



Report on the results of the SURE Project study on subtitle speeds and segmentation

by Agnieszka Szarkowska



ABOUT THE PROJECT

The project “**Exploring Subtitle Reading Process with Eye Tracking Technology (SURE)**” has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No. 702606. It was carried out by Dr Agnieszka Szarkowska at the Centre for Translation Studies, University College London, under the supervision of Prof. Jorge Díaz Cintas and in collaboration with Prof. Bencie Woll (UCL Deafness, Cognition and Language Research Centre) and with Olivia Gerber-Morón (Universitat Autònoma de Barcelona). The goal of the project was to experimentally study the subtitle reading process to establish quality indicators on optimum subtitle speed and segmentation.

ABOUT THE AUTHOR

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1. EXECUTIVE SUMMARY

Subtitling speed

- When watching films in English, young, well-educated viewers proficient in English are able to follow subtitles displayed at a speed of up to **20 characters per second** (cps). They prefer text to be **less condensed** in the subtitles in English-language films.
- When watching foreign films in an unknown language, most people prefer dialogue to be **condensed** and subtitles displayed at a **slower speed**.
- Subtitles displayed at slow speed (12 cps) result in more **re-reading**.
- When watching English-language films with slow subtitles (12 cps), viewers tend to notice **discrepancies** between the dialogue and the subtitles, resulting from text reduction.

Subtitle segmentation

- **Linguistic units** should be kept together and should not be split across the lines.
- Non-syntactically segmented text in the subtitles may increase **cognitive load** and induce more **re-reading**.
- It is more important to keep closely related linguistic units together than to create a certain **subtitle shape**, like a pyramid or rectangle.
- Subtitles should not have more than **two lines**.



2. STRESZCZENIE

Prędkość wyświetlania napisów

- W przypadku filmów anglojęzycznych, młodzi, dobrze wykształceni i znający język angielski widzowie są w stanie czytać napisy wyświetlane z prędkością do **20 znaków na sekundę**. Wolą oni, by w filmach anglojęzycznych napisy **dokładnie odzwierciedlały treść** dialogów.
- W przypadku filmów ze ścieżką dźwiękową w języku niezrozumiałym dla widzów, większość osób woli, by napisy zawierały **skróconą** wersję dialogów i były wyświetlane z **mniejszą prędkością**.
- Napisy wyświetlane z mniejszą prędkością (12 znaków na sekundę) sprawiają, że widzowie częściej wracają do nich wzrokiem i **czytają je ponownie**.
- W przypadku skróconych napisów do filmów anglojęzycznych wyświetlanych z mniejszą prędkością (12 znaków na sekundę) widzowie częściej zwracają uwagę na **rozbieżności** między dialogiem a napisami.

Podział tekstu (segmentacja)

- Nie należy rozdzielać od siebie **wyrazów stanowiących jedną całość składniową i znaczeniową**. Powinny one znajdować się w jednej linii.
- Jeśli tekst w napisach podzielono na linie niezgodnie z naturalnymi podziałami składniowymi, przeczytanie napisu może wiązać się z większym **wysiłkiem poznawczym**. Istnieje też prawdopodobieństwo, że widzowie będą czytać dany napis ponownie.
- Utrzymanie wyrażen stanowiących logiczną całość w jednej linii jest ważniejsze niż uzyskanie określonego **kształtu napisów**, np. trapezu czy prostokąta.
- Napisy w filmach nie powinny składać się z więcej niż **dwóch linii** tekstu.



3. RESUMEN EJECUTIVO EN ESPAÑOL

Velocidad de subtítulos

- Al ver películas en inglés, el público joven e instruido, que domina el inglés, es capaz de leer subtítulos a una velocidad de hasta **20 caracteres por segundo** (cps). Este público prefiere que **se evite condensar** el texto de los subtítulos en el caso de las películas de habla inglesa.
- Al ver películas extranjeras en un idioma desconocido para el espectador, la mayoría de las personas prefiere que el diálogo **se condense** y que los subtítulos se presenten a una **velocidad más lenta**.
- Se ha comprobado que hay **más relecturas** cuando los subtítulos se presentan a una velocidad más lenta (12 cps).
- Al ver películas en inglés con subtítulos lentos (12 cps), los espectadores tienden a notar **discrepancias** entre el diálogo y los subtítulos, debido a la reducción de texto.

Segmentación de subtítulos

- **Las unidades lingüísticas** deben mantenerse juntas y no dividirse entre líneas.
- Los subtítulos segmentados no sintácticamente pueden aumentar la **carga cognitiva** e inducir más **relecturas**.
- Hay que priorizar la segmentación sintáctica, manteniendo juntas las unidades lingüísticas estrechamente relacionadas entre sí, en lugar de crear **subtítulos que reproducen una determinada forma geométrica**, como por ejemplo una pirámide o un rectángulo.
- Los subtítulos no deben tener más de **dos líneas**.



4. INTRODUCTION

The **SURE Project** study tested subtitle speed and text segmentation in subtitling. Appropriate subtitle speed and segmentation allow viewers to follow the text in the subtitles comfortably and to have enough time to look at the on-screen action. If subtitle speed is too fast and segmentation does not adhere to linguistic rules, viewers may find it difficult to follow and understand the information contained in the subtitles.

Subtitle speed (also known as **reading speed**, **subtitle presentation rate** or **subtitle display rate**) is normally expressed using either characters per second (cps) or words per minute (wpm). The most famous rule on the subtitle speed is known as '**the 6-second rule**' (Díaz Cintas & Remael, 2007). According to this rule, a full two-line subtitle should be displayed for a maximum of six seconds and not less, because otherwise viewers will not have sufficient time to read the subtitle. Conversely, it should not be displayed for longer time as viewers will end up re-reading it. The 6-second rule translates into approximately **12 cps** and **144 wpm** (Díaz Cintas & Remael, 2007; Martí Ferriol, 2013; Romero-Fresco, 2009). Many broadcasters and language service providers now use increasingly higher reading speeds, reaching 17 to 20 cps (BBC, 2017; Díaz Cintas & Remael, 2007; Netflix, 2016).

Subtitle segmentation (also referred to as **line breaking**) is about how words are arranged across the lines in a subtitle (see page 12 for examples). Segmentation can be based on semantic and syntactic considerations, whereby closely related linguistic units are kept together in one line, or on more visual considerations such as subtitle shape (a pyramid/trapeze or a rectangle). Many subtitles, particularly on British television, are not segmented according to the rules recommended in subtitling standards (BBC, 2017; Díaz Cintas & Remael, 2007; Ivarsson & Carroll, 1998; Karamitroglou, 1998).

Today's changing audiovisual landscape calls for more up-to-date research on how fast different groups of people can read subtitles and on whether text segmentation in subtitles has a direct impact on the reading process.



5. ABOUT THE STUDY

The **goal of the study** was to experimentally investigate the subtitle reading process to establish quality indicators on optimum subtitle speed and text segmentation.

The study was conducted by Agnieszka Szarkowska and Olivia Gerber-Morón, between February and June 2017, at the Centre for Translation Studies (CenTraS) at University College London in cooperation with the UCL Deafness, Cognition and Language Centre.

Design

Three experiments were conducted:

Experiment 1: Subtitle speed in films in a language unknown by viewers

Viewers watched videos in an unfamiliar language (Hungarian) subtitled at slow (12 cps), medium (16 cps) and fast (20 cps) speeds.

Experiment 2: Subtitle speed in English-language films

Viewers watched English-language videos subtitled at slow (12 cps) and fast (20 cps) speeds.

Experiment 3: Subtitle segmentation

Part 1

Viewers watched subtitled videos with syntactically-segmented (SS) and non-syntactically segmented (NSS) subtitles.

Part 2

Viewers chose their preferred line breaks in subtitles displayed using screenshots.

Part 3

Viewers watched videos with two- and three-line subtitles and chose their preferred option.



Participants

We tested **97 people**, aged 19-74 (their mean age was $M=30.7$, only a few people were above 40 years of age). Our participants were either **hearing** native speakers of **English** (30 people), **Polish** (21 people) and **Spanish** (26 people), or English speakers that were **hard of hearing** (10) or **deaf** (10). They were all living in the UK at the time the study was conducted.

They were volunteers recruited from the UCL Psychology pool, social media, personal networking, the National Association of Deafened People and UCL Deafness, Cognition and Language Research Centre participant pool. See our publications (page 15) for more details.

The study received ethical approval from the UCL Research Ethics Committee.

Methods

Participants were tested individually in an eye tracking lab. They were informed they were taking part in a study on the **quality of subtitles**.

We used **eye tracking** (SMI RED 250) combined with **comprehension**, **cognitive load**, **enjoyment** and **preferences** tests as well as **interviews** and **reading experience**, **scene recognition** and **subtitle recognition** questions. See our publications for more details (section “Project Resources” on page 15).

Limitations

In this study we used videos lasting up to 6 minutes. Future research should examine how subtitle reading is affected by different subtitle speeds and line breaks in longer videos.

Participants in the study were relatively well-educated and proficient in English. Future research could investigate whether subtitle speeds and segmentation affect participants from other age groups and linguistic backgrounds in a similar way.

6. RESULTS

Subtitle speed

Experiment 1

When watching films in a language they did not know, most viewers preferred to have more condensed text in the subtitles and wanted the subtitles to be displayed at a slower speed.

Yet, most viewers declared they had sufficient time to follow the on-screen action (see Fig. 1) and to read the subtitles in all subtitle speed versions, including the fastest one (20 cps).

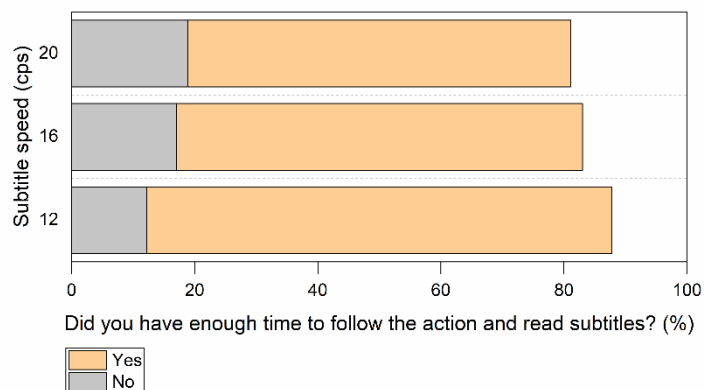


Fig. 1. Time to read the subtitles and follow the action in non-English films. Source: Szarkowska, A., & Gerber-Morón, O. (2018). [Viewers can keep up with fast subtitles: Evidence from eye movements](#). *PLOS ONE* 13(6). [doi:10.1371/journal.pone.0199331](https://doi.org/10.1371/journal.pone.0199331)

Slow subtitle speeds induced more re-reading than fast subtitle speeds (Fig. 2).

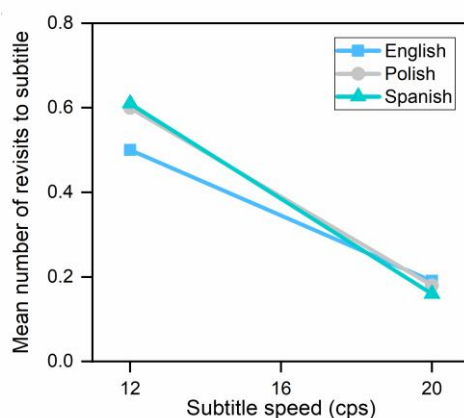


Fig. 2. Subtitle re-reading by speed. Source: Szarkowska, A., & Gerber-Morón, O. (2018). [Viewers can keep up with fast subtitles: Evidence from eye movements](#). *PLOS ONE* 13(6). [doi:10.1371/journal.pone.0199331](https://doi.org/10.1371/journal.pone.0199331)

Experiment 2

When watching **films in English**, a language that most participants knew, they preferred the dialogue in the subtitles to be **less condensed** and **more verbatim**. Viewers could cope well with the subtitle speed of 20 cps.

They declared they had enough time to follow the action and read the subtitles even in the fast subtitle speed option (Fig. 3).

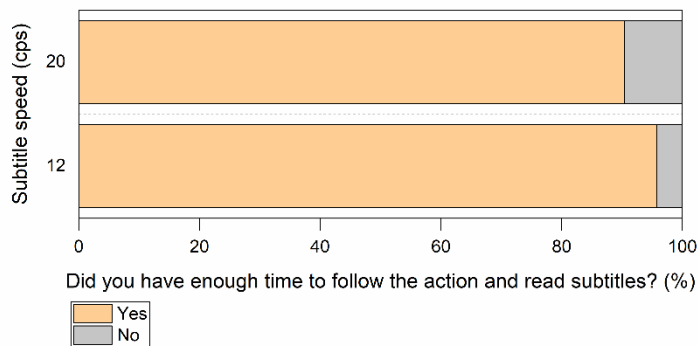


Fig. 3. Time to read the subtitles and look at action in English-language films. Source: Szarkowska, A., & Gerber-Morón, O. (2018). [Viewers can keep up with fast subtitles: Evidence from eye movements](https://doi.org/10.1371/journal.pone.0199331). *PLOS ONE* 13(6). doi:10.1371/journal.pone.0199331

As shown in Fig. 4, a number of participants, particularly English hearing people, noticed many **mismatches** between the dialogue exchanges and the subtitles in the slow subtitles version (12 cps). Many people expressed their disapproval with slow, condensed subtitles, pointing to “inaccuracies” when the subtitle text diverged from the dialogue.

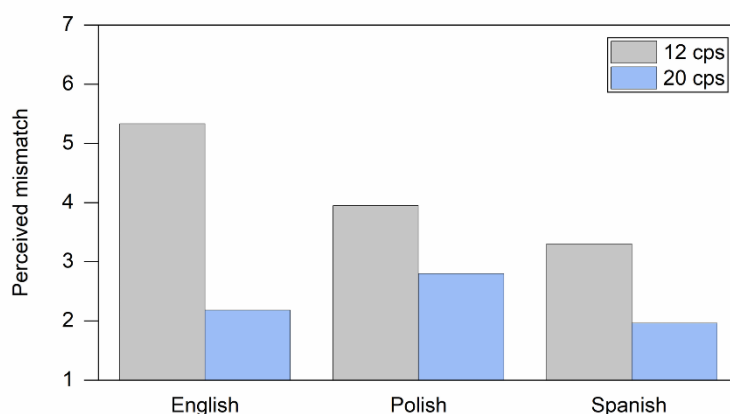


Fig. 4. Perceived mismatch in English-language clips by subtitle speed for hearing participants. Source: Szarkowska, A., & Gerber-Morón, O. (2018). [Viewers can keep up with fast subtitles: Evidence from eye movements](https://doi.org/10.1371/journal.pone.0199331).



Subtitle segmentation

Linguistic units should be kept together and should not be split across the lines. In particular, the following units should not be split:

Linguistic unit	Good practice	Bad practice
Subject and verb	Thank you very much for coming. <u>We have heard</u> a great deal about you.	Thank you very much for coming. <u>We have heard</u> a great deal about you.
Parts of compounds	He filmed that <u>video message</u> before he died.	He filmed that <u>video message</u> before he died.
Articles and nouns	Not so long ago I was on <u>a mission</u> that meant certain death.	Not so long ago I was on <u>a mission</u> that meant certain death.

Viewers preferred text in subtitles to be divided according to linguistic criteria (Fig. 5).

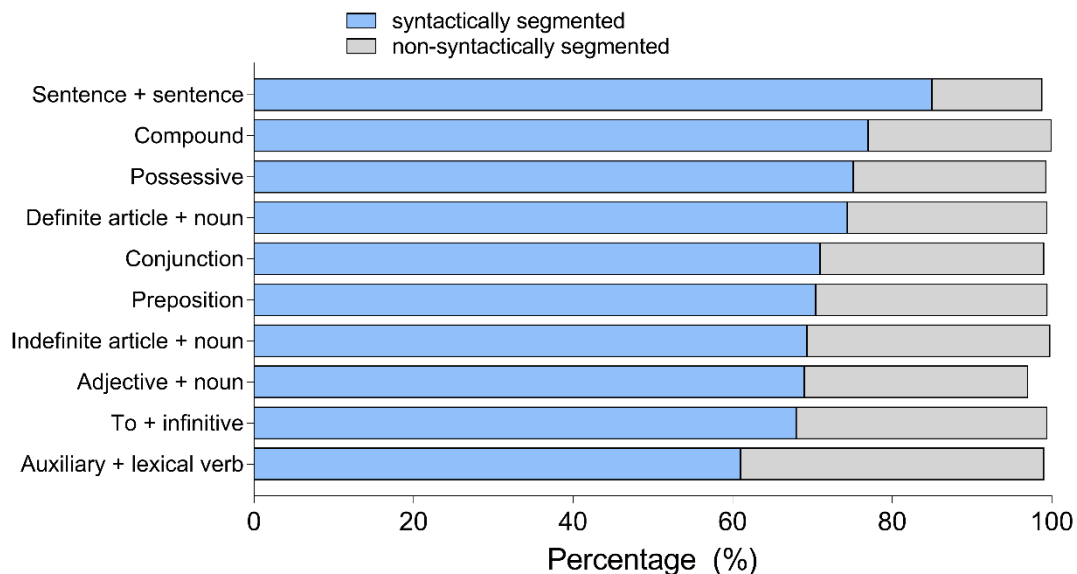


Fig. 5. Preferences for segmentation by linguistic unit. Source: Gerber-Morón, O. & Szarkowska, A. (2018). [Line breaks in subtitling: an eye tracking study on viewer preferences](#). *Journal of Eye Movement Research* 11(3):2. DOI: 10.16910/jemr.11.3.2



Subtitles containing non-syntactically segmented text (NSS) were more difficult to read and more frustrating than those where text was segmented following the semantic and syntactic units (SS), as shown in Fig. 6.

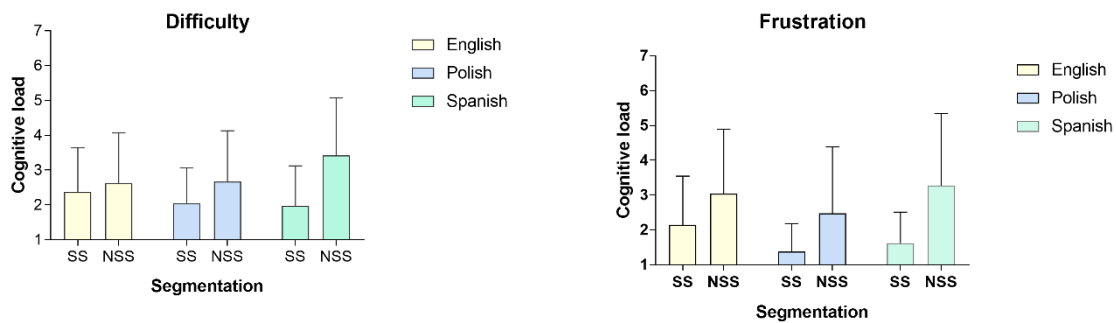


Fig. 6. Self-reported Difficulty and Frustration by segmentation type

Non-syntactic line breaks (NSS) in subtitles resulted in more revisits to the subtitle (re-reading) than in the case of subtitles which were segmented in accordance with linguistic units (SS), following the subtitling segmentation rules (Fig. 7).

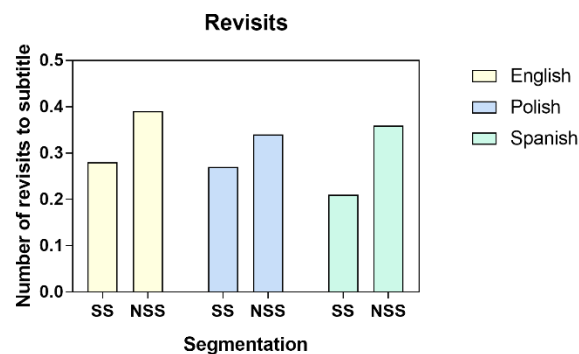


Fig. 7. Revisits to the subtitle area by segmentation type (based on eye tracking data)



For most people, keeping closely related linguistic units together in one subtitle line was more important than a particular subtitle shape (pyramid or rectangle), as illustrated in Fig. 8.

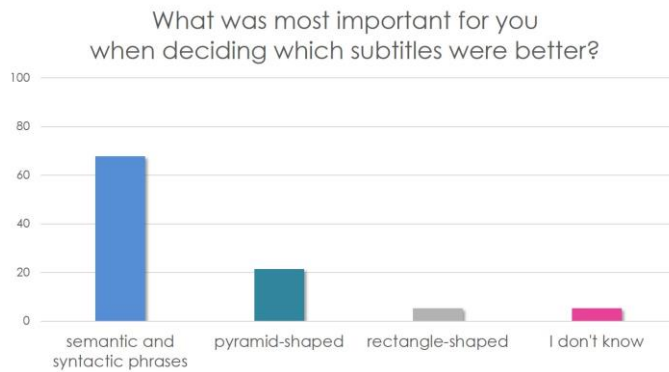


Fig. 8. Segmentation preferences

Two-line subtitles were preferred over three-line subtitles (Fig. 9).

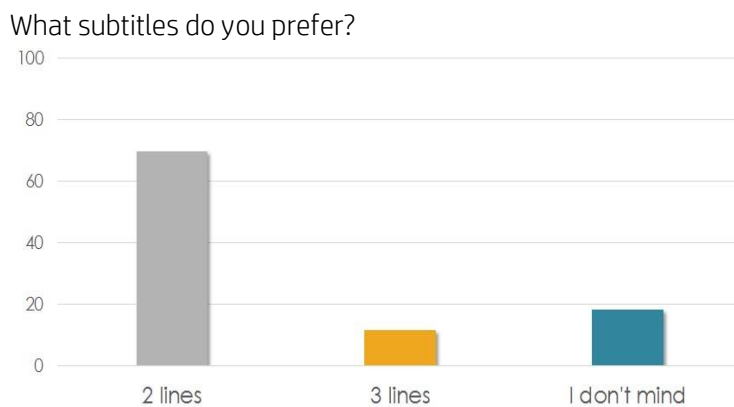


Fig. 9. Preferences for two- and three-line subtitles



7. PROJECT RESOURCES

Open access publications

Gerber-Morón, O. & Szarkowska, A. (2018). [Line breaks in subtitling: an eye tracking study on viewer preferences](#). *Journal of Eye Movement Research* 11(3):2.

DOI: 10.16910/jemr.11.3.2

Gerber-Morón, O., Szarkowska, A. & Woll, B. (2018). The impact of text segmentation on subtitle reading. *Journal of Eye Movement Research*, 11(4):1–18. DOI: 10.16910/jemr.11.4.2

Szarkowska, A., & Gerber-Morón, O. (2018). [Viewers can keep up with fast subtitles: Evidence from eye movements](#). *PLOS ONE* 13(6). [doi:10.1371/journal.pone.0199331](https://doi.org/10.1371/journal.pone.0199331)

Forthcoming publication

Szarkowska, A., Gerber-Morón, O. (forthcoming) Two or three lines: a mixed-methods study on subtitle processing and preferences.

Dataset

Szarkowska, A., & Gerber-Morón, O. (2018). SURE Project Dataset. RepOD. <http://dx.doi.org/10.18150/repod.4469278>

Video tutorial on subtitle speed

Szarkowska, A. (2018) Subtitle speed. Video tutorial. <https://avt.ils.uw.edu.pl/files/2018/07/ReadingSpeed.mp4>

Facebook Page

www.facebook.com/SureProject

Twitter hashtag

#SureProject

Public Mendeley group with SURE Project publications

www.mendeley.com/community/sure-project-1/



8. REFERENCES

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