster, whilst "Low" led to the opposite behavior. "Low" subtitles also led to longer times on the subtitles but the differences did not seem to be significant. These effects might be due to the fact that the density of the subtitles was the same in all the cases and only the presentation rates varied: "Low" subtitles were displayed for longer times (between four and six seconds) whilst "High" subtitles were displayed for shorter times (between one and two seconds).

Within this approach, the segmentation of the subtitles in one- or two-lines subtitles turns out to be especially relevant, as the "Low" speed of exposure presented fewer subtitles with a higher number of two-line subtitles (displayed for longer times) whilst "High" consisted of more subtitles and mostly one-line subtitles (displayed for shorter times.). As it has been found out by, among others, de Bruycker and d'Ydewalle (2003), d'Ydewalle et al. (1991), d'Ydewalle and Gielen (1992), d'Ydewalle and de Bruycker (2007), Praet et al. (1990) and Perego et al. (2010), one-line subtitles are read faster and through shorter fixations and a more regular reading pattern occurs with two-line subtitles. Moreover, one-line subtitles tend to result in more deflections between the subtitles and the images.

These tendencies were also observed in the present study, but they were not always statistically significant, probably due to the inclusion of an intermediate speed of exposure ("Medium") that did not show such a clear effect. Additionally, it must be remembered that all the three subtitling speeds of exposure displayed the exact same information in such a way that the less redundancy of information in relation to the visuals that was expected to occur in two-line subtitles was not pertinent in this case. Therefore, the less intense effect observed might be attributed only to the different presentation or exposure times. In any case, participants assigned to the "Low" speed made fewer visit to both areas (subtitles and image) in the two videos, which was expected as they had the smallest number of subtitles but the higher amount of two-line subtitles. This might have led participants to follow a slower rhythm in terms of attention switching. In the same terms, "High" led to a higher amount of visits, forcing participants to deviate attention and to follow a more demanding rhythm. Apart from that, the effects identified were different in each video, suggesting the impact of the type of content. In Video 1, —despite the fast visual rhythm— the "Low" speed of exposure led participants to spend more time and to make more fixations on the subtitles, thus prioritizing the activity of reading to the detriment of the processing of the image. Contrarily, in Video 2, "Low" led to more fixations on the image.

Apart from this, results on attention also indicated that the fixations on the images were longer than those on the subtitles, in line with what other studies have shown.

In terms of comprehension and cognitive effort, in the DTV4ALL project the hearing participants obtained the best results. The deaf and hard of hearing showed a comparable performance, even though the deaf participants obtained a poorer narrative and verbal comprehension. On average, their results corroborate the pattern that viewers with hearing loss experience problems in reading and comprehension.

Type of comprehension	All the participants	Hearing	Hard of hearing	Deaf
Overall	69.6%	77.2%	65.3%	66.2%
Subtitles	67.4%	76.25%	64.6%	61.4%
Images	71%	73.5%	66.2%	73.25%

Table 126: Average comprehension DTV4ALL (Romero-Fresco 2015e)

Contrary to what was observed in the DTV4ALL project, results from this study show that the "Deaf" and "Hearing" participants had a more or less similar and regular performance: showing the cognitive capacity to process the narrative, verbal and visual information. Except for their capacity to infer consequences, where the "Hearing" showed a better capacity. In the case of the "Deaf/SL", nonetheless, it is confirmed that they experienced problems to identify the relevant information in the subtitles and to extract and process the narrative and verbal information. In fact, the scores obtained by this group were even lower than the ones obtained in the DTV4ALL project. Nevertheless, despite having spent less time on the images, the "Deaf/SL" participants —as it also happened in DTV4ALL— were able to process the visuals effectively and to achieve an overall good visual comprehension, with scores almost good and sometimes better than the "Deaf" and "Hearing" participants.

The following table presents the overall correct results obtained in the two videos in accordance to the different type of comprehension investigated. It must be noted that —as it has been explained in Section 6.1— substantial differences were observed between the two videos. However, the overall results might still be an indication of the groups' average performance in terms of comprehension.

Type of comprehension	Hearing	Deaf	Deaf/SL
Narrative	81.25%	81.25%	39.58%
Visual	39.6%	70.85%	70.85%
Verbal	72.93%	67.7%	26.73%
Inference	89.6%	62.5%	47.35%

Table 127: Average comprehension results

The inclusion of the variable "Reading skills" into the analysis allowed for the confirmation of the relevance of reading skills in comprehension performance. Comprehension seemed to be related to reading proficiency, as the participants with higher level of reading skills were more able to comprehend the information. This confirms that the reading comprehension level of this population is lower than the level of the hearing population (Burham 2008). However, and according to Neves (2005), the heterogeneity of this population makes it very difficult to generalize. The problem of providing generalizations was also found in the present study, as a small group of "Deaf/SL" participants (four) demonstrated having a very good level of reading comprehension skills and, thus, of comprehension. These exceptions were the youngest "Deaf/SL" participants. However, the differences do not seem to be directly related to the age of the participants but to their early exposition to language, as, according to Neves, early exposition to accessible linguistic stimuli might contribute to reducing the difficulties encountered to learn to read efficiently. Acquiring a sign language as L1 at early stages of live does not involve the acquisition of the ability to read but studies have found out that native and skilled sign language users tend to perform better in reading than less-skills non-native sign language users (Chamberlain and Mayberry 2000). In fact, three of these four participants who performed very well in reading had studied in bilingual and integrated school where they used both languages: it encouraged the learning and use of sign language from very early stages but put a strong emphasis on the importance of reading and writing the spoken language.

Lastly, in terms of repercussion, the hearing and communication profile of the participants seems to have had a higher influence on the results than the speed of exposure of the subtitles. The “Deaf/SL” were more likely to report the existence of problems when watching and reading with subtitles, as well as excessive reading and watching times. The speed of exposure of the subtitles, according to the results, did not influence their perception and self-assessment. Despite this, when asked about the problems they had, most of them referred to the excessive speed of the subtitles. This is in line with what Arnáiz (2012a and 2015a) found out in her analysis of Spain as part of the DTV4ALL project and with what was reported by CESyA (2014), where the majority of the deaf participants reported to prefer slower subtitling times.

Chapter 7. Conclusions

This section presents a reflection on the conclusions reached in the present study. The preliminary conclusions obtained in each stage of reception have already been introduced in Chapter 5 (See Sections 5.1.6, 5.2.5, and 5.3.5), and a summary of the main findings has been included in Chapter 6. Section 7.1 presents the general conclusions achieved in the study and Section 7.2 reflects on its limitations and on the ways in which it could have been improved. Finally, Section 7.3 indicates venues for further research.

7.1 General conclusions

The main objectives of the study were:

- To describe and analyze in an empirical study the process of the reception of SDH, with a special interest in how participants with a different hearing profile and a different language background deal with semiotics.
- To evaluate whether the reception is affected by either the speed of exposure in which the subtitles are presented and/or by the hearing, communication and language profile of the viewers.

In relation to the first objective, this research intended to shed light on the way in which viewers process and prioritize the different verbal and non-verbal elements conveyed in the audiovisual text and on the intricate relationships that these elements maintained as well as its effects. In order to achieve this, the reception of two videos with a relatively high verbal load and a significantly different visual load were analysed. Differences between the receptions of the two videos were observed in the three groups of participants and in the three stages of reception, suggesting that reception is highly dependent on the type of audiovisual content.

In relation to the second objective, this study has attempted to search for similarities and differences in reception in terms of the profile of the participants and the speed of exposure of the subtitles. The profile of the viewers has influenced the overall process of reception, as effects have been found in the three stages. Surprisingly, more differences were observed within the two groups with hearing loss rather than between them and the hearing group. The effect of the speed of exposure of the subtitles, on the contrary, was mainly focused on the stage of response. The presentation rates of the subtitles were proven to have an effect on the attention allocation of the participants, but it did not affect comprehension. This might be due to the fact that all the subtitles, despite their different exposure times, presented the same amount of text and the same subtitle density (understood as cps and in this case of 15 cps). Previous research on the effect of subtitling speed tended to analyze the two parameters (density/ editing and subtitling speed) together, making it difficult to determine the exact role of them. In this case, however, the term "subtitling speed of exposure" was introduced and the parameter of subtitling speed was isolated from density/editing. According to the findings, thus, it seems that the effect previously observed on comprehension might have been due to the different density/editing of the subtitles rather than to their presentation or exposure times.

The multiplicity of stages and parameters involved in the reception of audiovisual translation implies a set of methodological and experimental challenges that range from the implementation of different methods —such as surveys and eye tracking— to the necessity to find a suitable sample —in terms of both size and representativeness— or the relevance of controlling factors outside the focus of the study. In this sense, the use of GLM in the statistical analyses proved to be adequate as, besides the profile of the participants and the speed of exposure of the subtitles, it allowed the inclusion of a set of variables of adjustment. Taking into account the heterogeneity of the sample on a set of factors, the inclusion of the familiarity of the participants with the content or (and mainly) their different reading comprehension skills allowed to specify the effects observed in the participants, providing a more accurate perspective.

The complex relations of interdependence between some of the variables, however, also pose a difficulty for the statistical analysis due to the collinearity or correlation between them that might lead to misleading effects. In order to avoid this, it becomes relevant to clearly define and isolate the variables and elements of analysis as much as possible. In fact, the reading skills turned out to be a relevant factor to consider as it played a significant role on the overall process of reception. This seems to indicate that differences between the groups of participants might be more due to reading-related factors rather than to communication, language and hearing aspects. "Reading skills" and "Profile" are nevertheless related, and the former seems to depend to a certain extent on the latter.

However, the fact of having a hearing loss does not imply not being able to gain proficiency in reading, as in general the pre-lingual deaf within the "Deaf" group obtained good results, both in comprehension and in the additional test used to assess their reading skills. The results of the "Deaf/SL" group were poor in general but the three younger participants that had received a bilingual (spoken and signed) education achieved a perfect score in both reading skills and comprehension. Finally, and interestingly, the reading skills of the participants affected variables where a priori was not expected, such as the duration of the fixations on the area of the image or the recollection and processing of verbal information, reinforcing the strong relationship between the audiovisual codes and the verbal and non-verbal elements. The use of an additional test in the pre-stage to evaluate the participants' reading skills in an empirical analysis rather than through a self-assessment questionnaire turned out to be essential for the interpretation of the results. Self-assessment questionnaires could provide unreliable information and thus, based on the importance of the viewers' reading skills on their performance in subtitling, its use may lead to misleading information.

This study presents the first empirical results on the impact of subtitling exposure speed on reception, which may have several implications that could be useful for future research on SDH as well as for the professional practice on SDH and its training.

First of all, it must be noted that —despite the introduction of the notion "subtitling exposure speed"— the aim of the study was not to contribute to the terminological debate surrounding subtitling speed but to shed some light on its complexity and scope of impact. In audiovisual translation in general and in subtitling and SDH in particular, the tight relationship between the different semiotic codes that participate in the conveyance of meaning —and therefore in its reception—, makes it necessary to embrace the study of the different parameters involved from a comprehensive and flexible approach. Therefore, in audiovisual translation research, it will be inevitable to consider the relationships of the parameter(s) of study with other parameters, yet it will be important to try to isolate them in order to evaluate its actual impact and obtain accurate and reliable results. In an attempt to follow this line, this research tried to dissociate subtitling speed from the degree of editing and the density in terms of cps and it is within this context that the term "subtitling speed of exposure" was selected.

Secondly, this study is a preliminary investigation of the impact of videos with a different load of verbal and visual density on reception. Results suggest that reception is highly dependent on the type of audiovisual content, at least in the context of fiction films.

This way, subtitlers should take into account the degree and balance of the visual weight of the scenes when creating and providing SDH. When a video displays continuous speech and has a high visual load (in terms of number and diversity of shots and locations) the visual information acts as a relevant support for understanding the narrative, especially for the viewers that are deaf sign language users who showed the ability to scan and process the visual information efficiently despite spending more time reading the subtitles. This specific profile of viewers, however, seemed to experience difficulties to process and understand the verbal narrative information conveyed by the subtitles. In this study, the subtitles that were displayed for longer times and that included more two-line sentences resulted in longer reading times and shorter times on the image but they also seemed to facilitate to a certain extent the comprehension of the verbal narrative information as well as not to hinder the processing of visual narrative information. The subtitles that were displayed for shorter times and that contained more one-line sentences, on the contrary, seemed to led to more deviations between the image and the subtitles and to force a fast reading and viewing rhythm. The deaf participants in the study seemed to be able to adapt their reading and viewing strategies to this situation but this was not the case for the deaf sign language users, who seemed to follow a slower pace and for whom faster subtitles could lead to a lower processing of both verbal and visual information. Thus, according to the preliminary results of this study, whenever it is possible, and for the benefit of the group of deaf sign language viewers, it would be recommended to provide longer subtitles displayed for longer times, which seems to ease the processing and integration of the verbal and the visual narrative information.

7.2. Limitations of the study

In an experimental study, the selection of the variables, the methods for data collection, tools and materials, and the participants need to be carefully justified. Multiple and diverse decisions have had to be taken throughout the course of the present research, from the stage of defining and designing the reception study itself to its development, thus limiting its scope. The three axes of the study (the reception study with combined methods, the profile of the participants and the speed of subtitling exposure) are already restrictive aspects and constitute its main limitations.

On the one hand, the decision to address the overall process of reception instead of focusing on one specific aspect or stage had direct implications on the type of analysis. Large sample sizes are advisable for eye-tracking and statistical analysis and comparison as they can yield more accurate results, but sometimes they are difficult to handle as well as being unsuitable for a micro-level analysis. For the purpose of this study —in which a total of 72 participants took part— a considerable amount of data was collected, from the eye-tracking measurement and recording to the set of questionnaires used to elicit information. This large data source could be used later on for more detailed analyses in order to investigate i.e. the behavior of a specific participant or group of participants or to focus on individual subtitles and specific scenes. A total of eight months were needed to achieve the expected number of participants, and the tests were carried out at four different locations (see Section 4.3.2). Taking into account the sensitivity of eye tracking and the long interval of time between the first and the final tests, a strict protocol was established aimed at guaranteeing the clarity of the instructions that were given to the participants and to maximizing the control over the laboratory settings in aspects such as lighting, type of chair, etc. (see Section 4.4.1.5). The use of a highly controlled laboratory setting is thus advisable in order to obtain more robust results, but it can sometimes be detrimental as some participants might feel uneasy, which could also affect the results.

In studies involving the use of multiple measurements and several techniques of data collection and analysis it is recommended to a carry out a set of pilot studies to validate the effectiveness of such tools. In this case, the pilot study that was conducted verified the usefulness of the tools but it did not analyze the validity of the statistical analysis. In further research, it may be advisable to test the statistical model and tests to be applied in order to ensure that they provide meaningful and expected effects. In the same way, only one hearing participant took part in the pilot study and, since this person acknowledged to have a high level of English, she did not carry out the test for evaluating her level of English listening comprehension skills. As explained in Section 4.3.3.6, this test turned out not to be adequate. Consequently, all the tools to be used in the final and definitive study should have been tested in the pilot study. Another aspect that should be reflected and justified is the use of appropriate audiovisual material. The length of the videos used in this research was based on previous similar studies. However, they might have been rather short as, according to Orero et al. (forthcoming) "a period of acclimatization may be required in order to measure particular effects". The use of slightly longer film or programme fragments may be advisable for further research.

The idiosyncrasy of the target population (see Section 2.2.1.) also set important limits in the study. First of all, the impossibility to rely on accurate information about the actual number of people with hearing loss made it difficult to establish a representative sample size. Based on the requirements of the research design and taking into account the number of participants in other studies, it was established that 48 deaf participants would be an appropriate number. In addition, in order to gain access to the population, contacts needed to be established with different entities and associations that acted as intermediaries. Furthermore, the presence of a sign language interpreter was required at all the stages to contact and communicate with the deaf/sign language participants. As explained in Section 3.4, this had different implications on the development of the study. For instance, there was no control over the age and the sex of the participants. Moreover, as I did not belong to the same sociocultural community, I sometimes had to readjust my role as a researcher in order to build trust with some of the participants in such a way that they did not feel judged and could instead be comfortable and participate more actively.

The subtitling speed itself set relevant limits to the study. In order to analyze its effect in separation from collinear variables such as subtitle density and editing, it was redefined and isolated. The approach taken in the definitions of key concepts such as linguistic density, editing strategies and subtitling speed implied the need to manipulate the segmentation of the subtitles and its exposure times. The manipulation was carefully done in order to maintain the average of 15cps without affecting the synchrony of the subtitles. This was helpful for the empirical analysis as it allowed to determine its specific role in a more accurate manner; however it implied the manipulation of the exposure rates. This manipulation led to less realistic situation that might not be feasible in a professional context but it was valid and turned out to be adequate in terms of research.

Finally, the use of certain other eye-tacking measurements, such as time to first fixation, number of regressions, saccades amplitude and duration and number of skipped subtitles — that were not incorporated into the analysis due to time limitations and to the need to narrow the scope of the research questions and hypotheses— could be considered in order to gain more knowledge about the reception process. In the same way, the exploration of heat maps could be used to support the visualization of the visual patterns identified. In the present study the fragmentation of the eye-tracking design required for the analysis at multiple levels of the profile of the participants and the speeds of exposure of the subtitles made it unsuitable to use heat maps, but its incorporation should be considered in further research.

7.3. Future research

The present study was intended to shed some light into how a specific audience —the deaf and hard-of-hearing viewers— undergo the process of the reception of films with SDH, as well as to determine the role of the subtitling speed in this process. In the present study, and contrary to what was expected based on previous research, the speed of subtitling exposure did not affect comprehension. More research should be carried out in order to confirm or contrast this finding. In the same way, this research also addressed the reception of two videos with a different type of verbal and visual load with the aim of identifying the role of each type of element and their relationship when conveying meaning. Further research could be carried out with different genres, products and content in order to gain more empirical knowledge about how the different relationships can be established between the elements and the codes that influence the reception of an audiovisual text.

According to the results obtained, the differences between the reading skills of the participants seem to explain the differences observed in their performance rather than their hearing and communication profile. In this sense, it would be interesting to develop further research with a particular portion of the population: the younger deaf generations that had been educated in a bilingual setting. The few participants with this specific background obtained good results in the comprehension questionnaires and in the additional test on reading comprehension they broke the pattern that relate pre-lingual deafness with reading problems. This could reinforce the idea that reading proficiency in deaf individuals could depend on an early and steady acquisition of any modality of language rather than the amount and intensity of oral or spoken training. However, due to the limited number of participants with this specific profile no conclusions can be drawn and more research would be needed.

On a different note, it must be noted that the videos used in this study —in order to prevent the participants with some degree of residual hearing from resorting to the audio to access and understand the dialogue and to force them to focus on the subtitles— were displayed with the original audio in English and with subtitles in Spanish. However, in future research, it would be interesting to use the dubbed audio tracks in order to set a more realistic situation and gain more practical and authentic knowledge, as most viewers with a hearing loss tend to prefer this modality when watching TV.

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Annexes

1. Information form

El objetivo de este estudio es estudiar el comportamiento de diversas personas mientras ven programas con subtítulos para personas sordas o con discapacidad auditiva.

El experimento funcionará de la manera siguiente: veréis una única vez dos videos de minuto y medio cada uno delante de una pantalla y en presencia de la investigadora. Después, se os dará instrucciones sobre cómo responder a sendos cuestionarios. Tendréis una hora como máximo.

La participación es totalmente voluntaria y, por tanto, podréis abandonar la prueba en cualquier momento, sin necesidad alguna de justificación y sin que repercuta de manera negativa.

No recibiréis compensación económica alguna por participar.

Vuestros datos serán anónimos y tan solo tendrá acceso a ellos la investigadora encargada del estudio.

La investigadora responsable de realizar las pruebas es Marta Miquel Iriarte y la podréis encontrar en miri.marta@gmail.com o en el teléfono XXXXXXXXX.

Los resultados forman parte de un estudio de tesis promovido por la Comisión Europea. Si deseáis continuar informados sobre la evolución de la investigación podéis escribir a la investigadora principal a través del correo electrónico anterior.

MUCHAS GRACIAS POR PARTICIPAR

2. Consent form

Título del experimento: *"The effect of subtitling speed of exposure in the reception of subtitling for the deaf and hard of hearing"*.

Yo, (NOMBRE Y APELLIDOS) ________________________________

- He leído la hoja de información que se me ha entregado así como el consentimiento firmado.
- He recibido suficiente información sobre el estudio y la he entendido.
- He podido realizar preguntas sobre el estudio.

He hablado con la investigadora MARTA MIQUEL IRIARTE y:

- Entiendo que mi participación es voluntaria.
- Entiendo que mis datos se tratarán de forma confidencial.
- Entiendo que puedo retirarme del estudio en cualquier momento, sin dar explicaciones y sin que repercuta de forma negativa.

Doy libremente mi conformidad para poder participar en el estudio.

Fecha y lugar:

Firma del participante — Firma de la investigadora

3. Pre-stage questionnaire

CUESTIONARIO DE SELECCIÓN DE PARTICIPANTES

Nombre & apellidos:

Edad:

Tipo de sordera o de deficiencia auditiva:

Tipo de escolarización:

a) escolarización especial para personas sordas o con deficiencias auditivas
b) escolarización común (con apoyo pedagógico específico para personas sordas o con deficiencias auditivas)
c) escolarización común (sin apoyo pedagógico específico para personas sordas o con deficiencias auditivas)
d) otros: por favor, especifica

Nivel de estudios: por favor, especifica

1. Comunicación diaria

1. ¿Cuál es tu lengua materna? Por favor, marca tu opción con una X.

Catalán oral	
Español oral	
Lengua de signos catalana	
Lengua de signos española	
Otros: por favor, especifica	

2. ¿Qué lengua hablas en casa normalmente?

3. ¿Qué lengua hablas en el trabajo/clase normalmente?

2. Equipamiento electrónico

1. ¿Cuál de estos aparatos tienes en casa? Por favor, marca tu opción con una X.

Televisión	
Reproductor de DVD	
Ordenador (de sobremesa o portátil)	
Teléfono móvil	
Smartphone o similar	
Otros: por favor, especifica	

2. ¿Te conectas regularmente a Internet? Sí/ No

3. Hábitos de lectura

1. ¿Lees todos los días? Sí/ No

2. Aproximadamente, ¿cuántas horas a la semana dedicas a la lectura? Por favor, marca tu opción con una X

Ninguna	
Menos de una hora	
Entre 1-2 horas	
Entre 2-3 horas	
Entre 3-4 horas	
Entre 4-5 horas	
6 horas o más	

3. ¿Qué tipo de medios lees más con más asiduidad? Por favor, marca tu opción u opciones con una X

Libros en papel	
E-books	
Periódicos y revistas en papel	
Periódicos y revistas online	
Otros: por favor, especifica	

Selección películas

1. ¿Has visto alguna de estas películas? Por favor, marca tu opción u opciones con una X

Casino Royale (James Bond), Martin Campbell	
El Diablo Viste de Prada, David Frankel	
Slumdog Millionaire, Danny Boyle	
El Discurso del Rey, Tom Hooper	
El sueño de Cassandra, Woody Allen	
Robin Hood, Ridley Scott	
Rambo IV, Sylvester Stallone	

4. Test of reading comprehension skills in Spanish

Por favor, lee con atención el siguiente texto y contesta a las preguntas.

Caperucita en Manhattan

La ciudad de Nueva York siempre aparece confusa en los atlas geográficos y al llegar se forma uno un poco de lío. Está compuesta por diversos distritos, señalados en el callejero por colores diferentes, pero el más conocido de todos es Manhattan; el que impone su ley a los demás y los empequeñece y los deslumbra. Le suele corresponder el color amarillo. Sale en las guías turísticas y en el cine y en las novelas. Mucha gente se cree que Manhattan es Nueva York, cuando simplemente forma parte de Nueva York. Una parte especial, eso sí.

Se trata de una isla en forma de jamón con un pastel de espinacas en el centro que se llama Central Park. Es un gran parque alargado por donde resulta excitante caminar de noche, escondiéndose de vez en cuando detrás de los árboles por miedo a los ladrones y asesinos que andan por todas partes y sacan un poquito la cabeza para ver brillar las luces de los anuncios y de los rascacielos que flanquean el pastel de espinacas, como un ejército de velas encendidas para celebrar el cumpleaños de un rey milenario.

Manhattan es una isla entre ríos. Las calles que quedan a la derecha de Central Park y corren en sentido horizontal terminan en un río que se llama East River, por estar al este, y las de la izquierda en toro: el río Hudson. Se abrazan uno con otro por abajo y por arriba.

Vigilando Manhattan por la parte de abajo del jamón, donde se mezclan los dos ríos, hay una islita con una estatua enorme de metal verdoso que lleva una antorcha en su brazo levantado y la vienen a visitar todos los turistas del mundo. Es la estatua de la Libertad, vive allí como un santo en su santuario, y por las noches, aburrida de que la hayan retratado tantas veces durante el día, se duerme sin que nadie lo note.

1. ¿Qué lugar se describe en el texto anterior?

2. ¿En qué distrito se centra la adaptación del texto?

3. ¿Con qué metáfora aparece descrito al inicio del segundo párrafo?

4. ¿Con qué se comparan los anuncios y los rascacielos?

5. ¿Qué hay en la parte de abajo del jamón?

5. Test of listening comprehension skills in English

Por favor, mira atento el siguiente fragmento de la película *Royal Tenenbaums*, en inglés y sin subtítulos. Tras un único visinado, por favor, contesta estas preguntas:

Por favor, marca la opción correcta con una X

1. ¿Qué es lo primero que el hombre le pregunta a la mujer?

Cuánto tiempo planea quedarse ahí	
Cuánto tiempo lleva ahí	
Hace cuánto que se conocen	

2. La mujer contesta que:

No lo sabe	
Aún no lo ha decidido	
Se quedará tres meses	

3. ¿Volverá la mujer a casa en algún momento?

Probablemente sí	
Seguramente no	
Quizá no	

4. Por su comentario, ¿cómo crees que el hombre interpreta la respuesta de la mujer?

Cree que la mujer está haciéndose la graciosa	
No quiere creer lo que le dice la mujer	
Cree que la mujer está jugando	

5. ¿Qué es lo que le apetece hacer al hombre?

Comer pan	
Morirse	
Hablar	

6. Questionnaire for Video 1

1: ¿Quiénes son los protagonistas? Por favor, escribe 2/3 líneas

2. ¿Cuál es el argumento de la escena? Por favor, escribe 2/3 líneas

3. principio de la escena, ¿cómo se acerca la mujer al niño?

4. ¿Qué hace el niño con el dinero que le da el hombre?

5. ¿Qué explicación da el niño sobre la muerte de la mujer del emperador (cuya tumba están visitando)?

6. ¿Cómo crees que reacciona la pareja al final de la visita guiada?

7. ¿Has tenido dificultades para leer los subtítulos? Sí/ No

¿Qué tipo de dificultades has sufrido? Por favor, escribe 2/3 líneas

8. ¿Qué opinas sobre la velocidad en la que aparecían los subtítulos? Por favor, marca tu opción con una X.

La velocidad de los subtítulos era demasiado lenta para una lectura cómoda	
La velocidad de los subtítulos era lenta para una lectura cómoda	
La velocidad de los subtítulos era cómoda para su lectura	
La velocidad de los subtítulos era rápida para una lectura cómoda	
La velocidad de los subtítulos era demasiado rápida para una lectura cómoda	
No sé/ No contesto	

9. Además de leer los subtítulos, ¿has tenido tiempo para mirar las imágenes? Por favor, marca tu opción con una X.

Sí, en todo momento	
Casi durante todo el video	
Tan solo durante algunos momentos (por favor, especifica:)	
En casi ningún momento	
No, en ningún momento	
No sabe/ no contesta	

7. Questionnaire for Video 2

1: ¿Quiénes son los protagonistas?

2. ¿Cuál es el argumento de la escena? Por favor, escribe 2/3 líneas

3. ¿Cómo definirías el estado anímico del personaje mayor? ¿En qué te basas?

4. ¿Hay algo en la ropa de los personajes que te llame la atención? ¿Por qué?

5. ¿Quién amenaza al personaje mayor? ¿Cuáles son sus intenciones?

6. ¿Crees que el personaje mayor quiere pedirle algo a los jóvenes? ¿El qué?

7. ¿Has tenido dificultades para leer los subtítulos? Sí/ No

¿Qué tipo de dificultades has sufrido? Por favor, escribe 2/3 líneas

8. ¿Qué opinas sobre la velocidad en la que aparecían los subtítulos? Por favor, marca tu opción con una X

La velocidad de los subtítulos era demasiado lenta para una lectura cómoda	
La velocidad de los subtítulos era lenta para una lectura cómoda	
La velocidad de los subtítulos era cómoda para su lectura	
La velocidad de los subtítulos era rápida para una lectura cómoda	
La velocidad de los subtítulos era demasiado rápida para una lectura cómoda	
No sé/ No contesto	

9. Además de leer los subtítulos, ¿has tenido tiempo para mirar las imágenes? Por favor, marca tu opción con una X

Sí, en todo momento	
Casi durante todo el video	
Tan solo durante algunos momentos (por favor, especifica:)	
En casi ningún momento	
No, en ningún momento	
No sabe/ no contesta	

8. Post-questionnaire

1. Hábitos de consumo audiovisual y subtitulación

1. ¿Utilizas subtítulos cuando ves programas de televisión o DVD? Por favor, marca tu opción con una X

Siempre	
A menudo	
A veces	
Solo con ciertos programas	
Nunca	
No sé/ no contesto	

2. ¿Ves programas con subtítulos todos los días? (TV, DVD, Internet...)

3. Aproximadamente, ¿cuántas horas semanales pasas viendo programas con subtítulos? Por favor, marca tu opción con una X.

Ninguna	
Menos de 1 hora	
1-2 horas	
2-3 horas	
3-4 horas	
Más de 4 horas	

4. ¿Qué tipo de medio utilizas más a menudo? Por favor, marca tu opción con una X.

TV	
DVD	
Internet	
Otro, por favor, especifica	

5. ¿Qué programas ves más a menudo? Por favor, marca tu opción con una X

Noticias/ Telediarios	
Debate/ concursos/ entrevistas	
Películas & series	
Documentales	
Eventos deportivos	
Otro: por favor, especifica	

6. ¿Para qué utilizas los subtítulos? Por favor, marca tu opción con una X

Los subtítulos son la única manera que tengo de acceder al diálogo	
Los subtítulos me ayudan a entender el diálogo	
Los subtítulos me ayudan a mejorar mi nivel de castellano	
No utilizo subtítulos	
No sé/ no contesto	

7. ¿Normalmente, cómo ves la TV y los DVD?

Solo/sola	
Con mis amigos/ familiares sordos o con pérdida auditiva	
Con mis amigos/ familiares oyentes	

8. ¿Tienes dificultades leyendo los subtítulos?

Nunca	
Casi nunca	
A veces	
A menudo	
Siempre	
No sé/ no contesto	

¿Qué tipo de dificultades afrontas?

2. Opinión & preferencias sobre los subtítulos

1. ¿Qué opinas de los subtítulos de la televisión? Por favor, escribe al menos 2/3 líneas

¿Qué opinas de los subtítulos de los DVD? Por favor, escribe al menos 2/3 líneas

2. ¿Qué opinas de la velocidad en la que aparecen los subtítulos en la televisión? Por favor, marca tu opción con una X

Creo que la velocidad de los subtítulos es demasiado lenta	
Creo que la velocidad de los subtítulos es lenta	
Creo que la velocidad de los subtítulos es cómoda	
Creo que la velocidad de los subtítulos es rápida	
Creo que la velocidad de los subtítulos es demasiado rápida	
No sé/ no contesto	

¿Qué opinas de la velocidad en la que aparecen los subtítulos de los programas de televisión en directo? Por favor, marca tu opción con una X

Creo que la velocidad de los subtítulos es demasiado lenta	
Creo que la velocidad de los subtítulos es lenta	
Creo que la velocidad de los subtítulos es cómoda	
Creo que la velocidad de los subtítulos es rápida	
Creo que la velocidad de los subtítulos es demasiado rápida	
No sé/ no contesto	

¿Qué opinas de la velocidad en la que aparecen los subtítulos de los DVD? Por favor, marca tu opción con una X

Creo que la velocidad de los subtítulos es demasiado lenta	
Creo que la velocidad de los subtítulos es lenta	
Creo que la velocidad de los subtítulos es cómoda	
Creo que la velocidad de los subtítulos es rápida	
Creo que la velocidad de los subtítulos es demasiado rápida	
No sé/ no contesto	