HERMĒNEUS

Ed UVa EDICIONES Universidad Valladolid

The effects of screen size on subtitle layout preferences and comprehension across devices*

Efectos del tamaño de pantalla en las preferencias de presentación de subtítulos y en la comprensión en distintos dispositivos

OLIVIA GERBER-MORÓN
UAB-Universitat Autònoma de Barcelona. Department of Translation and Interpreting and East Asian Studies. Faculty of Translation and Interpreting. Edifici MRA126, Campus UAB, 08193 Bellaterra, Spain.
Dirección de correo electrónico: gerbermoron.olivia@gmail.com
ORCID: https://orcid.org/0000-0001-6513-3662
OLGA SOLER-VILAGELIU
UAB-Universitat Autònoma de Barcelona. Department of Basic, Educational, and Developmental Psychology.
Faculty of Psychology. Edifici B, Carrer de la Fortuna, Campus UAB, 08193 Bellaterra, Spain.
Dirección de correo electrónico: olga.soler@uab.cat
ORCID: https://orcid.org/0000-0001-9219-1913
JUDIT CASTELLÀ
UAB-Universitat Autònoma de Barcelona. Department of Basic, Educational, and Developmental Psychology. Faculty of Psychology. Edifici B, Carrer de la Fortuna, Campus UAB, 08193 Bellaterra, Spain.
Dirección de correo electrónico: judit.castella@uab.cat
ORCID: https://orcid.org/0000-0002-6094-3516
Recibido: 29/1/2018. Aceptado: 17/7/2018.
Cómo citar: Gerber-Morón, Olivia, Soler-Vilageliu, Olga and Castellà, Judit, «The effects of screen size on subtitle layout preferences and comprehension across devices», *Hermēneus. Revista de Traducción e Interpretación*, 22 (2020): 157-182.
DOI: https://doi.org/10.24197/her.22.2020.157-182

Abstract: The present study sheds light on the possible effects that screen size can have on preferences and comprehension of subtitled audiovisual material. Thirty participants watched three subtitled video excerpts displayed on three devices with different screen sizes (monitor, tablet, and smartphone). After watching each excerpt, they filled out preference and comprehension questionnaires. This study aimed to provide new empirical evidence on viewers'

*This research study has been partially supported by La Caixa Foundation (E-08-2014-1306365) and Transmedia Catalonia Research Group (2017SGR113).

needs and preferences concerning readability by analysing the reception of subtitles across screens. The results obtained indicate that smartphone devices had the most unsatisfactory effects, suggesting the need to undertake further research on small screens to improve subtitle readability.
Keywords: Accessibility, new technologies, readability, screen size, subtitling.
Resumen: Esta investigación analiza los efectos que el tamaño de pantalla puede tener en las preferencias y en la comprensión de material audiovisual subtitulado. Treinta participantes vieron tres fragmentos de vídeo en tres dispositivos con distintos tamaños de pantalla (monitor, tableta y *smartphone*). Tras ver los fragmentos, los participantes respondieron a una serie de cuestionarios de preferencias y comprensión. A través del análisis de la recepción de los subtítulos en diferentes tamaños de pantalla, esta investigación tiene por objeto aportar nuevas pruebas empíricas sobre las necesidades y preferencias de los espectadores. Los resultados muestran que el dispositivo que se percibe con los efectos más negativos es el *smartphone*, lo que plantea la necesidad de seguir investigando los dispositivos con pantallas más pequeñas para mejorar la lectura de los subtítulos y adaptarlos en función del tamaño.
Palabras clave: Accesibilidad, nuevas tecnologías, legibilidad, tamaño de pantalla, subtítulos.

INTRODUCTION

The development of new technologies in recent decades has changed the way audiovisual products are consumed nowadays (Messerlin, Siwek, and Cocq, 2005). Innovative handheld devices, such as tablets and smartphones, provide the mobility to consume media everywhere (Palen, Salzman, and Youngs, 2000). The implementation of subtitles on these handheld devices makes video content accessible to different end-users, such as non-native speakers, deaf and hard-of-hearing viewers. Subtitles on mobile devices are also useful when sound has to be removed in public spaces. Because watching subtitled media on these devices is continually increasing in our society, it is important to present subtitles in

the most effective way. This study examines the effects of screen size on different subtitle layout parameters, with a view to improving the most determining factor in subtitling: readability. The process of readability becomes more complex with subtitled media because viewers are continually switching from text to image (d'Ydewalle, Van Rensbergen, and Pollet, 1987), without having control over the speed in subtitling (Romero-Fresco, 2015). We predict that subtitle readability may be hindered by the smaller screen size of handheld devices.

1. READABILITY AND LAYOUT PARAMETERS IN SUBTITLES

Scholars have established various parameters that need to be considered to improve the readability of subtitles. Karamitroglou (1998) and Perego (2005, 2008) distinguished three categories of parameters that affect the legibility and readability of subtitles: duration, text editing, and subtitle layout parameters. Duration parameters comprise the length of time the subtitles are on the screen, the leading-in and lagging-out time for each subtitle, the time break between two consecutive subtitles, and camera takes and cuts (Perego, 2005, 2008). Text editing parameters relate to punctuation and letter case, line breaks and line length, altering syntactic structures, omitting and retaining linguistic items of the original. In relation to layout parameters, Gottlieb (1992) compiled a list that included the position of subtitles on the screen, the number of lines, the number of characters per line, text alignment, typeface and distribution, and font colour and background.

Media regulators and professionals in the audiovisual industry have partly integrated these parameters in their guidelines to enhance the quality of subtitling (Media Access Australia, 2012; *Ofcom*, 2015; BBC, 2017; Described and Captioned Media Program, 2017). As a case in point, BBC's subtitles guidelines (BBC, 2017) recommends the use of one-line subtitle instead of two short lines because it takes less time to read and causes less disruption to the picture. In our study, we tested some of the layout parameters listed by the scholars previously mentioned to examine how viewers perceive subtitles across devices.

2. SCREEN SIZE EFFECTS ACROSS DEVICES

-According to our research, subtitle layout parameters have not been studied across devices. Nevertheless, other studies have been conducted on the effects of screen size in the fields of Audiovisual Translation. Two eye-tracking studies on watching subtitled videos across screen devices have shown more negative results in smartphone devices (Castellà, Oliver, Gerber, and Soler, 2016; Szarkowska, Laskowska, Oliver, and Pilipczuk, 2015). Szarkowska *et al*. (2015) studied reading patterns on smartphone, tablet and computer screen, and found evidence that smartphone has the lowest comprehension results, the longest mean fixation duration, and fewer fixations in comparison to tablet and monitor screens. In their eye-tracking study on watching subtitled videos on different screen devices, Castellà *et al*. (2016) suggested that smartphone devices require more cognitive load when reading subtitles than tablets and monitors.

A number of studies in the fields of Media Psychology, and Human-Computer Interaction (Al-Showarah, AL-Jawad, and Sellahewa, 2014; Kim, Sundar, and Park, 2011; Lombard, Ditton, Grabe, and Reich, 1997; Maniar, Bennett, Hand, and Allan, 2008) have also focused their research of screen size on viewers' perception of mobility and content, and on attitudes towards technology. Lombard *et al*. (1997) studied the role of screen size in small and large television screens. They measured responses via a questionnaire and found that large screen televisions elicit more intense responses for some genres (commercials, action-adventure, and reality) but not for others (talk shows and dramas). Maniar *et al*. (2008) looked at the effect of screen size on video-based learning by presenting videos on small, medium and large screen mobile phones. Their results from the questionnaires pointed out that larger screens induce more attention than medium and small screens. Moreover, they found that smaller screen displays may inhibit the effectiveness of the learning experience. Kim *et al*. (2011) carried out a study on the effects of screen size (across three different mobile phone devices) and communication modality (video format or text document) to assess through questionnaires the users' perception of mobility and content, and the degree of technology acceptance. Their results revealed that screen size does not affect the understanding of the news story or the perceived ease of use of the device. Nevertheless, it seems that larger screen size is the key to greater enjoyment for their participants. In another study, Al-Showarah *et al*. (2014) evaluated the effects of screen size on smartphone

and tablet usability across age groups and found that seniors show more difficulties in processing information on smartphone screens. Their eye-tracking results also showed that usability on a small screen size is more difficult for all age groups in comparison to large screen sizes. In general, all these studies indicate that large screen displays tend to contribute to a more satisfying experience.

3. OVERVIEW OF THE STUDY

The main objective of this study is to provide insight into the impact of subtitle processing across devices with different screen sizes (monitor, tablet, and smartphone), focusing the attention specifically on subtitle layout preferences and comprehension scores. This study aims to provide empirical evidence by testing differences of watching subtitled videos across devices on a sample of end users, in order to determine the screen device that requires more improvement in displaying subtitles. To this end, more subtitle layout parameters are evaluated in the questionnaires, which were not covered in previous studies (Castellà *et al*., 2016; Szarkowska *et al*., 2015). The effects of screen size on comprehension scores are also tested to establish whether there are differences on any of the devices tested and to empirically validate the previous study by Szarkowska *et al*. (2015).

Previous studies on screen size in Media Psychology and Human-Computer Interaction (Al-Showarah *et al*., 2014; Castellà *et al*., 2016; Maniar *et al*., 2008; Szarkowska, *et al*., 2015) suggested that larger screens provide a more satisfactory experience. Taking into account these studies, we put forward two hypotheses on the effects of screen size on subtitle layout preferences and comprehension:

> *Hypothesis 1*: viewers will evaluate subtitles differently depending on the screen size.
> *Hypothesis 2*: the smallest screen device (*i.e*. smartphones) will obtain more negative results regarding subtitle layout.

4. METHODS

4. 1. Participants

The study involved 30 volunteer participants ranging from 18 to 58 years of age (16 females, 14 males, mean age=30.5, SD=7.6). They were all Spanish native speakers or Catalan-Spanish bilinguals with normal or corrected-to-normal (contact lenses or glasses) vision. Most of the participants were university students from Spain or other Spanish-speaking countries. The majority of the participants reported not being habitual viewers of subtitled audiovisual material. None of the participants had any knowledge of the original language used for the film fragments (Norwegian).

4.2. Materials

4.2.1. Stimuli and apparatus

4.2.1.1. Video fragments

The stimuli were three short video fragments with Spanish subtitles taken from a Norwegian thriller (*Hodejegerne*, Tyldum, 2011). Each video fragment formed full scenes with coherent content, and the average duration of each of them was three minutes. We used a Norwegian film to expose participants to an unknown language, so that they would have to rely on the information provided by the subtitles to follow the video fragments.

4.2.1.2. Subtitles

The subtitles were created using EZTitles,[1] a professional subtitle editing software. As for the technical considerations, we followed the recommendations by Díaz Cintas and Remael (2007) for synchronization and presentation, using 15 subtitling spaces per second and lines of 38 characters. On average, each video fragment contained 37 subtitles: 15 sentences occupied one line of text and 22 occupied two lines. The video fragments and synchronised subtitles were presented using the freeware VLC Media Player on the three devices tested in the experiment: a 22-inch Toshiba TV monitor, a 9.7-inch iPad 2 and a 3.5-inch iPhone 4.

[1] For more detailed information, see http://www.eztitles.com (last accessed 30 November 2017).

4.2.2. Questionnaires

The preference questionnaire was administered to check viewers' reception of subtitles and their preferences concerning the general layout according to the screen size of each device. The questions for this study were inspired by Gottlieb (1992) and Gambier (2009), who provided a list of subtitle parameters to measure and evaluate the viewers' reception of subtitle readability. The questionnaire assessed the experience of reading subtitles on each device by asking questions on the following parameters:

- the perceived percentage of subtitles read;
- the ease of subtitle reading;
- the overall assessment on viewing the film excerpt on that device;
- the feeling of having lost essential parts of the plot (due to the fact of reading subtitles);
- the line length of the subtitles;
- the exposure time of subtitles;
- the line-break layout (i.e. division of lines on screen).

The questionnaire on reading and layout preferences for subtitles for this study included three questions on a 5-point Likert scale concerning the percentage of subtitles read ("What percentage of subtitles didn't you have time to read?", from 0% to 100%), the ease of reading subtitles on that device ("How did you find reading subtitles on this device?", from very difficult to very easy) and the experience of viewing the film excerpt on that device ("How would you rate the experience of watching a film on this device?", from very unpleasant to very pleasant). Furthermore, a yes / no question asked about the feeling of having lost essential parts of the film's action due to the fact of reading subtitles ("Do you think that you lost essential parts of the film's action due to the fact of having to read subtitles?"). Here is a sample of one of these questions on the ease of reading subtitles:

Example (1)
How did you find reading subtitles on this device?
- Very easy

- Easy
- Moderate
- Difficult
- Very difficult

In addition to these questions, participants had to answer three categorical questions on a 5-point scale about subtitle preferences for the line length and exposure time on the screen ("What do you think about the length of the subtitles for this device?" and "What do you think about the exposure time of the subtitles on this screen?", where 1=very long, 2=long, 3=appropriate, 4=short, 5=very short), and line-break layout ("What do you think about the line-break layout for this device?", where 1=unsuitable, 2=I would have preferred shorter subtitles of one line, 3=I would have preferred shorter subtitles, but two lines, 4=I would have preferred longer subtitles, but of one line, 5=appropriate). Here is a sample of one of these categorical questions on the line length of subtitles:

Example (2)
What do you think about the length of the subtitles for this device?
- 1 = Very long
- 2 = Long
- 3= Appropriate
- 4 = Short
- 5 = Very short

For further details on this questionnaire, please refer to Appendix 1.

4.2.2.2. Comprehension questionnaire

The comprehension questionnaire included a set of multiple-choice questions to verify whether participants understood the main textual information provided by the subtitles. After watching each film fragment, participants had to answer a set of five questions about the content of the video. For each question, participants were asked to complete a statement by selecting a response from a list of four items including a correct answer, two distractors and an "I don't remember" response option. We based the design and procedure of the comprehension questionnaire on

Day and Park (2005), Lavaur and Bairstow (2011), and Leung (2001). This is an example of the questions asked for comprehension assessment:

Example (3)
Roger's wife showed him a painting by…
- Rembrandt
- Rubens
- Jordaens
- I don't remember

For further details on this questionnaire, please refer to Appendix 1.

2.3. Design and Procedure

Participants watched three video excerpts with subtitles displayed on three devices with different screen sizes (monitor, tablet, and smartphones). Subtitles were identical across the three devices; the parameter that changed is the screen size of each device. They watched each video excerpt on a different device according to a within-subject design. We counterbalanced the order of the viewing of the film fragments following a Latin-square design. The screen size of the devices was the independent variable tested in the experiment, whereas the main dependent variables were preferences and comprehension measured through the evaluative questionnaire on subtitle reading and user preferences for the subtitle layout, as well as the multiple-choice questionnaire on general comprehension for each device. A pilot study with 10 participants was carried out prior to the main study to validate the experiment.

Each participant was tested individually in a laboratory. We informed participants that the study was on subtitled-film watching, but we did not provide additional information on the specific parameters tested. The participants signed a consent form, and read the experiment instructions. We did not reveal the audio language of the film to the participants. They watched one of the three-minute subtitled film excerpts on one of the devices. The distance at which devices were placed was monitored to avoid gathering inconsistent results. Participants were seated at a distance of 60 cm from the screen for the three devices (smartphone, tablet and monitor).

After viewing the video excerpt, participants were asked to fill out the preferences and comprehension questionnaires before watching the subsequent video fragments. They were asked to watch the remaining two video excerpts on the other devices and answer the questionnaires in the same way as they did for the first excerpt. After completing the last questionnaire, participants filled the demographic and control variable questionnaire on the preferred type of audiovisual translation (*e.g*. dubbing, subtitling, voice-over), gender, age and native language. The experiment lasted approximately 20 minutes.

5. RESULTS

5.1. Comprehension and readability items

All the analyses were performed using SPSS v.24 statistical package. First, analysis of variance (ANOVA) was performed to compare the differences among group means in the sample of participants tested across the three devices. One-way ANOVA tests were performed on the comprehension scores and on the three preference rating scores on readability (the percentage of subtitles read, the ease of reading subtitles and the experience of viewing the film excerpt on that device). None of the ANOVAs showed significant differences, suggesting that the type of device did not affect comprehension ($F(2,58)=.677$; $p=.51$). Participants were able to read the same percentage of subtitles in each device ($F(2,58)=.081$; $p=.92$), the three devices were equally readable in terms of ease ($F(2,58)=.979$; $p=.38$), and the experience did not differ as a function of device either ($F(2,58)=.548$; $p=.58$). The mean rating for each question as a function of device can be seen in (Table 1). These results showed that there were no significant differences in the way subtitles were processed across the three devices (*i.e*. comprehension levels were similar across devices). Moreover, these results seem to indicate that readability was similar across devices.

Table 1. Mean rating (standard deviations) for comprehension and for each preference question as a function of device. Values ranged from 1 to 5, where 5 indicated more positive ratings.

	Comprehension	% Not read	Ease of reading	Overall experience
Smartphone	4.20 (1.03)	4.27 (.69)	4.13 (.97)	3.07 (1.05)
Tablet	4.40 (.77)	4.30 (.98)	4.27 (.98)	3.30 (1.60)
Monitor	4.13 (1.01)	4.23 (.89)	4.40 (.77)	3.40 (1.71)

Note: 1 indicates participants could not read 100% of the subtitles, whereas 5 means that they were able to read them all (0% not read).

Regarding the yes / no question about the feeling of having lost essential parts of the film's action due to the fact of reading subtitles, we carried out Pearson's Chi-Square tests to determine whether there was a significant difference between the answers for the yes / no question. Chi-Square tests of independence revealed no significant differences between the percentage of "Yes" and "No" responses for the smartphone device (40% "Yes" versus 60% "No"), $\chi 2$ (1, n = 30) =1.20, p=.27. However, there was a significant difference between percentages for both tablet and monitor devices (26.7% "Yes" versus 73.3% "No"), $\chi 2$ (1, n = 30) = 6.53, p=.01 in both questions.

5.2. Subtitle preference items

Finally, the categorical questions about subtitle preferences for the line length, exposure time, and division of lines on screen (line breaks) were analysed. A related-samples Friedman's Two-Way Analysis of Variance by Ranks was performed in order to compare the distributions of answers across devices for these three categorical questions that involved non-normally distributed data. The distributions of percentages and frequencies did not significantly change across devices for the three categorical preference questions with p= .761 in line length, p= 1 in exposure time and p= .913 in division of lines on screen. There were no differences in how viewers preferred subtitle layout across devices. Therefore, the null hypothesis of distribution of percentages and frequencies can be accepted: screen size did not have any significant effect on subtitle reading preferences.

However, we observed some trends in the Chi-Square tests performed for each of these categorical questions, revealing significant differences between percentages in each question within each device (all

p<.001). Across the three devices, results showed that the majority of the participants found that the line length of the subtitles was appropriate, especially for the tablet device (86.7%). However, there was a minor tendency to report the line length for the monitor device as long (20%) and, at a slightly lower percentage, for the smartphone device (13.3%). These trends can be seen in (Table 2).

Table 2. Question "What do you think about the length of the subtitles for this device?" Percentage of each response option and Chi-Square values, as a function of device.

LENGTH	Very long	Long	Appropriate	Short	Very short	$\chi 2$ (2, n=30)
Smartphone	0%	13.3%	80%	6.7%	0%	29.60, p<.001
Tablet	0%	3.3%	86.7%	10%	0%	38.60, p<.001
Monitor	0%	20%	70%	10%	0%	18.60, p<.001

Likewise, and as can be seen in Table 3, the majority of the participants reported the exposure time for the subtitles as appropriate, especially for the smartphone device (86.7%). However, some of the participants stated that the exposure time for the subtitles was short for the tablet (16.7%) and monitor (13.3%) devices.

Table 3. Question "What do you think about the exposure time of the subtitles on this screen?". Percentage of each response option and Chi-Square values, as a function of device.

EXPOSURE TIME	Very long	Long	Appropriate	Short	Very short	$\chi 2$ (2, n=30)
Smartphone	0%	6.7%	86.7%	6.7%	0%	38.40, p<.001
Tablet	0%	6.7%	76.7%	16.7%	0%	25.80, p<.001
Monitor	0%	10%	76.7%	13.3%	0%	25.40, p<.001

As can be seen in Table 4, the findings highlight that the majority of the participants found the line-break layout appropriate, in particular for the tablet device (75.9% vs. 56.7% for smartphone and 66.7% for monitor), although some other minor slight tendencies were detected. In fact, 20%

of the participants would have preferred longer subtitles in one line for the smartphone device, and 16.7% of the participants would have preferred shorter subtitles in two lines for the monitor device.

Table 4. Question "What do you think about the line-break layout for this device?". Percentage of each response option and Chi-Square values, as a function of device.

LINE BREAKS	Inappropriate	Shorter, in 1 line	Shorter, in 2 lines	Longer, in 1 line	Appropriate	$\chi 2$ (2, n=30)
Smartphone	0%	10%	13.3%	20%	56.7%	16.67, p=.001
Tablet	0%	10%	6.9%	6.9%	75.9%	40.10, p<.001
Monitor	0%	10%	16.7%	6.7%	66.7%	28.40, p<.001

5.3. Correlations between age and comprehension, readability and subtitle layout preferences

To explore the parallels between participants' age and watching subtitles across devices with different screen sizes, we correlated the results of the questionnaires on comprehension, reading and layout preferences with age. The reason behind correlating the variable age with the results from the questionnaires stems from the fact that the age range was relatively large (from 18 to 58 years old). As such, age could be an element influencing subtitle processing and layout preferences. Using Spearman's rank correlation, we did not find any significant correlation between age and comprehension of subtitles in any of the devices, or between age and reading and layout preferences (all p >.05). This means that people's age is not associated with differences in subtitle processing or subtitle layout preferences across devices.

6. DISCUSSION

The experiment in this paper examined the influence of screen size on viewers' subtitle layout preferences and comprehension scores across three devices (monitor, tablet, and smartphone). The main aim was to provide additional data to the two previous studies on watching subtitled content across devices (Castellà *et al*., 2016; Szarkowska *et al*., 2015) by

analysing subtitle layout parameters that have not been previously studied. Another aim was to validate the comprehension scores by Szarkowska et al. (2015). Drawing on the previous studies on screen size (Al-Showarah *et al*., 2014; Castellà *et al*., 2016; Maniar *et al*., 2008; Szarkowska *et al*., 2015), we predicted that the smallest screen device (*i.e.* smartphones) would give the most unsatisfactory results regarding subtitle layout. We also expected to see differences in the viewers' reception of subtitle layout parameters across devices.

Regarding comprehension, no differences were found across screens: results did not decrease for any of the devices tested. The findings are in line with the *subtitle effectiveness hypothesis* (Perego, Del Missier, Porta, and Mosconi, 2010), which suggests that viewers can adapt their reading and visual skills for any screen displays. Contrary to the findings on comprehension scores by Szarkowska *et al*. (2015), our results imply that screen size is not a limitation and does not have a considerable impact on viewers processing subtitles across devices.

The results on the readability items did not show significant differences across devices, indicating that screen size does not affect the viewers' reception of subtitles across devices in terms of the percentages of subtitles read, the ease of subtitle readability, and the overall experience on each device.

The findings on subtitle layout preferences are consistent with our initial hypothesis about viewers evaluating subtitles differently depending on the screen size, as the results on subtitle layout preferences showed differences in the viewer experience of watching subtitled videos across devices. A general tendency was found towards preferring tablets to watch subtitled videos: the results from the questionnaires showed that participants were most satisfied with the length of subtitles and subtitle layout in this type of device. This is probably due to the fact that the tablet display provides a good balance between each subtitle line and its medium size, not forcing the eyes to move much, compared with larger screens (*i.e.* monitor). This preference was not due to participants being able to adjust reading distance, as it was controlled. As for the other two devices, a minor tendency declared preferring shorter subtitles of two lines for monitor screens, and longer subtitles of one line for smartphones. Participants also found the exposure time more appropriate for smartphone screens than tablets or monitors. However, there was a higher variation in the responses for smartphone screens with regard to the question about the feeling of having lost essential parts of the film's

action because participants were reading subtitles. One possible explanation is that viewers do not perceive these screens as optimal as other screens, and they do not feel as confident reading subtitles on them as on larger screen devices. This result is consistent with Kim *et al*. (2011), which suggested that larger screen size devices are the key to greater enjoyment.

Moreover, the majority of the participants declared that they did not have the feeling of having lost essential parts of the film's action because they were reading subtitles. However, we found significant results for the yes / no question for tablet and monitor screens. This finding shows that viewers feel capable of perceiving the incorporation of subtitles into tablets and monitors, in such a way as not to miss information from the rest of the audiovisual components. As for smartphone screens, results are not significant regarding the yes / no question. Our interpretation is that there is a broader range of opinions for smartphone screens because viewers do not perceive these screens as optimal as other screens. They may not feel as confident reading subtitles on these small screens as on larger devices.

7. CONCLUSIONS

Our study assesses the reception of subtitles across screens and has the main objective to establish viewers' needs and preferences on readability. It represents the first piece of knowledge on the effects of screen size on subtitle layout preferences, and it validates previous findings on comprehension scores across devices (Szarkowska *et al*., 2015).

Our main finding shows that participants adapt their viewing skills to different screen sizes to process short subtitled film clips, and are generally satisfied with the subtitle layout on the devices tested. Results show differences in the viewer experience of processing subtitled videos on devices with different screen size. We also found that screen size does not affect comprehension levels.

We acknowledge that the general profile in this experiment included university students, the average age was 30 years old, and all participants belonged to a dubbing country. We believe that differences in comprehension and preferences of the subtitles could be found if other user profiles with different technological and audiovisual material habits were tested in the experiment (*e.g.* children, the deaf and hard of hearing,

users with cognitive diversity or the elderly). We also acknowledge that subtitles were created *ad hoc* for these studies, following the criteria established by Díaz Cintas and Remael (2007), which although they provided larger experimental control, they could have influenced viewers' comprehension scores. Therefore, future studies should be carried out using the original professional subtitles, in order to represent the reality of the audiovisual market more precisely.

Based on the trends found for some of the subtitle layout parameters, we think that more empirical studies should focus on smartphone devices. Participants felt more comfortable reading subtitles in the larger screens (monitor and tablet): they did not have the impression of losing visual information and were more satisfied with tablet screens regarding subtitle line length and line-break layout. Our results for smartphone screens were not conclusive in terms of subtitle layout parameters, and do not validate the comprehension results by Szarkowska *et al*. (2015). New subtitle experiments on smartphone devices could also validate the results by Castellà *et al*. (2016), who found a different exploration pattern on viewers reading subtitles on smartphone devices: when reading subtitles in smartphone screens, there are fewer fixations but longer in duration compared to the other devices. Moreover, according to our research, there are no empirical studies on reading subtitles specifically on smartphone screens. Further research could explore different types of line-break layouts on these devices to measure the impact of this variable on comprehension, readability, and enjoyment of audiovisual products. Future studies could also look into different styles of subtitling for each device, in order to evaluate viewers' preferences, depending on the screen size.

REFERENCES

Al-Showarah, Suleyman, Naseer AL-Jawad, and Harin Sellahewa (2014), "Effects of User Age on Smartphone and Tablet Use, Measured with an Eye-Tracker via Fixation Duration, Scan-Path Duration, and Saccades Proportion", in Constantine Stephanidis and Margherita Antona (eds.), Universal Access in Human-Computer Interaction. Universal Access to Information and Knowledge. UAHCI 2014. Lecture Notes in Computer Science, volume 8514, Cham, Switzerland, Springer International, pp. 3-14. DOI: https://

doi.org/10.1007/978-3-319-07440-5_1.

BBC (2017), *BBC Subtitles Guidelines*, from http://bbc.github.io/subtitle-guidelines/#Line-breaks (accessed 11/10/2017).

Castellà, Judit, Andreu Oliver, Olivia Gerber, and Olga Soler (2016, May), *Smartphone, Tablet or PC: Which one is better to watch your favourite subtitled film?* Paper presented at the International Meeting of the Psychonomic Society, Granada (Spain).

D'Ydewalle, Géry, Johan Van Rensbergen, and Joris Pollet (1987), "Reading a message when the same message is available auditorily in another language: The case of subtitling, in John K. O'Regan, and Ariane Lévy-Schoen (eds.), *Eye Movements: From Psychology to Cognition*, Amsterdam, The Netherlands, Elsevier Science, pp. 313-321. DOI: https://doi.org/10.1016/B978-0-444-70113-8.50047-3.

Day, Richard R., and Jeong-suk Park, (2005), "Developing reading comprehension questions", *Reading in Foreign Language*, 17(1), pp. 60–73.

Described and Captioned Media Program (2017). *DCMP Captioning Key*. *The Described and Captioned Media Program*, retrieved from http://www.captioningkey.org/ (accessed 11/10/2017).

Gambier, Yves (2009), "Challenges in research on audiovisual translation" in Anthony Pym and Alexander Perekrestenko (eds.), *Translation Research Projects 2* (pp. 17–25), Tarragona, Spain, Intercultural Studies Group, pp. 17-25.

Gottlieb, Henrik (1992), "Subtitling. A new university discipline", in Cay Dollerup and Anne Loddegaard (eds.), *Teaching Translation and Interpreting 1. Training, Talent and Experience. Papers from the First Language International Conference*, Amsterdam, The Netherlands: John Benjamins, pp. 161-170. DOI: https://doi.org/10.1075/z.56.26got.

Karamitroglou, Fotios (1998), "A proposed set of subtitling standards in Europe", in *Translation Journal*, 2, retrieved from http://trans

lationjournal.net/journal/04stndrd.htm (accessed 1/10/ 2017).

Kim, Ki J., Shyam S. Sundar, and Eunil Park (2011), "The effects of screen-size and communication modality on psychology of mobile device users", in Desney Tan and Bo Begole (eds.), *CHI '11 Extended Abstracts on Human Factors in Computing Systems (CHI EA '11)*, New York, NY: Association for Computing Machinery, pp. 1207-1212. DOI: https://dl.acm.org/doi/10.1145/1979742.1979749.

Lavaur, Jean-Marc., and Dominique Bairstow (2011), "Languages on the screen: is film comprehension related to the viewers' fluency level and to the language in the subtitles?", *International Journal of Psychology: Journal International de Psychologie*, 46(6), pp. 455-462. DOI:10.1080/00207594.2011.565343.

Lombard, Matthew, Theresa B. Ditton, Maria E. Grabe, and Robert D. Reich (1997), "The role of screen size in viewer responses to television fare", *Communication Reports*, 10(1), pp. 95-106. DOI: https://doi.org/10.1080/08934219709367663.

Maniar, Nipan, Emily Bennett, Steve Hand and G. Allan (2008). "The effect of mobile phone screen size on video based learning", *Journal of Software*, 3(4), pp. 51-61. DOI: https://doi.org.10.4304/jsw.3.4.51-61.

Media Access Australia, (2012), *Captioning Guidelines*, from https://mediaaccess.org.au/practical-web-access ibility/media/caption-guidelines (accessed 10/10/2017).

Messerlin, Patrick A., Stephen E. Siwek, and Emmanuel Cocq (2005), *The Audiovisual Services Sector in the GATS Negotiations*, Washington, DC, American Enterprise Institute Press.

Ofcom, *Code on Television Access Services*, (2017), retrieved from https://www.ofcom.org.uk/__data/assets/pdf_file/0020/97040/Access-service-code-Jan-2017.pdf (accessed 1/10/2017).

Palen, Leysa, Marilyn Salzman and Edward Youngs (2000), "Going

Wireless: Behavior and Practice of New Mobile Phone Users", in Wendy Kellog and Steve Whittaker (eds.), *Proceedings of the ACM Conference on Computer Supported Cooperative Work*, New York, NY, Association for Computing Machinery, pp. 201-210. DOI: https://doi.org/10.1145/358916.358991.

Perego, E. (2005), *La traduzione audiovisiva*, Roma, Italy, Carocci editore.

Perego, E. (2008). "What would we read best? Hypotheses and suggestions for the location of line breaks in film subtitles", *The Sign Language Translator and Interpreter*, 2, pp. 35-63.

Perego, E., F. del Missier, M. Porta and M. Mosconi (2010), "The Cognitive Effectiveness of Subtitle Processing", *Media Psychology*, 13(3), pp. 243-272. DOI: https://doi.org/10.1080/15213269.2010.502873.

Romero-Fresco, Pablo (ed.) (2015), *The Reception of Subtitles for the Deaf and Hard of Hearing in Europe.* Bern, Switzerland: Peter Lang AG. DOI: https://doi.org/10.3726/978-3-0351-0888-0.

Szarkowska, Agniezska, Monika Laskowska, Andreu Oliver, Olga Pilipczuk (2015), *Reading subtitles across devices: A study into the differences in reading patterns of people watching subtitled videos on smartphone, tablet and computer screen*, conference paper presented at the International Conference on Eyetracking and Applied Linguistics, Warsaw, Poland, 21-22 September 2015.

FILM CREDITS

Hodejegerne (2011), dir. Mortem Tyldum, Noruega, Nordisk Film, ARD degeto.

***

APPENDIX 1: QUESTIONNAIRES USED IN THE EXPERIMENT

Reading and layout preference questionnaire for subtitles (Spanish)
This questionnaire was the same one across clips and devices.

¿En qué dispositivo has visto este clip?
Móvil/*Tablet*/Monitor

¿Qué porcentaje de subtítulos crees que NO te ha dado tiempo a leer?
0 1 2 3 4 5 6 7 8 9 10
0% 100%

¿Cómo te ha parecido la lectura de los subtítulos?
Valora de 1 a 10
0 1 2 3 4 5 6 7 8 9 10
Muy difícil Muy fácil

¿Cómo valorarías tu experiencia viendo una película en este dispositivo?
Valora de 1 al 10
0 1 2 3 4 5 6 7 8 9 10
Placentera / cómoda No placentera / incómoda

¿Crees que has perdido partes esenciales de la acción por leer los subtítulos?
Sí No

¿Cómo te ha parecido la longitud de los subtítulos para este dispositivo?
Cada línea de texto te ha parecido...

- muy larga
- larga
- la longitud era la adecuada
- corta
- muy corta

¿Qué opinas de la duración de los subtítulos en la pantalla?

- Muy larga
- Larga
- Adecuada
- Corta
- Muy corta

Para este dispositivo, ¿qué opinas sobre la presentación de los subtítulos?

- Adecuada
- Hubiera preferido subtítulos más largos, pero solo en una línea

- Hubiera preferido subtítulos más cortos, pero presentados en dos líneas
- Hubiera preferido subtítulos más cortos y solo en una línea

¿Cómo te ha parecido la calidad de los subtítulos?

- He perdido mucho tiempo leyendo los subtítulos y no he apreciado adecuadamente el resto del contenido audiovisual en pantalla
- He perdido un poco de tiempo leyendo los subtítulos y no he apreciado todos los detalles del resto del contenido audiovisual en pantalla
- He leído cómodamente los subtítulos y me ha dado tiempo de apreciar bastante el resto del contenido audiovisual en pantalla
- He leído cómodamente los subtítulos, que me han ayudado a apreciar el resto del contenido audiovisual en pantalla

Translation of reading and layout preference questionnaire for subtitles

On what device did you see this clip?
Smartphone / Tablet / Monitor

What percentage of subtitles do you think you did not have time to read?
0 1 2 3 4 5 6 7 8 9 10
0% 100%

How did you find the reading of the subtitles?
Values from 1 to 10
0 1 2 3 4 5 6 7 8 9 10
Very difficult Very easy

How would you rate your experience watching a movie on this device?
0 1 2 3 4 5 6 7 8 9 10
Pleasant / comfortable Unpleasant / uncomfortable

Do you think you have lost essential parts of the action by reading the subtitles?

- Yes
- No

How did you like the length of the subtitles for this device?
Each line of text seemed...

- Very long
- Quite long
- Adequate
- Short

- Very short

What do you think of the duration of the subtitles on the screen?

- Very long
- Long
- Adequate
- Short
- Very short

For this device, how did you find the presentation of the subtitles?

- Adequate
- I would have preferred longer subtitles, but only on one line
- I would have preferred shorter subtitles, but presented in two lines
- I would have preferred shorter subtitles and only on one line

What did you think of the quality of the subtitles?

- I lost a lot of time reading the subtitles and did not properly appreciate the rest of the audiovisual content on screen
- I lost a bit of time reading the subtitles and did not appreciate all the details of the rest of the audiovisual content on screen
- I read the subtitles comfortably and had time to appreciate the rest of the audiovisual content on screen
- I read the subtitles comfortably, which have helped me to appreciate the rest of the audiovisual content on screen

Comprehension questionnaires (Spanish)

SPN Headhunters Clip 1

*Obligatorio

ID *

1. La mujer de Roger le enseñó una pintura de...
    a. Rembrandt
    b. Rubens
    c. Jordaens
    d. No lo recuerdo
2. La pintura está valorada en hasta...
    a. 10 millones
    b. 50 millones
    c. 100 millones
    d. No lo recuerdo
3. La mujer de Roger quiere mover el cuadro a...

   a. un museo
   b. su galería
   c. una caja de seguridad
   d. No lo recuerdo
4. La abuela de Clas...
   a. recibió la pintura de un oficial alemán
   b. robó la pintura a un oficial alemán
   c. compró una pintura a un oficial alemán
   d. No lo recuerdo
5. Roger quiere celebrar...
   a. su relación y la inauguración de la galería de su mujer
   b. la fortuna que ganarán gracias al cuadro
   c. su aniversario de bodas
   d. No lo recuerdo

SPN Headhunters Clip 2

*Obligatorio

ID *

1. Roger dice que el currículum de Lander es...
   a. insuficiente
   b. como muchos otros
   c. impresionante
   d. No lo recuerdo
2. Roger le pregunta a Lander si tiene alguna pintura en el mismo rango de precios que la suya. Lander responde que...
   a. Sí, tiene una litografía de Munch
   b. Sí, tiene una litografía de Munch
   c. No, pero su mujer tiene una litografía de Munch en su galería
   d. No lo recuerdo
3. La mujer de Lander trabaja en...
   a. un bufete de abogados
   b. un hospital
   c. una galería
   d. No lo recuerdo
4. Según Roger, Lander cometió un error porque...
   a. encontró a alguien que le recomendara en lugar de presentarse él mismo
   b. no encontró a alguien que le recomendara en lugar de presentarse él mismo
   c. se sorprendió cuando contactaron con él
   d. No lo recuerdo
5. Lander piensa que si sigue el consejo de Roger...

a. no va a conseguir el trabajo
b. pensarán que es ambicioso
c. pensarán que no es serio
d. No lo recuerdo

SPN Headhunters Clip 3
*Obligatorio
ID *

1. Clas Greve se mudó a Oslo porque...
    a. quiere buscar un trabajo aquí
    b. tiene un trabajo bien pagado aquí
    c. quiere decorar la casa de su bisabuela
    d. No lo recuerdo
2. Roger piensa que...
    a. Clas debería presentarse a un puesto como directivo de Pathfinder
    b. la compañía de Clas debería comprar Pathfinder
    c. Clas debería recibir un ascenso
    d. No lo recuerdo
3. ¿De dónde sacó Clas Greve el bolígrafo con el logo de la compañía?
    a. Fue un regalo de la compañía para la que trabajó
    b. Lo robó de la compañía para la que trabajó
    c. Es un regalo del nuevo jefe de Clas
    d. No lo recuerdo
4. ¿Desde dónde se mudó Clas Greve a Oslo?
    a. Bélgica
    b. Holanda
    c. Otra parte de Noruega
    d. No lo recuerdo
5. Roger invita a Clar a...
    a. almorzar
    b. cenar
    c. tomar un café
    d. No lo recuerdo

<u>Translation of comprehension questionnaires 1</u>
SPN Headhunters Clip 1
* Mandatory
ID *
Comprehension questions
1. Roger's wife showed him a painting of....
    a. Rembrandt

b. Rubens
c. Jordaens
d. I don't remember

2. The painting is valued at up to...
   a. 10 million
   b. 50 million
   c. 100 million
   d. I don't remember
3. Roger's wife wants to move the painting to...
   a. a museum
   b. her gallery
   c. a safe deposit box
   d. I don't remember
4. Clas's grandmother...
   a. received the painting from a German officer
   b. stole the painting from a German officer
   c. bought the painting from a German officer
   d. I don't remember
5. Roger wants to celebrate....
   a. his relationship and the opening of his wife's gallery
   b. the fortune they will make from the painting
   c. his wedding anniversary
   d. I don't remember

SPN Headhunters Clip 2

* Mandatory

ID *

1. Roger says Lander's CV is...
   a. insufficient
   b. like many others
   c. impressive
   d. I don't remember

2. Roger asks Lander if he has any paintings within the same price range as his own. Lander answers that...
   b. Yes, he has a lithograph of Munch
   c. Yes, he has a lithograph of Munch
   d. No, but his wife has a lithograph of Munch in her gallery.
   e. I don't remember

3. Lander's wife works in the...
   a. a law firm
   b. a hospital
   c. a gallery

d. I don't remember

4. According to Roger, Lander made a mistake because....
   a. he found someone to recommend him instead of introducing himself.
   b. he couldn't find anyone to recommend him instead of introducing himself.
   c. he was surprised when they contacted him.
   d. I don't remember
5. Lander thinks that if he follows Roger's advice...
   a. he is not going get the job.
   b. they will think that he? is ambitious
   c. they will think that he is not serious
   d. I don't remember

SPN Headhunters Clip 3

* Mandatory

ID *

1. Clas Greve moved to Oslo because...
   a. he wants to look for a job there
   b. he has a well-paid job there
   c. he wants to decorate his great-grandmother's house
   d. I don't remember
2. Roger thinks that...
   a. Clas should apply for a position as a Pathfinder manager
   b. Clas's company should buy Pathfinder
   c. Clas should get a promotion
   d. I don't remember
3. Where did Clas Greve get the pen with the company logo?
   a. It is a gift from the company he worked for.
   b. He stole it from the company he worked for.
   c. It is a gift from Clas’s new boss.
   d. I don't remember
4. Where did Clas Greve move to Oslo from?
   a. Belgium
   b. Netherlands
   c. Another part of Norway
   d. I don't remember
5. Roger invites Clar to...
   a. have lunch
   b. have dinner
   c. have coffee

d. I don't remember