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Online News Videos: The UX of Subtitle Position

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ABSTRACT

Millions of people rely on subtitles when watching video content. The current change in media viewing behaviour involving computers has resulted in a large proportion of people turning to online sources as opposed to regular television for news information. This work analyses the user experience of viewing subtitled news videos that were presented as part of a web page. A lab-based user experiment was carried out with regular subtitle users, focusing on determining whether changes in video dimension and subtitle location could affect the user experience attached to viewing subtitled content.

A significant improvement in user experience was seen when changing the subtitle location from the standard position of within a video at the bottom to below the video clip. Additionally, participants responded positively when given the ability to change the position of subtitles in real time, allowing for a more personalised viewing experience. This recommendation for an alternative subtitle positioning that can be controlled by the user is unlike current subtitling practice. It provides evidence that further user-based research examining subtitle usage outside of the traditional television interface is required.

Categories and Subject Descriptors

• **Human-centered computing ~ Empirical studies in accessibility** • *Human-centered computing ~ User studies.*

General Terms

Design, Experimentation, Human Factors.

Keywords

Subtitles; user experience; laboratory experiment; experiment methodology.

1. Introduction

Subtitles are a method in which the audio content from a piece of video is shown to the viewer as text to accompany the broadcast. Recent Ofcom statistics show that over 8 million people in the UK have watched subtitled video content on at least one occasion [23]. Subtitles aid users in interpreting and understanding content that they may be otherwise excluded from. However, the positioning of subtitles on top of a video has the potential to block content that is important. This, in turn, can have a detrimental effect on the experience that subtitle users have when consuming media. This problem is amplified when viewing media in an online browser as video dimensions can decrease while text remains at a size that is still legible for the user. Therefore, while subtitles are important in contributing to the understanding of content provided through video, they can also act as a barrier to understanding this information. The presence, accuracy, and intelligibility of subtitles and the surrounding content are key in providing services that are accessible to all.

The purpose of this work is to investigate the positioning of subtitles inside a web browser window. Guidelines for subtitles have recommended a preference for subtitles at the bottom of the screen but note that the movement of subtitles so as to not obscure information is important [2]. This work investigates the positioning of these subtitles within and outside of the video being shown. It is carried out with a focus placed on small videos that are embedded within the BBC News website[1]. On average 256 million people a week visit this site [1] and subtitled content has a positive impact for a significant proportion of these visitors. Examining the positioning of subtitles in order to explore the user experience that is attached to this service provides an opportunity to have a clear benefit in overall content accessibility.

2. Previous Work

Displaying subtitles in alternative positions to that of a traditional television experience is not a new concept [8]. Within a cinema setting, an alternative 'secondary' screen can be placed underneath the main display to view subtitles only when needed [24]. A developing area of research regarding subtitle position focuses on the dynamic positioning of subtitle blocks fashion so as to not obscure any of the images on the screen, thus placing subtitles as a more integral part of the content [4, 13, 14]. This method, currently optimised for large television screens, shows promise in a developing a new subtitle format that may be suitable for television use. However, there is a growing number of users turning to online media [22] and surprisingly little research investigating the presentation and practical improvements to the presentation of subtitles on smaller videos.

An approach that may be suitable for use with small online videos is to drop the subtitles underneath the primary content being displayed. Shahraray et al. [24] present an implementation of this where pictorial transcripts of programmes are created where a video-still is displayed with transcripts placed underneath. This method, created primarily for use in printed media, can be adapted for use within a video context. Additionally, it may be possible for the television user to decide the positioning of the subtitles to either within or outside of the main display, with this placing the choice in the hands of the user instead of the broadcaster [12]. However, little user-based research exists which examine either of these solutions. In turn, it is not known to what degree this repositioning of subtitles would affect the overall user experience of subtitled content, and whether this would have a positive or negative effect for the end user.

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[1] http://www.bbc.co.uk/news

Research examining subtitle usage provides valuable information; however the results produced may only measure a small number of aspects associated with user experience. For example, user enjoyment has been examined in relation to subtitle usage with Hu [14] and Hong [13] both exploring the 'enjoyment' of subtitle usage with a single Likert-scored question in their work. Additionally, Lee et. al [19] has shown how a 7x7 grid of selections can be used to assess the mood and energy attached to subtitles in a user task. Jensema [16] has measured the readability of subtitles through a 5-point Likert scale, with participants asked to comment if subtitles were Too Fast, Fast, OK, Slow, or Too Slow. These examples show the willingness of research to accept that aspects of UX play an important part in viewing subtitled video content. However, a problem exists in determining a suitable process that can be used which encompasses a wider range of factors important in analysing the UX of subtitled video content.

Brown et. al [5] have recently used a framework specifically designed to look at the UX of subtitled video content. This was created in an attempt to consider factors that are both meaningful and reliable in examining the UX of subtitled video content; factors that are a necessity in UX work [18]. These factors, based on uncovering the benefits that a user may derive from a product [17], provide an insight to aid in understanding the experience of viewing subtitled video content.

2.1 A Framework for Data Capture
This work applied a working UX framework (see Brown et. al [5]) to measure the UX of subtitled video content in relation to variable subtitle position. This measures seven key components, all of which are important in understanding the concepts that are part of creating a positive user experience associated with subtitled video content.

Aesthetics is a measure of the visual appeal of the subtitled video content. High aesthetic appeal indicates that the content is visually pleasing. Low aesthetic levels indicate that the subtitles are displayed in a manner that is not visually pleasing to users.

Attention is a measure of the awareness that users have in relation to what is going on in subtitled video content. High levels of attention indicate that users are very focused on the video content. Low levels of attention indicate that it is difficult to focus on the subtitled video content and users may become distracted by other elements.

Involvement is used as a measure of how engaged users are with the subtitled video content. While *attention* attempts to understand a focus on the content, *involvement* is about the depth of engagement. Users reporting high levels of involvement would be 'drawn into' the subtitled. Users reporting low levels of involvement would feel less involved in the subtitled content.

Familiarity is a measure of how users feel the subtitled content is recognisable as to what they would expect subtitled content to look like; its naturalness. High levels of familiarity indicate coherence in the relationship between the subtitles and the video content. Low levels of familiarity would indicate disconnect in what is perceived as routine subtitle practice.

Perceived usefulness measures how useful the display of the subtitled content is. High levels of usefulness is categorised by users who see high levels of value in the subtitle display. Users with low levels of perceived usefulness will see low levels of value in the subtitle display.

Perceived usability is a measure of the challenge that is faced while engaging with the subtitled video content. Users that report high levels of perceived usability are likely to have found the subtitled content easy to understand, while users with low levels of perceived usability are likely to have found viewing the subtitled content more demanding.

Endurability is defined as a user's willingness to view subtitled video content using a similar method of subtitle display in the future. Users with high levels of endurability are likely to wish to use this method again, while users with low levels of endurability would be less likely to want to use this method again in the future. It is worth noting that *endurability*, while an important factor, is very difficult to analyse in lab-based research such as this.

3. Methodology
This work investigates the user experience attached to viewing subtitled news content displayed inside a web browser. The position of subtitle text within, below and above a video clip is investigated. This is examined to determine if it is possible to take advantage of the screen estate surrounding a video being displayed, and if this can improve the user experience associated with viewing subtitles. In this context, viewing clips inside a web browser allows extra screen space to be used for subtitle blocks – an affordance that is not possible when a video is in 'full screen'.

Specifically, this work intends to determine firstly; if overall user experience can be improved by changing the position of subtitles from within a video clip to below the video clip being presented and secondly; to discover if participants perceive there to be value in a control to change subtitle position in order to suit their own individual needs.

3.1 Participants
There are many reasons as to why an individual would wish to use subtitles. This can include users who regularly user subtitles as an access service, those who use subtitles as a translation from a foreign language [26], and those who occasionally use subtitles when they are situationally impaired [20]. In this work, we are investigating the use of subtitles with users who regularly use them as an access service.

26 participants were recruited for this study (age range 22-67; M = 47.2, SD = 13.6; 7 male, 19 female). Recruitment was carried out by an external user recruitment agency. Participants were required to fit the following criteria:

- All must regularly use the Internet to consume news and current affair information

- All must use subtitles at home to watch TV with the sound on

- All must use subtitles on a regular basis (i.e. daily)

- All must not have taken part in any research in the last six months

A mix of gender, socio-cultural/economic backgrounds was also used with a mix of males and females being recruited.

3.2 Experiment Design
A 2 x 2 within participant experiment design was used. The position of subtitles (within or below the video clip) and the physical dimensions (½ width, ⅔ width) were used as independent variables. These video dimensions are included based on guidance from [3]. Participant user experience (measured through a Likert scored questionnaire) was used as a dependant variable. The
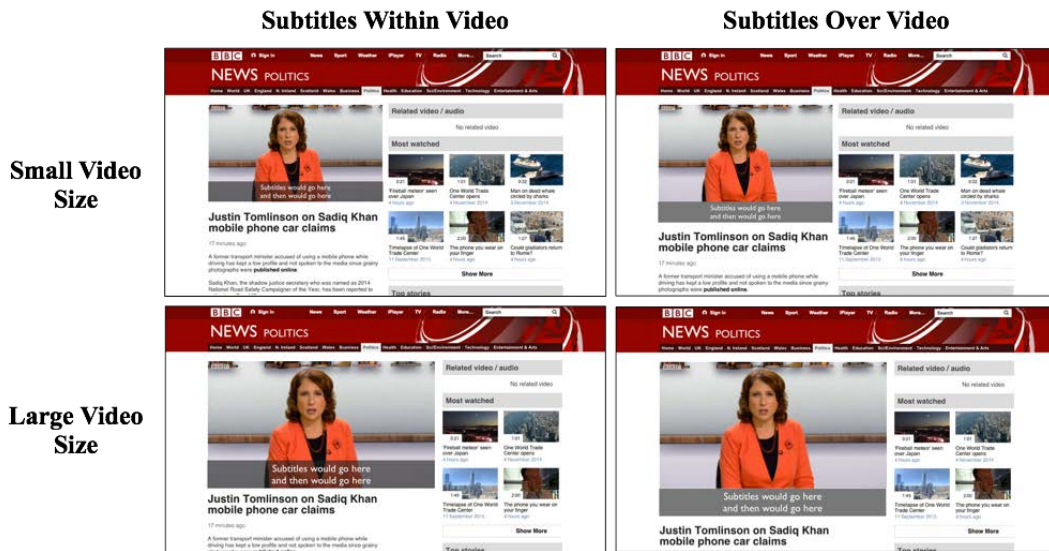
Subtitles Within Video   **Subtitles Over Video**

Small Video Size

Large Video Size

Figure 1 - Experiment Changes in Video Size and Subtitle Positioning

positioning of subtitles above a video, and the control of these subtitles by participants is visited using a qualitative methodology later in this paper.

3.3 Materials and Equipment

3.3.1 Video Clips

Four video clips were selected for participants to view based on criteria similar to that used by Burnham et. al. [6]. Videos adhered to the following guidelines:

1. The clip must be a news broadcast, selected from outside of the local region, in an attempt to ensure that topics would be unfamiliar to participants

2. No offensive, disturbing, or controversial material should be included in the clip

3. The selection of clips that should include talking head and narration clips,

4. Clip excerpts should be longer than 1 minute but shorter than 2 minutes,

5. A range of activity and engagement should be present across clip excerpts.

The clips selected fit within all of the above guidelines. The duration of clips was between 94 and 101 seconds (M = 97.5s, SD = 2.88s). A description of the 4 clips is given below:

Clip A[2] – *Woman falls 30ft from Wells Cathedral Tower*. A woman has been winched to safety by helicopter, after falling and becoming trapped at Wells Cathedral in Somerset.

Clip B[3] – *New 'Banksy' work appears near* GCHQ. "Guerrilla artist" Banksy is believed to be behind a piece of street art depicting three shadowy figures eavesdropping.

Clip C[4] – *Solar cycle path opens in* Netherlands. A public solar cycle lane has opened in the Netherlands as part of a pilot scheme.

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[2] http://www.bbc.co.uk/news/uk-27213646

[3] http://www.bbc.co.uk/news/entertainment-arts-27029515

[4] http://www.bbc.co.uk/news/technology-30024881

Clip D[5] – *New UK Great Western Main line trains unveiled in Japan.* The high-speed train, which will be used on the Great Western Main Line through the Thames Valley, has been unveiled in Japan.

3.3.2 Subtitle Control System

The selection of appropriate subtitle font, colour, and background vary greatly dependant on country, broadcaster, and even device. As such, no standardised method of subtitle display exists that can be used in this work. We chose to display subtitles in a semi-transparent box that spanned the width of the video being displayed, with text being a white colour (providing adequate contrast to the background), the Helvetica font being used, and text position being centre justified (seen in Figure 1).

A system was created that allowed for the manipulation of subtitle position and the video size independent of the clip being shown. When the subtitle box was placed below or above the video, the position of surrounding web content was adjusted so that it was not obscured. Subtitles could be positioned within or below the clip being played. Video size could be set as ½ of the page width or as ⅔ of the page width (Figure 1). These sizes were chosen to fit with BBC Global Experience Language (GEL) Guidelines [25]. All videos shown were in a 16:9 ratio. The ½ width video measured 480px across, and the ⅔ measured 640px across. The full size of the window frame was 976px. The system to control these adaptions used aspects developed by Hughes et. al [15].

3.3.3 Subtitle User Experience Questionnaire

A 14 question 5-point Likert scored (Strongly Agree, Agree, Neither Agree or Disagree, Disagree, Strongly Disagree) questionnaire was used to measure the user experience of viewing subtitled content. The questionnaire used the UX concepts outlined previously by Brown et al. [5]. Questions were a mix of positive (e.g. "*This feels like a familiar way to view subtitled video content*") and negative (e.g. "*I am not used to seeing subtitles viewed in this way*") statements. Once completed, negative question scores were inverted and mean responses computed. This created a score for each of the 7 UX factors as well as a combined overall UX scoring.

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[5] http://www.bbc.co.uk/news/uk-30042801

3.3.4 Conversation Prompts

Conversation prompts, consisting of screenshots of different interface options, were created to stimulate conversation with participants in order to further discuss their thoughts on subtitle positioning. These were based on positioning that subtitles were viewed in during the experiment

3.3.5 Semi-Structured Interview Script

A semi-structured interview script was constructed to explore participants' preference on subtitle position for videos displayed on a web page. A series of questions were constructed to probe deeper into the relationship between subtitle positioning and user experience. The script was created to encourage participants to discuss the advantages and disadvantages of the different subtitle positions. It was also used as an aid to help participants discuss any preferences that existed for alternative positional displays. Participants were encouraged to discuss any additional factors they deemed important in shaping their preferences. This was used to further understand the user experience in relation to the positional display of subtitles. Probes relating to the concepts discussed by Brown et al. [5] were included in this script. These, and accompanying participant comments, are shown in the discussion below.

3.4 Procedure

Participants were introduced to the study, being informed that the purpose of the work was to examine their experiences of subtitled content and whether this would change based on the positioning of the subtitles and the physical size of the video they are watching. An initial conversation then occurred where participants were prompted to discuss their current experiences with subtitles.

Participants were then introduced to the *subtitle control system* and were shown the series of 4 *video clips*. Counterbalancing occurred on the order in which clips were shown, the positioning of the subtitles, and the dimensions of the video. This was accomplished using a repeated orthogonal Latin squared design [9]. Participants were asked to complete the user experience survey after viewing each video. The order in which questions were asked in the user experience survey was randomised both within and between participants.

Participants were then shown the conversation prompts representing the different subtitle conditions that they had previously encountered. Participants were asked to rate the cards and then prompted to explain their choices. These questions focused on subtitle user experience and how this related to the position of the subtitles and the dimension of the videos shown.

The semi-structured interview was then used to explore participants' views and individual preferences towards the positioning of subtitles, and how this might relate to the size of video being presented. Participants were encouraged to discuss the advantages and disadvantages of variable subtitle positions and any other key factors or issues relating to subtitle position and the overall user experience.

3.5 Analysis

A mixed-method approach was performed in analysis, a technique suggested by O'Brien and Lebow [21]. This results in a combination of quantitative and qualitative data gathered to examine the subjective user experience properties associated with subtitle usage. In quantitative (as well as qualitative) analysis, the purpose was to examine any differences that were present between different subtitle positioning techniques, with subtitle position and video size being used as Independent Variables. This

resulted in a 2x2 repeated-measures ANOVA being used for analysis. Bonferroni correction was used on all testing and all data was standardised using Gelman's [11] method. Descriptive information is shown in Table 2.

In this work, an increase in scoring for each of the seven factors outlined by Brown et al. [5] indicates an improvement in user experience. However, this may not always be the case for other types of broadcast clip. Additional factors such as genre (e.g. horror) may strive to create lower levels of UX factors (e.g. aesthetics or even endurability) to improve the overall experience.

4. Results

A dependant measures ANOVA was used to examine if participants user experience would change based on the combination of subtitle position (below or within) and the video size (small or large). Kolmogorov-Smirnov's test of normality revealed normal distribution of the data, allowing for analysis to continue. However, no significant effect was found between these groups; $F(1,25) = .035$, $p = .853$. This indicates that no interaction effect was present between the position of the subtitles and the video size.

Table 1 - User Experience and Subtitle Positioning: Descriptive Information

|	Mean	SD	SE	K-S
Below/Small	3.51	.640	.125	p > .05
Below/Large	3.61	.553	.108	p > .05
Within/Small	3.29	.716	.140	p > .05
Within/Large	3.42	.685	.134	p > .05
Total	3.46	.653	.064	p > .05

Analysis of subtitle position and video size as separate factors was then used to determine the individual effect of these two independent measures, with these being Bonferroni adjusted. A significant difference was found between subtitles positioned below (M = 3.56, SD = .499) or within (M = 3.35, SD = .551) the video clip; $t(25) = -2.38$, $p = .025$, $r = .194$. No significant difference was found between small (M = 3.40, SD = .566) and large (M = 3.52, SD = .499) video clips; $t(25) = 1.25$, $p = .224$, $d = .45$.

These results indicate that a change in size of a video clip positioned inside a web page has no influence on the user experience attached to viewing subtitles on that page. However, the positioning of the subtitles either below or within the video clip does have a significant (medium [7]) effect on the user experience. In this instance, positioning subtitles below the video content instead of the traditional placement of within the video, showed to significantly increase the overall user experience that was attached to viewing subtitles.

4.1 UX Framework – Dimensional Factors

Figure 2 shows radar plots comparing the overall subtitle user experience. This is used to compare between subtitles within and below the video clip being shown.

The previous analysis compared subtitle blocks within the video clip and subtitle blocks below the video clip. The results from this suggested that having the subtitle block below the video clip significantly increased the user experience that was reported by participants. The largest increases occurred in the Involvement, Endurability, and Familiarity reported by users. Participants also reported slight increases in the Attention, Perceived Usefulness
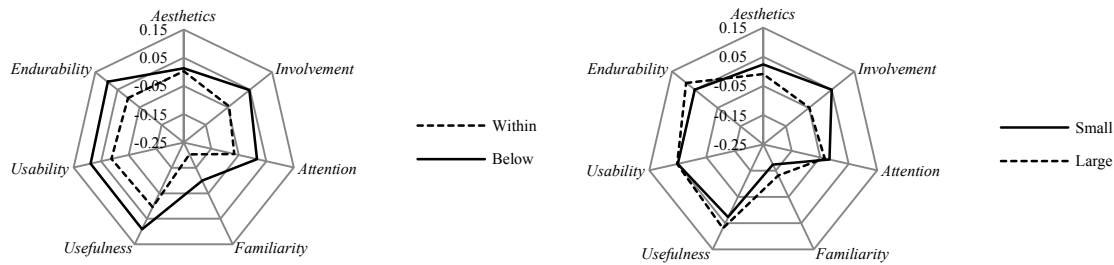
	Aesthetics	Involvement	Attention	Familiarity	Usefulness	Usability	Endurability
Within	0.002	-0.045	-0.067	-0.203	0.005	0.013	0.002
Below	0.013	0.047	0.016	-0.1	0.091	0.088	0.094
Small	0.024	0.05	-0.017	-0.173	0.027	0.05	0.05
Large	-0.009	-0.048	-0.034	-0.131	0.069	0.052	0.088

Figure 2 – Radar Plots and Experiment Data comparing subtitle Within/Below the video and small/large video size

and Perceived Usability that was attached to placing subtitles below the video clip being viewed. Analysis of the qualitative data provided explanation of participant's preferences for subtitle position.

4.1.1 Involvement
Did the subtitles feel connected to the visual content? Did the position have any impact on how involved or immersed you were in the content?

Responses to these questions were mostly positive. Participants stated that felt they were more involved with the subtitled videos due to content not being obscured by the placement of subtitles. For example, P.10 stated that they *much prefer having the subtitles below the screen because you're not missing anything.* Comments suggest that obscuring video content was one of the key benefits to placing subtitles below the video.

However, some participants commented that they felt more involved when subtitles were placed within the video at the bottom, with P19 stating that it was *easier on the eye,* when subtitles were positioned in this way. P.9 also preferred subtitles being displayed within the video at the bottom, adding that *they are almost integrated and you are paying attention to both things [subtitles and video content] at once.*

4.1.2 Endurability
Would you be able to watch subtitles like this for an extended period of time?

Due to the nature of the research, only subjective perceptions of the long-term endurability of positional display could be explored. Estimating the long-term endurability of a system when the only experience that a participant would have was in a lab environment does not, therefore, provide meaningful results. Participants echoed this reasoning in their own comments with P. 0 stating that it was difficult to know which would be easier and that *I'd know better if I was to spend a week watching and trying this out.*

4.1.3 Familiarity
Did this subtitle display feel familiar/strange? Was the display in line with your expectations?

Interestingly, participant questionnaire scorings indicated that subtitles placed below the video clip felt more familiar than subtitles within the video clip, even though this is something that participants had not viewed before.

I'm used to it like A (within) but I prefer it like B (below). (P.2)

A possible reason for this is given by P. 15, who explains that *it felt a bit more natural. It was still weird seeing it not hovering like it normally is with the white writing over the picture.* However, despite this tendency in participants to favour this new method for displaying subtitles, some participants still showed a preference for subtitles being displayed in a comparable fashion to their previous usage. For example, P. 9 stated that they *would pick the subtitles being overlaid...because this is a familiar way of watching.*

4.1.4 Attention
Were you able to focus comfortable on the video content and the subtitles? Did the position of the subtitles have any effect on where your attention was focused during the clip?

The focus that users reported on having regarding the subtitled content was slightly higher when subtitles were placed below the video. A possible reason for this could be that subtitles positioned underneath the video are outside of a viewer's normal viewing pattern and therefore more likely to be noticed and are drawn to their attention; P.6 describes this as being *disjointed*. A second potential reason could be down to the transparency used in the subtitle background, with this creating shifting content when placed on top of the video and consequently being more difficult for users to focus on. This is noted by P.0, who also comments that the placement below the video also puts the subtitles outside of his normal vision.

I think that below is more apparent, but it doesn't show off to my eyes as much. (P.0)

4.1.5 Perceived Usefulness
How useful do you find the subtitle display? Are there any advantages or disadvantages to placing the subtitles in this position?

Participants' comments revealed little difference in their perception of the perceived usefulness of the different subtitle positions, with this potentially due to the subtitles still being useful in both conditions (illustrated by both conditions scoring highly in the questionnaire). However, participants commented

that there could be difficulties in subtitles being placed within the video:

> *When things are moving around in the background behind the subtitles it can be difficult, it's hard to use. I prefer the subtitles being underneath. You don't feel like you are at a disadvantage*

Of note here, is P.20's feeling that when problems occur with subtitle display they feel *disadvantaged*. This feeling of isolation highlights the importance of subtitles to users that rely on them. However, it is common for users to accept subtitle appearance and placement without any criticism. For example, when asked for any advantages or disadvantages that may exist between different subtitling methods, P.9 responded that *I don't want to seem really picky because subtitles are subtitles.*

4.1.6 Perceived Usability
Did the subtitle display have any impact on how comfortably you were able to follow the subtitled content?

The ease at which content can be understood, or its usability, is an important aspect in understanding the user experience attached to subtitle usage. A common theme arising from participants surrounding this was that it was simple to see both the video content and the subtitles. For example, P.11 expressed that *the great advantage is that you can see more of the image, so you can see what is happening.* This ability to see (and separate) the video content from the subtitles made the overall subtitled content more usable for participants. P.5 even went as far to say that subtitles being placed within the video at the bottom *are really annoying to me now*. However, one participant raised concern as to how positioning subtitles underneath the video would work with a decline in vision:

> *As you get older your peripheral vision shrinks, and for that reason having it compact is better. Having subtitles underneath I have to move around a lot more* (P. 19)

Additionally, P.6 described mixed feelings towards the usability associated with subtitles being placed below the video, stating that it was an advantage that '*you get to see the whole video [and] you don't lose any information*' however, they also note the disadvantage attached to this positioning in that '*it feels a bit disjointed and you feel like you have to jump between the two*'.

4.1.7 Aesthetics
How aesthetically appealing did you find the subtitled content? Did the subtitles look 'right' in the context of the webpage?

Several participants commented on improvements in the overall aesthetics of viewing subtitles when they were below the video. For example P.8 stated*, I prefer having the subtitles underneath the footage. It's not super imposed on the image it seems more like part of the image.* Another common reason for this preference was due to the improved contrast between foreground and background.

> *There's a better contrast between the subtitles and the background (*P.10)

This increased contract was due the semi-transparent background used behind the subtitles resulting in a static background when it was not overlaying the moving images. However, this was not an opinion that was shared by all participants. For example, P. 6 stated that they preferred subtitle being overlaid on the video as when subtitles were below the video they were *jumping between the two* and not able to follow the news item as easily. This idea of separation between subtitles and content was mirrored in P. 11 who stated that *aesthetically I like the subtitles over the video better, because it's not blocked off.*

It is also worth noting that the visual difference between subtitles within the video clip and below the video clip was very small. Some participants failed to notice the difference until after they had seen a side-by-side comparison as part of the conversational prompt.

> *I wasn't conscious of this I will admit, but I prefer the dropped box, I feel like I'm getting more of the visuals.* (P.14)

The interview data explained why users preferred the subtitles below the video clip. However, it also showed variation in preference, and reasons for preference which illustrations the limitations of a one size fits all approach to subtitle position.

4.2 Alternative Positions and Giving Participants Control
After completing the original study procedure, participants were shown two further subtitle positions in order to gather feedback on their thoughts of these as alternative positioning for subtitled content. While not a primary research question in this work, these positions were used to explore alternative options that may be beneficial for users. Participants were first shown two additional *conversation prompt cards*, which provided examples of the new subtitle positions – overlaid at the top of the video and above the video. They were then asked for their thoughts and reflections on these. Following this, participants were shown a subtitled video clip and given the opportunity to adjust the position of the subtitles to any of the four positions (the original *below clip* and *bottom of clip,* and the new *top of clip* and *above clip*) in real time through an arrow control at the right hand side of the subtitles. Participants were encouraged to try all of the positions and comment on each. An analysis of further structured conversational data and observational data of participants using a control for subtitle position focused on further understanding participations preferences for subtitle position.

4.2.1 Alternative Subtitle Positions
Participants had mixed opinions about the two new subtitle positions - overlaid at the top, and above the video. Whilst most participants preferred subtitles to be placed at the bottom of the video or below the video, it is worth noting that some participants commented that they would prefer subtitles at the top of the video. Several unexpected reasons were given for this, from personal reading preference to situational dynamics, one participant noted that if felt natural to read the subtitles at the top of the screen and then dropping their eyes down to view the visual content. A further participant commented on the practicality of having them at the top of the screen in a domestic environment with young children.

> *I'm used to reading it along the bottom but I'd prefer it [at the top]. If the kids are in the way I don't need to get them to move I can just look at the top.*
> (P.2)

Corrective lenses also played a decisive factor in a preference for position. Participants wearing bi-focals tended to report preferring the subtitles below the video and participants wearing vari-focals tended to report preferring it above. Whilst tentative, these examples illustrate the additional personal, social and contextual factors that effect subtitle users preferences for subtitle position.

Overall, findings from the qualitative data revealed that most participants preferred subtitles to be positioned at the bottom of the screen, either within the video clip or below the video clip. P 10 commented that *it feels uncomfortable to be reading it at the top* and that *you can get a better idea of what's going on with the*

text at the bottom. This falls in line with guidelines that are used in creating usable subtitles [2], yet it is important to note that these guidelines do not work for all participants. The research illustrated that preference for a position is contingent on a number of interrelated factors. Thus highlighting the limitations of a one size fits all approach in terms of the accessibility of subtitle display.

4.2.2 Control of Subtitles

It is interesting to note that some participants were very open to experimenting with the position of subtitles and that they would try a variety of positions before deciding on the one that they preferred. P10 talked of a conflict between their preference and what they would consider a 'better' position. *I think that my preference is still having it underneath the video. Having it transparent at the top actually works better so I think that would be my second choice but I think personally I would want to be able to choose.*

On being asked to discuss the use of a control for changing the position of subtitles, participants valued being given the option to alter the position to suit their needs or requirements. However, options were divided as to whether this would take the form of a UI setting as shown to participants in the study, or a general setting. Ideally, participants noted that there was value in the *option* of having a UI control for flexibility, but they would also like to be able to set it in a position and then leave it. P.1 referred to this as a *set and forget* method of customisation. Overall, participants valued the ability to control the position of subtitles and saw worth having a feature such as this made available. For example, P15 stated that h*aving the control is good. If that was a feature I'd appreciate it. I'd use it.*

An additional theme that appeared when discussing this control was that that the position of subtitles may change based on the content that is being watched. For example, P. 21 commented that it *makes me realise that I might not have went for the option that I originally thought…it just depends on certain things.* This idea complements the concept that no single interface adaption can address the needs of all users [10] and that adaptions to accessibility service, even at a level as simple as adjusting the position of subtitles, can benefit the end user. This was echoed by P.0, who commented that *I'd like to change it [the subtitles] according to what I'm watching. Potentially I could repair the subtitles to solve the problems that I'm having with them, it would be really helpful.* Overall, participants expressed a need and a desire for feature to allow them to alter the position of subtitles to suits their personal, contextual and content related needs.

5. DISCUSSION

This research shows a significant improvement in user experience when changing the subtitle location from the standard position of within a video at the bottom to below the video clip. Additionally, participants responded positively when given the ability to change the position of subtitles in real time, allowing for a more personalised viewing experience.

An important theme that emerged in discussions about subtitle position and user experience was that user needs are not always being met. For example, fixed subtitle positions can obscure programme information, which can cause immense frustration to the viewer. Furthermore, people's preferences for subtitle position remain dependent on personal and situational needs.

This can have significant consequences on individuals' thoughts towards subtitled services at a very basic level. In the first instance, the absence of adequate subtitles can create a feeling of solitude in viewers with this resulting in a sense of segregation from other members of the audience. *It's not necessarily crucial, but it makes you feel a bit more isolated from the information* (P.20). In the second instance, people feel that their needs are not always being met by the current one-size fits all model.

A secondary theme that emerged among a small subset of users was a discourse of gratitude that subtitles existed at all, subjugated expectations of the subtitled viewing experience that ran counter to conversations of how the service can be improve. This was articulated well by P. 18 who said that *when you're deaf and you're used to being deaf, just having any subtitles at all is a big improvement so I'm not too fussy.* Whilst options to personalise the position, or the ability to control the position were recognised by this group as offering an enhancement to the service, these users didn't want to come across as being seen as being to demanding. This view of the UX of subtitles reveals the problem of lower expectations among some subtitle users with regard to their entitlement to a quality user experience that is equivalent value to non-subtitle users.

The research presented in this work was completed with participants that used subtitles due to a variety of different hearing impairments and that all viewed subtitles in their native (English) language. Additionally, participants viewed only news clips that placed within an Internet browser. Keeping the scope of this study focused in this manner aids in determining outcomes for this specific situation but a number of limitations need to be considered when interpreting this work. Firstly, additional research is needed to understand if the results presented in this paper would hold true for a full screen display (either on a computer screen on standard television set). Secondly, further work is needed to understand if these results would benefit individuals that use subtitles for needs other than as accessibility services (e.g. foreign language subtitles). Finally, an understanding is needed into the effect that a change in genre would have on the positioning of subtitles as discussed in this paper, different on-screen situations may present interesting challenges in the personalisation of subtitle position. Furthermore, this work was conducted as a lab based experiment and therefore results may be different than those experienced by individuals in their own homes and with their own computer equipment.

6. CONCLUSIONS

This work set out to determine firstly, if overall user experience can be improved by changing the position of subtitles from within a video clip to below the video clip being presented and secondly; to discover if participants perceive there to be value in a control to change subtitle position in order to suit their own individual needs. This work reported on a lab-based user study where 26 participants with hearing difficulties took part in an experiment investigating the position of subtitles within, below, and above a video clip placed in a web page. Analysis initially focused on developing an understanding of the user experience that surrounds subtitles placed within or below a video clip. This then moved on to discuss subtitles placed above a video clip and also participant reaction to being given the ability to control the position of subtitles.

Positioning subtitles below a video clip in a web browser, rather than within the video, leads to an increase in user experience. During this work, participants viewed 4 video clips that altered the size of the video (small and large) and also the position of the subtitles in relation to the clip (within the video or below the video). Participants answered a short questionnaire following viewing each video clip. The results from this

questionnaire suggested that there is a significant improvement in user experience when subtitles are placed below the video clip being viewed, rather than within the clip. This was mirrored in conversations with participants; however a more mixed opinion on subtitle position was present indicating limitations to the current one size fits all approach that is used.

Personalisation of subtitle position was viewed positively by participants. Participants were given the opportunity to change the position of subtitles to below, within, and above a news clip. This was met with approval by a large number of participants. Some participants wishing to set it once (e.g. P1 commenting on a *set and forget* method*),* others wished to change the position based on their surrounding (e.g. P2 commenting on *if kids are in the way*) and some commented on changing the position based on what they were watching at the time. The current one size fits all approach to positioning subtitles has clear limitations.

The UX of Subtitled Video Content can only be measured when users believe that adequate access to subtitles exists. Participants in this work highlighted concerns over feelings of exclusion when subtitles are not present, with one participant commenting that *having any subtitles at all is a big improvement, so I'm not too fussy*. This feeling of segregation that exists when subtitles are not present is important to consider in future research in this area. Providing access to clear, accurate, and reliable subtitles must occur before a larger understanding of the user experience of subtitled content can be achieved.

Combined, these results should encourage others to continue examining the use of subtitles in relation to online media. It should also allow others to further question the conventions that exist around standard subtitle practice and user experience.

7. ACKNOWLEDGMENTS

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