

# Subtitled Media Adaptations for People with Aphasia

## Ongoing Accessibility Barriers and Emerging Design Practices

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Figure 1: Traditional subtitle display on BBC.

### Abstract

The consumption of subtitles via TVs, laptops and smartphones has the potential to marginalize people based on their complex accessibility needs. The current one-size-fits-all approach to this accessibility aid is no longer fit for purpose and work is required to look at how it can be adapted to be personalised for individual users based on individual context, content, and consumption habits. People with Aphasia, for example, encounter significant challenges in understanding subtitle texts.

We see our work as a call to action for more inclusive practices, focusing on how the thoughts and opinions of people with aphasia can be included in media research. Our work investigates how to develop future media solutions for people with aphasia to create a more inclusive media viewing environment. We believe the key to this is appropriate prototyping tools and methods to allow equitable inclusion in the system design process.

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### CCS Concepts

• **Human-centered computing** → **Accessibility technologies**; *Empirical studies in accessibility*; *Accessibility design and evaluation methods*.

### Keywords

Subtitles, Closed Captions, Adaptive Media, Aphasia, Participatory Design, Accessibility Intervention

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## 1 Current Realities: State-of-the-art subtitles accessibility research

Subtitles/Closed Captions<sup>1</sup> textualise the film/television's spoken content [31] and are traditionally displayed as white text with a black background at the bottom centre of the screen [4], as suggested by BBC guidelines with an example in Figure 1. However,

<sup>1</sup>Closed captions (CC) also provide a text description of sound effects. Most streaming sites only have the option for 'English[CC]' for English subtitles and therefore in this work, we collectively refer to both as subtitles.

these are not equally accessible to everyone due to the one-size-fits-all approach to subtitle display and the temporal nature of subtitles being directly attached to time-stamped points within media.

The presentation of subtitles is heavily researched with work taking place over the last three decades focusing on improving this for all users. In 1995, Brett [5] used on-click explanations for complex subtitle words to enhance people's listening skills. The animated subtitles that conveyed speakers' emotions were designed by Rashid et al. [25] around ten years later. External techniques and alternative modalities have started being considered in the 2020s, such as using people's eye gaze to gauge the subtitle placement [14] and translating subtitle audio into vibrations that can be felt on the wrists of deaf and hard of hearing (DHH) people [35].

Additional considerations have to be taken when creating subtitles for immersive interfaces. In recent years, BBC Research & Development proposed four subtitle behaviours in the virtual reality space [6] and determined *moving-with-head* subtitles [7] with 12.5 degrees below the eye-line [26] as the optimal location from user studies.

## 2 Future Perspectives: Developing accessible subtitled media

Inspired by the current state of subtitles accessibility research, we explore future perspectives on accessible subtitled media. This section addresses the population our research targets, and strategies to enhance user experience and comfort during media consumption.

### 2.1 Community of focus

Aphasia is a language and communication disorder onset by stroke that may impair a person's understanding, speaking, reading, writing, and using numbers [28]. This stands for at least 350,000 people in the UK [1], facing challenges engaging in daily activities at home and workplace [12, 24], which have been addressed by researchers from several angles in recent years. For instance, augmentative and alternative communication (AAC) strategies [17] have been adopted to support their communication via wearable devices [9, 11].

The digital content creation skills of people with aphasia have also been leveraged in terms of rearranging words to form new sentences [19], making comic strips [29] and drawing [18]. While prior works have contributed valuable insights into several accessibility challenges people with aphasia encounter, enabling access to subtitled media remains necessary. Moreover, an increase in traction of accessibility research within the subtitle space has been identified [21], where none of them focuses on the community of aphasia. Given the growing significance of inclusive digital access and the complexity of subtitle display, it is crucial to understand the challenges of subtitle adaptation that meet their requirements.

### 2.2 Design Thinking and Co-design

To develop tailored solutions that improve engagement and understanding of subtitled media for people with aphasia, a combination of **Double Diamond Design Thinking** [13] and **Co-design** [27] approaches have been proposed. In our work, we plan to involve end users throughout the design, development, and evaluation of the accessibility interventions. This strategy has gained attention in recent years, where researchers have been focusing on addressing

accessibility challenges faced by older people [16, 33] and disabled communities such as visual impairments [23, 34], hearing loss [34], people with aphasia [10, 20] and dementia [15].

To ensure that we develop appropriate digital artefacts, we need to properly understand the problem we are trying to solve by attempting to gain insights regarding the current challenges they face when consuming subtitles. This can be achieved by conducting exploratory interviews with speech and language therapists (SLTs) [22] and surveying people with aphasia with appropriately structured closed questions [3], in which the findings can be synthesized to design guidelines of subtitle adaptation interventions to cater to the needs of people with aphasia. The design guidance pinpoints the "rightness" of a solution, and the implementation will begin afterwards.

In our work, we plan to use eye-tracking devices<sup>2</sup> [30] to monitor users' current screen focus and subsequently use this to understand the overall effectiveness of our created system. A horizontal prototyping [2] strategy will be considered, as it is likely that our solution will contain many independent/loosely dependent features that will be developed iteratively. We will evaluate our prototype once most of the system features are functional. This involves gathering a mixture of quantitative and qualitative data, highlighting the challenges and opportunities in developing systems that assist people with aphasia in consuming subtitled media content. Our intervention will be compared pairwise with other existing accessibility interventions (i.e., users select one of the two or neutral) [32], complemented by semi-structured interviews [8] that allow them to elaborate on their responses.

## 3 Conclusion

In our work we aim to improve the ability of people with aphasia to consume subtitled media content. We contribute to HCI research in three main aspects [36]. First, insights from surveys and interviews with SLTs enable us to draft user requirements and design recommendations for the subtitle adaptation intervention, which correspond to a combination of empirical and theoretical contributions. Our second contribution is in the development and implementation of a high-fidelity prototype that personalizes and customizes the subtitled media for people with aphasia. Our final empirical contribution will be made from findings based on data collected from user studies that capture the experience of people with aphasia when interacting with our accessibility intervention.

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<sup>2</sup><https://www.tobii.com/products/eye-trackers>

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